Volume 13 Issue 5
Originally issued as H2

Global Journal of Medical research
Orthopedic and Musculoskeletal System
Volume 13 Issue 2 Version 1.0 Year 2013
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4618 & Print ISSN : 0975-5888

Oxidative Stress in Primary Infertility of Women

By Majid K. Hussain, Hamza J. Mohammed, Basima S. Al- Ghazali & Mazin Thamir Abdul Hasan

University of Kufa College of Medicine

Abstract - The current study was designed to investigate the changes of oxidative stress (OS) in primary infertility of females. To achieve the intended aim, 84 infertile women of ages 28.66 ± 6.29 years (mean ± SD) and 30 healthy fertile women of ages 30.3± 6.45 years (mean±SD) were enrolled. The levels of malondialdehyde (MDA), catalase (CAT) and glutathione-S-transferase (GST) were determined by spectrophotometric methods. Serum follicule stimulating hormone (FSH) and luteinizing hormone (LH) levels were measured by an enzyme linked fluorescent assay (ELFA). The results indicated a significant ($p<0.001$) increase of MDA concentration and significant ($p<0.001$) decreases of CAT and GST activities in the infertile women when compared with those of the control group. The linear regression analysis demonstrated significant ($r = 0.27, p<0.05$) positive correlation for MDA levels and significant negative correlations for CAT ($r = - 0.24, p<0.05$) and GST levels ($r = - 0.26, p<0.05$) with the age of infertile women.

Changes of oxidative stress was observed to be dependent on the body mass index (BMI) and the duration of infertility of the enrolled women. The changes of MDA, CAT and GST levels seem to be independent on etiology of infertility and the menstruation pattern. The2linear regression analysis revealed significant ($r = 0.28, p<0.05$) positive correlation for MDA levels with the FSH concentration and significant($r = - 0.29, p<0.05$) negative correlation with the LH concentration.CAT exhibited significant ($r = 0.30, p<0.05$) positive correlation with the FSH concentration, while GST activity demonstrated significant($r = 0.24, p<0.05$) positive correlation with the LH concentration.

These results suggest that oxidative stress is involved in the path ophysiology of primary infertility in females, in particular through the directing of gonadotrophin changes in these patients.

GJMR-H Classification : NLMC Code: WJ 709



Strictly as per the compliance and regulations of:

© 2013. Majid K. Hussain, Hamza J. Mohammed, Basima S. Al- Ghazali & Mazin Thamir Abdul Hasan. This is a research/review paper, distributed under the terms of the Creative Commons Attribution-Noncommercial 3.0 Unported License http://creativecommons.org/licenses/by-nc/3.0/), permitting all non-commercial use, distribution, and reproduction inany medium, provided the original work is properly cited.

Oxidative Stress in Primary Infertility of Women

Majid K. Hussain [α], Hamza J. Mohammed [σ], Basima S. Al- Ghazali [ρ] & Mazin Thamir Abdul Hasan[ω]

Abstract - The current study was designed to investigate the changes of oxidative stress (OS) in primary infertility of females. To achieve the intended aim, 84 infertile women of ages 28.66 ± 6.29 years (mean ± SD) and 30 healthy fertile women of ages 30.3± 6.45 years (mean±SD) were enrolled. The levels of malondialdehyde (MDA), catalase (CAT) and glutathione-S-transferase (GST) were determined by spectrophotometric methods. Serum follicule stimulating hormone (FSH) and luteinizing hormone (LH) levels were measured by an enzyme linked fluorescent assay (ELFA).

The results indicated a significant ($p<0.001$) increase of MDA concentration and significant ($p<0.001$) decreases of CAT and GST activities in the infertile women when compared with those of the control group. The linear regression analysis demonstrated significant ($r = 0.27, p<0.05$) positive correlation for MDA levels and significant negative correlations for CAT ($r = - 0.24$, $p<0.05$) and GST levels ($r = - 0.26, p<0.05$) with the age of infertile women.

Changes of oxidative stress was observed to be dependent on the body mass index (BMI) and the duration of infertility of the enrolled women. The changes of MDA, CAT and GST levels seem to be independent on etiology of infertility and the menstruation pattern. The2linear regression analysis revealed significant ($r = 0.28$, $p<0.05$) positive correlation for MDA levels with the FSH concentration and significant($r = - 0.29$, $p<0.05$) negative correlation with the LH concentration.CAT exhibited significant ($r = 0.30$, $p<0.05$) positive correlation with the FSH concentration, while GST activity demonstrated significant($r = 0.24$, $p<0.05$) positive correlation with the LH concentration.

These results suggest that oxidative stress is involved in the path ophysiology of primary infertility in females, in particular through the directing of gonadotrophin changes in these patients.

I. Introduction

Oxidative stress (OS) is a common condition caused by biological systems in aerobic conditions such that antioxidants cannot scavenge the reactive oxygen species (ROS). This causes an excessive generation of ROS, which damages cells, tissues, and organs (1). Evidence suggests that OS induced by ROS such as superoxide anion ($O2^{\bullet-}$), hydroxyl radicals ($OH^{\bullet}$) and a range of lipid peroxyl radicals produced in vascular cells is involved in the pathogenesis of a wide range of diseases of there productive system such as endometriosis and infection (2).

Author α σ : Department of biochemistry, University of Kufa College of Medicine.
Author ρ : Department of Gynecology, University of Kufa College of Medicine.
Author ω : Department of Pharmaceutical chemistry, University of Kufa, College of Pharmacy.

OS impacts fertilization and can further induce apoptosis, resulting in embryo fragmentation, implantation failure, or abortion. In the fallopian tubes, OS may induce damaging effects in an embryo. The endometrium, which facilitates embryo implantation and development, can become defective when the female reproductive tract experiences an ROS–antioxidant imbalance (3). OS may hinder the support required for the continuation of a pregnancy by causing luteal regression and insufficient luteal hormone levels (4). Several other known causes of infertility, such as endometriosis, hydrosalpinx, polycystic ovarian disease, unexplained infertility, and recurrent pregnancy loss (RPL) may be attributed to O in the environment (5).3

OS induces infertility in women through a varietyof mechanisms. Ovarian follicles experiencing OS can lead to direct damage to oocytes. Oocytes and spermatozoa can also experience direct damage, which can lead to impaired fertilization due to an environment of OS in the peritoneal cavity. Even when fertilization occurs, apoptosis leading to embryo fragmentation, implantation failure, abortion, or congenital abnormalities in offspring can occur. OS in the fallopian tubes can cause direct adverse effects on the embryo defects in the endometrium, which normally supports the embryo and its development, can arise when there is an ROS antioxidant imbalance in the female reproductive tract (3).ROS-antioxidant imbalance is also implicated in luteal regression and insufficient luteal hormonal support for the continuation of a pregnancy(4). OS has been implicated in many other causes of infertility, such asendo metriosis, hydrosalpinx, polycystic ovarian disease, unexplained infertility, and recurrent pregnancy loss (6).

II. Patients And The Control Groups

A total of eighty four women with primary infertility of age's 18-41years with a mean ± SD 28.66 ±6.29 years attending the fertility centerin the AL-Sadder Teaching Hospital in Najaf city fromOctober2008 to May 2009 were included in the study. To compare the results, thirty healthy age matched (mean ± SD 30.3±6.45 years) females with history of at least one child birth were also enrolled. Subjects suffered from diseases (hypertension, asthma and diabetes mellitus) interfere with the data obtained were excluded.

Disposable syringes and needles were used for blood collection. Venous blood samples, about 10 ml were collected from patients and healthy volunte erson day-2 of their menstrual cycle in tubes. After4allowing

© 2013 Global Journals Inc. (US)

the blood to clot at room temperature for 15 min, blood samples were centrifuged at 3000 xg for 15 min. Sera were separated and divided into five aliquot samples stored at _17C°, two for determination of the hormonal profile, the three others were used for estimation of oxidatives tress parameters.

III. Determination of Malondialdehyde, Catalase and Glutathione – S – Transferase Levels

The level of malondialdehyde was determined by modified procedure described by Guidet B. and Shah S.V. (7).

Catalase (CAT) activity was determined by the measurement of the decrease in the absorbance due to hydrogen peroxide (H2O2) consumption as described by Aebi H. (8).

GST activity was analyzed by measuring the conjugation of glutathione (GSH) and 1-chloro2, 4dinitrobenzene (CDNB) as asubstrate, as described by Habig WH.et al (9)

IV. Determination of Serum FSH and LH Concentration

VIDAS® FSH and LH are an automated quantitative test for use on the VIDAS instruments for the determination of human folliculestimulating hormone (FSH) and human luteinizing hormone (LH), inhuman serum or plasma using the Enzyme Linked Fluorescent Assay(ELFA) technique.(10)

V. Results

a) Level of Malondialdehyde, Catalase and Glutathione -STransferasein Infertile Women and the Control Group

Malondialdehyde (MDA), catalase (CAT) and glutathione-Stransferasefemales with primary infertility and thirty healthy women. The results were analyzed using student's-test. There were significant ($p<0.001$) decreases in CAT and GST activity level sins era of females with primary infertility when compared with those of the control group. In contrast, MDA levels were found to increase significantly ($p<0.001$) in females with primary infertility when compared with those of the control group (Table 3.1).

Table 3.1 : Levels of Malondialdehyde (MDA), Catalase (CAT) and Glutathione -S -Transferase (GST) in Infertile Women and Control Group

Parameters	Subjects	NO.	Mean ± SD	Range	P-value
MDA (µM)	Control	30	1.74 ± 0.75	0.54 –3.10	
	Patients	84	4.12 ± 1.24	2.29 –8.08	<0.001
CAT (U/ml)	Control	30	6.82 ± 4.72	1.74 –22.42	
	Patients	84	4.5 ± 2.21	0.78 –9.68	<0.001
GST (U/L)	Control	30	1628.42 ± 284.86	1104.69 –2335.63	
	Patients	84	731.57 ± 190.90	284.06 –1136.25	<0.001

b) Relevance of Ages of Infertile Women with Malondialdehyde, Catalase and Glutathione –S-Transferase Levels

To verify the impact of age on MDA, CAT and GST values in infertile women, patients were categorized into 3 groups. Group A consisted of 29 patients of ages (18–25 years), group B consist of 34patients of ages (26– 33 years) and group C consist of 21 patients of ages (34–41 years).

The results indicated significant ($p<0.001$) elevation of MDA levels in the three groups of patients when compared with those of the control group. On the other hand, CAT and GST activities exhibited significant ($p<0.01$ and <0.001 respectively) decreases in the three groups of patients with respect to those of the control groups. The linear regression analysis demon strated significant ($r = 0.27$, $p<0.05$) positive correlation for MDA levels and significant negative correlations for CAT ($r = - 0.24$, $p<0.05$) and GST levels ($r = - 0.26$, $p<0.05$) with the age of in far tile women (Table 3.2, 3.3).

© 2013 Global Journals Inc. (US)

Table 3.2 : Levels of Malondialdehyde (MDA) , Catalase (CAT) and Glutathione -S- Transferase (GST) in Various age Related Groups of Infertile Women

Parameters	Group	NO.	Mean ± SD	Range	P-value
MDA (µM)	Control	30	1.74 ± 0.75	0.54 –3.10	
	18-25 y	29	3.85 ± 1.33	2.42 –8.08	<0.001
	26-33 y	34	4.0 ± 0.78	2.29 –6.06	<0.001
	34-41 y	21	4.74 ± 1.42	2.69 –7.81	<0.001
CAT (U/ml)	Control	30	6.82 ± 4.72	1.74 –22.42	
	18-25 y	29	4.54 ± 2.52	1.57 –9.68	<0.01
	26-33 y	34	4.97 ± 2.12	0.92 –8.59	<0.01
	34-41 y	21	3.64 ± 1.62	0.78 –6.48	<0.01
GST (U/L)	Control	30	1628.42 ± 284.86	1104.69 –2335.63	
	18-25 y	29	733.56 ± 222.33	284.06 –1136.25	<0.001
	26-33 y	34	746.89 ± 166.82	441.88 –1073.13	<0.001
	34-41 y	21	650.79 ± 167.75	347.19 –883.75	<0.001

Table 3.3 : Correlation Factors of Serum Malondialdehyde (MDA), Catalase(CAT) and Glutathione-S-Transferase (GST) Levels with Age in Infertile Women

Parameters	**r**	**P-value**
MDA	**0.27**	**<0.05**
CAT	**– 0.24**	**<0.05**
GST	**– 0.26**	**<0.05**

c) Influence of Body Mass Index on Malondialdehyde, Catalase and Glutathione – S Transferase Levels in Infertile Women

To understand the effect of body mass index (BMI) on the levels of serum MDA, CAT and GST in female infertility, patients were categorized into three groups. Group 1 consisted of 26 patients who had BMI values ≤ 25 Kg/m2 (normal females). Group 2 comprised 28patients who had BMI > 25–30 Kg/m2 (overweight) and Group 3comprised 30 patients who had BMI >30 Kg/m2 (obese).

The results pointed out a significant ($p<0.001$) increase of MDA and significant decreases of CAT ($p<0.01$) and GST ($p<0.001$) levels in the three groups of infertile women when compared with the control group (Table 3.4). The linear regression analysis stated significant ($r = 0.23$, $p<0.05$) positive correlation for MDA and significant ($r = – 0.26$, $p<0.05$) negative correlation for CAT levels with BMI values in the infertile women (Table 3.5).

Table 3.4 : Influenc of Body Mass Index (BMI) on Malondialdehyde (MDA), Catalase(CAT) and Glutathione -S- Transferase (GST) Levels in Infertile Women

Parameters	Group	NO.	Mean ± SD	Range	P-value
MDA (µM)	Control	30	1.74 ± 0.75	0.54 –3.10	
	≤25	26	3.77 ± 1.04	2.29 –6.59	<0.001
	>25-30	28	4.17 ± 1.33	2.56 –8.08	<0.001
	>30	30	4.42 ± 1.29	2.42 –7.81	<0.001
CAT (U/ml)	Control	30	6.82 ± 4.72	1.74 –22.42	
	≤25	26	5.34 ± 2.32	0.92 –9.68	<0.01
	>25-30	28	4.41 ± 2.09	0.78 –8.59	<0.01
	>30	30	3.86 ± 2.06	1.26 –8.59	<0.01
GST (U/L)	Control	30	1628.42 ± 284.86	1104.69 –2335.63	
	≤25	26	768.43 ± 208.21	441.88 –1136.25	<0.001
	>25-30	28	729.32 ± 185.9	441.88 –1073.13	<0.001
	>30	30	697.53 ± 183.73	284.06 –1010.00	<0.001

© 2013 Global Journals Inc. (US)

Table 3.5 : Correlation Factors of Serum Malondialdehyde (MDA) , Catalase (CAT) and Glutathione-S-Transferase (GST) Levels with Body Mass Index (BMI) in Infertile women

Parameters	r	P-value
MDA	**0.23**	**<0.05**
CAT	**– 0.26**	**<0.05**
GST	**– 0.12**	**NS**

d) Relevance of Etiology of Infertility to Malondialdehyde, Catalase and Glutathione -S Transferase Levels in Infertile Women

To verify the impact of infertility causes on MDA,CAT and GSTvalues in infertile women, patients were categorized into 3 groups. Group A consisted of 37 females of ovulatory factor, group B consist of 14females of tubal and uterine factors and group C consist of 33 females of unexplained factor. As shown in table 3.6, the three groups of infertile women showed a significant ($p<0.001$) elevation of MDA and significant decreases of CAT ($p<0.05$) and GST ($p<0.001$) levels when compared with those of the control group.

Table 3.6 : Levels of Malondialdehyde(MDA), Catalase (CAT) and Glutathione-S- Transferase (GST) in Infertile Women of Various Etiologies

Parameters	Group	NO.	Mean ± SD	Range	P-value
MDA (µM)	Control	30	1.74 ± 0.75	0.54 –3.10	
	OF	37	4.23 ± 1.16	2.42 –7.81	<0.001
	TUF	14	4.20 ± 1.41	2.56 –7.54	<0.001
	UF	33	3.93 ± 1.28	2.29 –8.08	<0.001
CAT (U/ml)	Control	30	6.82 ± 4.72	1.74 –22.42	
	OF	37	4.79 ± 2.35	0.78 –9.68	<0.05
	TUF	14	4.41 ± 2.09	1.59 –8.59	<0.05
GST (U/L)	UF	33	4.43 ± 2.14	0.92 –8.59	<0.05
	Control	30	1628.42 ± 284.86	1104.69 –2335.63	
	OF	37	751.53 ± 191.96	441.88 –1136.25	<0.001
	TUF	14	678.59 ± 215.41	284.06 –1136.25	<0.001
	UF	33	737.41 ± 201.30	284.06 –1041.56	<0.001

O F: Ovulatory Factor
TUF: Tubal and Uterine Factor
U F: Unexplained Factor

e) The Dependency of Malondialdehyde, Catalase and Glutathione –S-Transferase Levels on the Duration of Infertility in Infertile Women

To demonstrate the influence of duration of infertility on MDA, CAT and GST values in infertile women, the linear regression analysis was used to evaluate the data. Significant negative correlations were obtained for CAT ($r = – 0.23$, $p<0.05$) and GST ($r = – 0.27$, $p<0.05$) levels with the duration of infertility. MDA levels stated significant($r = 0.30$, $p<0.01$) positive correlation with duration of infertility (Table3.7).

Table 3.7 : Correlation Factors of Serum Malondialdehyde (MDA), Catalase (CAT), Glutathione-S-Transferase (GST) Levels with the Duration of Infertility in Infertile Women

Parameters	r	P-value
MDA	**0.30**	**<0.01**
CAT	**– 0.23**	**<0.05**
GST	**– 0.27**	**<0.05**

f) The Impact of Menstruation Pattern on the Levels of Malondialdehyde, Catalase and Glutathione -S - Transferase in Infertile Women

To perceive the impact of menstruation pattern on thelevels of MDA, CAT and GST in infertile women, patients were categorized into 2groups. Those of regular cycle were 45 patients and those of irregularcycle were 39 patients. Their data were compared with the values of the control group by using the ANOVA analysis. A significant($p<0,001$)increase of MDA levels andsignificant decreases for CAT ($p<0.01$) andGST ($p<0.001$) activities were observed in the two groupsofpatientswhen compared with those of control group (Table 3.8).

© 2013 Global Journals Inc. (US)

Levels of Malondialdehyde(MDA), Catalase (CAT Table) and Glutathione –S-Transferase (GST) in Infertile Women with Regular and Irregular Cycle

Parameters	Group	NO.	Mean ± SD	Range	P-value
MDA (µM)	Control	30	1.74 ± 0.75	0.54 –3.10	
	RC	45	4.29 ± 1.31	2.29 –8.08	<0.001
	IRC	39	3.93 ±1.14	2.42 –6.99	<0.001
CAT (U/ml)	Control	30	6.82 ± 4.72	1.74 –22.42	
	RC	45	4.32 ± 2.12	0.78 –8.59	<0.01
	IRC	39	4.73 ± 2.24	1.26 –9.68	<0.01
GST (U/L)	Control	30	1628.42 ± 284.86	1104.69 –2335.63	
	RC	45	740.67 ± 177.99	347.19 –1073.13	<0.001
	IRC	39	713.80 ± 207.93	284.06 –1136.25	<0.001

RC: Regular Cycle
IRC: Irregular Cycle

g) Correlations of FSH and LH Concentrations with Malondialdehyde, Catalase and Glutathion STransferase Levels in Infertile Women

To verify the relevance of FSH and LH concentrations to the MDA, CAT and GST levels in infertile women, the linear regression analysis was used to evaluate the data. The results indicated significant ($r = 0.28$, $p<0.05$) positive correlation for MDA levels with the FSH concentrations and significant ($r = -0.29$, $p<0.05$) negative correlation with LH concentrations. CAT showed significant ($r = 0.30$, $p<0.05$) positive correlation with FSH concentrations. GST activity exhibited significant ($r = 0.24$, $p<0.05$) positive correlation with LH levels in infertile women (Table 3.9).

Table 3.9 : Correlations of Serum Malondialdehyde (MDA),Catalase (CAT) and Glutathione-S-Transferase (GST) with FSH and LH Levels in Infertile Women

Parameters		**r**	**p-value**
MDA	**FSH**	**0.28**	**<0.05**
	LH	**– 0.29**	**<0.05**
CAT	**FSH**	**0.30**	**<0.01**
	LH	**0.02**	**NS**
GST	**FSH**	**– 0.07**	**NS**
	LH	**0.24**	**<0.05**

VI. Discussion

Successful pregnancy results from an interaction between myriad physiological processes in both men and women. Any disruption to this interactive system, whether in a man or woman, can result in an inability to have a biological child called infertility (4). ROS exert their cytotoxic effects by causing per oxidation of membrane phospholipids, which results in an increase in membrane permeability, loss of membrane integrity, enzyme inactivation, structural damage to DNA and cell death (11). Oxidative stress can have detrimental effects on female fertility by affecting ovulation, fertilization, embryo development, and implantation (4,12). Thus, OS is considered a cause of female infertility. This is particularly clear in cases of

© 2013 Global Journals Inc. (US)

endometriosis (13). It is suggested that OS is caused by ROS overproduction rather than antioxidant depletion (14).

The results indicate that infertile women have increased serum level of MDA and decreased serum levels of GST and CAT as compared to fertile women. They are in agreement with previous reports.

Veena Bhaskar S et al have found significantly higher concentration of MDA in serum of infertile women than in fertile women (15). Savita Setal have shown significantly high plasma levels of MDA in infertile women when compared to parous women and this is noticed from there ductions of levels of eicosapentaenoic acid (EPA), and more so indocosahexaenoic acid (DHA), they suggested that these changes are consequence of increased oxidative stress that mediate lipid per oxidation Product , i.e. MDA (16).

In the present study, MDA levels were found to be elevated with advancing age in infertile women suggesting raised lipid per oxidation in these patients. The rise seems to be developed as a consequence of 15declined production of antioxidant enzymes. Such decline was apparent for the activities of CAT and GST in association with the elevation of MDA levels as ages of the patients were advanced. Thus, aging could be considered as a risk factor for elevation of oxidative stress, and impaired fertility in aged females involves the imbalance in there do x potentials of these patients.

The present results were in a agreement with previous works in which follicular fluid aspirates from twelve young women aged 27–32years and twelve older women aged 39–45 years undergoing IVF treatment were analysed for the activity and protein expression of catalase, SOD, G-PX, GST and G-Red. The specificactivity of catalasewas _60% lower in the older women when compared with the youngerwomen. GST was also lower in the older women with respect to the younger patients (17). It is well known that germ cell membranes are particularly vulnerable to be attacked by ROS, being very rich in polyunsaturated fatty acids (18).

The current results illustrated elevated lipid peroxidation in association with depleted cytoprotective enzyme activity, i.e., CAT and GST, as weight of infertile women was raised. The reason of the dysregulation of the redoxe system may due to increased levels of adipose NADPH oxidase activity which raise the production of ROS in accumulated fat (19). This hypothesis was proved by experimental obeserats, in which rised lipid peroxidation has been observed (20).

The link between obesity and oxidative stress has been suggested in some studies. A good correlation between BMI and oxidative stress has been reported, indicating obesity as an independent risk factor for plasma lipid peroxidation (21,22). Obesity may induce systemic oxidative stress, which is, in turn, the underlying cause of selective increase in ROS, 16 dysregulation of adipocytokines and development of metabolic syndrome (23).

In the present investigation, the elevation of lipid peroxidation and the depletion of antioxidant enzymes seems to vary similarly in the infertile women regardless to the etiology of infertility. The consequences appear to be equal precipitation in the pathophysiology of there productive systems in infertile patients. These evidences suggest that oxidative stress is an independent etiologic factor in female infertility. Such independency may relate to the activation of macrophages which are a source of generation of ROS (24).

In the present study, raised lipid peroxidation and decreased antioxidant enzyme activities are evident as the duration of infertility was prolonged in the enrolled infertile women. The results suggest that prolonging of the duration of infertility exaggerate the implication of oxidative stress in the impairment of female infertility.

OS is involved in the modulation of cyclical changes in the endometrium. Altered SOD and ROS levels have been demonstrated in the endometrium during the late-secretory phase, just before menstruation. An elevated lipid peroxide concentration and decreased SOD concentrations have been reported in human endometrium in the latesecretory phase, and these changes may be responsible for the breakdown of the endometrium, implicating the involvement of OSin the process of menstruation (25). The expression of endothelial nitric oxide synthase(NOS) and inducible NOS have been demonstrated in the humanendometrium and the endometrial vessels (26,27). Endothelial NOS is also thought to bring about changes that prepare the ndometrium for im plantation (25).

FSH was found to be positively correlated with MDA and CAT levels, suggesting oxidative effect in there productive system of the infertile women. In contrast, LH was ascertained to be correlated negatively with MDA level and positively with GST activity, suggesting antioxidative, i.e. protective role in the reproductive system of these patients. The oxidative effect of FSH may be induced through the action of progesterone, since this hormone has been documented to elicit oxidative stress in rats (28). Unfortunately progesterone and estradiolconcentrations could not be measured in the studied patients due to technical limitations. The protective role of LH may be produced through the action of estradiol, the beneficial function of estradiol has been elucidated in rats (28).

Elevated endogenous LH concentration seems to be a powerful protective enzyme against oxidative stress, since it is correlated negatively with MDA level and positively with GST activity. These observations are essentially related to vitamin E. It was demonstrated that LH administration is associated with accumulation of ovarian vitamin E (29). The mechanism of LH stimulation of vitamin E accumulation is not clear, but may be due

© 2013 Global Journals Inc. (US)

to increased lipoprotein accumulation by the corpusluteum. Vitamin E is transported by lipoproteins inplasma (30). LH isknown to stimulate the accumulation of lipoproteins by the rat corpusluteum (31,32). Hence, the accumulation of lipoproteins, may be the reason of elevated vitamin E and consequently the antioxidative function of LH in the reproductive tract.

References Références Referencias

1. Pasqualotto F.F; Sharma R.K; Kobayashi H., et al: Oxidativestress in normospermic men undergoing infertility evaluation.Andrology, 2001; 22: 316-322.
2. Benjamin N; Peter N; Rakesh K; et al. Varicocele is associatedwith elevated spermatozoal reactive oxygen species production anddiminished seminal plasma antioxidant capacity. Urology, 1999 ;161:1831-1834 .
3. Iborra A; Palacio J.R; and Martinez P. Oxidative stress and autoimmune response in the infertile woman. Chemical immunology and allergy, 2005; 88: 150–162.
4. Agarwal A and Allamaneni S.S: Role of free radicals in female reproductive diseases and assisted reproduction. Reproductive Biomedicine Online, 2004; 9: 338–347.
5. Agarwal A; Gupta S and Sikka S. The role of free radicals and antioxidants in reproduction. Current Opinion in Obstetric and Gynecology, 2006; 18: 325–332.
6. Agarwal A; Said TM; Bedaiwy MA, et al. Oxidative stress in an assisted reproductive techniques setting. Fertility and Sterility, 2006; 86(3): 503–512.
7. Guidet B and Shah Sv: Enhanced in vivo H2O2 generation by ratkidney in glycerol- induced renal failure. American journal of physiology, 1989; 1257: 440-444.
8. Aebi H.: Methods of enzymatic analysis, ed., New York, AcademicPress, 1974; 2: 674.
9. Habig W; Pabst M; and Jakoby W. Glutathione S-Transferase. The First Enzymatic Step in Mercapturic Acid Formation. Biological Chemistry, 1974; 22(25): 7130-7139.
10. Manual of FSH determination by VIDAS FSH Kit , Biomerieux-France, REF 30407.Halliwell B. Free radicals, antioxidants and human disease: curiosity, cause or consequence? Lancet 1994; 54: 485-500.
11. Agarwal A, Gupta S and Sharma R. Oxidative stress and its implications in female infertility – a clinicians perspective. Reproductive Biomedicine Online, 2005; 11(5): 641–650.
12. Bedaiwy M.A and Falcone T. Peritoneal fluid environment in endometriosis: Clinico pathological implications. Minerva Ginecologica, 2003; 55: 333–345.
13. Agarwal A and Allamaneni S. Oxidants and antioxidants in human fertility. Middle East Fertility Journal, 2004; 9: 187–197.
14. Veena Bhaskar S; Sharmila Upadhya; Satish Kumar Adiga; et al. Evaluation of oxidative stress, antioxidants and prolactin in infertile women. Indian Journal of Clinical Biochemistry, 2008 ; 23186-190
15. Savita S. Mehendalei; Anitha S. Kilari Bams; Chaya S. Deshmukal. Oxidative stress-mediated essential polyunsaturated fatty acid alterations in female infertility. Human Fertility, 2009; 12(1):28–33.
16. Carbone M.C; Tatone C; Delle Monache S; et al. Antioxidant enzymatic defences in human follicular fluid: characterization and age-dependent changes. Molecular Human Reproductive, 2003; 9:639–643.
17. Lenzi A; Gandini L; Lombardo F; et al. Polyunsaturated fatty acids of germ cell membranes, glutathione and blutathione-dependent enzyme- PHGPx: from basic to clinic. Contraception, 200265:301-304.
18. Gower BA; Nagy T.R; Goran M.I; et al. Fat distribution and plasma lipid-lipoprotein concentrations in pre- and postmenopausal women. International Journal of Obesity and Related MetabolicDisorders1998; 22: 605–611.
19. Dobrian A.D, Davies M.J, Prewitt R.L, et al. Development of hypertension in a rat model of diet induced obesity. Hypertension, 2000:35: 1009-1015.
20. Trevisan M; Browne R; Ram M; et al. Correlates of markers of oxidative status in the general population. American Journal of Epidemiology, 2001; 154: 348–56.
21. Olusi SO. Obesity is an independent risk factor for plasma lipid peroxidation and depletion of erythrocyte cytoprotective enzymesin humans. International Journal of Obesity and Related Metabolic Disorders, 2002; 26: 1159–1164.
22. Furukawa S; Fujita T; Shimabukuro M; et al. Increased oxidativestress in obesity and its impact on metabolic syndrome. Journal of Clinical Investigation, 2004; 14: 1752–1761.
23. Szczepanska M; Kozlik J; Skrzypczak J et al. Oxidative stress maybe a piece in the endometriosis puzzle. Fertility and Sterility, 2003; 79: 1288–1293.
24. Sugino N; Takiguchi S; Kashida S, et al. Superoxide dismutaseexpression in the human corpus luteum during the menstrual cycleand in early pregnancy. Molecular Human Reproduction, 2000; 6(1): 19–25.
25. Rosselli M; Keller PJ and Dubey RK. Role of nitric oxide in the biology, physiology and pathophysiology of reproduction. Human Reproduction Update, 1998; 4(1): 3-24.
26. Ota H; Igarashi S; Hatazawa J; et al. Endothelial nitric oxidsynthase in the endometrium during thEmenstrual cycle in patientswith endometriosis and adenomyosis. Fertility and Sterility, 1998; 69(2): 303-308.

© 2013 Global Journals Inc. (US)

27. Yakup Kumtepe; Bunyamin Borekci; Mehmet Karaca; et al. Effect of acute and chronic administration of progesterone, estrogen, FSH and LH on oxidant and antioxidant parameters in ratgastric tissue. Chemico-Biological Interactions, 2009:182: 1–6.
28. Raymond F; Aten, Krishna M. Duarte; and Harold R. Behrman Regulation of Ovarian Antioxidant Vitamins, Reduced Glutathione, and Lipid Peroxidation by Luteinizing Hormone and Prostaglandin F2α. Biology Of Reproduction, 1992;46: 401-407.
29. Halliwell B and Gutteridge J.M.C. Free radicals in biology and medicine. 4th ed. Oxford, UK: Clarendon Press; 2007.
30. Strauss JF; MacGregor C and Gwvnne Jr. Uptake of high density lipoproteins by rat ovaries in vivo and dispersed ovarian cells in vitro. Direct correlation of high density lipoprotein uptake with steroidogenic activity. Journal of Steroid Biochemistry, 1982; 16:525-53 1.
31. Rajkumar K; Couture RL and Murphy BD. Binding of highdensitylipoproteins to luteal membranes: the role of prolactin. Luteinizing hormone and circulating lipoproteins. Biology of Reproduction, 1985; 32: 546-555.

© 2013 Global Journals Inc. (US)