European Journal of Molecular & Clinical Medicine

ISSN2515-8260 Volume 09, Issue 02, 2022

Original research paper

A study on relation between hormonal parameters and risk markers in infertility

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Abstract

One in every four couples in developing countries is affected by infertility. The magnitude of the problem calls for urgent action, particularly when the majority of cases of infertility are avoidable. Of 60-80 million couples suffering from infertility every year worldwide, probably between 15 and 20 million (25%) are in India alone. A case-control study layout was adopted for the present study on relation between hormonal parameters and risk markers in infertility the test subjects were referred from various infertility clinics were chosen for the study. Out of 150 study subjects, 100 infertile women showed increased FSH concentration and they revealed increased MDA concentration, mean b/c value and mCBMNF. Infertile women with low concentration of estradiol demonstrated an elevated MDA concentration, mCBMNF and mean b/c value than others with increased level of estradiol. Out of 150 study subjects, 115 individuals showed an increased PRL concentration and they revealed increased values of MDA concentration, mCBMNF and mean b/c value.

Keywords: Hormonal parameters, risk markers, infertility

Introduction

WHO (1991) reported that, "infertility is a serious health issue worldwide, affecting approximately 8%-10% of couples worldwide". According to Poongothai *et al*. (2009), "of 60-80 million couples suffering from infertility every year worldwide, probably between 15 and 20 million (25%) are in India alone". Mascarenhas *et al*. (2012) suggested that, "one in every four couples in developing countries is affected by infertility. The magnitude of the problem calls for urgent action, particularly when the majority of cases of infertility are avoidable" [1].

As per the report of WHO, Calverton (2004) mentioned that, "the overall prevalence of primary infertility ranged between 3.9% and 16.8%". In a previous study by Talwar *et al*. (1986) it was estimated that, infertility vary widely among Indian states from 3.7% in Uttar Pradesh, Himachal Pradesh and Maharashtra, to 5% in Andhra Pradesh, and 15% in Kashmir.

In 2007, Kumar reported, "the prevalence of primary infertility has also been shown to vary across the tribes and castes within the same region in India". According to the study by Shamila and Sasikala (2011) it was reported that, "the prevalence of female infertility was 45.67% in Kanyakumari, 44.24% in Thirunelveli and 41.91% in Thiruvananthapuram" [2].
Sadock and Sadock (2011) observed that, "40% of infertility cases were related to men, 40% of women and 20% of both genders". According to a multicentric study conducted by WHO (1987) it was point out that, "from 1982 to 1985, 20% of cases were attributed to male factors, 38% to female factors, 27% had causal factors identified in both partners and 15% could not be satisfactorily attributed to either partner" [3].
In 2011, Unuane *et al*. suggested that, "female infertility occurs in about 37% of all infertile couples". In a study by Kumar and Singh (2015) mentioned a report on the status of infertility in India i.e., "nearly 50% of infertility is related to the reproductive anomalies or disorders in the females. In addition, over 25% of infertility cases, no detectable cause can be traced after routine tests, which leaves the case as unexplained infertility"[4].
According to Domar *et al*. (1990), "female infertility accounts for up to 70% of these cases, largely due to the very complex processes involved in the female reproductive system". In 2013, Direkvand-Moghadam *et al*., "the incidence of female infertility is rising and varies from 10 to 20%". Agarwal and Allamaneni (2004) suggested that, "infertility is a common problem; treatment is sometimes inadequate because the aetiology is not fully understood" [5].
In 2005, a study by Agarwal *et al*. mentioned that, "the absolute number of couples seeking infertility services has increased dramatically". Olooto *et al*. (2012) reported that, "female infertility is caused by genetic, hormonal, or environmental factors". In addition, Olooto *et al*. (2012) add on that, "pelvic inflammatory disease, uterine fibroids, age-related factors, tubal blockage and hostile cervical mucus can cause infertility in females" [6].

Methodology

A case-control study layout was adopted for the present study on relation between hormonal parameters and risk markers in infertility. The test subjects were referred from various infertility clinics were chosen for the study. Demographic, physiological and lifestyle features were noted using proforma. Venous blood samples were collected and used to measure CBMN assay, mutagen sensitivity analysis, MDA and hormonal assay. Observations and outcomes were analyzed using the SPSS statistical software.

Study variables

- **Hormonal parameters:** Serum PRL, Serum Progesterone, Serum LH, Serum FSH, Serum TSH, Serum Estradiol.
- **Genetic instability and oxidative stress parameters:** CBMN assay, mutagen sensitivity analysis and MDA.

Study subjects

In order to evaluate the role of OxS and genetic instabilities among subjects with female infertility, a test-control study was designed. For the study 150 clinically diagnosed infertile female subjects and 150 age matched healthy females with one or more children were involved in the study as control.

Inclusion criteria

- **Patients:** Clinically proven patients with infertility by a Gynaecologist were included in the study.

- **Controls:** Subjects without history of infertility, dyslipidemia, hypertension, diabetes, renal disease or other cardio vascular disease were not included as Controls.

Exclusion criteria

- Neither the patients nor the controls should be suffering from any acute or chronic illness, cancer or on prolonged medication are excluded.
- Subjects above the age of 45 and below the age of 18 are excluded.

Results

Table 1: Comparison study of risk markers and TSH level

TSH	Number	MDA	mCBMNF	Mean b/c value
≤4	75	2.4	12.10	0.750
>4	75	3.00	12.50	0.799

Infertile females within creased TSH level showed a higher MDA concentration, elevated mCBMNF and mean b/c value.

Table 2: Comparison study of risk markers and FSH level

FSH	Number	MDA	mCBMNF	Mean b/c value
≤21.5	50	2.00	12.47	0.742
>21.5	100	2.95	12.50	0.800

Out of 150 study subjects, 100 infertile women showed increased FSH concentration and they revealed increased MDA concentration, mean b/c value and mCBMNF.

Table 3: Comparison study of risk markers and LH level

LH	Number	MDA	mCBMNF	Mean b/c value
≤12.5	10	2.80	12.12	0.735
>12.5	140	3.08	13.10	0.780

Infertile women with elevated LH showed comparatively higher MDA concentration, mCBMNF and mean b/c value than the rest.

Table 4: Comparison study of risk markers and progesterone level

Progesterone	Number	MDA	mCBMNF	Mean b/c value
≤20	137	2.90	13.00	0.810
>20	13	1.72	12.39	0.768

Infertile women with reduced progesterone levels reported higher MDA, mCBMNF and mean b/c value than those with higher progesterone concentration.

Table 5: comparison study of risk markers and Estradiol level

Estradiol	Number	MDA	mCBMNF	Mean b/c value
≤120	124	2.95	12.80	0.801
>120	26	2.50	12.62	0.789

Infertile women with low concentration of estradiol demonstrated an elevated MDA concentration, mCBMNF and mean b/c value than others with increased level of estradiol.

ISSN2515-8260 Volume 09, Issue 02, 2022

Table 6: Comparison study of risk markers and PRL level

PRL	Number	MDA	mCBMNF	Mean b/c value
≤29	35	2.70	12.42	0.777
>29	115	2.98	12.59	0.780

Out of 150 study subjects, 115 individuals showed an increased Prolactin concentration and they revealed increased values of MDA concentration, mCBMNF and mean b/c value.

Discussion

According to Szczepańska *et al*. (2003), "Oxidative Stress (OxS) biomarkers have been found in various sites in the female reproductive tract, suggesting their role in various physiological functions". In 2001, Polak *et al*. suggested that, "ROS are involved in various causative factors of infertility, i.e. tubal factor, peritoneal factor, endometriosis and unexplained infertility" [7].

Van Langendonckt *et al*. (2002) explained that, "the scientific basis of unexplained infertility remains a challenge and OxS may have a role in its pathophysiology. The role of OxS in infertility is not completely ascertained". Szczepańska *et al*. (2003) point out that, "a number of studies have evaluated the role of OxS in tubal factor infertility, endometriosis and peritoneal factor infertility [8].

The tubal and peritoneal microenvironments influence fertilization and early embryonic development". Agarwal *et al*. (2003) suggested that, "elevated concentrations of ROS in these environments may have detrimental effects on the spermatozoa, oocytes, sperm oocyte interaction and embryos both in the fallopian tube and the peritoneal cavity". In 2005 another study by Agarwal *et al*., "activated macrophages have been implicated in the pathogenesis of endometriosis. These macrophages are the source of increased generation of ROS in the peritoneal environment associated with endometriosis" [6].

According to Kumar (2007), "infertility is a global health issue, affecting approximately 8-10% couples worldwide". According the report of "World Health Organization", Adamson *et al*. in 2011 estimated that, "60 to 80 million couples worldwide currently suffer from infertility". Vander and Wyns (2018) reported that, "from 1950 to 2010 and projections to 2050, as measured by the average number of births over a woman's lifetime" [9].

Parikh *et al*. (2012) has been suggested that, "infertility may share some common pathways with CVD. Polycystic ovarian syndrome (PCOS), obesity and thyroid dysfunction are all known to be associated with CVD". In a study by Sotiriadis *et al*. (2007) explained that, "Hypercoagulable states or thrombophilia may contribute to early miscarriages, a potential unrecognized cause of subfertility" [10].

In a previous study by Andrews *et al*. (1991) point out that, "women with fertility have also increased levels of psychological stress, as manifested in conditions such as depression and anxiety, which may contribute to CVD" [11]. In 2012 Agarwal *et al*. explained that, "OxS, which has an important role in the development of CVD, is also increased in infertile patients with conditions such as endometriosis, PCOS, obesity and unexplained infertility". However, the association between female infertility and CVD was not yet studied [6].

According to Martin (2008), "DNA damage is a form of cell stress and injury that has been implicated in the pathogenesis of many neurological disorders". In 2003, Andreassi explained that, "DNA damage is caused by multiple endogenous and exogenous factors such as OxS, age, smoking, hypertension, hyperlipidemia and diabetes mellitus". In another study by Andreassi *et al*. (2005) it was reported that, "diabetes is a major determinant of somatic DNA instability". Simon *et al*. (2011) has been proved that, "OxS can provoke extensive oxidative DNA damage, DNA strand breaks and chromosomal aberrations" [12].

ISSN2515-8260 Volume 09, Issue 02, 2022

Conclusion

- Hormonal Parameters such as, TSH, FSH, LH and Prolactin showed positive correlation with mCBMNF, MDA and Meanb/c value.

References

1. Rutstein SO, Shah IH. Infecundity, infertility and childlessness in developing countries (No. 9). ORC Macro, MEASURE DHS, 2004.
2. Sabarre KA, Khan Z, Whitten AN, Remes O, Phillips KP. A qualitative study of Ottawa university students' awareness, knowledge and perceptions of infertility, infertility risk factors and assisted reproductive technologies (ART). Reproductive health. 2013;10(1):41.
3. Sadock BJ, Sadock VA. Kaplan and Sadock's synopsis of psychiatry: Behavioral sciences/clinical psychiatry. Lippincott Williams & Wilkins, 2011.
4. Unuane D, Tournaye H, Velkeniers B, Poppe K. Endocrine disorders & female infertility. Best Practice & Research Clinical Endocrinology & Metabolism. 2011;25(6):861-873.
5. Domar AD. Stress and infertility in women: Is there a relationship? In Session: Psychotherapy in Practice: Psychotherapy in Practice. 1996;2(2):17-27.
6. Agarwal A, Allamaneni SS. Role of free radicals in female reproductive diseases and assisted reproduction. Reproductive biomedicine online. 2004;9(3):338-347.
7. Szczepańska M, Koźlik J, Skrzypczak J, Mikołajczyk M. Oxidative stress may be a piecein the endometriosis puzzle. Fertility and sterility. 2003;79(6):288-1293.
8. Lanoix D, Lacasse AA, Reiter RJ, Vaillancourt C. Melatonin: the smart killer: the human trophoblast as a model. Molecular and cellular endocrinology. 2012;348(1):1-11.
9. Kumar N, Singh AK. Trends of male factor infertility, an important cause of infertility: A review of literature. Journal of human reproductive sciences. 2015;8(4):191.
10. Parikh NI, Cnattingius S, Mittleman MA, Ludvigsson JF, Ingelsson E. Subfertility and risk of later life maternal cardiovascular disease. Human reproduction. 2012;27(2):568-575.
11. Andrews FM, Abbey A, Halman LJ. Stress from infertility, marriage factors and subjective well-being of wives and husbands. Journal of health and social behavior, 1991, 238-253.
12. Andreassi MG, Botto N, Simi S, Casella M, Manfredi S, Lucarelli M, *et al*. Diabetes and chronic nitrate therapy as co-determinants of somatic DNA damage in patients with coronary artery disease. Journal of Molecular Medicine. 2005;83(4):279-286.