RESEARCH ARTICLE

Association of Extracelluar Matrix Protien 1 with Semen Parameters and Testosterone Concentration in Male Infertility

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ABSTRACT

Background: Extracellular matrix protein 1 (ECM1) is a glycoprotein that interacts with extracellular proteins into semen predominantly by epididymis, supports considering the role of the epididymis in sperm maturation. Testosterone is a steroid hormone from the androgen group is primarily secreted in the testes.

Objectives: The aim of this study is to assess the concentration of ECM1 and serum by (ELISA) kit with semen parameters in fertile and infertile men in Najaf City, Iraq.

Material and Methods: A total of 90 participants (45 infertile and 45 fertile men) were mean age (40.02) control fertility male, while the mean age as infertile (40.22) years included in the current study. The patients were sub-grouped into: 45 infertile with semen abnormal oligozoospermia, azoospermia, asthenozoospermia and teratozoospermia patients, it used for measuring the concentration and parameters ECM1and serum testosterone by Elisa kit.

Results: Statistical analysis showed highly significant differences between the two groups show ($p < 0.05$)**.** The level of ECM in the infertile group was lower in concentration than the control group with statistically significant differences ($p < 0.0001$*). The difference between the totals was highly significant by a criterion ($p < 0.0001$*) 45 in all group that studied a positive person correlation highly significant between serum testosterone (IU/mL) and seminal ECM1, (pg/mL) in all age groups of 45 male infertility at a ($p < 0.001$*).

Conclusion: The decrease in serum testosterone levels with the decrease in the level of seminal plasma ECM1 in infertile men provide evidence that levels can be used as reliable markers in the diagnostic criteria of male infertility. This study's results suggest that concentration ECM1.

Keywords: Extracellular matrix protein 1, Testosterone, Male infertility.

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INTRODUCTION

Infertility has become a serious issue. On average, roughly 10% of all couples struggle to start a family, which can lead to feelings of personal failure, especially in Arabic society, where religious and socioeconomic traditions have made it nearly mandatory for everyone to have children.[1] Diagnostic options for men who are having difficulty conceiving with their partners are limited and frequently consist of simply a conventional semen analysis. This baseline test serves as a rudimentary estimate of male fertility, leaving patients and physicians in need of additional diagnostic biomarkers.[2]

This study focuses on current and new seminal biomarkers in various male infertility scenarios since seminal fluid includes the highest concentration of chemicals from the male reproductive organs. Extracellular matrix protein 1 (ECM1) is a secreted glycoprotein that interacts with extracellular proteins to preserve skin integrity. ECM1 is a protein released primarily by the epididymis into the sperm. In light of the epididymis' function in sperm maturation, the findings help to explain why male infertility is associated with low sperm motility.[3]

Under the influence of LH, the Leydig cell secretes testosterone, which works as a negative feedback mechanism on the hypothalamus, reducing the production of gonadotropin-releasing hormone (GnRH), as well as acting particularly on the anterior pituitary gland.[4]

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MATERIAL AND METHODS

Ninety participants were collected in an AL-Saddar Medical City, Najaf Government Fertility Center. The groups were divided into 45 infertile males and 45 healthy fertile individuals. Their age ranged from 20 to 49 years, a mean age (40.02) in control fertility males, and the mean age was patients infertile male (40.22) years. The samples were collected from December 2021 until the end of April 2022. All patients were diagnosed with seminal fluid examination and diagnostic and confirmed by Infertility center review. Semen was collected from infertile patients (45 men) in addition to the control group (45 men) by ELISA kit to estimate the seminal plasma ECM1**.**

Semen Collection

Normally, human semen can be separated into seminal plasma and spermatozoa. To obtain seminal plasma depleted from sperm, the semen was centrifuged collected from healthy people with proven fertility and men with infertility by masturbation after 3 to 5 days. Using enzyme-linked immunosorbent assay (ELISA) kit to estimate the seminal plasma ECM1.

Blood Collection

Blood samples were collected by vein puncture technique to obtain 5 mL of blood from infertile patients and fertile men as control. After that, hold the blood at room temperature so as to clot. Then, centrifugation was done at 5000 rpm for 5 minutes to obtain serum. Using ELISA technique will estimate the testosterone concentration.

RESULT AND DISCUSSION

Indicated highly a significant decrease (p<0.05) in serum hormonal and biomarker seminal plasma in infertile comparison with control group (fertile normospermic) which biomarker seminal plasma included ECM1 with mean control (121.88 ± 5.45) and infertile patients with mean **(**10.14 ± 1.08) whilst serum hormonal include testosterone mean control (18.68 ± 1.08) and infertile patients with mean **(** 2.42 ± 0.18) (Table 1)**.**

Seminal plasma ECM1 levels in fertile control and infertile patients (Figure 1). It was measured in seminal plasma of all groups as mean ± SD of seminal plasma, respectively. ECM1 of oligozoospermia men with mean of 16.21 ± 1.7 pg/mL, asthenozoospermia men with mean of 14.11 ± 1.58 pg/mL, azoospermia men with mean of 3.97 ± 0.45 pg/mL, terato/oligozoospermia men with mean of 3.62 ± 0.27 pg/mL,astheno/oligozoospermia men with mean of 3.34 ± 0.56 pg/mL which the difference between the totals is highly significant by a criterion (p <0.0001*) 45 in all groups (Figure 2).

ECM1 is a component of the extracellular matrix that directly impacts cell destiny, tissue structure, and function. Research has shown that ECM1 interacts with integrins and hence inhibits latent TGF activation.[5]

ECM1 is necessary for tissue homeostasis, and lower ECM1 expression has been linked to a faster development of fibrosis. I concur.[6] In male infertility, determining the seminal plasma level of ECM1 may aid in identifying the original cell/tissue responsible for ECM1 synthesis. I concur with this research.[7] During sperm maturation in the epididymis, the epididymis epithelial cells' unique secretory and absorptive activity ensures a comprehensive interchange of proteins between sperm and seminal plasma. The aberrant concentration of ECM1 in seminal plasma, which might be related to epididymis secretion and/or absorption malfunction, could be the reason of the upregulated ECM1 in sperm.[8,9]

The effect of ECM1 concentration on the proliferation of sperm cell maturation was demonstrated in this study. The expression level of ECM1 was lower than the reference range in infertile groups, and the proliferation of germ cells in the testes was severely reduced.[10]

ECM1 regulates the proliferation of the sperm cells. It found that ECM1 could impact spermatogenesis while the expression level of ECM1 in male infertility was decreased, resulting in the ECM1 concentration two commonest pathways for degradation of acrosome one and second, the exogenous others body spermatozoa agree with.[11]

The logical explanation of the extracellular matrix protein1 concentration had been found to be associated with various semen abnormal parameters. The changes in activity or, morphology or count levels in cells epididymis are the same. Hence, it found seminal plasma is closely related to the pathological features of male infertility, represented by oligo asthenozoospermia, teratozoospermia, azoospermia, and astheno oligozoospermia.[12,13] Asthenozoospermia is a prevalent cause of male infertility characterized by impaired sperm motility. To identify the proteins and related pathways implicated in the molecular pathophysiology of asthenozoospermia, various comparative sperm proteome studies such as ECM1 have been done. Several causes have been identified as contributing to sperm motility decrease, including energy metabolic malfunction, structural flaws in

Table 1: Serum testosterone and seminal plasma ECM1 of fertile and infertile males

Variables	*Control N=45.*	*Infertile patients N=45.*	*p-value*
	Mean ± SE.	*Mean ± SE.*	
ECM1 (pg/mL)	121.88 ± 5.45	10.14 ± 1.08	0.0001 *
Testosterone (IU/mL)	18.68 ± 1.08	2.42 ± 0.18	0.0001 *

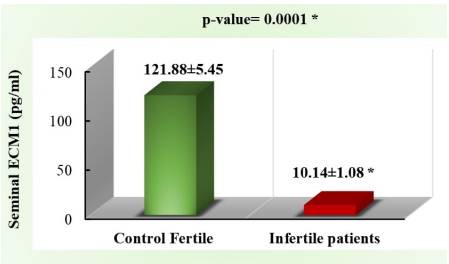

Figure 1: Comparison of seminal plasma of ECM1 in the control fertile male and infertile male*; is highly significant at p <0.05*

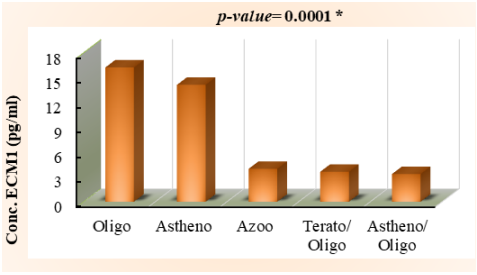

Figure 2: Fertile men (normozoospermic) and infertile men subgroups' serum ECM1 levels were compared.,data are the mean ± SD (n=45 in each group) is significant at $p < 0.05^*$

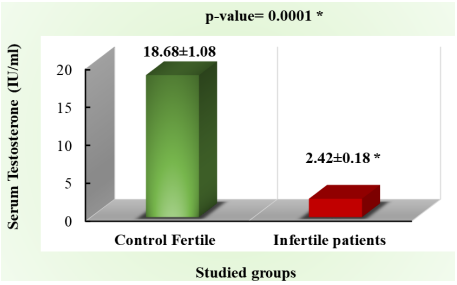

Figure (3): Comparison of serum concentration of Testosterone Hormone in the control fertile male and infertile male.*; is significant at $p < 0.05$*

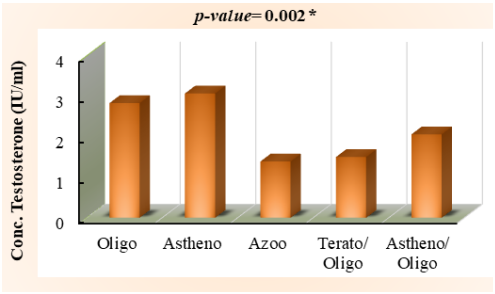

Figure 4: Testosterone levels in the blood of fertile men (normozoospermic) and infertile men (non-normozoospermic). Data are the mean ± SD (n=45 in each group) is significant at $p < 0.05$*

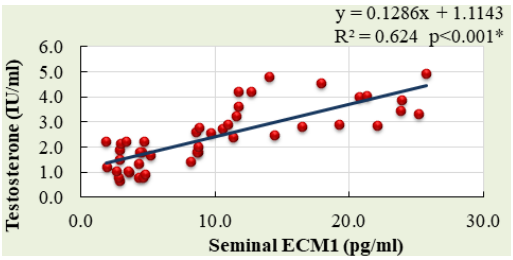

Figure 5. Correlation between serum Testosterone and seminal Extracellular Matrix Protein1(ECM1) n=45. p (<0.001).*
Is significant at p <0.01**, is significant at p <0.05. No significant NS

sperm-tail protein components, and reduced expression of proteins important in sperm motility, I concur.[14]

ECM1 is engaged in many biological processes, including binding activity, according to a concentration proteomic study of oligo-asthenozoospermic and teratozoospermic seminal plasma.[15]

ECM1 was discovered as a biomarker to differentiate obstructive azoospermia OA from normal spermatogenesis in a proteomic study of seminal plasma from men with normal spermatogenesis and azoospermia. Furthermore, there has been a deferential expression of testis-expressed protein 101 (TEX101) in distinct non obstructive azoospermia NOA subtypes.[16]

Serum Testosterone Level

The comparison of testosterone between serum of the control (fertile men) group and serum of (infertile men) group. Statistical analysis showed highly significant differences between the two groups (p <0.05)**.** The level of testosterone in the infertile group was lower in concentration by mean (2.42 ± 0.18) than the control group that were (18.68 ± 1.08) with statistically significant differences *(p* <0.0001*). The infertile group that a mean 45 (2.42 ± 0.18) compared to the fertile group mean 45 (18.68 ± 1.08) (Figure 2).

Serum testosterone hormone levels infertile control and infertile patients. Testosterone hormone was measured in serum of all groups as mean ± SD of these groups, respectively. testosterone of oligozoospermia men with mean of 2.83 ± 0.29 pg/mL, asthenozoospermia men with mean of 3.07 ± 0.03 pg/mL, azoospermia men with mean of 1.39 ± 0.26 pg/mL, terato/oligozoospermia men with mean of 1.5 ± 0.29 pg/mL, astheno/oligozoospermia men with mean of 2.06 ± 0.35 pg/mL which the difference between the totals is significant by a criterion (p-value 0.002*) 45 in all groups (Figure 4).

ECM1 Correlation with Hormone Testosterone

A positive pearson correlation highly significant correlation (R^2=0.624) between serum testosterone (IU/mL) and seminal ECM1 (pg/mL) in all age groups of 45 male infertility at a (*p-value* of <0.001*). Our study showed a positive correlation between testosterone hormone the ECM1 marker (Figure 5).[17]

CONCLUSION

This study concluded that a seminal plasma ECM1 decrease affects the semen quality and results in a decreased fertilization rate.

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