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The Effect of Oxidative Stress on Oocyte Characteristics and Pregnancy Outcome in a Sample of Iraqi Infertile Women Undergoing ICSI

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Abstract

Oxidative stress in the field of reproduction has been extensively considered in association with sperm properties and male infertility; in any case, the effect of oxidative stress in association with oocyte trademark got less thought than that of sperms. The goal of the study is to understand the possible association among serum and follicular oxidative markers in infertile women and oocyte characteristics and pregnancy result in ICSI cycles. The present case-control study included 57 infertile women undergoing ICSI that was done in the High Institute of Infertility Diagnosis and Assisted Reproductive Technologies at Al-Nahrain University. The assessment started in April 2018 and connected with March 2019. Mean metaphase II oocyte count of all women was 5.70±3.87, that of pregnant women was 6.90±3.68 and that of non-pregnant women was 4.46±3.73; there was a basic qualification in mean metaphase II oocyte check among pregnant and non-pregnant women ($P = 0.016$); being higher in pregnant women. The mean abnormal oocyte count of all women was 0.63±1.26, that of pregnant women was 0.28±0.45 and that of non-pregnant women was 1.00±1.68. Oxidative stress markers inside and out affected clinical pregnancy result ($P < 0.05$) and appear to impact clinical pregnancy bring about women undergoing ICSI due to its effect of oocyte characteristics.

Keywords: Oocyte quality, Oxidative stress, ICSI

1. Introduction

Infertility is a disease of the reproductive system defined by the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse (Vander Borght, et al. [1]). Twenty to thirty percent of infertility cases are caused by male infertility, while 20-35% is due to female infertility, 25-40% is due to combined problems and, and in 10-20% of cases, the cause is unknown. The most common cause of female infertility is ovulatory problems which are generally manifested by sparse or absent menstrual periods (Elhussein, et al. [2]). The introduction of assisted conception advancement made an intelligent agitation in the restorative reproductive medicine field concerning desolateness (Huang, et al. [3]). With the headway of intrauterine insemination (IUI), controlled ovarian impelling, selection of ovulation, and intracytoplasmic sperm injection (ICSI), the estimate of unbeneficial couple ended up being all the more promising, and the pace of clinical pregnancy and live birth may land at respectably high figures in certain concentrations in developing countries (Sharma, et al. [4]). Regardless, there are cases of desolateness that do not respond to any therapeutic intervention and the unprofitability research tasks are facilitated toward settling the trouble of such cases (Sharma, et al. [4]). Oxidative stress (OS) plays a vital role in human reproduction. It rises as a consequence of excessive reactive oxygen species (ROS) production and/or reduced total antioxidant capacity (TAC) protection (Oleiwi, et al. [5]). Oxidative stress and oxidant administrators are associated with different helpful infirmities, such as degenerative issues, blazing conditions, and neoplastic conditions (Pizzino, et al. [6]). Vanity in the two folks have been comprehensively surveyed concerning oxidative stress and it has been shown that oxidative stress inside and out impacts sum and nature of sperms (Hindal, et al. [7]); in any case, the effect of oxidative stress in association with oocyte trademark got less thought than that of sperms (Dutta,

et al. [8], Agarwal, et al. [9]). By virtue of nonappearance of understanding about the activity of oxidative stress in association with oocytes quality and because of relative remarkableness of Iraqi composed works with this regard, the streams study was orchestrated and coordinated in order to comprehend the possible association among serum and follicular oxidative markers in infertile women and oocyte characteristics and pregnancy result in ICSI cycles.

2. Materials and Methods

The present case-control study included 57 infertile women undergoing ICSI in the High Institute of Infertility Diagnosis and Assisted Reproductive Technologies at Al-Nahrain University. The assessment started in April 2018 and connected with March 2019. Women were presented to ICSI methodology as showed by frameworks and methodologies in the High Institute of Infertility Diagnosis and Assisted Reproductive Technologies at Al-Nahrain University with adversary ovarian actuation show. Components fused into the present examination were measurement characteristics, age, weight list, length or duration of infertility, the purpose behind desolateness, and kind of infertility and oocytes characteristics. Serum ROS was evaluated at cycle day 2 and day of oocyte retrieval, while, follicular fluid ROS was assessed at the day of oocyte retrieval figuratively speaking. The biochemical estimation of ROS was finished by the headings of the giving association. The fundamental outcome was pregnancy rate and discretionary outcomes included oocyte and creating life characteristics. Every patient counted in this study gave her written informed consent, which was approved by the ethical committee in the institute. Data were then changed into an SPSS structure 23 spreadsheets for verifiable assessment. Data were analyzed, laid out, and presented using suitable real gadgets and the level of significance was set at $P \leq 0.05$. The primary obstacle in the present assessment was the issue of getting

infertile women encountering agonist shows.

3. Results

Close to the completion of the assessment, 29 women winning to get clinically pregnant, along these lines the clinical pregnancy pace of social occasion 1 was 50.9 %. The measurement characteristics of infertile women tried the present assessment, ordered by clinical pregnancy result, are appeared in Table 1. None of these characteristics impacted pregnancy results basically (P > 0.05). Oocytes characteristics of infertile women are showed up in Table 2. The mean total recuperated oocyte check of all women was 9.95±3.33, that of pregnant women was 10.69±2.71 and that of non-pregnant women was 9.18±3.77; there was no critical differentiation in mean hard and fast recouped oocyte count among pregnant and non-pregnant women (P = 0.087), Table 2. Mean metaphase II oocyte check of all women was 5.70±3.87, that of pregnant women was 6.90±3.68 and that of non-pregnant women was 4.46±3.73; there was a basic difference in mean metaphase II oocyte count among pregnant and non-pregnant women (P = 0.016); being higher in pregnant women, Table 2. Mean metaphase I oocyte check of all women was 2.79±2.07, that of pregnant women was 2.66±2.14 and that of non-pregnant women was 2.93±2.02; there was no imperative differentiation in mean metaphase I oocyte count among pregnant and non-pregnant women (P = 0.622), Table 2. Mean germinal vesicle oocyte count of all women was 0.82±0.95, that of pregnant women was 0.86±0.99 and that of non-pregnant women was 0.79±0.92; there was no important qualification in mean germinal vesicle oocyte count among pregnant and non-pregnant women (P = 0.764), Table 2. Mean abnormal oocyte check of all women was 0.63±1.26, that of pregnant women was 0.28±0.45 and that of non-pregnant women was 1.00±1.68 (Table 2). Mean treated (2PN) oocyte check of all women was 0.77±0.98, that of pregnant women was 0.66±0.94

and that of non-pregnant women was 0.89±1.03; there was no enormous differentiation in mean arranged (2PN) oocyte count among pregnant and non-pregnant women (P = 0.366), Table 2. The mean treatment pace of all women was 77.93±18.88%, that of pregnant women was 83.09±14.87% and that of non-pregnant women was 72.58±21.26%. The serum union of ROS at cycle day 2 everything considered, similar to center and between quartile broaden, was 1.59 (0.37) ng/ml, that of pregnant women was 1.538 (0.4) ng/ml and that of non-pregnant women was 1.599 (0.37) ng/ml; there was no essential differentiation in the centralization of ROS at cycle day 2 among pregnant and non-pregnant women (P = 0.780), Figure 1. The serum gathering of ROS at the day of ova pickup everything considered, with respect to center and between quartile broaden, was 1.08 (1.04) ng/ml, that of pregnant women was 0.6 (0.82) ng/ml, and that of non-pregnant women was 1.13 (0.56) ng/ml; there was incredibly important differentiation in the serum centralization of ROS at the day of ova pickup among pregnant and non-pregnant women (P = 0.009); being less in pregnant women, Figure 1. The follicular fluid gathering of ROS everything being equivalent, in regards to center and between quartile broaden, was 1.08 (0.64) ng/ml, that of pregnant women was 0.905 (0.47) ng/ml and that of non-pregnant women was 1.242 (0.59) ng/ml; there was significantly basic difference in the follicular fluid centralization of ROS among pregnant and non-pregnant women (P = 0.014); being less in pregnant women, Figure 1.

Table (1): Demographic characteristics of subfertile women undergoing ICSI according to antagonist protocol and categorized according to clinical pregnancy outcome

Characteristic	Total *n* = 57	Pregnant *n* = 29	Non-pregnant *n* = 28	*P*
Age				
Mean ±SD	29.29 ±5.22	29.31±5.00	29.28±5.53	0.986 † NS
Range	18 - 36	18 – 36	18 - 36	
< 35, *n* (%)	46 (81.7%)	23 (79.3%)	23 (82.1%)	0.786 ¥ NS
≥ 35, *n* (%)	11 (19.3%)	6 (20.7%)	5 (17.9%)	
BMI				
Mean ±SD	24.15 ±2.76	23.69±3.10	24.63±2.32	0.200 † NS
Range	19.40 -35.30	19.40 -35.30	20.10 -29.10	
Normal, *n* (%)	36 (63.2%)	20 (69.0%)	16 (57.1%)	0.355 ¥ NS
Overweight, *n* (%)	21 (36.8%)	9 (31.0%)	12 (42.9%)	
Causes of infertility				
Male factor, *n* (%)	24 (42.1%)	13 (44.8%)	11 (39.3%)	0.222 ¥ NS
Female factor, *n* (%)	19 (33.3%)	7 (24.1%)	12 (42.9%)	
Combined, *n* (%)	1 (1.8%)	0 (0.0%)	1 (3.6%)	
Unexplained, *n* (%)	13 (22.8%)	9 (31.0%)	4 (14.3%)	
Antioxidant administration onset				
Mean ±SD (Months)	2.05 ±0.81	2.03±0.82	2.07±0.81	0.865 † NS
Range	1 -3	1 -3	1 -3	
1 month, *n* (%)	17 (29.8%)	9 (31.0%)	8 (28.6%)	0.980 ¥ NS
2 months, *n* (%)	20 (35.1%)	10 (34.5%)	10 (35.7%)	
3 months, *n* (%)	20 (35.1%)	10 (34.5%)	10 (35.7%)	
Duration of antagonist administration				
Mean ±SD (days)	3.53 ±0.73	3.48±0.83	3.57±0.63	0.653 † NS
Range	2 -5	2 -5	3 -5	

n: number of cases; SD: standard deviation; †: Independent samples t-test; ¥: Chi-square test; NS: not significant at $P \leq 0.05$

4. Discussion

Clearly, the clinical pregnancy rate achieved in the present assessment is tolerably high in relationship with that practice in some area and nearby readiness centers according to literature. (Hussain, et al. [10], Ahmeid [11], Fadhil, et al. [12], Ashrafi, et al. [13], Eftekhar, et al. [14], Zagadailov, et al. [15]).

This may be attributed to the use of unfriendly to oxidant framework

Table (2): Oocytes characteristics of subfertile women undergoing ICSI according to antagonist protocol and categorized according to clinical pregnancy outcome

Oocyte Characteristic	Total *n* = 57	Pregnant *n* = 29	Non-pregnant *n* = 28	*P*
Oocyte number	9.95 ±3.33	10.69 ±2.71	9.18 ±3.77	0.087 † NS
MII oocytes	5.70 ±3.87	6.90 ±3.68	4.46 ±3.73	0.016 € S
MI oocytes	2.79 ±2.07	2.66 ±2.14	2.93 ±2.02	0.622 € NS
GV oocytes	0.82 ±0.95	0.86 ±0.99	0.79 ±0.92	0.764 € NS
Abnormal oocytes	0.63 ±1.26	0.28 ±0.45	1.00 ±1.68	0.029 € S
Fertilized (2PN) oocytes	0.77 ±0.98	0.66 ±0.94	0.89 ±1.03	0.366 € NS
Fertilization Rate %	77.93 ±18.88	83.09 ±14.87	72.58 ±21.26	0.034 † S

Data were expressed as mean ±standard deviation; *n*: number of cases; †: Independent samples t-test; €: Mann Whitney U test; NS: not significant at $P \leq 0.05$; S: significant at $P \leq 0.05$

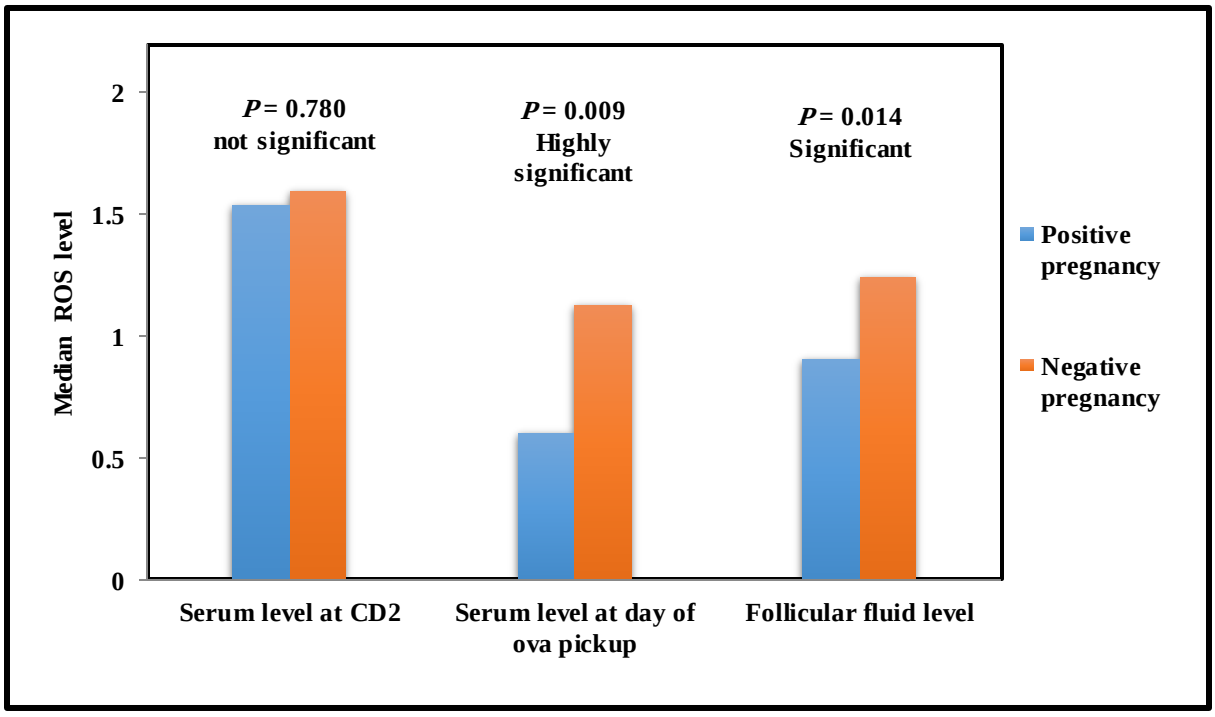

Figure (1): The concentration of reactive oxygen species (ROS) in women undergoing ICSI according to antagonist protocol and categorized according to clinical pregnancy outcome

before starting ICSI cycle for women tried this examination. The effect of oxidative stress and against oxidant use in Assisted Reproductive Technologies (ART's), particularly ICSI, will be discussed in nuances later on in this part inside the portion of oxidative stress markers. As a general rule, we acknowledge that the idea of recouped oocytes, instead of unquestionably the number, is the guideline factor that may anticipate positive pregnancy result following ICSI. Thusly, we separated the connection between oocytes' quality and clinical pregnancy results. For instance, it has been showing up in the present examination that the mean number of metaphase II (create) oocytes was out and out higher in women who winning to get pregnant diverged from that of women who fail to get pregnant; in any case, the mean number of metaphase I (young) oocytes had no colossal impact of clinical pregnancy result. Meanwhile, it has been showing up in this examination that a low number of unordinary oocytes is connected with better clinical pregnancy rate imperatively anyway the mean number of germinal vesicle oocyte had no basic effect on clinical pregnancy result. These results are in simultaneousness with the delayed consequences of various investigators who found a vital connection between the amount of MII oocytes and clinical pregnancy bring about ART's (Ozgur, et al. [16], Hariton, et al. [17]). The realities show that just MII oocytes are ordinarily picked for ICSI technique; regardless, not all MII oocytes realize clinical pregnancy, as such a proposal can be made that not all MII oocytes have a comparable ability to offer climb to powerful pregnancy, yet the higher the number, the better the chance to get an MII oocyte with a likelihood to offer rising to clinical pregnancy. In the present assessment, there was no basic qualification in the gathering of ROS at cycle day 2 among pregnant and non-pregnant women. This is in simultaneousness with various makers who found no basic differentiation in serum assembly of oxidative stress

markers among pregnant and non-pregnant women (Jozwik, et al. [18]). We, in the present assessment, treated infertile women with cell fortifications, henceforth, there was extraordinarily basic differentiation in the serum centralization of ROS at the day of ova pickup among pregnant and non-pregnant women; being less in pregnant women. Also, there was significantly colossal complexity in the follicular fluid combination of ROS among pregnant and non-pregnant women; being less in pregnant women. Our results are in simultaneousness with that of (Oral, et al. [19]), who inspected follicular fluid Malondialdehyde (MDA) (as an oxidative stress marker) in women encountering ART's and found that women with positive pregnancy had on a very basic level less MDA level than women with negative pregnancy (Oral, et al. [19]). The same makers in another assessment had investigated the association between ROS levels in follicular fluid and oocyte advancement, treatment, and pregnancy. Hence they have itemized that follicular fluid ROS levels may be a potential marker for anticipating accomplishment in ART's (Attaran, et al. [20]). Follicular and unique fluid contain cell fortifications that are prepared for offsetting or deactivating free radicals, along these lines ensuring their essence at perfect physiologic levels. Two cell support systems have been seen; the enzymatic structure which fuses superoxide dismutase, catalase, and glutathione peroxidase, and the non-enzymatic structure which fuses ascorbic destructive (supplement C), urate, tocopherol (supplement E), pyruvate, glutathione, and others (Agarwal, et al. [21]). In the ART's setting, oocytes and sperm which are removed from their normal microenvironments can be displayed to irrational degrees of ROS as the malignant growth anticipation operator assurance instruments are lost (Agarwal, et al. [22]), finally realizing a region of OS (du Plessis, et al. [23]). On account of its ability to alter cell particles, for instance, lipids, proteins, and nucleic acids, OS apply

blocking ramifications for extravagance through upsetting sperm layer genuineness and bringing out fundamental sperm DNA hurt, mitochondrial changes, adenosine triphosphate depletion, and apoptosis (Agarwal, et al. [24], Agarwal, et al. [25]). The activity of antagonistic to oxidants in ART's has been surveyed by different makers and the revelations were strong of the usage of foes of oxidants in ART's because of the higher rate related to their use (ElSheikh, et al. [26], Galatioto, et al. [27], Peivandi, et al. [28], Safarinejad [29], Safarinejad, et al. [30], Wong, et al. [31], Omu, et al. [32], Lenzi, et al. [33], Ciftci, et al. [34], Greco, et al. [35], Raheem, et al. [36]). Up until this point, serum ROS on the day of ova pickup is the best marker of positive pregnancy bring about women encountering ICSI being empowered for ovulation using an adversary show and tolerating cell fortification treatment. In addition, we recommend making a framework, using cell fortifications to treat the fruitless couple, at any rate, one month before selection into ART's program.

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Author Contribution

Al-Muttalibi FA, performed the study, Mossa HAL, Altamimi LR, Abdulhamed WA examined and reviewed results and manuscript writing.

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Biography

Dr. Fatima Abdulrazzaq Al-Muttalibi

She graduated from Almustansiryia University, college of medicine in 2008. She started her permanency in Obstetrics and Gynecology Department at Alzahra' teaching hospital, Wasit, Iraq in 2015. She got accepted at the High Institute of Infertility Diagnosis and Assisted Reproductive Technologies, Al Nahrain University to study clinical infertility in 2017. Currently, she is about to finish the degree to get a High Diploma degree in clinical infertility and ART.

Dr. Hayder A. L. Mossa

He is an assistant professor at Al Nahrain University. He is a member of the Iraqi Society of Fertility, Iraqi Society of Zoonotic Diseases (ISZD) & Iraqi Zoonotic Communicable Diseases (ISZCD), Iraqi Academics Syndicate, European Society of Human Reproduction and Embryology (ESHRE). An editorial board member of Merit Research Journal of Medicine and Medical Sciences (MRJMMS), International Journal of Medical Research & Health Sciences (IJMRHS). A reviewer at global journals Inc. (USA). He was a candidate for the award of Arabian Young Researchers in 2007. He granted for many appreciation certificates in the scientific & administrative fields. He participated & supervised in more than 60 scientific & medical conferences, workshops & training course. Has many kinds of

research & articles published in Iraqi & national medical journals. Chief & member of nearly 60 scientific & administrative committees from 2006-till now. Has interests in assisted reproductive technologies, reproductive micromanipulation, medical terminology, research methods and seminars, reproductive physiology, advanced embryology.

Dr. Liqaa R. Altamimi

She is a Senior Clinical Embryologist, the director of Baghdad Specialized IVF and Genetics Center in Baghdad. She got B.Sc. in Medical Microbiology from Baghdad and the High Diploma in Medical Laboratory Analysis in Baghdad. She got her Ph.D. in Genetic Engineering from Charles Molnar University in Malaysia 2012. She published many kinds of research in global journals in Clinical Embryology, Reproductive Medicine during the last 15 years. She is the Pioneer Clinical Embryologist, many Embryologists had been practiced under her marvelous supervision. She is a member of the European Society of Human Reproduction And Embryology (ESHRE), American Society of Reproductive Medicine (ASRM), Middle East Fertility Society (MEFS), and an active member in Iraqi Fertility Society (IFS). She had multiple certificates for training and supervising from many centers worldwide.

Dr. Wasan A. Abdulhameed

She received M.B.CH.B. from the University of Baghdad, College of medicine in 1992, the diploma and the Arab Board in Gyn.&Obs from Medical City, Baghdad in 1998. She worked in Al Sharjah University, UAE. She earned the laparoscopic surgery certificate from India in 2009. She was a Lactation consultant in Australia in 2010. She occupied many administrative positions She attended more than 20 academic congresses internationally.

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