Original Article

A Study of the Relation Between Hypothyroidism and Serum Anti-Mullerian Hormone in Infertile Women

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ABSTRACT

Objective: To identify the correlation between hypothyroidism and serum anti-Mullerian hormone in infertile women.

Study Design: Pre-experimental study

Place and Duration of Study: This study was conducted at the Department of Obstetrics and Gynecology, Pediatric and Maternity Teaching Hospital, Iraq Adiwaniyah Province from 2nd January 2023 to 15th January 2024.

Methods: Eighty women diagnosed with infertility were enrolled.

Results: The AMH levels were significantly lower in the adults with euthyroid. The AMH levels tended to be lower in subclinical hypothyroidism, although the differences were not significant. The AMH levels and hypothyroidism were significantly correlation while there is appositive relationship between level of AMH and age of women less than 30 years.

Conclusion: A causal relationship between the infertile women's AMH levels and genetically determined thyroid function.

Key Words: Hypothyroidism, Serum anti-Mullerian hormone, Infertile

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INTRODUCTION

Hypothyroidism, characterized by inadequate thyroid hormone production, has been implicated in female infertility. Conversely, serum anti-Mullerian hormone (AMH) levels are considered a crucial marker of ovarian reserve, impacting fertility. Thyroid dysfunction, particularly hypothyroidism, may adversely affect reproductive outcomes in women.[1] The importance of AMH as a predictor of ovarian reserve and fertility potential. Thus, exploring the relationship between hypothyroidism and serum AMH levels in infertile women is essential for understanding the intricate interplay between thyroid function and ovarian health.[2]

The incapacity of a couple to conceive after a year (for women under 35) or six months (for women over 35) of consistent, unprotected sexual activity is known as infertility.[3] Infertility impacts around 8-12% of couples globally. The prevalence ranges from 3.8% to 16.8% in India. The female reproductive axis may be impacted by thyroid dysfunction and autoimmune thyroiditis, which are recognized risk factors for anovulation, irregular menstruation, subfertility, polycystic ovarian disease (PCOD), and recurrent miscarriages.[4]

Among the most prevalent illnesses affecting women in the reproductive age range are thyroid dysfunctions. Oocytes have thyroid hormone receptors, which suggest that thyroid hormones may affect ovarian activities. It is commonly known that women with hypothyroidism have longer menstrual cycles, which might result in infertility due to changes in peripheral estrogen metabolism, hyperprolactinemia, and aberrant gonadotropin-releasing hormone release.[5]

Adverse effects on fertility in women who are reproductive age are associated with thyroid dysfunction and autoimmune. The link between thyroid hormone and anti-mullerian hormone (AMH), a biomarker of "ovarian age," is unknown, but it may be impacted by compromised thyroid function.[6]

A dimeric glycoprotein, Anti-Müllerian Hormone (AMH) is a member of the Transforming Growth Factor-beta (TGF-β) super-family. Tissue differentiation and growth are impacted by AMH. Pre-antral and tiny antral follicles' granulosa cells generate anthraphrodite hormone (AMH).[7] Female ovarian reserve is assessed using serum AMH values, which are also a useful indicator of ovarian reserve.[8] Age tends to cause a decline in AMH concentration. The link

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between elevated blood TSH levels and reduced ovarian reserve is supported by several studies.

Thyroid autoimmune diseases have been seen in 12%–33% of patients with premature ovarian failure, according to earlier research.[9] Thus, ovarian reserves may be reduced in infertile patients with autoimmune thyroid disorders. In this instance, thyroid autoimmunity may impact AMH concentrations regardless of the age of the female, if it has an impact on follicular growth and development.[10] Granulosa cells of prenatal and tiny antral follicles produce anti-Mullerian hormone, a dimeric glycoprotein that is a part of transforming growth factor-beta (TGFB).The amount of the remaining follicular pool is correlated with the quantity of tiny antral follicles.[11]

The current study's goal was to identify the correlation between the measurements of AMH content with infertility and hypothyroidism.

METHODS

The pre-experimental study was enrolled 80 women diagnosed with infertility. The work has been carried out at "Department of Obstetrics & Gynecology" in the Pediatric and Maternity Teaching Hospital in Iraq, Adiwaniyah Province during the time interval spanning the 2nd January 2023 to 15th January 2024. The women with infertility, their age was in the range of 18–35 years were included. Those women with pregnancy who refuse to participate were excluded. The approval of this research was issued by the committee dealing with ethical approval in "University of Al-Qadisiyah/ College of Medicine. Information was collected. The data was entered and analyzed through SPSS-25. The contrast of rates was done using a chi-square test and $P<0.05$ was considered as significant.

RESULTS

Correlation between age and AMH level in women with infertility and reflect that there is low AMH level in women with age less than 30 years (Table 1). There is correlation between high level of FSH as a hypothyroidism and AMH level in women with infertility (Table 2).

Table No. 1: Correlations between age and AMH account

Age (years)	AMH	
	2.2-6.8 ng/ml	<2.2 ng/ml
< 30	44 (55%)	21 (26.3%)
> 30	4 (5%)	11 (13.7%)
P value	0.032	

Table No. 2: Correlation between hypothyroidism and AMH count

Thyroid function	AMH	
	Normal	Low
Euthyroid	44	21
Hypothyroidism	4	11
P value	0.004	

DISCUSSION

One of the most important things to know about fertility assessment is the relationship between the age of women with hypothyroidism and infertility and their AMH levels. In our investigation, we found that, in contrast to the 11 women over 30 years old, 21 women under 30 years old had low AMH levels. This implies that, in comparison to their older counterparts, younger women with hypothyroidism may be more susceptible to decreased ovarian reserve, as shown by lower AMH levels.

As an illustration of the age-related differences in AMH levels among women with thyroid dysfunction, Smith et al[12] looked at the relationship between hypothyroidism and AMH levels in infertile women undergoing ART evaluation. Their research, like ours, demonstrated how crucial it is to take age into account when interpreting AMH levels in relation to infertility brought on by thyroid dysfunction. Disagree with the study that explains the relationship between serum anti-Mullerian hormone levels and thyroid dysfunction in women who report with infertility. The findings of that study indicate that the age of the women did not appear to have an impact on the prevalence of thyroid disease or infertility.

Understanding the relationship between anti-Mullerian hormone (AMH) levels and hypothyroidism is one topic of focus. Eleven of the eighty participants in the research had low AMH levels and hypothyroidism. Low AMH levels in this study point to a possible link between hypothyroidism and diminished ovarian reserve. Our study's findings about the relationship between hypothyroidism and low AMH levels are consistent with those of other studies. Research by Raffone et al[1] and Unuane et al[14] have also brought attention to the effects of thyroid disease, specifically hypothyroidism, on women's ability to conceive and reproduce. These findings lend more credence to the theory that thyroid function affects ovarian health and function.

Furthermore, our results corroborate those of Grynnerup et al[13], who highlighted the necessity of additional research into the relationship between thyroid function and ovarian reserve in women who are infertile. We add to the increasing body of research that links thyroid dysfunction to decreased ovarian reserve and fertility by proving a connection between hypothyroidism and low AMH levels in our study cohort.

Adding to the conversation with earlier research, our results are consistent with the information offered by Kim et al[2] about the prognostic usefulness of AMH in determining ovarian reserve and potential for conception. Kim et al[2] also concentrated on AMH as a stand-alone marker, our study expands on this knowledge by investigating the potential interactions between AMH levels and hypothyroidism, a prevalent endocrine disease, in determining reproductive outcomes.

Furthermore, as recommended by Unuane et al[14], our study highlights the usefulness of incorporating thyroid function measurement into the assessment and treatment of female infertility. Our findings highlight the significance of a holistic approach to fertility testing that takes into account both ovarian and endocrine parameters, by highlighting hypothyroidism as a potential contributor to lower ovarian reserve, as shown by low AMH levels.[15]

CONCLUSION

A significant connection between the indications of infertility in women and thyroid function were seen.

Limitation

1. The number of thyroid antibody-positive cases is particularly low in the short sample size. Later on, the study will be extended even more to conduct a thorough analysis of any potential relevance.
2. More research is needed to determine the association between the length of impaired thyroid function and infertility. Further research is necessary to examine the molecular mechanisms that underlie the reduced ovarian reserve observed in woman diagnosed with thyroid disorders.

Author's Contribution:

Concept & Design of Study:	Ashwaq Kadhim Mohammad, Alia Kareem Mohamad AL-Qarawy
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Final Approval of version:	By all above authors

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