Correlation between serum anti-müllerian hormone AMH and total testosterone for those with infertile Iraqi men

3 authors:

Duraid Abdulkareem
University of Anbar
5 PUBLICATIONS **0** CITATIONS

SEE PROFILE

Muhammad Hammad Jasim Alajeely
University of Anbar
8 PUBLICATIONS **0** CITATIONS

SEE PROFILE

Ehab Mohammad
11 PUBLICATIONS **1** CITATION

SEE PROFILE

Some of the authors of this publication are also working on these related projects:

Project   The Role of Prophylactic "Window" Hydrocelectomy in Prevention of Postvaricocelectomy Hydroceles View project

Correlation between serum anti-müllerian hormone AMH and total testosterone for those with infertile Iraqi men

Duraid Taha Abdulkareem[1], Muhammad Hammad Jasim Alajeely[2],Ehab Jasim Mohammad[3]

[1, 2] College of Medicine, University of Anbar, Ramadi, Iraq,
[3] College of Medicine, IbnSina University of Medical and Pharmaceutical Sciences, Baghdad, Iraq

*Corresponding author: ehabgmh@yahoo.com (Mohammad)

Abstract

Anti-Müllerian Hormone (AMH) is a dimeric glycoprotein hormone belonging to the transforming growth factor-beta family of the growth of the factor. It is secreted via the sertoli cells and is accountable for the abatement of Müllerian ducts in the male sexual discrimination, but formed if testicular Sertoli cells are existent and can thus aid in the diagnostic road for the unrest the development sexual. Testosterone as an AMH regulator has the possibility of lessening AMH term in Sertoli cells. The objective of the study is to correlate the relationship within serum testosterone-AMH ratio due to adult male infertility, which may provide further clues to investigate the potential regulation and biological mechanism of male fertility. The subjects involved in this study were 26 consecutive male patients aged ranging (22-57) years presented, with infertile complications. Total testosterone, FSH and AMH levels are tested. Variables of the clinical and laboratory display were expressed as mean ± SD. ANOVA was used for the comparison of variables. Pearson correlation coefficients were calculated for the whole study Mean (± SD) age for the patients was 38.08±9.91 (p<0.001), range (22-57) years. The AMH range value (4.3- 9.22) ng/ml and total testosterone was (208-402) ng/mL. Infertile patients are shown a decrease in testosterone levels beyond 40 years of age. It was noted to be reduced with aging progress (388.2 & 288.6 respectively). The AMH level in adult males is significantly elevated, as the class of age increased (5.40.15 & 7.69 respectively). The decline in testosterone and increase in AMH showed a significant inverse correlation (r=-517, p=0.008). The positive correlation between serum testosterone and FSH for males recorded in our study was (r=+0.552, p=0.004). AMH was observed strongly negatively associated with FSH (r =-0.684, p<0.001). In conclusion, Low testosterone levels in infertile men associate with AMH levels. Our result may suggest that the correction of the Testosterone/AMH ratio is important in improving fertility. A prospective controlled study is required to assess the hypothesis generated by the current study.

Key words: Anti-Müllerian Hormone (AMH), Total Testosterone, FSH, Sertoli cells

Introduction

Anti-Müllerian Hormone (AMH), too well-known as müllerian-inhibiting substance, is a dimeric glycoprotein hormone belonging to the transforming growth factor-beta family of growth factors [1]. It is secreted via the Sertoli cells and is accountable for the abatement of Müllerian ducts in the male sexual discrimination [2, 3]. The concentrations of AMH serum in males found high in males under 2 years old and then gradually lowering to puberty. the endocrinology In pediatric clinical the function of AMH, as an indication of Sertoli cells function, and the importance of testosterone levels, also an indication of function Ledig cells [4]. Male AMH is rise at birth continue at a high postnatal level till puberty. Though beginning and expression continued basal of fetal male AMH is independent gonadotropin, Follicle Stimulating Hormone (FSH) testicular spur Sertoli cell proliferation up organize AMH transcription [5]. However, to the beginning of puberty, the rise intratesticular production of androgens, along with the term of the Sertoli cell receptor androgen, beat the stimulatory effect of FSH on AMH production, major to the downregulation of AMH [6, 7]. In the adult male, AMH expression in slightly

indistinguishable Sertoli cells that are occasionally seen in infertile men, often in cell Sertoli only tubules [8, 9]. Because of the variations gender concentrations of the AMH, its changes in concentrations circulating for development sexual, and it's explicit for Sertoli and cell granulosa, measurement of AMH has an interest in the estimate of the gonadal role, gender and as a gonadal growth indication [10, 11]. Testosterone as an AMH organizer has the possibility of lessening AMH term in Sertoli cells. The guide is based on the reverse association among testosterone and AMH levels in the process development of males [12]. The objective of the study is to correlate the relationship within serum testosterone-AMH ratio due to adult male infertility, which may provide further clues to investigate the potential regulation and biological mechanism of male fertility.

Methods
A total of 26 consecutive male patients aged ranging (22-57) years presented, with infertile complication to Al-Andalus private urology clinics, Ramadi, Iraq, from August 2019 to December 2019. In the study, blood fresh was drawn from patients and allowed to clot at the temperature room. The serum was prepared via centrifugation 1 to 2 hr. after blood collection and tested to determine total testosterone, FSH and AMH levels utilizing MiniVidas which is a compact automated immunoassay method based on the (ELFA) principles. Patients suspected of thyroid dysfunction, previous surgery or medication, diabetes mellitus, and kidney failure were excluded from the study. The patients were divided into 2 groups according to their age: less than 40 years, and equal or over 40 years. The statistics of 2 different age groups and the average, mean values of the clinical and laboratory variables are depicted in table-1.

Table(1): Clinical parameters of patients undergoing infertile male.

Parameters	< 40y	≥ 40y	Total	Normal value	p-value
Number of patients (%)	15 (57.7)	11 (42.3)	26 (100)		
Age, mean ±SD	31.00±5.25	47.73±5.42	38.08±9.91		p<0.001
BMI, mean ±SD	25.21±2.13	26.03±1.63	25.56±1.94	18.5-24.9 kg/m^2	
AMH, mean ±SD	5.40±0.81	7.69±0.85	6.37±1.41	0.7-19 ng/ml	p<0.001
tTes, mean ±SD	338.2±67.4	288.6±40.4	317.2±61.8	262-870ng/ml	p<0.05
rTES/AMH ±SD	65.19±19.79	37.90±6.52	53.65±20.63		p<0.001
FSH, mean ±SD	6.07±0.98	4.79±0.19	5.53±0.98	1.7-12 µIU/ml	p<0.001

Abbreviations: BMI, Body Mass Index;AMH, Anti-Mullerian Hormone; tTes, total Testosterone;rTES/AMH, serum ratio (total Testosterone/AMH);FSH,Follicle Stimulating Hormone; SD, standard deviation.

Results
As shown in table-1, the mean age for the patients was 38.08±9.91 (p<0.001). The maximum age of the patient enrolled for the study was 57 years and the minimum was 22 years. The maximum AMH value recorded in the study was 9.22ng/ml and the minimum was 4.31ng/ml, though the mean AMH was 6.37±1.41 ng/ml (p<0.001). The maximum total testosterone was 402ng/mL, and the minimum was 208ng/mL as shown in table-1. Statistical analysis was carried out by SPSS statistics (IBM Corp., New York, United States) version 23 program. One-way analysis of variance (ANOVA) test to analyze several in numerical data (age, BMI, AMH, tTes, FSH and rTes/AMH) among different age groups and catheter usage groups. Pearson correlation test was performed to compare age with other variables such as AMH, tTes, FSH and rTes/AMH are depicted in table-2. AP value of less than 0.001 was considered statistically significant.

Table(2): Pearson Correlations.

Parameters	FSH	rTes/AMH	tTes	AMH	BMI
Age	-0.685***	-0.756***	-0.526**	+0.882***	-0.013
BMI	-0.347	+0.023	+0.150	+0.049	
AMH	-0.684**	-0.783***	-0.517**		
tTes	+0.552**	+0.903***			

rTes/AMH	+0.784***

Discussion

Infertile patients are shown a decrease in testosterone levels beyond 40 years of age which agrees with previous studies [13]. It was noted to be reduced with aging progress (388.2 & 288.6 respectively) as shown in table (1). The present study confirmed previous studies that showed that the AMH level in adult males is significantly elevated [14]. As the class of age increased (5.40.15 & 7.69 respectively). The decline in t-Tes and increase in AMH showed a significant inverse correlation (r=-517, p=0.008) was compatible with previous studies [12]. The positive correlation between serum t=Tes and FSH for males recorded in our study was (r=+0.552,p=0.004) as other studies [15].

Previously Young *et al.*, found a negative correlation among AMH and FSH, as in our study AMH was observed strongly negatively associated with FSH (r =-0.684, p<0.001)[16]. AMH was observed robustly negative connected with FSH (r =-0.684, p<0.001) [16]. AMH term and excretion via Sertoli cells is adjusted via inhibitory paracrine actions of intratesticular testosterone and neighboring germ cells and via a stimulating hormonal effect of FSH. The effect of FSH on testicular AMH production may be due to immediate effect on AMH term in each individual Sertoli cells, a proliferative impact on Sertoli cells, or both. The testis prepubertel is mainly composed of Sertoli cells, which clarify, most than 75% of the mass of gonadal [17] and are active [18]. Determination of the AMH to use to reconnoiter the reserve of the function in response to FSH, because the spermatogenic possibility of the testis is reliant on the role of the Sertoli cells [19, 20].In conclusion, Low testosterone levels in infertile men associate with AMH levels. Our result may suggest that the correction of the Testosterone/AMH ratio is important in improving fertility. A prospective controlled study is required to assess the hypothesis generated by current study.

References

1. Josso N. Anti-Müllerian hormone: Hormone or growth factor? Prog Growth Factor Res.1990; 2(3):169–79.
2. Josso N, Cate rl, Picard J-Y, Vigier B, DI Clemente N, Wilson C, et al.Anti-Müllerian hormone: the Jost factor. In: Recent progress in hormone research.Elsevier; 1993. p. 1–59.
3. Rey RA, Grinspon RP. Normal male sexual differentiation and aetiology of disorders ofsex development. Best Pract Res ClinEndocrinolMetab. 2011; 25(2):221–38.
4. Josso N, Rey RA, Picard J-Y. Anti-Müllerian hormone: a valuable addition to the toolboxof the pediatric endocrinologist. Int J Endocrinol. 2013; 2013.
5. Ahmed SF, Achermann JC, Arlt W, Balen A, Conway G, Edwards Z, et al. Society forEndocrinology UK guidance on the initial evaluation of an infant or an adolescent with asuspected disorder of sex development (Revised 2015). ClinEndocrinol (Oxf).2016; 84(5):771–88.
6. Aksglæde L, Sørensen K, Boas M, Mouritsen A, Hagen CP, Jensen RB, et al. Changes inanti-Mullerian hormone (AMH) throughout the life span: a population-based study of1027 healthy males from birth (cord blood) to the age of 69 years. J ClinEndocrinolMetab. 2010; 95(12):5357–64.
7. Lukas-Croisier C, Lasala C, Nicaud J, Bedecarrás P, Kumar TR, Dutertre M, et al.Follicle-stimulating hormone increases testicular Anti-Mullerian hormone (AMH)production through sertoli cell proliferation and a nonclassical cyclic adenosine 5′-Monophosphate-mediated activation of the AMH Gene. MolEndocrinol.2003; 17(4):550–61.
8. Steger K, Rey R, Kliesch S, Louis F, Schleicher G, Bergmann M. Immunohistochemicaldetection of immature Sertoli cell markers in testicular tissue of infertile adult men: a5preliminary study. Int J Androl. 1996; 19(2):122–8.
9. Rajpert-De Meyts E, Jørgensen N, Græm N, Müller J, Cate RL, SkakkebækNE.Expression of anti-Mullerian hormone during normal and pathological gonadaldevelopment: association with differentiation of Sertoli and granulosa cells. J ClinEndocrinolMetab. 1999; 84(10):3836–44.
10. Lindhardt Johansen M, Hagen CP, Johannsen TH, Main KM, Picard JY, Jørgensen A, etal. Anti-Müllerian hormone and its clinical use in pediatrics with special emphasis ondisorders of sex development. Int J Endocrinol. 2013; 2013.
11. Ahmed SF, Keir L, McNeilly J, Galloway P, O'toole S, Wallace AM. The concordancebetween serum anti-Mullerian hormone and testosterone concentrations depends onduration of hCG stimulation in boys undergoing investigation of gonadal function. ClinEndocrinol (Oxf). 2010; 72(6):814–9.

12. Al-Attar L, Noël K, Dutertre M, Belville C, Forest MG, Burgoyne PS, et al. Hormonal andcellular regulation of Sertoli cell anti-Müllerian hormone production in the postnatalmouse. J Clin Invest. 1997; 100(6):1335–43.

13. Moskovic DJ, Eisenberg ML, Lipshultz LI. Seasonal fluctuations in testosterone-estrogenratio in men from the southwest United States. J Androl. 2012; 33(6):1298–304.

14. Tehrani FR, Mansournia MA, Solaymani-Dodaran M, Minooee S, Azizi F. Serumvariations of anti-mullerian hormone and total testosterone with aging in healthy adultIranian men: A population-based study. PLoS One. 2017; 12(7):1–13.

15. Vasquez JM, Ben-Nun I, Greenblatt RB, Mahesh VB, Keel BA. Correlation betweenfollicle-stimulating hormone, luteinizing hormone, prolactin, and testosterone with spermcell concentration and motility. Obstet Gynecol. 1986; 67(1):86–90.

16. Young J, Chanson P, Salenave S, Noël M, Brailly S, O'Flaherty M, et al. Testicular anti-mullerian hormone secretion is stimulated by recombinant human FSH in patients withcongenitalhypogonadotropichypogonadism. J ClinEndocrinolMetab. 2005; 90(2):724–8.

17. Nistal Manu, Abaurrea MA, Paniagua R. Morphological and histometric study on thehumanSertoli cell from birth to the onset of puberty. J Anat. 1982; 134(Pt 2):351.

18. Chemes HE. Infancy is not a quiescent period of testicular development. Int J Androl.2001; 24(1):2–7.

19. Wreford NG, Rajendra Kumar T, Matzuk MM, de Kretser DM. Analysis of the testicularphenotype of the follicle-stimulating hormone β-subunit knockout and the activin type IIreceptor knockout mice by stereological analysis. Endocrinology. 2001; 142(7):2916–20.

20. Sahib, A.H.A., Al-Shareefi, E. and Hameed, I.H., 2019. Harpagophytumprocumbens and Cordiamyxa: In vitro Antibacterial Activity and Bioactive Compounds of Methanolic Fruit Extract Using Fourier-Transform Infrared Spectroscopic Technique. Indian Journal of Public Health Research & Development, 10(1), pp.981-987.