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Original Research Article.

Assessing the Relationship Between Thyroid Function and Bone Profile in Menstrual Disorders in Tertiary Care Hospital

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ABSTRACT

Background: Disorders with the menstrual cycle are concerns that affect a woman's regular menstrual pattern and are a frequent cause for women to seek gynecological care. The symptoms of menstrual disorders can interfere with a woman's everyday activities and may impact fertility. One of the most prevalent gynecologic disorders that affect women of childbearing age globally is this condition, with a prevalence ranging from 30 to 70%. No significant data is available for comparison of thyroid profile with bone profile vitamin D, calcium and phosphorus in abnormal uterine bleeding (AUB), polycystic ovarian syndrome (PCOS) and dysmenorrhea are included in menstrual disorders.

Aims and Objectives: Association of thyroid (serum T3, T4, TSH) and bone profile (vitamin D, calcium and phosphorus) in patients with menstrual disorders and normal healthy females.

Materials and Methods: 115 Patients in each group were included from OPD, department of gynecology and obstetrics of Santosh medical college and hospital, Ghaziabad. Females from 18-45 years suffering from different menstrual disorders (AUB, PCOS and Dysmenorrhea) were included.

Results: The most common condition amongst menstrual disorders was PCOS (n=65). The association between thyroid levels and bone profile in various menstrual disorders i.e. AUB, PCOS, and dysmenorrhea was analyzed. Thyroid profile (T3, T4, TSH), PRL and phosphorus in all disorders were higher in comparison with healthy controls. On the other hand, calcium and Vitamin D was significantly lower in disorders in comparison with healthy females.

Conclusion: Serum TSH levels are increased in patients with AUB, PCOS, and dysmenorrhea. In females suffering from these diseases, serum T3 and T4 levels decrease. This shows a high incidence of thyroid disorders, particularly hypothyroidism. This study also suggests that bone profile lowers in females with menstrual disorders. Thus, it may be advantageous to check menstrual problem patients for thyroid dysfunction.

Keywords: Menstrual Disorders, PCOS, AUB, Dysmenorrhea, Bone Profile.

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INTRODUCTION

Menstrual disorders encompass disruptive physical and/or emotional symptoms that occur just before and during menstruation, such as heavy bleeding, skipped periods, and difficult mood swings. Certain women experience their monthly periods without much trouble or worry. Their periods arrive consistently, beginning and ending at almost the same time each month, causing little more than a slight inconvenience.[1] Menstrual irregularities and endocrine irregularities, which lead to anovulation, infertility, and hyperandrogenism, are the hallmarks of PCOS. The two most prevalent endocrine abnormalities associated with PCOS are hyperandrogenism and insulin resistance (IR).[2] Additionally, this causes the ovaries to expand and bulge. In this situation, the ovaries will start producing androgens in excess, which causes symptoms like male pattern hair loss, abdominal weight gain, irregular periods, and in some extreme cases, even infertility.

PCOS, or polycystic ovary syndrome, is a prevalent hormonal disorder that impacts women in their reproductive years. Onset typically occurs during adolescence, with symptoms varying over time. PCOS can lead to hormonal imbalances, irregular menstrual cycles, elevated androgen levels, and the development of ovarian cysts. The irregular menstrual cycles, often accompanied by an absence of ovulation, can hinder fertility. PCOS stands as a primary cause of infertility. This condition is chronic and has no cure, although certain symptoms can be alleviated through lifestyle adjustments, medications, and fertility interventions.

The most prevalent endocrine disorder in the world is a thyroid disorder.[3] Menstrual irregularities and infertility are linked to both PCOS and hypothyroidism, despite their distinct etiopathogenesis.[4] PCOS patients frequently experience thyroid issues, particularly hypothyroidism, which is characterized by elevated levels of thyrotropin releasing hormone (TRH), which changes the ratio of follicle stimulating hormone (FSH) to luteinizing hormone (LH) and elevates dehydroepiandrosterone (DHEAS). FSH receptors are stimulated when thyroid stimulating hormone (TSH) levels are elevated.[5] Elevated ovarian mass and cystic ovarian alterations are caused by variations in thyroid hormone levels. Thyroid problems are more common in PCOS-afflicted women than in the general population, according to a few studies.[6-8]

Although the benefits of vitamin D and calcium for bone health are well established, research on the vitamin's impact in reproduction is still relatively young. The uterus, placenta, and ovary all express vitamin D receptors. Early menarche, dysmenorrhea, uterine fibroids, and pre-syndrome have all been linked to lower vitamin D levels.

Thyroid dysfunction is a critical component of this evaluation. Both hypothyroidism and hyperthyroidism have been associated with various menstrual irregularities, impacting not only the regularity of menstrual cycles but also the levels of sex hormones such as estrogen and progesterone. Hypothyroidism can lead to increased prolactin levels, which further disrupts menstrual function, while hyperthyroidism may accelerate bone turnover and lead to decreased bone mineral density.

Bone health is particularly concerning in women with menstrual disorders, as disruptions in estrogen levels can lead to increased bone resorption and a higher risk of osteoporosis. The combination of hormonal imbalances from thyroid disorders and menstrual irregularities may exacerbate the decline in bone density, placing these individuals at greater risk for skeletal complications later in life.

Given the prevalence of both thyroid disorders and menstrual irregularities, this study aims to investigate the relationship between thyroid function, bone mineral density, and menstrual health. By analyzing thyroid profiles alongside bone health indicators in women experiencing menstrual disorders, we seek to enhance understanding of these interconnected systems and identify potential areas for clinical intervention. This research could ultimately contribute to improved management strategies for women facing these overlapping health issues.

MATERIALS AND METHODS

The study was conducted in the Department of gynecology and obstetrics and department of biochemistry of Santosh medical college and hospital, Ghaziabad. Patient diagnosed for menstrual disorders, visiting the outpatient department (OPD) of gynecology fulfilling the inclusion criteria were enrolled for the study (n=115). 115 age matched healthy females with a regular menstrual cycle constituted the control group.

- Females from 18-45 suffering from different menstrual disorders (AUB, PCOS and Dysmenorrhea) are included.

Exclusion criteria include patients with a history of thyroid disease or current thyroid medication, use of hormonal contraceptives within the last six months, medical conditions affecting bone metabolism (e.g., osteoporosis, chronic renal disease), recent pregnancy or lactation and malignancy.

Ethical Considerations

The study adhered to ethical guidelines, ensuring confidentiality and the right to withdraw from the study at any time without repercussions. Participants were provided with educational materials regarding thyroid and bone health as part of the study. The study was conducted subject to approval from the **Institutional Ethics Committee** (IEC) of Santosh deemed to be university vide letter SU/R/2024/1344[4] dated 17.05.2024 Written and informed consent was obtained from all participants before enrolled into the study. Serum T3, T4, TSH, PRL and Vitamin D were analyzed by CLIA using Cobas e 411 analyzer and Serum Ca, Mg, PO4 were analyzed by Cobas C 311 analyzer.

RESULTS

Table 1 Represents the distribution of females on the basis of different menstrual disorders. The subject distribution includes female with AUB, PCOS, and Dysmenorrhea. The selected females were group on the basis of menstrual disorders as:

- Abnormal uterine bleeding (AUB) n = 32
- Polycystic ovary syndrome (PCOS) n = 65
- Dysmenorrhea n = 18

115 healthy subjects of comparable age with no history of bleeding disorder and a regular menstrual cycle contributed the control group.

Results obtained were presented as mean ± SD in the above-mentioned groups and subjected to statistical analysis. P-value <0.05 was considered as significant.

In table 2 on comparing AUB with healthy females, the mean age for AUB group were statistically lower as compare to healthy subjects(P=NS) T3 and T4 levels for AUB group were significantly lower as compare to healthy subjects (P=0.069, P=0.005)TSH and PRL levels for AUB group were significantly higher as compare to healthy females(P=0.000, P=0.000) Serum Ca and Vitamin D level was significantly lower in AUB group as compare to healthy subjects(P=0.002).

Serum PO4 levels were significantly higher in AUB group as compared to healthy subjects (P=0.000, P=0.000)

Table 3 shows that on comparing PCOS with healthy subjects the mean age for PCOS group were statistically non-significant (P=NS)T3 and T4 levels for PCOS group were significantly lower as compare to healthy females (P=0.311, P=0.633) TSH and PRL levels for PCOS group were significantly higher as compare to healthy females(P=0.040, P=0.000) Serum Ca and vitamin D level was significantly lower in PCOS group as compare to healthy females (P=0.000)Serum PO4 levels were significantly higher in PCOS group as compare to healthy group (P=0.000)

On comparing dysmenorrhea with healthy females Table 4 shows, mean age for Dysmenorrhea group were statistically non-

significant when compared to control group (P=NS)T3 and T4 levels for Dysmenorrhea group were significantly lower as compare to healthy group (P=0.012, P=0.013)TSH and PRL levels for Dysmenorrhea group were significantly higher as compare to healthy subjects(P=0.000, P=0.000)Serum Ca and vitamin D levels were significantly lower in Dysmenorrhea group as compare to healthy subjects(P=0.063) Serum PO4 levels was significantly higher in Dysmenorrhea group as compare to healthy subjects(P=0.000).

Table 5 presents a comparison of the thyroid profile and bone profile between patients with menstrual disorders and healthy subjects. Patients with menstrual disorders exhibit notably elevated thyroid profiles and significantly reduced bone profiles compared to healthy subjects.

Table 1: Distribution of the study subjects on the basis of menstrual disorders

Group	No of subject (n)	Percentage	Total
Abnormal Uterine Bleeding (AUB)	32	27.8%	115
Polycystic Ovary Syndrome (PCOS)	65	56.5%	
Dysmenorrhea	18	15.6%	

Table 2: Comparison of Thyroid Profile and bone profile in the AUB group

PARAMETER	CONTROL(N=115)	AUB (N=32)	p-value
AGE (years)	32.30±6.24	31.63±3.34	NS
T_3 (ng/ml)	1.22±0.21	1.23±0.63	0.069
T_4 (µg/dl)	7.44±2.75	6.75±3.12	0.005
TSH (µlU/ml)	3.66±0.99	5.81±3.02	0.000
PRL (ng/ml)	9.79±4.72	19.11±7.50	0.000
Ca (mg%)	9.28±0.63	7.14±1.76	0.002
Po4 (mg%)	4.03±0.60	5.28±1.39	0.000
Vitamin D (ng/ml)	32.14±13.47	18.56±9.63	0.000

Table 3: Comparison of Thyroid Profile and bone profile of the PCOS group

PARAMETER	CONTROL (n=115)	PCOS (n=65)	P-value
AGE (years)	32.30 ± 6.24	33.63 ± 4.50	NS
T_3 (ng/ml)	1.22±0.21	1.40±0.44	0.311
T_4 (µg/dl)	7.44±2.75	7.85±2.85	0.633
TSH (µlU/ml)	3.66±0.99	4.04±6.19	0.040
PRL (ng/ml)	9.79±4.72	28.41±17.11	0.000
Ca (mg%)	9.28±0.63	7.93±1.55	0.000
Po4 (mg%)	4.03±0.60	5.43±1.64	0.000
Vitamin D (ng/ml)	29.5±7.51	17.25±10.14	0.000

Table 4: Comparison of Thyroid Profile and bone profile of the Dysmenorrhea group

PARAMETER	CONTROL (n=115)	DYSMENORRHEA (n=18)	P-value
AGE (years)	32.30±6.24	34.68±7.00	NS
T_3 (ng/ml)	1.22±0.21	1.65±0.91	0.012
T_4 (µg/dl)	7.44±2.75	7.12±4.11	0.013
TSH (µlU/ml)	3.66±0.99	5.94±3.52	0.000
PRL (ng/ml)	9.79±4.72	21.65±12.81	0.000
Ca (mg%)	9.28±0.63	7.75±1.72	0.063
Po4 (mg%)	4.03±0.60	5.21±1.54	0.000

Table 5: Comparing thyroid profile and bone profile in patients with healthy subjects

	THYROID PROFILE			BONE PROFILE		
Parameter	**T3**	**T4**	**TSH**	**Ca**	**Po4**	**Vitamin D**
Patients N=115	1.40±0.56	7.45±2.05	5.16±6.52	6.95±2.11	6.23±1.44	17.21±9.17
Healthy Subjects N=115	1.22±0.21	7.44±2.75	3.66±0.99	9.28±0.63	4.03±0.60	32.14±13.47
P- Value	0.311	0.633	0.040	0.00	0.00	0.00

DISCUSSION

The thyroid gland secretes two important hormones T4 and T3. T3 is naturally a more dynamic form of thyroid hormone produced through the deiodination process of T4 with the help of enzyme T4-5' deiodinase in peripheral tissues.[9] Further, it is observed that uremia knowingly diminishes the production of a dynamic form of thyroid hormone. In day-to-day life, thyroid hormones play vital roles such as thermoregulation, regulation of body hemodynamic and almost all the body's metabolisms including carbohydrate, fat, proteins and electrolyte homeostasis.

Thyroid dysfunctions affect menstrual cycle. Studies depict correlation of thyroid disorders (hypo & hyperthyroidism) with menstrual disturbances including anovulatory cycles.

In 2019 a study Ebrahimabad M et al., concluded Vitamin D and calcium were significantly lower in patients with hypothyroidism (P<0.0001). Free T3 and calcium levels differed significantly among hypothyroid patients based on their vitamin D status (P<0.0001), but vitamin D levels were within sufficient range in all groups.[10]

In the study by Nath CK, Barman B, Das A, et al., 2019 FSH/LH ratio abnormality was detected in 70% of patients. Hypothyroidism was a common endocrinal abnormality and prolactin was inversely correlated to TSH levels in PCOS patients.[11] According to John JD et al., 2017 the serum prolactin levels and the serum TSH levels showed a perfect positive correlation which indicates that as the TSH level increases prolactin levels also increases in AUB patients.[12] In 2018Anuj Modi et al., concluded that hyperthyroidism and hypothyroidism may lead to hypercalcemia and hypocalcemia respectively, which are the cause of may disorders and disabilities.[13] N Bhavani et al., 2015 reported that both subclinical hypothyroid and overt hypothyroid cases together were the commonest thyroid dysfunction and menorrhagia was their commonest menstrual abnormality. [14]

In our study T3 and T4 levels in AUB group were significantly lower. TSH level in AUB group were significantly higher as compare to healthy control group. Pahwa S et al. 2013, reported that in their study that out of 100 AUB patient, 22 were found to be hypothyroid, 2 hyperthyroid and the rest of the patient were euthyroid.[15] Seeri O et al., reported that the prevalence of hyper prolactinemia is 15-20% in women with AUB. S. Kirti et al found decreased levels of vitamin D in women presenting with abnormal uterine bleeding. It is very important to check for vitamin D levels at the baseline itself when women present with abnormal uterine bleeding. This clearly indicates that the therapeutic approach should be directed towards supplementation of Vitamin D in reproductive women with abnormal uterine bleeding.[16]

In the present study TSH levels in PCOS group were significantly higher as compared to healthy control group. Blackwell RE et al., reported that deficiency of thyroid hormones has many profound end organ effects, which also include those in the reproductive system of the human female. Thyroid dysfunction can impact the secretion of gonadotropins by elevating the level of prolactin in the bloodstream. According to Kakuno Y et al., menstrual disturbances have been linked to thyroid dysfunction, with some studies showing varying rates of menstrual disorders in this condition.[17] Dahiya K et al. also discovered elevated TSH levels in patients with PCOS. Janssen OE et al. found a high prevalence of thyroid dysfunction in cases of PCOS.[18]

A study in North India revealed a significant connection between vitamin D deficiency and thyroid disorders, and it also established a notable negative correlation between TSH and vitamin D levels.[19]

TSH levels in Dysmenorrhea group were significantly higher as compared to healthy control group. Kumar P et al., reported that hypothyroidism is associated with an increase in thyrotrophin releasing hormone which in turn may be associated with a raised PRL level and hence amenorrhea.[20]

The results of this study are aligned with findings from other research, underscoring the potential role of Vitamin D in managing dysmenorrhea. An observational trial identified that participants with lower serum Vitamin D levels experienced more severe dysmenorrhea.[21]

A randomized controlled study reported lower serum Vit. D in dysmenorrhea has a negative correlation between dysmenorrhea and Vit. D.[22]

Although our research offers important insights, it is important to acknowledge certain limitations. The cross-sectional design hinders our ability to establish causation, and the sample size may not accurately reflect the wider population of women with menstrual disorders. Moreover, self-reported menstrual histories could be influenced by recall bias. It is essential to conduct future longitudinal studies to gain a deeper understanding of these associations.

CONCLUSION

Our study indicates a relation between thyroid levels and bone profile in different menstrual disorders including AUB, PCOS and Dysmenorrhea. It was observed that there is an increase in serum TSH and PRL in patient of AUB, PCOS, and dysmenorrhea. Females with these disorders experience a decrease in serum T3 and T4 levels. Bone profile i.e. vitamin D and Ca in these disorders are significantly lower, which further suggest supplementation of these minerals in females.

The interrelation of thyroid function, menstrual disorders, and bone health underscores the need for a holistic approach to the management of women presenting with these issues. Clinicians should consider routine screening for thyroid dysfunction in patients with menstrual irregularities, especially given the potential for early intervention to mitigate long-term complications such as osteoporosis.

Additionally, educating patients about the importance of maintaining bone health through adequate nutrition and physical activity is vital, particularly for those experiencing menstrual disruptions. Further research is warranted to explore the long-term effects of thyroid disorders on bone health in this population, as well as to assess the impact of treatment interventions on both menstrual and bone health outcomes. Our research highlights the significant associations between thyroid function, menstrual disorders, and bone health. Understanding these relationships is essential for improving the management of affected women and preventing long-term health consequences.

REFERENCES

1. Odongo, E., Byamugisha, J., Ajeani, J. et al. Prevalence and effects of menstrual disorders on quality of life of female undergraduate students in Makerere University College of health

sciences, a cross sectional survey. BMC Women's Health 2023, 23, 152.
2. Bharali MD, Rajendran R, Goswami J, Singal K, Rajendran V. Prevalence of Polycystic Ovarian Syndrome in India: A Systematic Review and Meta-Analysis. Cureus. 2022;14(12):e32351.
3. Smith RP. Cyclic pelvic pain and dysmenorrhea. Obstet Gynecol Clin North Am. 1993;20:753-764
4. Unnikrishnan AG, Kalra S, Sahay RK, Bantwal G, John M, Tewari N. Prevalence of hypothyroidism in adults: An epidemiological study in eight cities of India. Indian J Endocrinol Metab. 2013;17:647- 52.
5. Marwaha RK, Tandon N, Ganie MA, Kanwar R, Sastry A, Garg MK, et al. Status of thyroid function in Indian adults: Two decades after universal salt iodization. J Assoc Physicians India. 2012;60:32- 6.
6. Erel CT, Senturk LM, Kaleli S, Gezer A, Baysal B, Tasan E. Is serum leptin level regulated by thyroid functions, lipid metabolism and insulin resistance in poly cystic ovary syndrome? Gynecol Endocrinol. 2003; 17(3):222-3.
7. Sinha U, Sinharay K, Saha S, Longkumer TA, Baul SN, Pal SK. Thyroid disorders in polycystic ovarian syndrome subjects: A tertiary hospital based cross sectional study from Eastern India. Indian J Endocrinol Metab 2013; 17:304- 9.
8. Janssen OE, Mehlmauer N, Hahn S, Offner AH, Gärtner R. High prevalence of autoimmune thyroiditis in patients with polycystic ovary syndrome. Eur J Endocrinol 2004;150:363-9.
9. Sabatino L, Vassalle C, Del Seppia C, Iervasi G. Deiodinases and the Three Types of Thyroid Hormone Deiodination Reactions. Endocrinol Metab (Seoul). 2021 Oct;36(5):952-964.
10. Zare Ebrahimabad M, Joshaghani HR Vitamin D Status and its Relationship with Thyroid Function Parameters in Patients with Hypothyroidism. mljgoums. 2019; 13(5): 8-12
11. Nath CK, Barman B, Das A, et al. Prolactin and thyroid stimulating hormone affecting the pattern of LH/FSH secretion in patients with polycystic ovary syndrome: A hospital-based study from North East India. J Family Med Prim Care. 2019;8(1):256-60.
12. John JD, Damodaran V, Radhakrishnan S. Assessment of thyroid and prolactin levels among the women with abnormal uterine bleeding. Int J Reprod Contracept Obstet Gynecol 2017;6:2547.
13. Modi A, Sahi N. Effect of thyroid hormones on serum calcium and phosphorous. Int J Clin Biochem Res. 2018;5(4):570-573.
14. Bhavani N, Avanthi S, Aradhana G, Sangeeta C, Prasannakumar VS. A study of correlation between abnormal uterine bleeding and thyroid dysfunction. Int J Recent Trends Sci Tech. 2015;14(1):131-135.
15. Pahwa S, Gupta S, Kumar J. Thyroid dysfunction in dysfunctional uterine bleeding. J Adv Res Bio Sci 2013; 5(1):73-8.
16. S. kriti, K. apeksha. Study of vitamin D levels in women with abnormal uterine bleeding. Journal of cardiovascular research 2023; 14(11): 980-986.
17. Kakuno Y, Amino N, Kanoh M, Kawai M, Fujiwara M, Kimura M, et al. Menstrual disturbances in various thyroid diseases. Endocr J. 2010;57(12):1017-22.
18. Dahiya K, Sachdeva A, Singh V, Dahiya P, Singh R, Dhankhar R, Ghalaut P, Malik I. Endocrinol 2012; 3 (6): 34-55.
19. Janssen OE, Mehlmauner N, Hahn S, Offner AH, Gartner R. High prevalence of autoimmune thyroiditis in patient with polycystic ovary syndrome. Eur J Endocrinol. 2004:150(3):363-9.
20. Gupta G, Sharma P, Kumar P, Itagappa M. Study on Subclinical Hypothyroidism and its Association with Various Inflammatory Markers. J Clin Diagn Res. 2015 Nov;9(11):BC04-6.
21. Lin K-C, Huang K-J, Lin M-N, Wang C-Y, Tsai T-Y. Vitamin D Supplementation for Patients with Dysmenorrhoea: A Meta-Analysis with Trial Sequential Analysis of Randomised Controlled Trials. Nutrients. 2024; 16(7):1089.
22. Chen YC, Chiang YF, Lin YJ, Huang KC, Chen HY, Hamdy NM, Huang TC, Chang HY, Shieh TM, Huang YJ, Hsia SM. Effect of Vitamin D Supplementation on Primary Dysmenorrhea: A Systematic Review and Meta-Analysis of Randomized Clinical Trials. Nutrients. 2023 Jun 21;15(13):2830.

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