ORIGINAL RESEARCH PAPER
Volume - 9 | Issue - 6 | June - 2020 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

PSYCHO-SOCIO TRAUMA BEHIND INFERTILITY: LEADING CAUSE OF BIOCHEMICAL STRESS AMONG COUPLES AND YOGA BEING EFFECTIVE THERAPEUTIC INTERVENTION

Medicine

Vidhu Gill — Resarch Scholar, Central Research Station, Subharti Medical College, Swami Vivekanand Subharti University, Meerut, India

Kritanjali Singh* — Research Officer and Head Medical College, Swami Vivekanand Subharti University, Meerut, India *Corresponding Author

Ashok Kumar — Post Doctoral Fellow, Department of Medical Genetics, Sanjay Gandhi Post Graduate Institute of Medical Sciences, Lucknow,India.

Bhawna Pant — Professor, Department of Community medicine, Subharti Medical college, Swami Vivekanand Subharti University, Meerut, India

Mamta Tyagi — Professor and Head, Department of Obs. & Gynae, Subharti Medical College, Swami Vivekanand Subharti University, Meerut, India

ABSTRACT

Due to artificial intelligence and modern technology, human race isfacing mental crisis, physical trauma and social stigma. Eventually, the couples who are unable to reproduce suffer with a psychological distress and exaggerated social status. Unbiased infertility may suffocate both the partnersand their differences might lead to separation or divorce. Due to infertility there is a severe hike in divorce rates. Disturbed hormonal or chemical influx leads to oxidative stress and further damages DNA, which may interrupt various functions, or increases accumulation of free radicals and stress hormone. Yoga boosts our spiritual and mental health, and becomes a potent method of treatments. It sounds promising in balancing out stress in both the partners and elevating their chances of conception when given with or without Assisted Reproductive Therapies (ART). This review will focus on psycho-social stress inducing infertility in a couple by disturbing biochemical status and its treatment with Yoga.

KEYWORDS

ART, NFHS, Infertile couples, Stress, Yoga

INTRODUCTION

Infertility in female is the failure to achieve a clinical pregnancy after 12 months or more of regular unprotected sexual intercourse. It also defines as “the inability of a sexually active, non-contraceptive couple to achieve pregnancy in one year”. Male infertility/sub-fertility is diagnosed by a variety of clinical interventions or laboratory evaluation of semen[2].

Sir Charles Darwin in his greatest theory about origin of species has explained that Evolution is the key to understand nature's guiding force and prompt. Just like any other animal, human divide and reproduce to continue its race which is necessary to pass on variations from one generation to other[3]. One of his theory's postulate also decides our stability in a population i.e. Survival of the fittest. In a conquest to achieve almost everything, this survival abruptly exhibits stress on body, mind and soul.

Human race is blessed with no seasonal breeding and its gestational period is most suitable to increase its chances of survival. On the other hand, there is a contrasting statement stating we too possess a mating season based on our heat pattern[4] which is actually decided by seasons, our position fromequator in latitudes and months of a year. It is folksy said that chances of conception increases if planned according to the position of sun and optimal temperature is between 50-70°F[4]. These footnotes of traditional treatments should be taken into consideration by the doctors while providing any ART to the patient, which might be increase its success rates[5].

Global burden of infertility

1. International Status

To underline the global status of this disease, a descriptive work was published by Mascarenhas M N et al 2012 which depicted a broader view. They have used Bayesian Hierarchical model to estimate the prevalence and trends in infertility in 190 countries and territories.

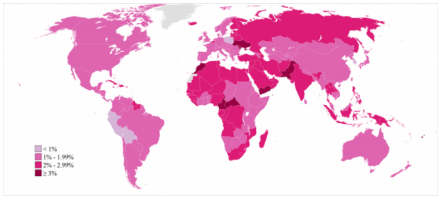

Figure 1.Prevalence of Primary Infertility among women who seek a child, in 2010[6]

Infertility prevalence is indexed on the female partner; age –standardized prevalence among women aged 20-44 years is shown here(Picture Credit: National, Regional, and Global Trends in Infertility Prevalence Since 1990: A Systematic Analysis of 277 Health Surveys)

The study group consisted of people aged 20-44 who had unprotected sexual intercourse, only 1.9% been unable to attain a live birth (primary infertility) and those who tried for a second child (secondary infertility) are at the risk of 10.5% infertility. They have calculated the couples affected by infertility with an increase in population (42 million in 1990 rose up to 48 million in 2010)[6]. An increasing rate of infertility is affecting around 10-15% of couples globally and males are solely responsible for 20-20 % cases of infertility. On global level male infertility data is not accurately analyzed yet[7].

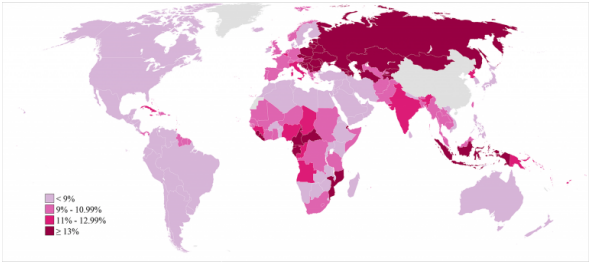

Figure 2. Prevalence of secondary infertility among women who have had live birth and seek another, in 2010[6]

2. National Burden: Indian subcontinent

With respect to our Indian subcontinent, we fall intocategory of country with low prevalence rate of infertility in contrast withits global status. Various surveys on family health done by our government in between last 3 decades have shown that in India incidence of infertility has lowered down by 7.7 % from last two surveys[8]. It was around 2.0% during 1998-1999; 1.85 % during 2005-2006; but in past decade it tooka dramatic leap of around 18-20 % which describes that situation of current status of fertility in India is in shallow waters (NFHS-4).

We have a comparable data of fertility for bothmen and women, underlining infertility ratio and its greater inclination. Data collected in NFHS-4 in the year 2015-16 was taken after ten year gap and in these years'modernization and technology have developed and reached to each and every part of the country, be it urban areas or backward rural areas. Parent's outlook towards schooling and early marriage has changed perspective of girl child.From the contrasting data on fertility rate of both men and women aged between 20-19 years residing in both urban and rural areas of our country we may speculate the situation's adverse effects and can guide government with better planning. Comparison oftotal fertility rate of 2005-06 (purple) and different indicators in 2015-16 such as total fertility rate(TFR) green, urban/rural red/blue, men/women is given in the following diagram (Fig.3).

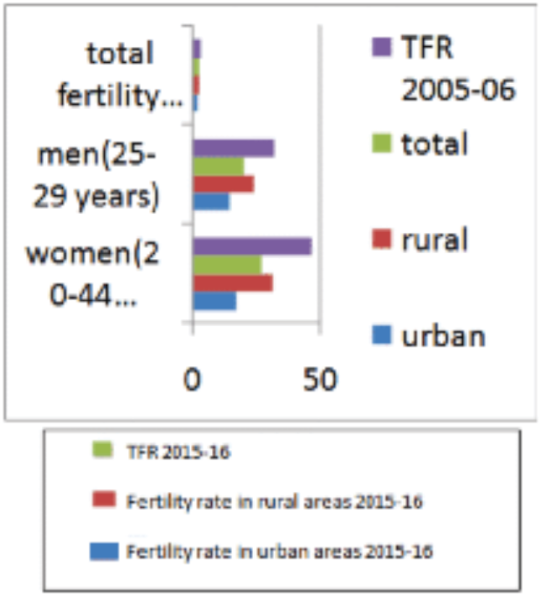

Figure 3: Data collected from the National Family Health Survey-4 (NFHS-4) by Government of India(available on their website) conducted after a gap of 10 years shows a drastic change in the fertility rate in men and women of reproductive age between 20-29 years living in both urban and rural areas.

This data shows an increasing trend of infertility. In NFHS-3 it was concluded that TFR of India in 2005-06 was 2.7% which later declined by 0.5%in survey of 2015-16 NHFS-4 (2.2%). TFR in men and women shows down slope of fertility and this data is an eye opener. In women TFR in NFHS-3 was 47.4 and decreased by 20.6 % in NFHS-4(26.8%). In men this range is little lower than women i.e. TFR in NFHS-3 was 32.3% and lowered by 12 % in NFHS-4(20.3%). This comparable fertility data when collected in urban and rural areas proved that men and women in rural areas are more fertile than urban residents. In NFHS-4 it has been found that fertility rate of men and women of urban areas is 14.1% & 17.5% respectively and in rural areas it is 24.4% & 31.5 %.

In NFHS-4[9],fertility and its prevalence rate is given in a state-wise manner and various unprecedented biomarkers are described in it. In the given data of all 29 states when studied it was found that Sikkim has lowest TFR i.e. 1.2 [Child per Woman (CPW)] and Bihar with maximum TFR i.e. 3.4 CPW. In the table enlisted below state wise fertility of women is described and effect of urbanization and schooling is also given in tabular form to understand its effect on fertility. From CPW ranges of urban areas Sikkim again topped with lowest range of 1.1 and Bihar 2.4. In contrast with urban areas when data of rural areas is compared both the states ranked lowest and highest CPW respectively (Table 1).

Education is a necessary tool for complete mental and social growth of both girl and boy child. The data from various surveys and NFHS-4 it looks that it might affect the early and unwanted reproductive and endocrinal growth and sexual behavior of children in adolescence age. When state-wise data of NFHS-4 is studied fertility rates of women who had no schooling had higher fertility rates as compared to those who had been to school for 12 years or more. In women with no schooling maximum CPWwere found in Nagaland and lowest in Kerala with only 1.5. Bihar had relatively higher CPW in women with no schooling when compared to their TFR i.e. 4.1. Sikkim once again had lowest fertility rate with CPW of 1.0 with women who had schooling of 12 years or more. With women who went to school highest CPW counted as 2.2 were calculated in three states i.e. Manipur, Madhya Pradesh and Bihar.Table 1.State-wise description of fertility rates in India.

Table1.State-wise description of fertility rates in India.

Name of the State	Total Fertility Rate (CPW=Children per woman)	Fertility rates in areas	Fertility rates in women		
		Urban (CPW)	Rural(CPW)	No schooling(CPW)	Schooling till 12th or more(CPW)
Andhra Pradesh	1.8	1.5	2.0	2.2	1.6
Arunachal Pradesh	2.1	1.7	2.3	3.2	1.6
Assam	2.2	1.5	2.3	2.9	1.7
Bihar	**3.4**	**2.4**	**3.6**	4.1	**2.2**
Chattisgarh	2.2	1.8	2.4	2.7	1.8
Goa	1.7	1.7	1.6	3.2	1.6
Gujarat	2.0	1.8	2.2	3.3	1.7
Haryana	2.1	1.8	2.2	3.3	1.7
Himachal Pradesh	1.9	1.4	1.9	3.0	1.9
Jammu and Kashmir	2.0	1.6	2.2	2.8	1.7
Jharkhand	2.6	1.8	2.8	3.2	1.9
Karnataka	1.8	N.A	N.A.	2.0	1.7
Kerala	**1.6**	N.A.	N.A.	**1.5**	1.6
Madhya Pradesh	2.3	2.0	2.5	3.1	**2.2**
Maharashtra	1.9	1.7	2.1	2.7	1.6
Manipur	2.6	2.1	2.9	3.3	**2.2**
Meghalaya	**3.0**	1.7	**3.5**	4.3	1.9
Mizoram	2.3	2.0	2.7	3.1	1.5
Nagaland	2.7	1.8	3.4	**4.4**	1.8
Odisha	2.1	1.7	2.1	2.7	1.6
Punjab	**1.6**	1.6	1.6	2.6	1.4
Rajasthan	2.4	1.9	2.6	3.1	1.8
Sikkim	**1.2**	**1.1**	**1.2**	**1.7**	**1.0**
Tamil Nadu	1.7	1.5	1.9	1.9	1.7
Telangana	1.8	1.7	1.5	2.2	1.8
Tripura	1.7	1.4	1.8	2.9	1.5
Uttar Pradesh	2.7	**2.1**	3.0	3.5	1.9
Uttarakhand	2.1	1.8	2.2	3.1	1.7
West Bengal	1.8	1.6	1.9	2.5	1.3

Total fertility rate is given in CPW i.e. child per woman along with rural and urban areas. Also a comparative data of fertility is given with women who had no schooling at all or those who had 12 or more years of study (9). *variables are round figured to one decimal place**Women studied for this report are of ages between 15-49 years ***Survey courtesy: National Family Health Survey-4 2015-16 by Government of India.

Psycho-socio stress correlating Infertility

Though this medical term focuses on conceiving one's partner rather it is quite a judgmental statement about the psycho-socio status of both the couples surviving infertility. Processing of stress in couples due to elevated pressure in education, uncomfortable working environments, family pressure of bearing a child, previous miscarriages, failed assisted reproductive technology(ART) and many other fiscal issues

which may lead to unsuccessful marriage and divorces. Various studies suggested that infertile couples suffer with divorced/ separate status after years of cohabitation three times more than those who have children[10].

In lower and middle income countries like Gambia or other sub Saharan countries women are usually imposed with strict cultural morbidities like early age marriages, forced and polygynous marriages. These women who are suffering with infertility are specifically stressed emotionally or due to partner's physical violence or lack of financial support and finally their married life ends at separation or divorce[11].Womenwho are suffering with infertility suffers with adjustments as a couples and men as a partner are psychologically in pressure to make their partner conceive at the right time of the month[12]. A study specially conducted on 274 men suffering with infertility, 32 were diagnosed with depression, 60% of them suffered with anxiety disorders and 11 of them have observed counseling sessions[13].

A study conducted in Jordan on 164 infertile couples had relatively high level of psychological distress with repressed levels of life satisfaction but in contrast they had a positive mindset towards infertility being a temporary phase of their life. A significant difference of $P<0.05$ was found in both men and women due to depression and optimism[14]. In a couple it has been determined in various studies that women are more affected as compared to men. In one of a kind study on dyadic adjustments and social status of infertile couples, men seems to be less influenced and have higher dyadic adjustments and quality of life as compared to their partners. There was significant relationship of 37% with $p<0.001$[15].

Biochemical changes due to Psycho-social stress

Although oxygen is very important in maintaining and is essential in development of early embryo but after fertilization, pre and post implantation of embryo takes place in hypoxic and almost in anaerobic conditions. Increased oxidative stress in uterine environment may pose a threat may cause fragmented embryo or impaired early embryo development or induce apoptotic death of oocyte or early embryo[16]. Oxidative stress (OS) or Excessive reactive oxygen species (ROS) may hinder the endometrial lining whose main function is to support implantation of embryo. It may play a role in inducing etiopathogenesis of endometriosis, poly cystic ovarian syndrome, hydatidiform mole, tubal factor infertility and unexplained infertility[17]. Seminal fluid contain large amount of polyunsaturated fatty acids and under conditions of spontaneous lipid peroxidation there may be some loss to phospholipids which is responsible for the motility and viability of sperms in the fluid[18]. Major ROS like hydrogen peroxide and superoxide anion are responsible for causing defective sperm function in case of male infertility. Leukocyte produces much larger amount of ROS as compared to spermatozoa. The presence of leukocytes in seminal fluid is unexplainable. Determination of etiology of male infertility is important so as to develop strategies to combat and design therapeutic interventions to reduce oxidative stress in males by understanding the role glutathione peroxidase[19].

Leptin is also secreted by ovaries and induces Estrogen surge by indirect stimulation of luteinising hormone. It also possessesangiogenic activity helping in the early establishment of the vascular system between blastocyst and uterus. Leptin not only helps in fertility, conception, vascularization in uterus, implantation but it is also required in moderate amount after parturition as leptin helps in breast tissue development and induces formation of milk in mammary gland[20].Serum levels were higher in severe obese people then in people with normal BMI. It has been suggested by them that Leptin is a cytokine which affects the patho-physiology of infertility. It is found relatively higher range as 31.20±2.84 ng/ml for women with unexplained infertility as comparison with fertile women with low leptin levels 24.89±2.93 ng/ml[21]. If the expression of Leptin gene is altered at m-RNA or Protein level it might have a little effect on the sperm concentration but there might have change in the motility of the sperms. In case of altered gene product produces fewer changes in the follicle development, ovulation andluteal phase[22].

Another study on increased levels of Leptin was conducted in male and female infertile subjects as compared to fertile group. They explained that hyperleptinemia is generally associated with infertility in females rather than compared to the men in the group. Increased Leptin levels may cause changes in the eating pattern by altering the control of brain on supressing our food intake as the route to this signalling is blocked due to impaired Leptin metabolism. The disruptive control by Leptin may disregulate hypothalamic-pituitary gonadal system which further impairs reproductive functions like ovarian reserve, Poly cystic ovarian syndrome, endometriosis and major Infertility[23].

Yoga: A possible Therapeutic intervention to infertility

A relaxing approach of Yoga stated that in women Yoga and Meditation both helps in soothing the mind and making our body relax[24] so that it can prepare itself hormonally and physically for rigorous IVF treatments later on.In men, reproductive health is as important as women. The yoga sessions for men who are treated for infertility must be designed with great care and precision. Kundalini Yoga is proposed to be the best Yoga for men's virility and Sexual energy. Yoga also heals sexual dysfunctions increasing sexual potency in men. Exercises that utilize moolabandha has been directly associated with the relief in spermatthorrea, may prevent inguinal hernia and also controls secretion of Testosterone[25].

Oron G [26]stated that women experiencing infertility who were about to have IVF treatments were given complementary therapeutic interventions like Hatha Yoga have improved their stress and anxieties by improving levels of emotional functions. There by improving the success rate of their infertility treatments.A study was conducted on couples undergoing infertility treatment lead to a conclusion that effects of yoga on assisted reproductive therapies (ART) is additive[27]. Yoga Asana, pranayama and meditation profoundly increased the positive outcome and success of ART by overcoming stress, anxiety, and in turn infertility by cognition between physiological and psychological status of both men and women participating in the study. A recent study have shown a significant decrease in adrenocorticotropic hormone and cortisol levels in the group of people recruited for laughter Yoga therapy for 6 months[28]. Their results have indicated that Yoga is effective in improving the physiological and psychological status of the healthy adults. In United States a study on Yoga based practices on new university students was performed. Two programs were developed focusing on movement andbreathe[29]. Participant so f both the programs have shown a decrease in perceived stress and cortisol both. Form their findings they have hypothesized that yoga based therapies may have a neurophysiological and neurocognitive mechanisms.

Yoga reduces stress in both men and women and thus improving reproductive health by balancing Neuro-hormonal profile. It reduces urinary secretion of catecholamine, aldosterone, testosterone and luteinising hormone and increases the secretion of cortisol in urine. It controls and alters brain's alpha waves and thus reduces the secretion of serum cortisol[30].

Approaches like yoga and meditation in men can help in overcoming the oxidative stress induced infertility. These interventions can help in maintaining the integrity of sperm DNA, by increasing the genes responsible for DNA repair, cell- cycle controlling and it also anti-inflammatory effects. These in turn will lower down the incidences of infertility in men and complex diseases in the offspring[31]. After Yoga based lifestyle modifications sperm count had a positive increase of $p<0.01$ with improved and progressive motility ($p<0.001$). Reactive oxygen species reduced in sperm with hefty 69 %[32].

CONCLUSION

Infertility makes a couple those who areexpecting a child more despondent to insecurities, instabilities, loss of concentration at their work and daily chores. Making it unspeakable, mothers tend to get more tensed and under pressure as they might fall into a trap of either adisillusion of an unsuccessful partner or not to reproduce for his family. Assisted Reproductive therapies force woman's physiology and mental health into stressdue to excess in their hormonal load. They tend to become more irritated or sympathetically more demanding from their partners alas their frictions turns into living separate or completely separated. Psychological stress along with physiological changes engrosses into oxidative stress with higher levels of free radicals that further intensify or aggravatestheir infertility at molecular levels.

Yoga, on the other hand seems promising to aid assisted reproductive therapies and increases their success rates. These traditional tools when combined with alternate methods might balance all the toxins and auras and releases it out of the body making it more compatible for

ART and other fertility treatments. Today clinicians should focus on this aspect as balancing chemical load instead of artificial methods and boosting fertility with their diet. These factors will be additive to their treatments and they shall get higher rates of successful pregnancies.

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