The Relation between Some Hormonal And Biochemical Parameters In Infertile Women

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Abstract

Infertility is the most gynecological problem which is increasing all over the world. Many studies were done and many theories were tried to put the pathophysiology and causes of infertility in order to find solutions to this problem. The aim of this study is:-

1. To study the distribution of the problem all over Tikrit governorate.
2. To study the relation between some hormones, biochemical parameters and infertility.

Patients and Methods*:** 600 infertile patients were enrolled .The study conducted at obstetrics and gynecology out-patient of Tikrit Teaching Hospital. The primary investigations of infertility were done to all women. Seventy two patients complained of ovarian cause infertility were taken randomly as a group -1- and 18 normal fertile women as a control group or group -2- to study FSH, LH, prolactin, insulin, leptin, TSH, T3, T4, blood sugar, lipid profile, BMI ,Glutathione (internal anti-oxidant) and Malondialdehyde (oxidative stress product). ***Results: infertility increased in Iraq after 2003 war. The primary infertility is more than secondary infertility. Many factors associated with it such as: age, BMI, blood groups, blood sugar, lipids profile and hormones. Different relations between study's hormones, Glutathione and Malondialdehyde. ***Conclusion:*** The environmental factors can participates in infertility since 2003 in Iraq. Different hormones such as FSH,LH,Prolactin,Insulin, TSH, T4, T3, Leptin and others play a role in pathogenesis and different mechanisms of infertility. These hormones and infertility at the end result would be affected by oxidative stress of the body.

علاقة بعض الهرمونات والمتغيرات الكيميائية في النساء العقيمات

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الخلاصة

دراستنا تهدف الى معرفة توزيع مشكلة العقم في محافظة صلاح الدين وعلاقته ببعض الهرمونات والمتغيرات الكيمياوية مع بعضها في مشكلة العقم. اخذت600 مريضة تعاني العقم من قسم النسائية والتوليد ووجد ان 72 % هو بسبب خلل في عمل المبيض ووجد زيادة في تلك المشكلة بعد سنة 2003. ووجد ايضا" ان هناك علاقة بين تلك المشكلة وكتلة الجسم وفصيلة الدم وعلاقة بعض الهرمونات وعلاقتها بالكلوتاثيون والمونولدهايد كعناصر تشارك في الجهد التأكسدي كإحدى اسباب العقم.

Introduction

American society of reproduction and medicine (ASRM) define infertility as disability to conceive after one year of unprotected sexual intercourse. It is either primary or secondary infertility. The causes may be female factor or male factor or both. The causes of female factor are: ovarian, tubal, uterine or cervical factors. Unexplained infertility If no causes were found in both male and female . The most important cause of infertility is hormonal imbalance. The main hormones that play role are:- GnRH which secreted from hypothalamus in pulsatile manner to stimulate secretion of FSH and LH. FSH and LH are a glycoprotein hormones secreted from anterior lobe of pituitary to stimulate oocyte growth, estrogen secretion and endometrial growth while LH helps ovulation and increases endometrial secretion under effect of progesterone. Estrogen and progesterone both are secreted from granulosa and luteinized granulosa cells of ovary respectively. [(1)] Prolactin is polypeptides hormone. It acts with estrogen in secondary sexual characteristics development such as breast development. Any disturbance in its level may be due to pituitary macro or micro adenoma, oral contraception, lactation, thyroid diseases, breast surgery, renal problems and stress can cause menstrual irregularities and infertility.[(2)] Any disturbances in serum level of TSH (glycoprotein hormone) and its action in T4, T3 can cause menstrual irregularities and infertility. [(3)] Insulin which is a protein hormone acts on all over the body cells, so many hormones can affect its function and any increase in the weight of female can cause insulin resistance and ovarian dysfunction. [(4)] Leptin is a polypeptide proteins product of (ob_gene). Fat cells produce it . Leptin affects hypothalamus to decrease food intake, increases energy, decreases neuropeptide (Y) which increases appetite and increases pro-opiomelanocortin (POMC) which decrease appetite .[(5)]So in obese person its level increases with resistant to its action. [(6)(7)]Other tissues that produce leptin are:- ovary, placenta, breast, skeletal muscle, bone marrow, liver and pituitary gland. [(8)]Melatonin regulates and increases it especially at night. Insulin participates with melatonin to increase up regulation of insulin stimulated leptin expression and decrease appetite at sleep. [(9, 10, 11, 12)] So the treatment of diabetic patients with leptin will decrease blood sugar [(13)]. It also plays a role in atherosclerosis; angiogenesis and increase surfactant production by alveolar pneumocystes type -2-. [(14, 15)] Body mass index (BMI) increases leptin levels and resistant to its action in obese women that affects GnRH , FSH ,LH ,ovarian function, menstrual irregularities and infertility .[(16, 17, 18)] Other biochemical parameters in blood can affect ovarian function and fertility such as serum glucose and serum lipid profile because cholesterol is essential to steroid synthesis, oocyte production, ovulation and corpus luteum function. [(19,20)] They found that follicular antral fluid has high level of HDL which may explain the benefit of it to the growing follicles and steroid synthesis.[(21)] Some new theories to explain infertility include oxidative stress and many drugs and supplements try to treat the effect of oxidative stress. Oxidative stress defines it as imbalance between production and removal of free radicals. [(22)] The free radicals can cause damage to all body cells through changes in cell DNA, [(24)] destruction of cell wall, [(27)] and changes of cell wall receptors. They lead to subfertility and abortions due to their effects on sperms , tubes, ovaries especially follicular growth and corpus luteum and endometrium.[(23)] The origin of free radicals may be endogenous such as metabolism [(22,24)] or exogenous such as:- smoking, pollution, radiations, psychological stress and continuous drugs users. [(24,25, 26)] So malignancy, medical diseases such as hypertension, myocardial infarction, atherosclerosis, diabetes and infertility will be the results. [(25,26,28)] Malondialdehyde is normal endogenous products of oxidative

process inside body, if its production uncontrolled due to any pathological process, the fatty acids oxidize to lipid hydroperoxide and break to smaller products called malondialdehyde which affect DNA and genetic mutation with cellular dysfunction and even malignancy. [25,26,29,30] Antioxidant is a compound which is very important to human body to prevent different disorders. Antioxidant is either enzymatic or non-enzymatic and intracellular or extracellular. [25,28] One of important antioxidant is Glutathione. It's a peptide containing three amino acids (GSH).At cell level ,it has different biological actions like amino acids transport, metabolism, and regulates some different defense mechanisms. Glutathione plays important role in antioxidant defense, nutrient metabolism, and regulation of cellular events (including gene expression, DNA and protein synthesis, cell proliferation and apoptosis, signal transduction, cytokine production and immune response, and protein glutathionylation).When Glutathione decreases, it contributes to oxidative stress, which may cause aging, kwashiorkor disaeses, seizure, Alzheimer's disease, Parkinson's disease, liver disease, cystic fibrosis, sickle cell anemia, HIV, AIDS, cancer, heart attack, stroke, and diabetes. [25,26,30, 31]

Patients and methods

This study was done in Tikrit Teaching Hospital in the period between September, 2008 to January 2010. Six hundreds infertile women who attended to gynecology outpatient were enrolled in the study. All women had full history, examination (general and pelvic examination), blood group, and primary investigations of infertility.[1] These investegations included husband's semen fluid analysis, hormonal study which was done by ELIZA at third day of the cycle and included:- FSH, LH and prolactin. Hysterosalphgography was done to each woman who had previous pelvic surgery or infertility for 3 years period . Some cases had laparoscopic reports. Serial ultrasound examinations were done to monitor ovulation. All women had no medical diseases. From these 600 infertile women 72 were selected randomly complained of ovarian cause of infertility as a group (1) and 18 randomly selected fertile women as a control group or group (2). All 90 (72 + 18) women had blood test by ELIZA for LH, FSH, prolactin, T3, T4, TSH, insulin, leptin, blood sugar, blood group and lipid profile where done by enzymatic method at morning when women fasting. Measuring of Glutathione (GSH) by Thioborbituric acid interaction by Elman's method as antioxidant substance [32]and malondialdehyde (MDA) as a product of oxidative process were done. [33] Metric Body mass index (BMI) was measured by dividing the weight of woman in kilograms on the square of her length by meters. [34] Lipid profile include cholesterol, triglyceride, high density lipoprotein (HDL), low density lipoprotein (LDL) and very low density lipoprotein (VLDL) were also measured.

Statistical analysis and data management

The Statistical Package for Social Sciences (SPSS, version 18) was used for data entry and analysis. Chi (χ^2) square test of association was used to compare proportions of different factors among cases with the same proportions among controls. Unpaired Student t test was used to compare means of numerical variables among cases and the control group, and Pearson correlation was used to determine the correlation between variables. P value of ≤ 0.05 was regarded as statistically significant.

Results

The primary infertility was (59.3%) and secondary infertility was (41.7%).The general characteristics of 600 infertile women are shown in table (1).The ovarian cause of infertility was the highest cause (39.7%)

,uterine and cervical causes were the lowest cause (0.2%).Polycystic ovarian syndrome was (3.5%) of all ovarian cause.

Table (1):- The different characteristics and hormonal levels between primary and secondary infertility.

Characteristics	Primary infertility		Secondary infertility		Total		P value
	Mean	SD	Mean	SD	Mean	SD	
Age(year)	26.0843	13.7092	30.0902	19.20177	27.7133	16.27388	<0.05
BMI(Kg/M²)	27.65	6.18342	29.5631	6.10516	28.428	6.21814	<0.05
FSH level(mlu/ml)	8.8567	4.57466	8.5576	4.90738	8.7354	4.71071	> 0.05
LH level(mlu/ml)	9.022	4.50485	9.158	5.21121	9.0777	4.80306	>0.05
Prolactin level(ng/ml)	16.2765	12.69035	16.2721	11.76872	16.2747	12.31194	> 0.05

Table (2) Shows marriage date, the duration of infertility and infertility type which explain the increment of infertility after 2003.There is a small number of patients complained of infertility before 2003.

Table (2):- The distribution of infertility cases according to marriage date and type of infertility.

Year of marriage	Type of infertility		Total
	Primary infertility	Secondary infertility	
<2000	32	88	120
	(9%)	(36.1%)	(20%)
2001	6	11	17
	(1.70%)	(4.5%)	2.80%
2002	7	13	20
	(2%)	(5.3%)	(3.3%)
2003	14	28	42
	(3.9%)	(11.5%)	(7%)
2004	16	21	37
	(4.5%)	(8.6%)	(6.2%)
2005	30	18	48
	(8.4%)	(7.4%)	(8%)
2006	39	24	63
	(11%)	(9.8%)	(10.5%)

2007	49	22	71
	(13.8%)	(9%)	(11.8%)
2008	88	19	107
	(24.7%)	(7.8%)	(17.8%)
2009	75	0	75
	(21.1%)	(0.00%)	(12.5%)
Total	356	244	600
	(100%)	(100%)	(100%)

Table (3) shows the educational levels of infertile women. The low levels of education was high among infertile patients.

Table (3):- The relation between infertility and female educational level.

Educational level		**Type of infertility**		**Total**
		primary infertility	**secondary infertility**	
	Illiteracy	156	120	276
		(43.8%)	(49.2%)	(46%)
	Read and write	103	76	179
		(28.9%)	(31.1%)	(29.8%)
	Primary	28	17	45
		(7.9%)	(7.0%)	(7.5%)
	Secondary	11	7	18
		(3.1%)	(2.9%)	(3%)
	College	21	7	28
		(5.9%)	(2.9%)	(4.7%)
	Master	35	16	51
		(9.8%)	(6.6%)	(8.5%)
	PhD	2	1	3
		(0.6%)	(0.4%)	(0.5%
Total		356	244	600
		(100%)	(100%)	(100%)

The blood group distribution in infertile couple is shown in table (4).

Table (4):- The distribution of infertility according to blood group and type of infertility

Type of infertility	Male blood group	Female blood group							Total
		O+	B+	A+	AB+	B-	O-	A-	
Primary infertility*	O+	243	78	1	7	2	1	0	332
		93.5%	95.1%	100%	87.5%	100%	100%	0.0%	93.80%
	A+	16	3	0	1	0	0	0	20
		6.2%	3.7%	0.0%	12.5%	0.0%	0.0%	0.0%	5.60%
	AB+	1	1	0	0	0	0	0	2
		0.4%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.6%
	Total	260	82	1	8	2	1	0	354
		100%	100%	100%	100%	100%	100%	0.0%	100%
Secondary infertility*	O+	170	21	3	3	1	1	1	200
		80.20%	91.30%	100%	100%	100%	100%	100%	82.00%
	A+	42	2	0	0	0	0	0	44
		19.80%	8.70%	0.00%	0.00%	0.00%	0.00%	0.00%	18.00%
	Total	212	23	3	3	1	1	1	244
		100%	100%	100%	100%	100%	100%	100%	100%

*not significant (p >0.05)

Table (5) shows the Pearson correlation among different variables in 600 women. It shows significant correlation between age and BMI, age and years of secondary infertility. BMI was significantly correlated with age, years of secondary infertility and date of marriage. FSH level was significantly correlated with LH, and prolactin level. LH level was significantly correlated with FSH, Prolactin, and years of secondary infertility.

Table (5):- The Pearson correlation among different variables in 600 women

Variables	Age(year)	BMI(Kg/M²)	FSH level(mlu/ml)	LH level(mlu/ml)	Prolactin level(ng/ml)	Date of marriage	Years of secondary infertility
Age(year)	1	.137**	0.022	0.049	0.02	0.012	0.145**
BMI(Kg/ M²)	0.137**	1	-.021-	-0.068	0.009	-0.122-**	0.118**
FSH level(mlu/ ml)	0.022	-.021	1	0.428**	0.171**	-.011-	0.026
LH level(mlu/ ml)	0.049	-.068	.428**	1	0.232**	-.019-	.116**
Prolactin level(ng/ml)	0.02	0.009	0.171**	0.232**	1	-.036-	0.034
Date of marriage	0.012	0.122**	-.011	-.019	-.036-	1	0.003
Years of secondary infertility	0.145**	.118**	0.026	0.116**	0.034	0.003	1

**. Correlation is significant at the 0.01 level (2-tailed). The second part of results related to the ovarian cause of infertility (group 1) in comparison to control group(group 2).Table (6) shows the characteristics of both groups. The primary infertility was 69.44% while secondary infertility was 30.56% in group (1).

Table (6):- General characteristics of group (1) and group (2)

Characteristics	Group (1)		Group(2)		Total		P value
	Mean	SD	Mean	SD	Mean	SD	
Age(year)	26.61	8.05	27.89	7.12	26.87	7.85	>0.05
BMI(Kg/ M²)	28.28	6.60	23.76	1.81	27.37	6.22	<0.05
Years of 2ndry infertility	1.14	2.24	0.00	0.00	0.91	2.05	<0.05
No. of Gravida*	2.01	1.41	2.17	1.04	2.04	1.34	>0.05
No. of living baby	1.51	0.99	1.50	0.79	1.51	0.95	>0.05
No. of dead baby	0.92	1.70	2.50	1.29	1.23	1.74	<0.05

No. of abortions &ectopic pregnancy	0.75	1.55	2.33	1.33	1.07	1.63	<0.05

<0.05 = significant, >0.05 = non –significant *Gravida :number of pregnancies

Table (7) shows the different levels of hormonal and biochemical parameters in 72 women (group(1)) and 18 women, (group (2)).

Table (7):- The differences between hormonal and biochemical parameters among group(1) and group(2).

	Group(1)		Group(2)		Total		P value
	Mean	**SD**	**Mean**	**SD**	**Mean**	**SD**	
FSH level(mlu/ml)	9.8	4.4	6.3	1.7	9.1	4.2	<0.05
LH level(mlu/ml)	8.9	4.5	6.2	1.7	8.4	4.3	<0.05
Prolactin level (ng/ml)	16.1	11.6	9.7	4.1	14.8	10.8	<0.05
leptin(ng/ml)	1.3	0.3	1.2	0.2	1.3	0.3	>0.05
Insulin(mlu/ml)	10.1	1.7	9.3	2.1	10.0	1.8	>0.05
TSH(mlu/ml)	30.6	36.1	28.4	42.1	30.2	37.2	>0.05
T4(µg/dl)	3.8	7.9	1.7	1.5	3.4	7.2	>0.05
T3(ng/ml)	1.8	2.5	0.7	0.2	1.6	2.3	>0.05
Glucose(mmol/L)	2.7	3.2	1.5	1.4	2.4	3.0	>0.05
Cholesterol(mmol/L)	86.0	12.2	81.9	8.9	85.2	11.7	>0.05
Tri(mmol/L)	188.6	41.3	159.9	24.5	182.9	40.1	<0.05
HDL(mmol/L)	97.1	31.7	84.9	26.9	94.7	31.0	>0.05
LDL(mmol/L)	32.9	10.4	31.7	4.4	32.7	9.5	>0.05
V LDL(mmol/L)	125.7	55.1	100.9	23.9	120.7	51.3	>0.05
Malondialdehyde(nmol/L)	0.9	0.3	0.7	0.3	0.9	0.3	<0.05
Glutathione(µmol/L)	0.9	0.2	0.9	0.3	0.9	0.2	>0.05

<0.05 = significant, >0.05 = non -significant

Pearson correlation shows significant positive correlation between BMI and HDL in group(1) in comparison with positive correlation with leptin in group (2). Pearson correlation of leptin level with different variables shows positive correlation with insulin level as compared with positive correlation with HDL and T4 among group(2). The glutathione significantly has positive correlation with the malondialdehyde among group (1) as compared with non- significant weak correlation among group (2) which indicates an active role in the pathology of the infertility. Table (8).

Table (8):- The Pearson correlation between variables among group (1) and group(2).

	BMI(Kg/ M²)		Leptin(ng/ml)		Triglyceride(mmol/L)		Malondialdehyde (nmol/L)		Glutathione (µmol/L)	
	Group (1)	Group (2)	Group (1)	Group (2)	Group (1)	Group (2)	Group (1)	Group (2)	Grou p(1)	Group (2)
BMI(Kg/ M²)			0.033	.618**	0.019	-.105-	0.029	0.113	0.022	0.044
FSH level(mlu/ml)	0.148	-.097-	-.018-	-.049-	.282*	-.168-	0.055	-.070-	-.131-	0.125
LH level(mlu/ml)	0.045	-.006-	0.161	-.327-	0.011	-.088-	-.219-	0.192	-.121-	-.069-
Prolactin level(ng/ml)	-.066-	-.387-	-.024-	-.445-	-.077-	0.333	0.016	0.013	0.105	-.218-
Leptin(ng/ml)	0.033	.618**			0.022	-.092-	0.084	-.131-	0.049	-.056-
Insulin(mlu/ml)	-.021-	-.236-	.646**	-.104-	0.064	0.101	0.042	-.042-	-.151-	-.087-
TSH(mlu/ml)	0.17	-.119-	-.054-	-.147-	0.093	.823**	-.020-	0.445	-.134-	-.061-
T4(µg/dl)	-.045-	-.174-	-.160-	-.383-	-.102-	0.026	0.051	-.025-	-.006-	0.044
T3(ng/ml)	0.03	-.218-	0.224	-.153-	0.025	-.337-	0.134	-.224-	0.145	-.130-
Glucose(mmol/L)	-.081-	-.073-	-.132-	-.227-	-.12-	0.057	0.03	-.189-	0.009	-.261-
Cholesterol(mmol/L)	0.145	0.05	-.032-	0.392	0.114	-.374-	0.011	-.334-	0	-.287-
Triglyceride(mmol/L)	0.019	-.105-	0.022	-.092-			-.021-	0.393	-.099-	-.074-
HDL(mmol/L)	.306**	0.323	-.191-	0.339	0.041	0.445	0.024	-.119-	0.087	0.073
LDL(mmol/L)	-.011-	0.239	-.024-	-.004-	-.178-	-.025-	-.182-	0.102	-.002-	0.406
VLDL(mmol/L)	-.104-	0.041	0.046	0.185	.732**	-.471-*	0.028	-.406-	-.002-	-.066-
Malondialdehyde (nmol/L)	0.029	0.113	0.084	-.131-	-.021-	0.393			.599**	-.154-
Glutathione (µmol/L)	0.022	0.044	0.049	-.056-	-.099-	-.074-	.599**	-.154-		

Discussion

The Middle East (ME), an area rich in history and tradition with>300 million population, includes 18 heterogeneous countries concerning resources, income per capita, available healthcare services, population density, growth rate, birth rate, total fertility rate and life expectancy. There is a high prevalence of infertility in the ME because of

post-partum infection, unsafe abortion, iatrogenic tubal and pelvic infertility, tuberculosis, schistosomiasis and high incidence of male factor infertility. [35] The percentage of primary and secondary infertility was similar to other studies in the North of Iraq.[36] The high rate of primary infertility may be due to genetic and social factors. The violence stemming from the occupation and civil war between 2003 and 2008 in Iraq redefined the oppression and suffering of Iraqi women, disrupting and shifting their social and familial roles, while also making them vulnerable as targets in the civil conflicts and affects Iraqi women's health and well-being.[37] The differences between rural and urban area may be due to the differences in pollution, environments, social, psychological, genetic and nutritional factors. The common cause of infertility was ovarian cause and this result agreed with many studies. This may be due to disruption of hypothalamic pituitary gonadal axis which can result in menstrual disorders and infertility through impairment of folliculogenesis, ovulation, and endometrial maturation. The WHO classification of ovulating infertility into four groups were WHO group I: hypogonadotropic hypogonadal anovulation(hypothalamic amenorrhea), WHO group 2-, normogonadotropic normoestrogenic anovulation (polycystic ovarian syndrome) WHO group 3 hypergonadotropic hypoestrogenic anovulation (premature ovarian failure, advanced maternal age) and WHO group 4 hyperprolactinemic anovulation. The most common causes of above are polycystic ovarian syndrome and advanced woman age.[38] The distribution of causes found in our study agrees with Tahir (2006) in Kurkuk city.[39] Earlier studies of infertility, abortion, pregnancy loss and other different medical diseases found the relation of them to ABO system. These results agreed with previous our work about ABO and infertility.[40] Many hormones play a role in the problem of subfertility either by endocrine or paracrine manner. FSH and LH are the main players in ovarian function. The high level of FSH is found in our results agrees with other studies [42], but they disagree with our previous work in the same governorate.[43] FSH level irregularities occur in young female at puberty and increases at premenopausal women due a decrease in ovarian reserve; [42] other causes of its increment are disorders like thyroid and adrenal disorders, chromosomal defects, irregular usage of oral contraceptive pills, pelvic surgery, abortion, pelvic inflammatory disease, chemotherapy and radiotherapy.[44] High LH level agrees with other studies [45] and it disagrees with our previous work.[43]. It may be due to the high number of polycystic ovarian syndrome cases that include in this study and the disturbance in leptin secretion may increase GnRH that increases LH secretion.[46] Prolactin level increased in infertile women. This result agrees with others.[43, 47] Factors that increases it are multiple and interlacing like: sleep disturbances, surgery, heart diseases, pituitary adenoma, hypothyroidism and some drugs.[2,48] In different studies. It's high level can suppress GnRH and decrease LH and FSH then decrease estrogen,, progesterone with high level of androgens can affect ovarian functions, endometrial thinning and endometrial receptivity which lead to anovulation, menstrual irregularities, amenorrhea, embryo maldevelopment and infertility. [47,48] Harmful high level of prolactin can cause oxidative stress on genital tract and inhibit B-indorphins, prostaglandins and nitric oxide inside ovaries which are responsible for folliculogenesis, ovarian blood flow and ovulation.[49,50,51] Male and female genital tract functions in part would depend on thyroid gland. Any disturbances in it can cause menstrual irregularities, subfertility and abortions.[53] Increment in BMI can be associated with increase in insulin hormone leading to its resistance in peripheral tissues, increment in androgen, prolactin, LH hormones levels leading to subfertility,

implantation defects of embryo and abortion.[54, 55] Leptin is one of new player in the problem of energy balance, weight control, GnRh release, FSH and LH release, ovarian function and infertility. The higher level of this hormone found in infertile women group agreed with other studies that found it increases in infertile women with high BMI that lead to a high level of neuropeptide (Y), Leptin resistance and hypothalamic hypogonadism and suppress ovarian function and folliculogenesis.[56,57] Endometeriosis found with high level of Leptin in peritoneal fluid.[58] Kisspeptin are proteins which have more recently been found to play a role in regulation of the HPO axis, via the mediation of the metabolic hormone Leptin's effect on the hypothalamic gland. Mutation in the kisspeptin receptor, gp-54, are associated with delayed or absent puberty probably due to reduction leptin-linked triggers for gonadotropin release.[1] As high leptin and insulin level, the level of cholesterol, LDL would increase due to metabolism disturbances due to increase lipid consumption and liver dysfunction. High levels of the above TG will lead to atherosclerosis, cardio vascular problems associated with PCOS.[59] HDL levels may play a role in female fertility.[60] Increment of MDA may be due to oxidative stress and free radicles can decrease the biological age of ovary. High level of MDA concentration was found in peritoneal fluid of infertile female.[61] There is reduction of antioxidant concentration in unexplained infertility, tubal factor and endometriosis.[62] The increase in MDA level is associated with obesity and might cause infertility. [22,61]

Conclusion

There is a wide range of factors that affect infertility especially hormonal and ovarian female infertility.

Recommendation

Larger studies about different etiologies, causes and factors that affect infertility are needed to find different solutions to this wide world growing problem.

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