

Summer Training at



(16th April 2012 – 9th June 2012)

**Perception of Gynecologists towards the Use of Antioxidant & Vitamin
Combination in Female Infertility**

**By
Ritika Das**

**Under the Guidance of
Dr. Kapil Garg**

**Post Graduate Diploma in Pharmaceutical Management
2011-2013**



**Institute of Health Management Research,
Jaipur
2012**

**INSTITUTE OF HEALTH
MANAGEMENT RESEARCH**

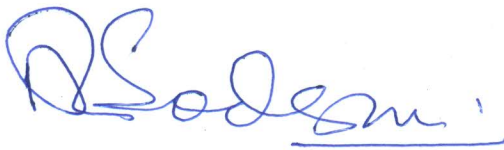
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Certificate

This is to certify that Ritika Das has undergone summer training in Sun Pharmaceuticals Ltd, Mumbai from 16th April to 9th June, 2012

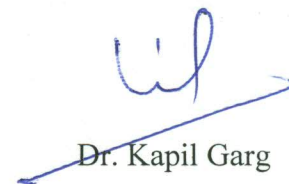
The candidate carried out all the studies related to summer training herself. Her approach to the studies has been sincere, scientific, and analytical. This summer training in partial fulfillment of the course requirement is recommended for the award of Post Graduate Diploma in pharmaceutical Management.

I wish her success in all future endeavors.



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TO WHOMSOEVER IT MAY CONCERN

This is to certify that **Ms. Ritika Das** of Indian Institute of Health Management Research, Jaipur has undergone her summer project in Sun Pharmaceutical Industries Ltd, in **Spectra Division** from **April 16, 2012** to **June 9, 2012**. Her project title was **"Perception of Gynaecologists towards the use of Antioxidant and Vitamin combination in Female infertility"**

She has completed the project to the satisfaction of her project guide and the organisation.

We wish her success in all future endeavors.

for **SUN PHARMACEUTICAL INDUSTRIES LTD.**

DEBASHISH ROY
GM – HR (CORPORATE)

ACKNOWLEDGEMENT

I would like to express my sincere gratitude towards **Sun Pharmaceutical Industries Limited** for selecting me as a summer trainee and giving me an opportunity to work on this project and also for providing a good working ambience for successful completion of this project.

I thank **Mr. Debashish Roy, Ms Anupama Dang, Mr. Paresh** of HR Department for placing me in the **SPECTRA Division** of Sun Pharmaceuticals Industries Ltd. I would like to express my special gratitude towards my guide **Ms Rashmi Parekh** who throughout my project has been a great teacher and supporter for showing me the right direction and motivating me during my project. Without her encouragement, guidance and interest, this project would not have materialized.

I would like to thank **Mr. Sanjay Sahai** (General Manager-Strategic Marketing) for sharing his valuable expertise all through the completion of this project.

I am highly grateful to Doctors for giving me their valuable time during their practice. Owing to their support and cooperation, I have successfully completed and compiled this report.

Last but not the least; I would like to express my sincere thanks to my Institute **IIHMR** and my mentor **Dr. Kapil Garg** for guiding and providing me all kind of support in my summer placement at Sun Pharmaceutical Industries Ltd.

Ritika Das

TABLE OF CONTENTS

S.No	Topic	Page No.
1	Executive Summary	3
2	Introduction to Subject	6
3	Introduction to project	26
4	Research Objectives	31
5	Research Methodology	31
6	Survey, Findings, Inferences	33
7	Conclusion	59
8	Recommendations	60
9	Bibliography	61
10	Annexure: Questionnaire	62

EXECUTIVE SUMMARY

- ✚ There is an increase in number of infertility cases especially female infertility cases.
- ✚ Oxidative stress is regarded to be one of the major reasons for female infertility.
- ✚ The purpose of this research project is to study the perception of gynaecologists towards the use of Antioxidant & vitamin combination in female infertility.
- ✚ The research will cover following points:
 - The prevalence of females infertility
 - The common causes of female infertility
 - The treatments given in common causes of female infertility
 - The prescribing frequency of antioxidants & vitamin combination in various causes of female infertility
 - The constituents which gynaecologist regard to be important in antioxidant & vitamin combination
 - The benefits expected from the use of antioxidant & vitamin combination
 - The prescribing pattern of gynaecologist for infertility treatment in both partners
 - The indications apart from female infertility where antioxidant & vitamin combination may be useful
 - The willingness of gynaecologist to use astaxanthin in female infertility treatment.
- ✚ It was found that:
 - ✓ Female infertility cases are more prevalent than male infertility cases and form a major bulk of infertility cases.
 - ✓ Ovulation disorder is the most common cause of female infertility followed by unexplained infertility, tubal and uterine causes. Cervical is the least common cause of female infertility.
 - ✓ Ovulation induction is the treatment given for ovulation causes. Surgery and IVF are the most common treatment given for tubal and uterine causes. IUI is the most common treatment given in unexplained causes.
 - ✓ Antioxidant & vitamin combination are always prescribed in unexplained infertility, age related decline in fertility, PCOS related infertility, before going for an IVF treatment, as a preconception treatment. They are also prescribed in endometriosis, PID, tuberculosis.
 - ✓ Folic acid, vitamin B6, vitamin B12, vitamin E, selenium are some of the most important components of antioxidant & vitamin combination.

- ✓ Better chances of pregnancy, mental satisfaction are some of the benefits expected from the use of antioxidant & vitamin combination
- ✓ Antioxidant & vitamin combination is generally prescribed to both the partners simultaneously.
- ✓ Antioxidant & vitamin combination is also generally prescribed in pregnancy.
- ✓ Gynaecologists are willing to prescribe a combination having astaxanthin, a more potent antioxidant along with other vitamins and minerals.

**INTRODUCTION TO
SUBJECT
FEMALE INFERTILITY AND
OXIDATIVE STRESS**

INFERTILITY

Infertility is defined as the inability to achieve a pregnancy after one year of unprotected intercourse. Conception is normally achieved within 12 months in 80-85% of couples using no contraceptive measures.

Infertility is increasing at an alarming pace in India. Out of around 250 million individuals estimated to be attempting parenthood at any given time, 13 to 19 million couples are likely to be infertile. Around 10% of the couples are infertile with almost equal incidence of female and male infertility.

FEMALE INFERTILITY- A female is infertile or sub fertile if any of these processes fail to occur:

- 1- Eggs released from ovaries (Ovulation)
- 2- Eggs must go through the fallopian tube towards the uterus
- 3- Sperm must join with the egg in the fallopian tube (Fertilization)
- 4- Fertilized egg must attach to the uterine wall (Implantation)

Causes of Female Infertility

1. **OVULATION DISORDERS:** Ovulation disorders account for infertility in majority of infertile couples. These can be caused by flaws in the regulation of reproductive hormones by the hypothalamus or the pituitary gland or by problems in the ovary itself. A woman has ovulation disorder if she ovulates infrequently or not at all.
 - **Abnormal FSH and LH secretion:** The two hormones responsible for stimulating ovulation each month – follicle stimulating hormone (FSH) and luteinizing hormone (LH)- are produced by the pituitary gland in a specific pattern during the menstrual cycle. Excess physical or emotional stress, a very high or very low body weight, or a recent substantial weight gain or loss for instance, 10% of body weight, can disrupt this pattern and affect ovulation. The main sign of this problem is regular or absent periods. Much less commonly, specific diseases of the pituitary, usually associated with other hormone deficiencies or with excess production of prolactin, may be the cause.
 - **Polycystic ovary syndrome (PCOS):** In PCOS, complex changes occur in the hypothalamus, pituitary and ovary, resulting in overproduction of male hormones (androgens), which affects ovulation. PCOS can also be associated with insulin resistance and obesity. In current gynaecological practice, PCOS is one of the most common causes of infertility.

- Luteal Phase defect: Luteal phase defect happens when ovary does not produce enough hormone progesterone after ovulation. Progesterone is vital in preparing the uterine lining for a fertilized egg.
 - Premature ovarian failure: This disorder is usually caused by an autoimmune response, where body mistakenly attacks ovarian tissues. It results in the loss of the eggs in the ovary, as well as in decreased estrogen production.
2. **TUBAL CAUSES:** When fallopian tubes are damaged or blocked, they keep sperm from getting to the egg or close off the passage of the fertilized egg into the uterus. Causes of fallopian tube damage or blockage can include:
- Inflammation of the fallopian tubes (salpingitis) due to Chlamydia or gonorrhoea (bacterial infection), previous ectopic pregnancy (in which a fertilized egg becomes implanted and starts to develop in a fallopian tube instead of in the uterus), previous surgery in the abdomen or pelvis may cause obstruction in the fallopian tubes, which prevents conception.
 - Endometriosis: Endometriosis occurs when tissue that normally grows in the uterus implants and grows in other locations. This extra tissue growth and the surgical removal of it- can cause scarring, which impairs fertility. Researchers think that the excess tissue may also produce substances that interfere with conception.
3. **CERVICAL CAUSES:** Also called cervical stenosis, this can be caused by an inherited malformation or damage to the cervix. The result is that the cervix can't produce the best type of mucus for sperm mobility and fertilization. In addition, the cervical opening may be closed, preventing any sperm from reaching the egg.
4. **UTERINE CAUSES:** Benign polyps or tumors (fibroids or myomas) in the uterus, common in women in their 30s, can impair fertility by blocking the fallopian tubes or by disrupting implantation. However, many women who have fibroids can become pregnant. Scarring within the uterus also can disrupt implantation, and some women born with uterine abnormalities, such as an abnormally shaped uterus, can have problems becoming or remaining pregnant.
5. **UNEXPLAINED INFERTILITY:** In many instances, a cause for infertility is not found. It's possible that combinations of minor factors in both partners underlie these unexplained fertility problems. The nutritional factors, oxidative stress, increasing age are some of the explanations provided to the unexplained infertility. Around 40% infertile women suffer from unexplained infertility.

OVERVIEW OF OXIDATIVE STRESS

Oxidation is a chemical process by which an atom, molecule, or ion robs electron from another atom or molecule. The most familiar oxidizing agent is oxygen itself.

Free radicals/oxidants are by- product of aerobic metabolism. Reactive oxygen species and free radical are unstable and highly reactive. Because of this, they steal the electron from the neighbouring molecule and become stable. However, in this the process the neighbouring molecule becomes free radical (because now it is devoid of electrons). And this chain continues. This chain is highly dangerous because it can attack cell components like DNA, cell wall, mitochondria.

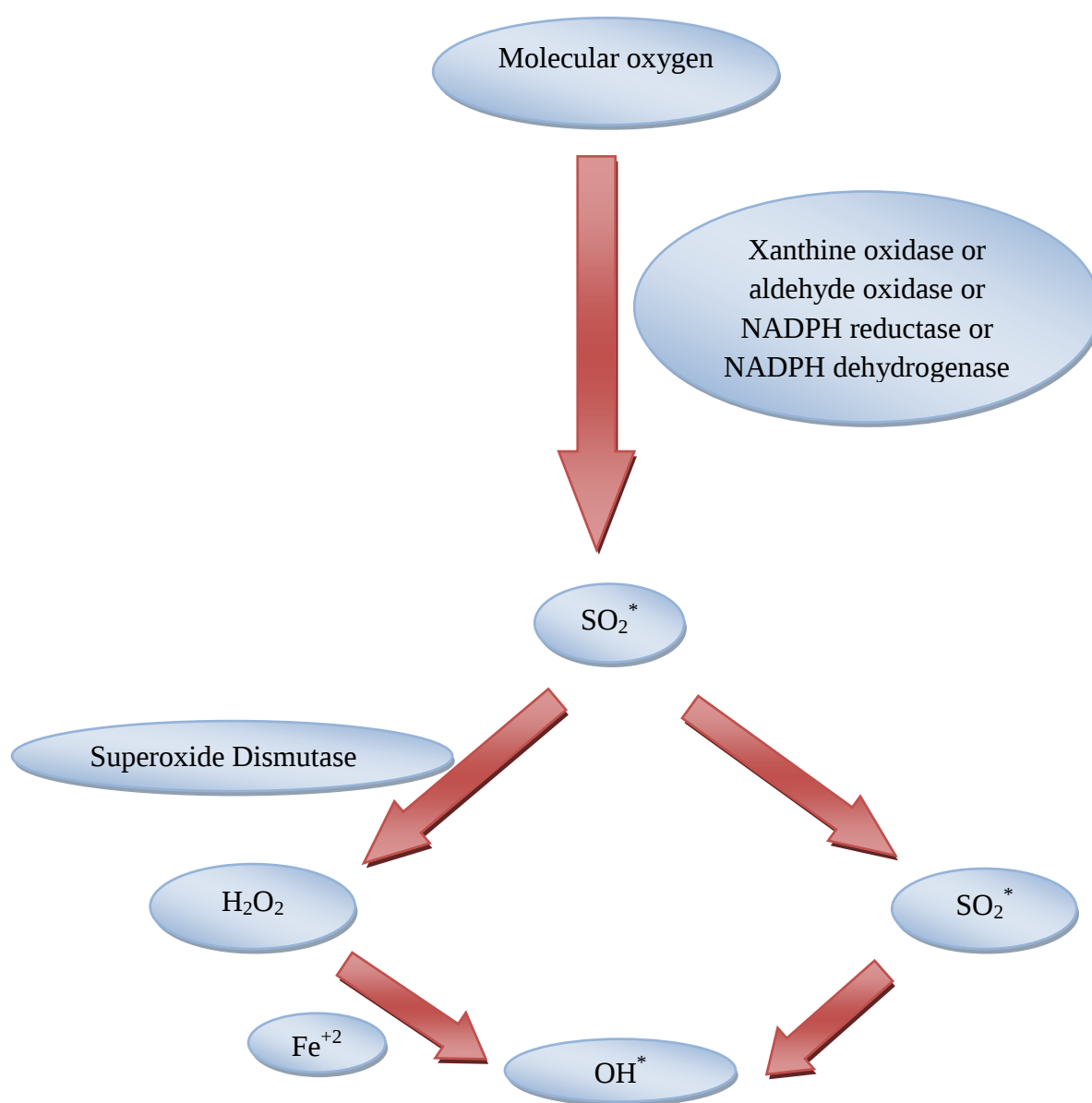


Fig 1 - Redox pathway of Superoxide generation.

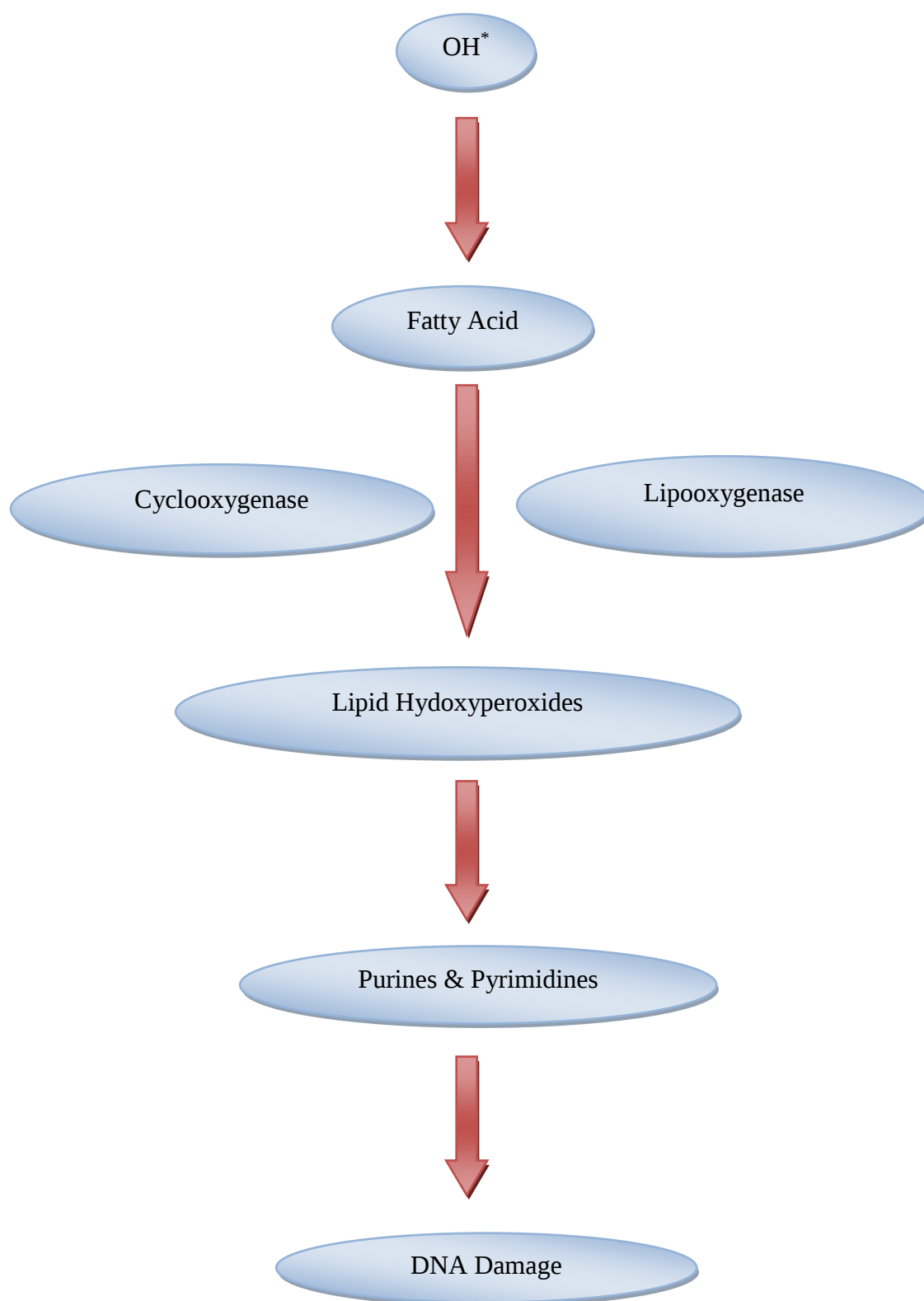
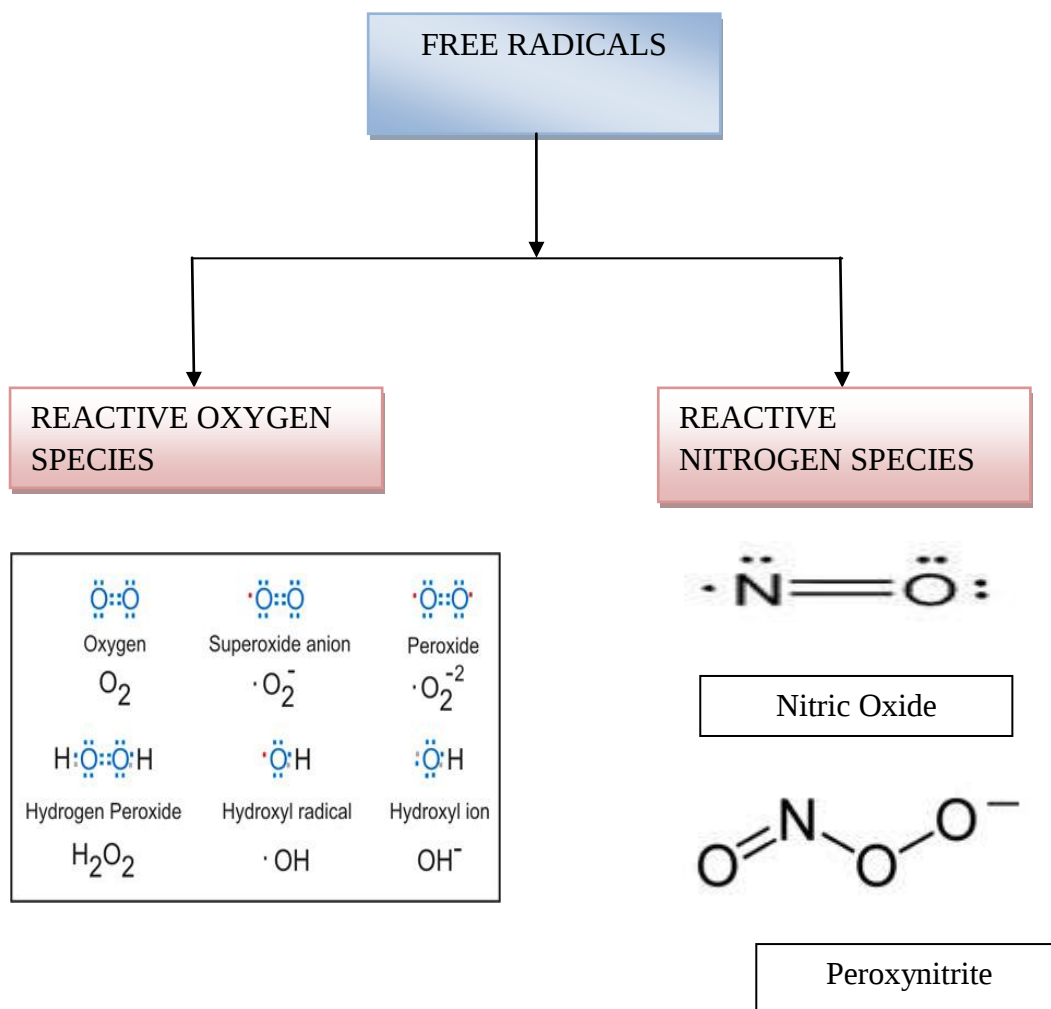


Fig 2- Induction of DNA damage by free radicals

FREE RADICALS: Species with one or more unpaired electrons in the outer orbit.



Antioxidants are the molecules that neutralize free radicals (e.g. glutathione). Normally the antioxidants are in enough quantity and they take care of these free radicals. But when the free radicals or reactive oxygen species are excess in number and the body's antioxidants fail to neutralize them, it leads to a condition called **OXIDATIVE STRESS**.

Oxidative stress

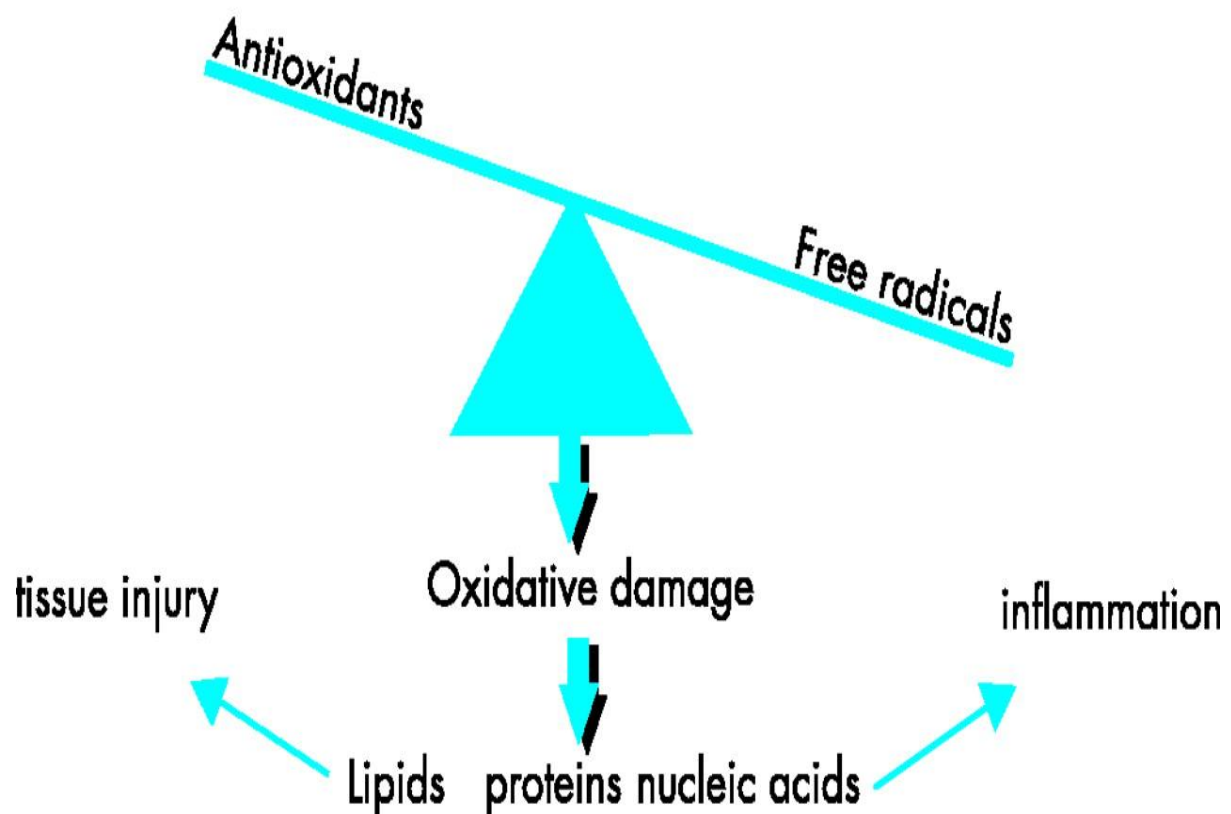


Fig 3 -Occurrence and effects of oxidative damage.

OXIDATIVE STRESS AND INFERTILITY

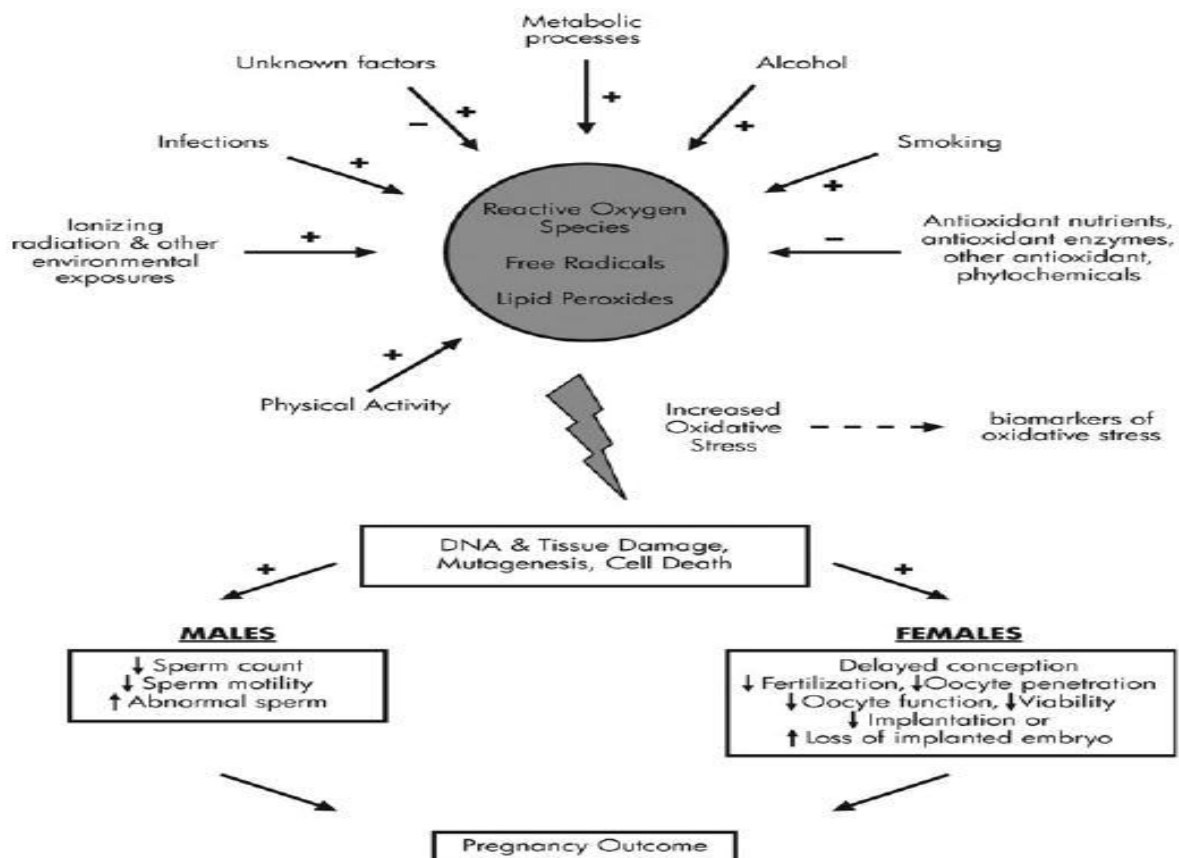


Fig 4- Effects of Oxidative Stress

OXIDATIVE STRESS has shown to play a role in unexplained infertility, infertility due to PCOS & endometriosis, which are among the common causes of female infertility.

Oxidative stress influences entire reproductive lifespan of women. It plays a role in multiple physiological processes from oocyte maturation and embryo development. Many in vitro as well as animal and human studies shows that oxidative stress is associated with

- Decline in ovarian function.
- Decreased steroidogenesis (decreased hormone secretion)
- ROS negatively affects oocyte maturation.
- Decreased fertilization and blastocyst development.
- Age related decline in fertility.
- Decreased oocyte penetration.
- Decreased implantation.
- Increased loss of implanted embryo.

Oxidative stress in UNEXPLAINED INFERTILITY

There is enough literature to show that oxidative stress may play role in unexplained infertility. Total antioxidant level, in patients with unexplained infertility were significantly lower than those in fertile patients. Level of malondialdehyde (MDA), a lipid peroxidation end product in peritoneal fluid was higher in patients with unexplained infertility. ROS in peritoneal fluid were significantly higher in patients with idiopathic infertility as compared to control women suggesting that localized oxidative stress in the peritoneal cavity may have role in the etiology of unexplained infertility.

Oxidative stress in VASCULAR ENDOTHELIAL DYSFUNCTION

Vascular endothelium that lines the lumen of vessels is critically important in maintaining vascular tone. Vascular endothelium governs vaso-responsiveness by synthesizing and releasing factors that act on vascular smooth muscles. The principal vasodilator that is secreted by the endothelium is nitric oxide (NO).

Oxidative stress induced by reactive oxygen species impairs NO formation and plays important role in vasomotor dysfunction. And this vasomotor dysfunction has profound adverse consequences on reproductive health which may be cause of infertility. NO causes vasodilation in uterine arteries may help in implantation.

Oxidative stress in PCOS

Insulin resistance and chronic low level inflammation are often present in women with polycystic ovary syndrome (PCOS). Studies conducted to determine the effects of hyperglycemia on reactive oxygen species (ROS) generation from mononuclear cells (MNCs, a type of WBCs) in PCOS. The percent change in ROS generation from MNCs was higher in lean and obese PCOS patients, compared with lean controls. The percent change in ROS generation from MNCs correlated positively with increasing glucose concentration & plasma levels of testosterone and androstenedione. ROS generation from MNCs in response to hyperglycemia is increased in PCOS independent to obesity. The resultant oxidative stress may contribute to a proinflammatory state that insulin resistance and hyperandrogenism in women with PCOS.

Oxidative stress in ENDOMETRIOSIS

Endometriosis is common gynaecological disorder characterised by the growth of endometrial glands and stroma outside the uterus. It is one of the common cause of female infertility. Oxidative stress and increased lipid peroxidation is found in patients with endometriosis which may be a possible explanation of infertility.

Oxidative stress and MENSTRUAL CYCLE

Endometrial changes in the proliferative and secretory phase during each cycle are influenced by various antioxidants expressed in the endometrium. The levels of SOD increase and the ROS levels increase in the endometrium in the late secretory phase just before menstruation, indicating that these changes in the level of expression indicate involvement in endometrial breakdown and shedding. The differential expression of the antioxidants indicates the existence of oxidative stress during cyclical endometrial changes. Literature reports point towards abnormal angiogenesis induced as a result of oxidative stress as a causative factor of the abnormal bleeding.

Oxidative stress and PREGNANCY

Higher levels of superoxide are reported to be generated from the placental mitochondria. Elevated levels of lipid peroxides and vitamin E have been reported in pregnancy. The antioxidant and the peroxidation product levels are increased in pregnancy. During the third trimester of pregnancy, levels of intracellular ROS in the leucocytes increase. Pregnancy leads to leucocyte activation and these results in an inflammatory state. The leukocyte activation response is further exacerbated in pregnancies complicated by preeclampsia. Lipid peroxides levels are increased during the second trimester and then it tapers off, lowering further after delivery. Aberrant placentation causes placental ischemia which leads to generation of placental oxidative stress. Placental oxidative stress has a key role in the pathophysiology of spontaneous abortions, preeclampsia, and in pregnancies complicated by intrauterine growth restriction (IUGR).

Oxidative stress and DIABETIC PREGNANCY

Diabetes complicating pregnancy is associated with elevated levels of OS and reduction in antioxidant reserves and this may lead to poor fetal outcomes. A large study on 70 patients with pregestational diabetes demonstrated an association between poor fetal outcomes and elevated peroxide levels and reduced antioxidant capacity.

In a semi-randomized controlled trial on antioxidant supplementation during pregnancy, sister chromatid exchange (SCE) rate was used as an indicator of DNA damage. The test group that was given the multivitamin/mineral supplementation showed a decrease in SCE rates after 10 weeks of supplementation. Park et al demonstrated benefits of antioxidant supplementation resulting in reduced DNA damage. Excellent glycemic control during pregnancy may help with reduction of the OS levels in pregnancy complicated with diabetes.

Oxidative stress in RECURRENT PREGNANCY LOSS

RPL has been reported to affect around 1%-5% of couples attempting pregnancy. In the reproductive age group of women, that is 15-45 years of age, loss of three or more consecutive pregnancy before 20 weeks of gestation or weighing less than 500 g is considered recurrent pregnancy loss. The majority of the pregnancy losses are early, usually before 12 weeks of gestation. There is a body of literature highlighting the various risk factors and etiological factors such as demographic factors including age and racial/ethnic differences, cytogenetic abnormalities, anatomic abnormalities of uterus and others. Besides these are autoimmune diseases, infections, environmental factors and occupational exposures responsible for spontaneous or recurrent abortions. In about fifty to sixty percent of miscarriages etiology remains unknown, while endothelial damage, impaired placental vascularisation, and immune malfunction are some of the proposed factors to play a role in idiopathic abortion. In pregnant women significant elevation of lipid peroxides and plasma glutathione and lower levels of vitamin E, vitamin C and beta-carotene are reported to be associated with recurrent miscarriages. Similarly lower concentration of α - tocopherol, total thiols and glutathione are observed in patients with unexplained abortions.

Oxidative stress and ASSISTED REPRODUCTION.

Assisted reproductive techniques (ART) have become the treatment of choice in many cases of male and female infertility. Despite technical advances in gamete handling and culture conditions, success rates after ART procedures are still unsatisfactory. When the levels of various ROS are excessively high, oocyte quality is comprised resulting in compromised embryos. In a study Seino et al, the effects of OS on the quality of oocytes and embryos in IVF and ICSI cycles was determined by quantitatively measuring levels of 8-hydroxy-2deoxyguanosine (8-OHdG), an indicator of cellular DNA damage in the granulosa cells at oocyte aspiration. Higher levels of 8-OHdG were associated with low fertilization and subsequently low quality embryos. Women with endometriosis had further higher levels of 8-OHdG than did patients with other indications for IVF. Thus accelerated OS induced damage to granulosa cells may be responsible for poor outcomes in women with endometriosis undergoing IVF procedures. OS has been implicated in arrest of embryo development and poor quality embryos that develop *in vitro*.

Oxidative stress in INTRA UTERINE GROWTH RETARDATION (IUGR)

Intra-uterine growth retardation (IUGR) is an abnormality of pregnancy. Neonates with IUGR weigh less than the 10th percentile for gestational age. The level of lipid peroxidation was significantly higher in the IUGR group. The antioxidant enzyme activities and the levels of antioxidants were significantly lower in the IUGR group. Damage of proteins and DNA was slightly, higher in the IUGR group. Neonates with IUGR seem to have significant deficiencies in antioxidant defence. IUGR is correlated with significant oxidative stress.

Oxidative stress and PREECLAMPSIA

The oxidative stress in the maternal compartment may be preexisting (e.g., obesity, diabetes, hyperlipidemia) or may be caused by placental secretion of lipid peroxides. Decreased placental antioxidant enzyme protection leads to a cascade of events in the placenta of uncontrolled lipid peroxidation with increased thromboxane production and tumor necrosis factor (TNF- α) production. Increased placental secretion of lipid peroxides and/or TNF- α results in activation of leukocytes as they circulate through the intervillous space. The activated leukocytes serve as circulating mediators that link the increased oxidative stress of the placenta with a widespread increase in oxidative stress and endothelial dysfunction in the mother. In the third trimester, when the placenta is growing rapidly, the mother's antioxidant capacity is no longer able to compensate, and the clinical symptoms of preeclampsia appear.

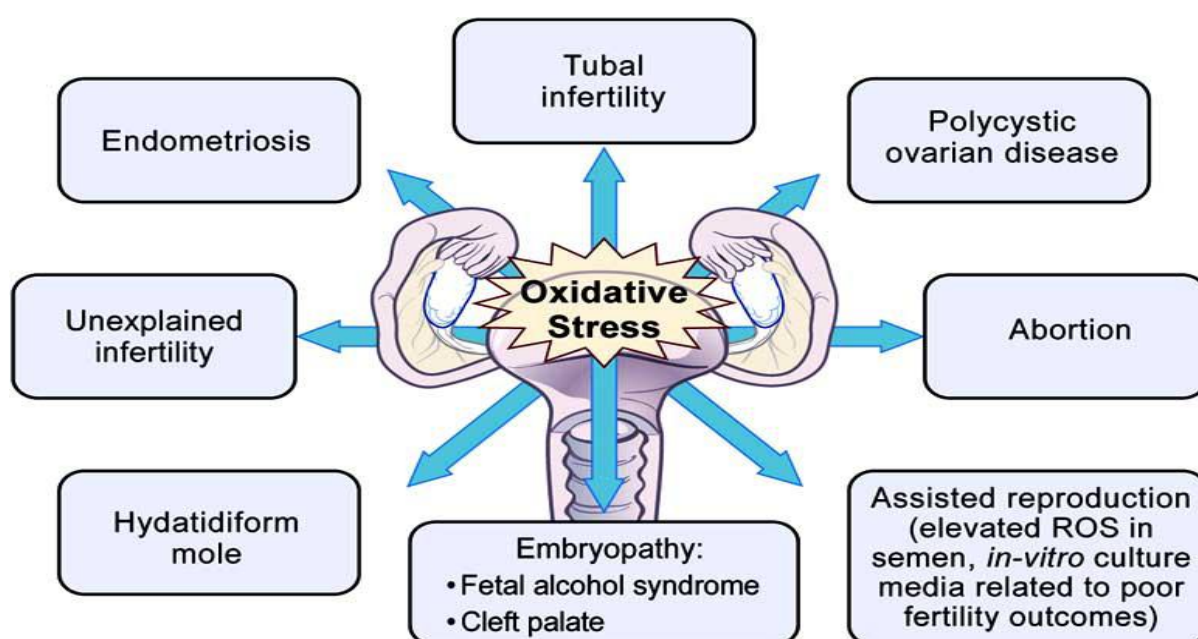
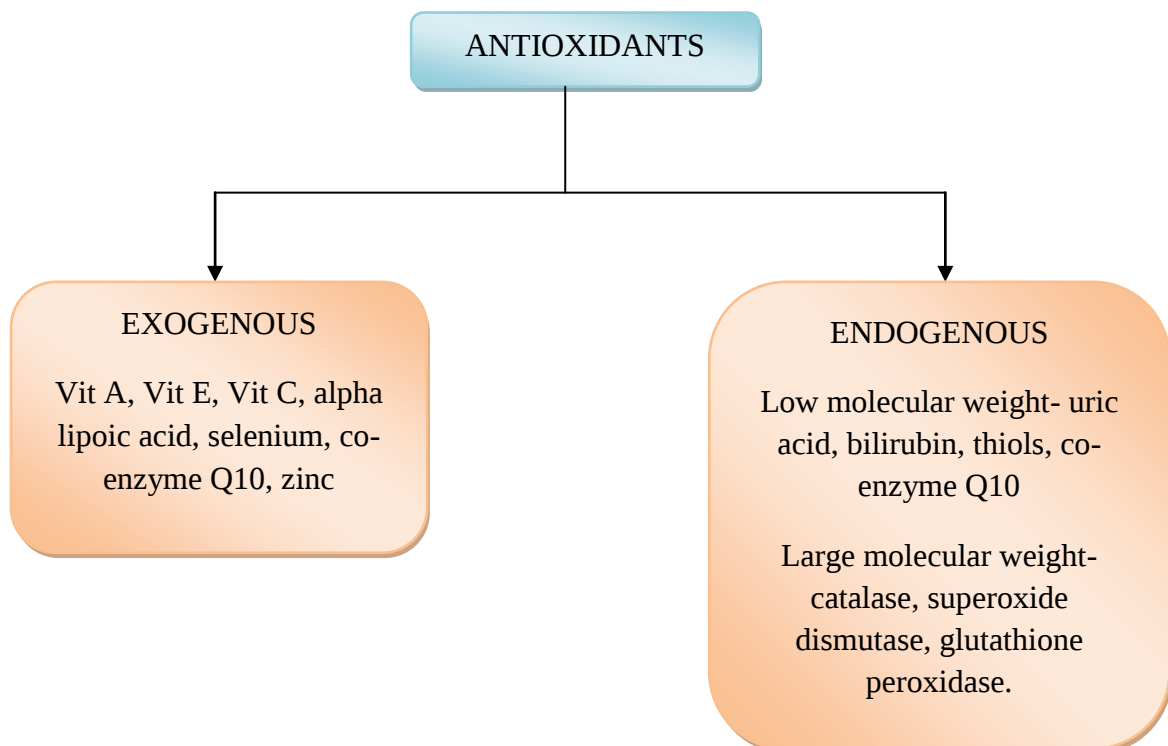
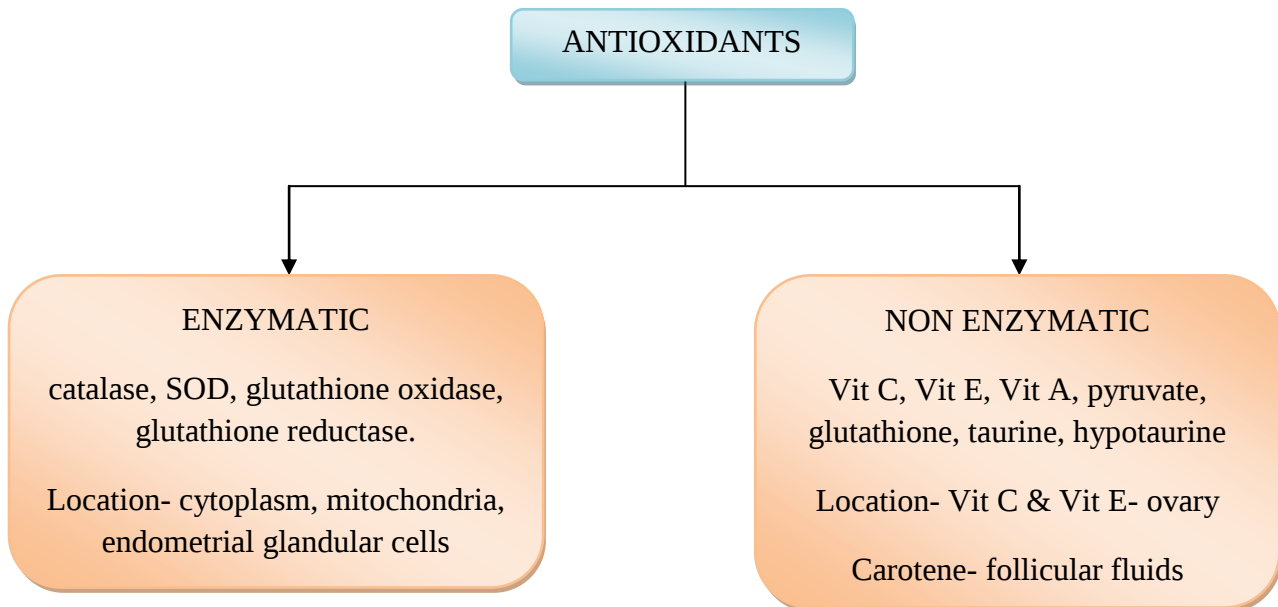


Fig 5 - The role of oxidative stress in obstetric and gynaecologic conditions that contribute to infertility.

ANTIOXIDANTS

Antioxidants can be described as a substance, which can dramatically delay or prevent oxidation of an oxidizable substrate.



Mechanism of action:

All antioxidants act through two basic mechanisms

1. Quenching (or satisfying the need of electron) of singlet oxygen
2. Scavenging (searching) of radicals to prevent or terminate chain reactions

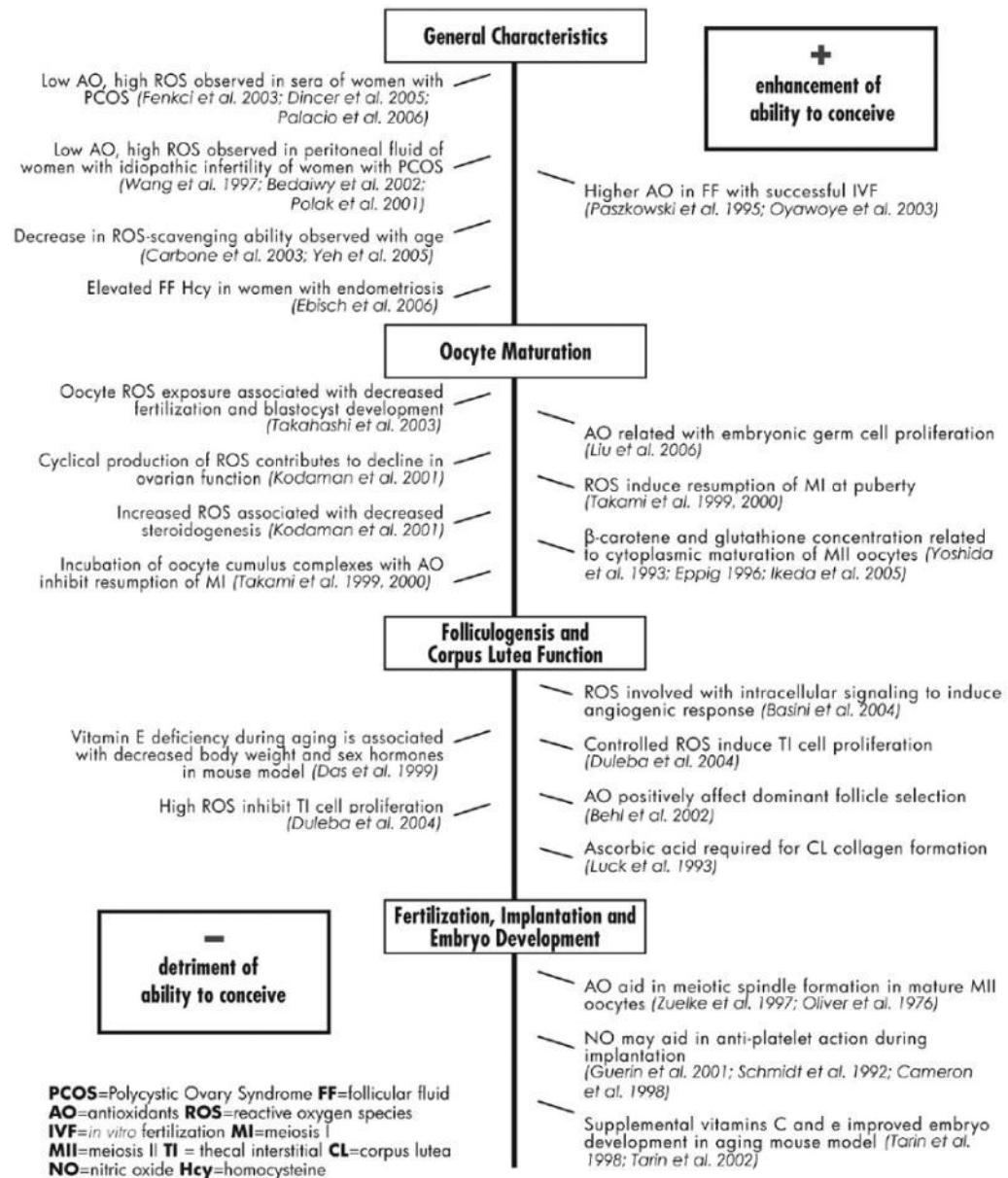


Fig 6 - Flow chart showing the effects of absence and presence of antioxidants at various levels of female reproduction cycle.

ROLE OF NUTRITIONAL SUPPLEMENTS IN OXIDATIVE STRESS:

Good nutrition is a prerequisite for fertility and child bearing and is especially important for those deciding to become pregnant at more advanced age. Antioxidants have proven to be helpful in reducing free radical damage to ova, sperm and reproductive organs. Antioxidants are believed to work better in combination than alone because they protect each other, from oxidation. Supplementation with vitamins B6, vitamin B12, folic acid, zinc, selenium, L-arginine improves female infertility. Antioxidants like astaxanthin and lycopene are useful in treating infertility. These nutritional supplements (antioxidants + vitamins) may play an important role in optimizing fertility health, leading to improved conception rates and could provide an effective alternative or adjunct to conventional fertility therapies.

ASTAXANTHIN: King of the Carotenoids



Fig 7- Natural Astaxanthin concentrated in *Haematococcus microalgae*

Astaxanthin belongs to one of the group of natural pigments known as carotenoids. It is an lipid soluble antioxidant. It occurs in wide variety of living organisms e.g shrimp, crawfish, and crabs.

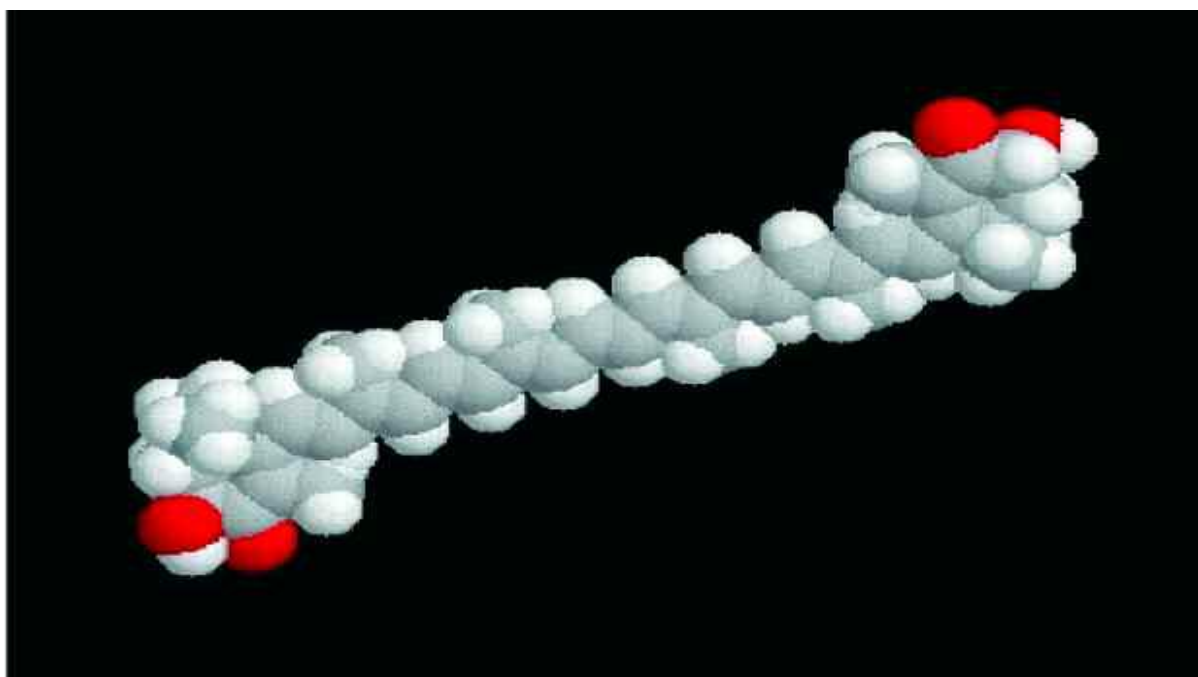
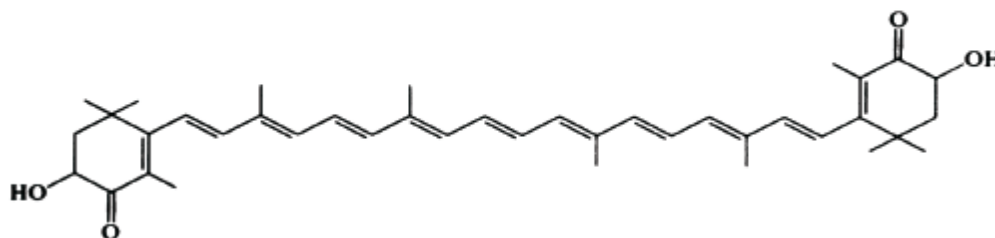


Fig 8- The Astaxanthin Molecule

Astaxanthin is similar to beta- carotene but there is small difference in structure.



ASTAXANTHIN

β -Carotene

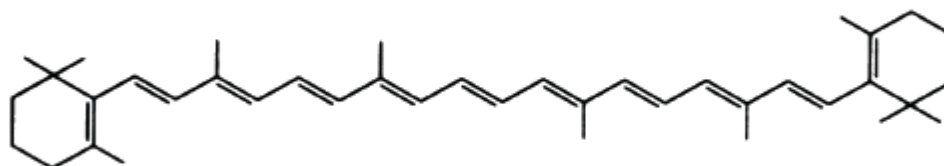


Fig 9- Hydroxyl groups at the end of the Astaxanthin molecule make it very different from beta carotene and other carotenoids

Astaxanthin has 13 conjugated double bonds (beta carotene has only 11)

- This gives it significantly greater antioxidant capacity

Astaxanthin has hydroxyl groups at the 3 and 3 prime position

- This makes the molecule highly polar

This unique structure enables astaxanthin to

- Span the double layer membrane exposing itself to interior as well as outside the cell.
- Its stabilizes the cell membrane like a bridge thus increasing its rigidity and mechanical strength.

Mechanism of action of ASTAXANTHIN

- ☐ It accumulates in the membranes like cell membrane, mitochondrial membrane.
- ☐ It entraps free radicals by adding them to its long, double- bonded chain.

- It inhibits the destruction of the fatty acids and proteins in cell membranes and mitochondrial membranes in cells caused by peroxidation of fats
- Prevention of LDL oxidation: Astaxanthin dose dependently prolongs lag time of LDL oxidation compared with control. It effectively reduces LDL oxidation in contrast to other antioxidants. As astaxanthin increases the time lag, the oxidative stress decreases.
- Anti- inflammatory properties: Astaxanthin has shown to inhibit inflammation induced nitric oxide production and inflammatory gene expression by suppressing nuclear factor kappa B activation.

ASTAXANTIN -SUPER ANTIOXIDANT !

- Astaxanthin has singlet oxygen quenching activity > 500 times greater than Vitamin E.
- Astaxanthin is better than beta carotene in delaying the lipid peroxidation and scavenging the peroxy radicals.
- In comparison to beta carotene and zeaxanthin, autoxidation rate of astaxanthin is 2 times slower.
- Inhibitory effect of astaxanthin on lipid peroxidation is 100- 500 times stronger than that of Vitamin E.

LYCOPENE- THE REPAIRING ANTIOXIDANT

Lycopene is a powerful lipophilic natural antioxidant. It is most common carotenoid in human body & one of the most potent carotenoid antioxidants. Lycopene might act as an antioxidants in vivo by repairing vitamin E and vitamin C radicals.

- Lycopene has highest antioxidant activity compared to other carotenoids & vitamin E.
- Antioxidant capacity of lycopene is greater than vitamin E by 100 times and greater than Glutathione by 125 times.
- It exhibits an important role as an anti- radical antioxidant in protection of lipid peroxidation.
- Lycopene is required for oocyte maturation.

ZINC- IMMUNO MODULATORY ANTIOXIDANT

Zinc is micronutrient which serves as cofactor for more than 80 metalloenzymes involved in DNA transcription and protein synthesis.

Mechanism of action of Zinc

- Zinc has antioxidant property by counteracting oxidation through binding sulphhydryl groups in proteins and by occupying binding sites for iron and copper in lipids, protein and DNA.
- Zinc can reduce generation of free radicals via fenton type reactions by inhibiting the binding of redox active metals, such as iron, and copper.
- Zinc deficiency is shown to increase lipid peroxidation.
- Zinc deficiency in females is associated with
 - Impaired synthesis/secretion of FSH and LH
 - Abnormal ovarian development
 - Disruption of estrous cycle
 - Frequent abortion
 - Affects oocyte maturation
 - Cessation of oogenesis and ovulation
 - Zinc may have role in regulation of menstrual cycle by regulating progesterone, prolactin and other receptor binding in the CNS.
 - Women with low plasma zinc level suffer from vaginitis 3 times more frequently than those with higher level of plasma zinc.

SELENIUM – ENZYMATIC ANTIOXIDANT

Selenium is a trace element that is essential to good health but required only in small amounts. It is incorporated into proteins to make selenoproteins, which are important antioxidant enzymes especially the selenium is incorporated in enzyme glutathione peroxidase.

Mechanism of action:

Selenium incorporated into selenoenzyme glutathione peroxidase, which catalyzes the breakdown of hydrogen peroxides into lipid hydroperoxides in both extra and intra cellular compartments and thereby protects the integrity of cell structures against peroxides damage by internal and external insult.

Role of selenium in female infertility

Patients with unexplained infertility have decreased levels of selenium & GSPHx in follicular fluid. Oral selenium supplementation on such patients enhances RBC-GSH-Px (Red blood cells glutathione peroxidase) levels. Selenium assist in magnesium repletion and helps in improving RBC magnesium levels. Enhanced selenium and magnesium status improves female fertility.

L- ARGININE:

L- arginine is an essential amino acid. It is synthesized in the body from citrulline. Increasing evidence suggest that dietary arginine is nutritional regulator of fertility.

Mechanism of action:

L- arginine is an obligatory substance for the enzyme nitric oxide synthases (NOS), which produces nitric oxide (NO). NO is potent vasodilator which helps in improving circulation to reproductive organs which may enhance oocyte development and embryo implantation.

FERROUS GLUCONATE

It is the iron salt of gluconic acid. It is commonly used as iron supplement.

Role of iron in reproduction

Proliferating cells have an absolute requirement for iron which is delivered by transferring with subsequent intracellular transport via transferrin receptors. Transferrin and its receptors are distributed heterogeneously in human granulosa cells, with more pronounced expression in more mature follicles. Granulosa cells perform an essential role in ovarian follicles and ovum development. Hence follicular maturation is closely related to high level of cellular transferring and transferring receptors which in turn is dependent on iron concentration in the body.

Iron deficiency is commonly associated with pregnancy and perinatal complications. Depleted iron stores inhibit placental isoferritin synthesis and resulting early fetal rejection. Hence iron supplements during periconceptional period has dual role of promoting fertility and preventing anemia during pregnancy.

B VITAMINS**Vitamin B6 (Pyridoxine hydrochloride)**

It is important for metabolism of amino acids, lipids, heme and neurotransmitter biosynthesis.

Vitamin B12

It is required for proper red blood cell formation, neurological function, and DNA synthesis. It functions as a cofactor for methionine synthase which catalyzes the conversion of homocysteine to methionine.

Vitamin B9 (Folic acid)

Folates are group of inter- convertible co- enzymes involved in amino acid metabolism, purine and pyrimidine synthesis and methylation of large number of nucleic acids, proteins and lipids. Inadequate dietary folate intake results in reduction in DNA biosynthesis and reduction in cell division. A decrease in methylation cycle results in elevation of plasma homocysteine (hyperhomocysteinemia).

HYPERHOMOCYSTEINEMIA leads to:

- ☐ Reduced cell division
- ☐ Vascular inflammation by enhancing pro- inflammatory cytokines.
- ☐ Decreased bioavailability of NO a major endothelium dependent vasodilator
- ☐ Production of reactive oxygen species in endothelial and smooth muscle cells leading to oxidative stress
- ☐ Increases apoptosis
- ☐ Defective methylation DNA may lead to abnormal fetal development
- ☐ Neural tube defects and other congenital anomalies
- ☐ Pre-eclampsia
- ☐ Abruptio placentae
- ☐ Intrauterine growth retardation
- ☐ Preterm birth
- ☐ Intrauterine fetal death
- ☐ Early pregnancy loss
- ☐ Reduced oocyte maturation
- ☐ Fertilizability of ovum

**INTRODUCTION TO
PROJECT**

**MARKET ANALYSIS OF
ANTIOXIDANT- VITAMIN
COMBINATION IN
TREATMENT OF FEMALE
INFERTILITY**

RATIONALE

- Infertility is increasing at an alarming pace in India. Out of 250 million individuals estimated to be attempting parenthood at any given time, 13 to 19 million couples are likely to be infertile. The increasing trend in infertility cases are mainly due to lifestyle changes, and rising stress levels amongst people, excessive pollution, and exposure to increased radiation, electronic discharge.
- Oxidative stress induced damage is involved in many causes leading to female infertility like unexplained infertility, recurrent pregnancy loss, PCOS related infertility, age related decline in fertility etc.
- Antioxidants have proven to be helpful in reducing free radical damage to ova, sperm, and reproductive organs.
- Currently, market lacks supplements containing powerful antioxidants which could provide better benefits in female infertility treatment.
- None of the antioxidants/vitamin supplements currently prescribed in female infertility contains astaxanthin which is a powerful antioxidant and has proved to be useful in treating male infertility.
- A unique and powerful combination of astaxanthin and vitamins can play a role in optimizing fertility health, leading to improved conception rates and could provide an effective alternative or adjunct to conceptional fertility therapies.
- Also the antioxidant market is huge and valued 650 crores with an average growth rate of 14%.

MARKET OVERVIEW

BRANDS PRESCRIBED IN INFERTILITY

Infertility Brands	Company	MAT (lacs)	Gr%
OVACARE	Meyer	1195	52
PRODUCTIV- F	Wanbury	600	31
F- GAM	Glen G&G	208	269
LYCORED CAPS	Jagsonpal	1644	12
EVION FORTE	Merck	571	0
BIOPREG-F	Mankind Pharma	402	51
BECADEXAMIN	GSK	1528	1
COBADEX-CZS	GSK	2822	12
E-COD OMEGA	Universal	253	6
FOL-THRIVE CAPS	Elder	41	-1
TOTAL VALUE		9264	

Source: ORG MAT Oct' 2011 DATA

- Major brands like Ovacare, Productiv F, F-GAM, Biopreg F shows excellent growth rates.

TOP MOLECULES STANDING UNDER INFERTILITY

MOLECULE	100
Folic acid plain	14.1
Pyridoxine HCL+ Folic acid	5.3
Vitamin E	3.2
Lycopene & Comb	2.5
Folic acid+ DHA	2.5
Methylcobalamin & Comb	2.1
Multivitamin + Multiminerals	1.1
Biotin & Comb	1.1
Pyridoxine	1.1
Antioxidant Vitamins	0.7
Folic acid + Other comb	0.7
Vit B- Complex	0.4

C MARC MAR-JUN 2011

- The top 4 molecules prescribed in infertility are folic acid, Vitamin B6, Vitamin E and lycopene.

PRESCRIPTION TREND OF ANTIOXIDANT

Specialist: Gynae

Absolute Rx Response Trend- Four Monthly

Brand	Company	Nov - Feb' 09	Mar - Jun' 09	July- Oct'0 9	Nov- Feb'1 0	Mar- Jun'1 0	July- OCT'1 0	Nov- Feb'1 1	Mar- Jun'11
BIOPREG- F tab	Mankind	11	27	30	36	62	75	87	96
OVACARE tab	Meyer	52	51	48	53	61	62	66	63
PRODUCTIV F tab	Wanbury					12	23	14	17
F- GAM tab	Glenmark						6	11	16
FOLTHRIVE caps	Elder						3	4	12
LYCORED tab	Jagsonpal	30	26	25	22	17	23	19	16
COBADEX CZS tab	GSK	58	62	90	73	75	67	68	59
EVION	Merck	19	29	20	19	20	16	15	19
FORTE caps									
OVACARE FORTE tab	Meyer								14

ORG MAT JULY'11 DATA

Gynaecologist are major prescribers of Ovacare, Productiv F, F- Gam and Biopreg F.

RESEARCH OBJECTIVES AND METHODOLOGY

Research Objective:-To study the perception of gynaecologist towards the use of antioxidant & vitamin combination in female infertility cases.

Sub objectives:

1. To know number of females suffering from infertility
2. To know the common causes of female infertility
3. To know the treatments given in common causes of female infertility
4. To know the prescribing frequency of antioxidants & vitamin combination in various causes of female infertility
5. To know the constituents which gynaecologist regard to be important in antioxidant & vitamin combination
6. To know the benefits expected from the use of antioxidant & vitamin combination
7. To know the prescribing pattern of gynaecologist for infertility treatment in both partners
8. To know the indications apart from female infertility where antioxidant & vitamin combination may be useful
9. To know the willingness of gynaecologist to use astaxanthin in female infertility treatment.

Research Methodology

S. No	Parameter	Description
1.	Research type	Quantitative & Qualitative
2.	Data Collection	Primary
3.	Measurement Technique	Structured Questionnaire
4.	Sample Selection	Area wise
5.	Sample Unit	Gynaecologist
6.	Sample Size	100
7.	Analysis of Data	Using Microsoft Excel

Areas covered: Western suburban area of Mumbai which included Dahisar, Borivali, Kandivali, Malad, Goregaon, Jogeshwari, Andheri, Vile Parle, Santa Cruz, Khar Road.

SURVEY, FINDINGS & INFERENCES

1. Average number of infertility cases coming in a week.

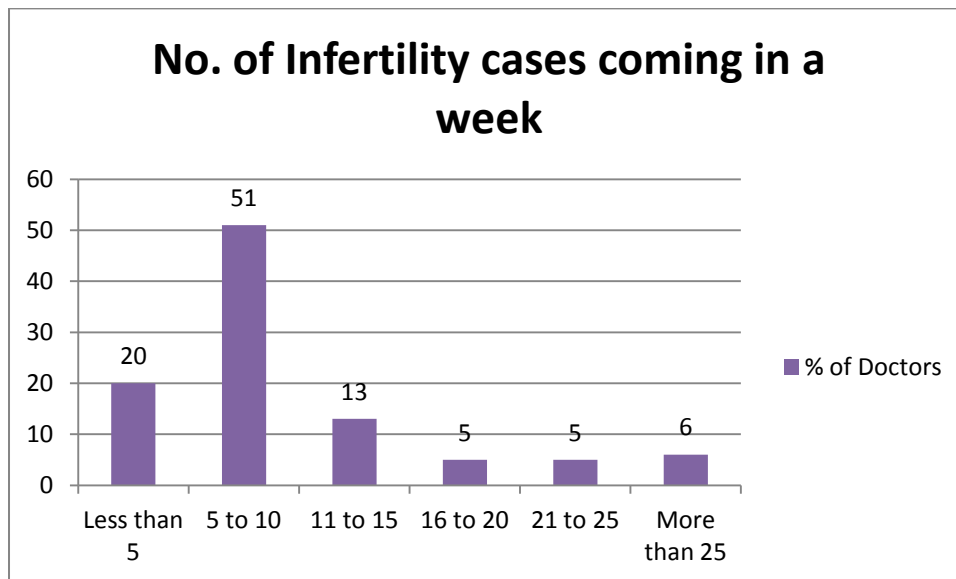


Fig. 10- Bar chart showing average number of infertility cases coming to gynaecologists in a week.

OBSERVATIONS:

- 20 out of 100 gynaecologist see less than 5 infertility cases in a week
- 51 out of 100 gynaecologist see about 5-10 infertility cases in a week
- 13 out of 100 gynaecologist see about 11-15 infertility cases in a week
- 5 out of 100 gynaecologist see about 16-20 infertility cases in a week
- 5 out of 100 gynaecologist see about 21-25 infertility cases in a week
- 6 out of 100 gynaecologist see more than 25 infertility cases in a week

INFERENCE: About 2 infertility cases are seen by majority of gynaecologist per day

2) Most common infertility cases

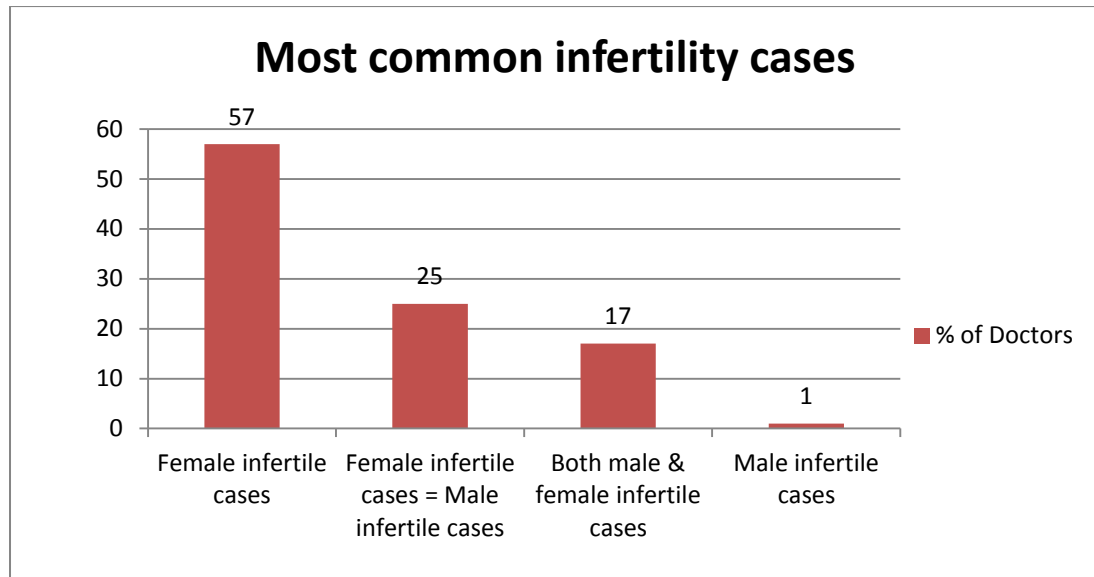


Fig 11- Bar chart showing the most common infertility cases

OBSERVATIONS:

- 57 out of 100 gynaecologists said that Female infertility cases are most common.
- 25 out of 100 gynaecologists said that Female infertility cases and Male infertility cases are equally common.
- 17 out of 100 gynaecologists said that Both female and male being infertile cases are most common
- 1 out of 100 gynaecologists said that Male infertility cases are most common.

INFERENCE: Female infertility cases form the major bulk of infertility cases.

3) Most common cause of female infertility

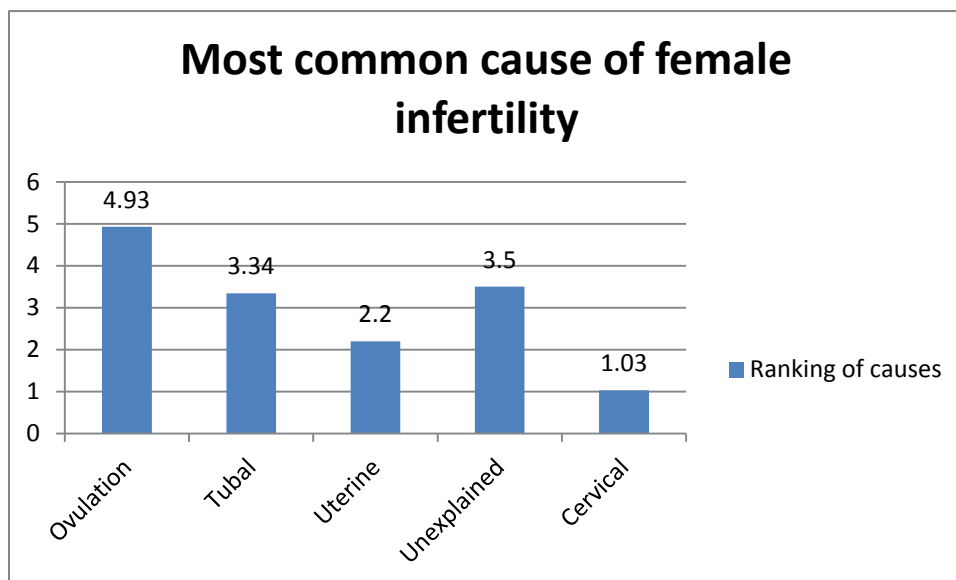


Fig 12- Bar chart showing the most common cause of female infertility

OBSERVATIONS:

- 94 out of 100 gynaecologists ranked ovulation as most common cause of female infertility.
- 54 out of 100 gynaecologists ranked unexplained infertility as 2nd most common cause of female infertility.
- 49 out of 100 gynaecologists ranked tubal as 3rd most common cause of female infertility.
- 76 out of 100 gynaecologists ranked uterine as 4th most common cause of female infertility.
- 98 out of 100 gynaecologists ranked cervical as 5th most common cause of female infertility.
- In ovulation causes, PCOS was the major reason of female infertility
- In tubal causes, Blocked tubes and Infections arising due to tuberculosis were the major reasons of female infertility
- In uterine causes, Fibroids was the major reason of infertility
- In unexplained infertility, Age related decline in fertility and Oxidative stress were the major reasons of female infertility

INFERENCE: Ovulation cause (PCOS) is most common cause of female infertility followed by unexplained infertility, tubal, uterine causes. Cervical cause is the least common cause of female infertility.

4) **Most common treatment given in**

a) **Ovulation causes**

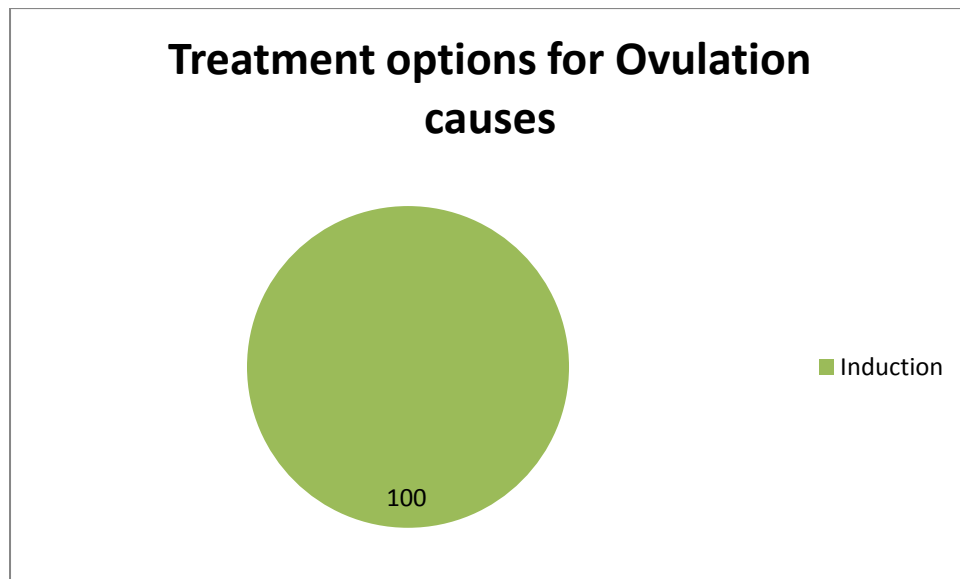


Fig 13 -Pie chart showing various treatment options used by gynaecologists in Ovulation causes.

OBSERVATION:

- All gynaecologists give ovulation induction in the form of oral drugs or injectables as the treatment for ovulation causes.

b) Tubal causes

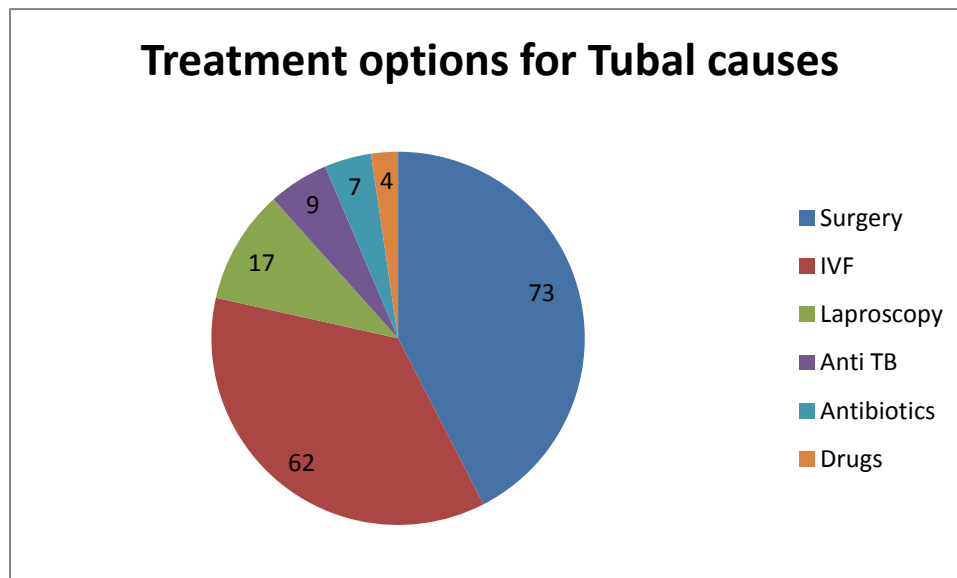


Fig 14- Breakup of various treatment options used in tubal causes

OBSERVATIONS:

- Gynaecologists prefer many treatment options for tubal causes
- Majority of gynaecologists prefer Surgery to correct blocked tubes
- Many gynaecologists also give IVF treatment
- Some of the gynaecologists give Anti TB treatment to correct tuberculosis
- Some of the gynaecologists give Antibiotics to correct infections

c) Uterine causes

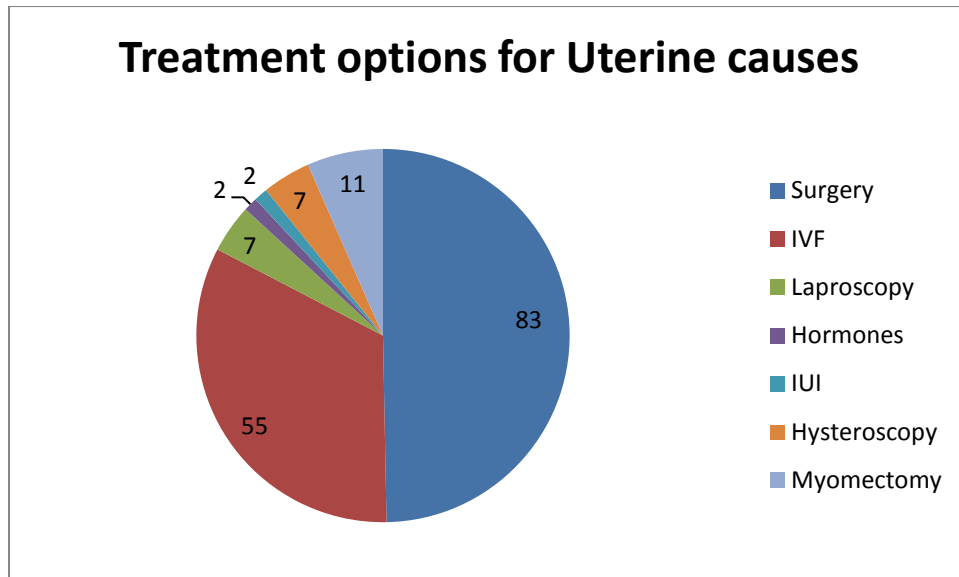


Fig 15- Breakup of various treatment options used in uterine causes

OBSERVATIONS:

- Gynaecologists prefer many treatment options for uterine causes
- Majority of the gynaecologists prefer Surgery to treat fibroids
- Many gynaecologists also give IVF treatment
- Many gynaecologists prefer Myomectomy, Hysteroscopy and Laparoscopy
- Some gynaecologists also prefer Hormones, IUI

d) Unexplained causes

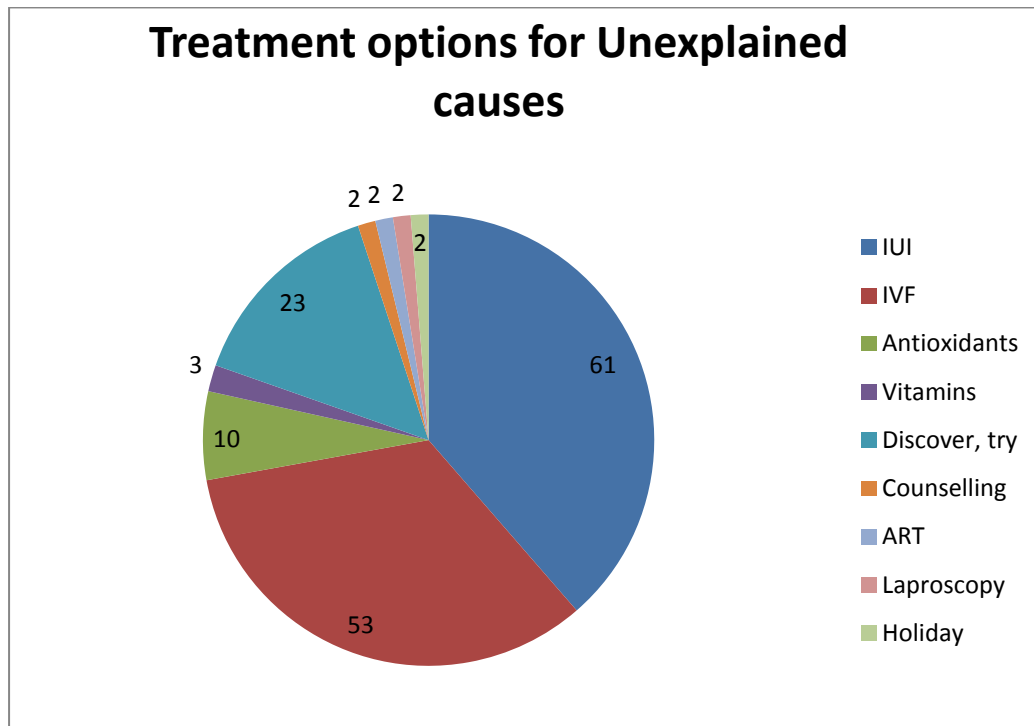


Fig 16- Breakup showing various treatment options for unexplained infertility

OBSERVATIONS:

- Gynaecologists try many treatment options for unexplained infertility
- Majority of gynaecologists prefer IUI
- Many gynaecologists prefer IVF
- Many gynaecologists keep Discovering and Trying in unexplained infertility cases
- Many also give Antioxidants
- Some gynaecologists prefer options such as Vitamins, Counselling, ART, Laproscopy, Holidays.

INFERENCE: Ovulation Induction is the most common treatment given for Ovulation causes. Surgery and IVF are the most common treatment for Tubal and Uterine causes. IUI is the most common treatment for Unexplained Infertility.

- 5) **Increase in Oxidative Stress has led to an increase in number of female infertility cases.**

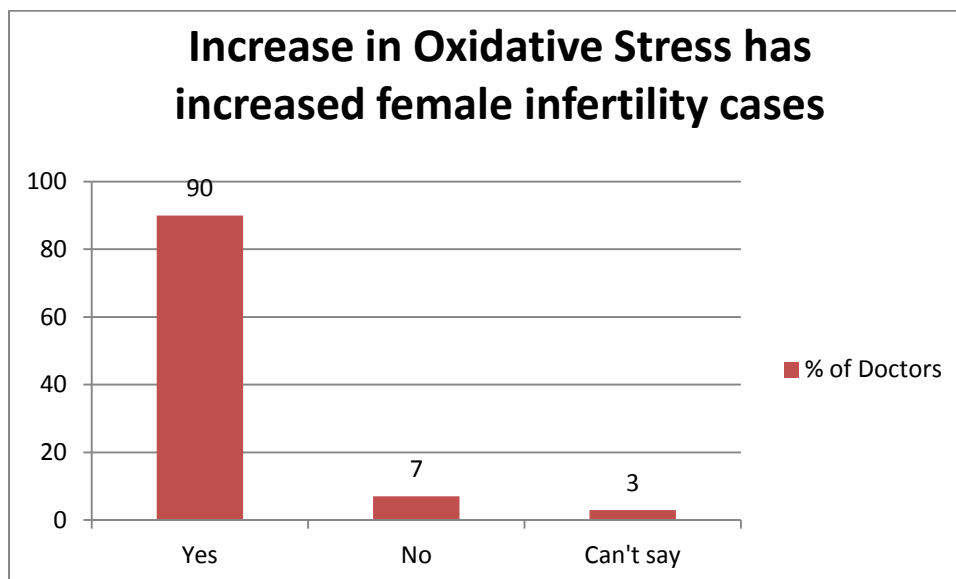


Fig 17- Bar chart showing response for oxidative stress leading to female infertility cases

OBSERVATIONS:

- 90 out of 100 gynaecologists Agreed that increase in oxidative stress has led to an increase in number of female infertility cases.
- 7 out of 100 gynaecologists Disagreed that increase in oxidative stress has led to an increase in number of female infertility cases.
- 3 out of 100 gynaecologists responded “Can’t say” that increase in oxidative stress has led to an increase in number of female infertility cases.

INFERENCE: Majority of the gynaecologists agreed that Increase in oxidative stress has led to an increase in number of female infertility cases.

6) **Prescribing antioxidant & vitamin combination in female infertility cases.**

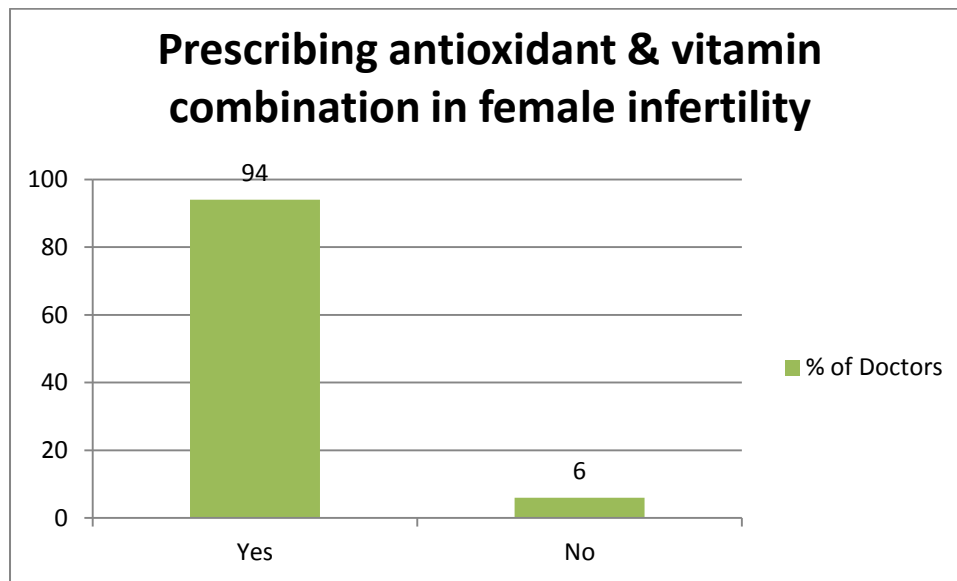


Fig 18- Bar chart showing the response for prescribing antioxidant & vitamin combination in female infertility cases.

OBSERVATIONS:

- 94 out of 100 gynaecologists DO prescribe antioxidant & vitamin combination in female infertility cases
- 6 out of 100 gynaecologists DO NOT prescribe antioxidant & vitamin combination in female infertility cases

INFERENCE: Majority of the gynaecologist prescribe antioxidant & vitamin combination in female infertility cases.

7) Frequency of prescribing antioxidant & vitamin combination

a) In Unexplained Infertility

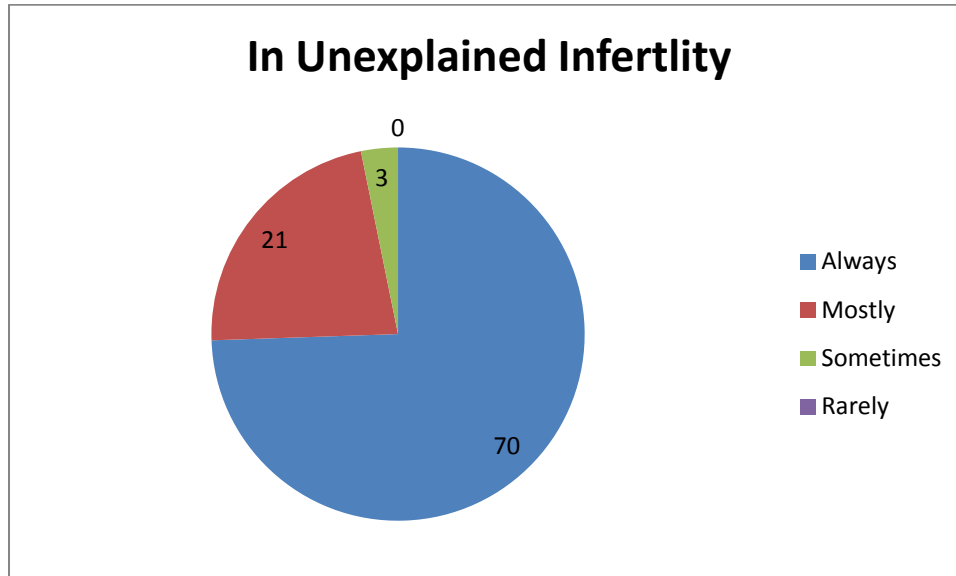


Fig 19- Breakup of frequency in which antioxidant & vitamin combination is prescribed in unexplained infertility

OBSERVATIONS:

- 70 out of 94 (74.5%) gynaecologists ALWAYS prescribe antioxidant & vitamin combination
- 21 out of 94 (22.3%) gynaecologists MOSTLY prescribe antioxidant & vitamin combination
- 3 out of 94 (3.19%) gynaecologists SOMETIMES prescribe antioxidant & vitamin combination

INFERENCE: Majority of the gynaecologists ALWAYS prescribe antioxidant & vitamin combination in Unexplained Infertility

b) In PCOS

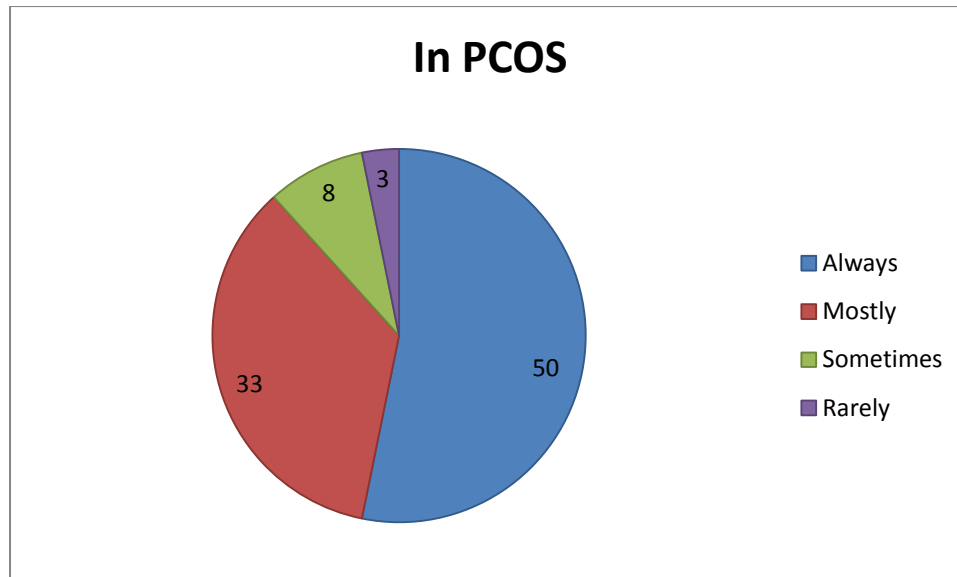


Fig 20- Breakup of frequency in which antioxidant & vitamin combination is prescribed in PCOS

OBSERVATIONS:

- 50 out of 94 (53.1%) gynaecologists ALWAYS prescribe antioxidant & vitamin combination
- 33 out of 94 (35.1%) gynaecologists MOSTLY prescribe antioxidant & vitamin combination
- 8 out of 94 (8.5%) gynaecologists SOMETIMES prescribe antioxidant & vitamin combination
- 3 out of 94 (3.1%) gynaecologists RARELY prescribe antioxidant & vitamin combination.

INFERENCE: Majority of the gynaecologists ALWAYS prescribe antioxidant & vitamin combination in PCOS

c) In Endometriosis

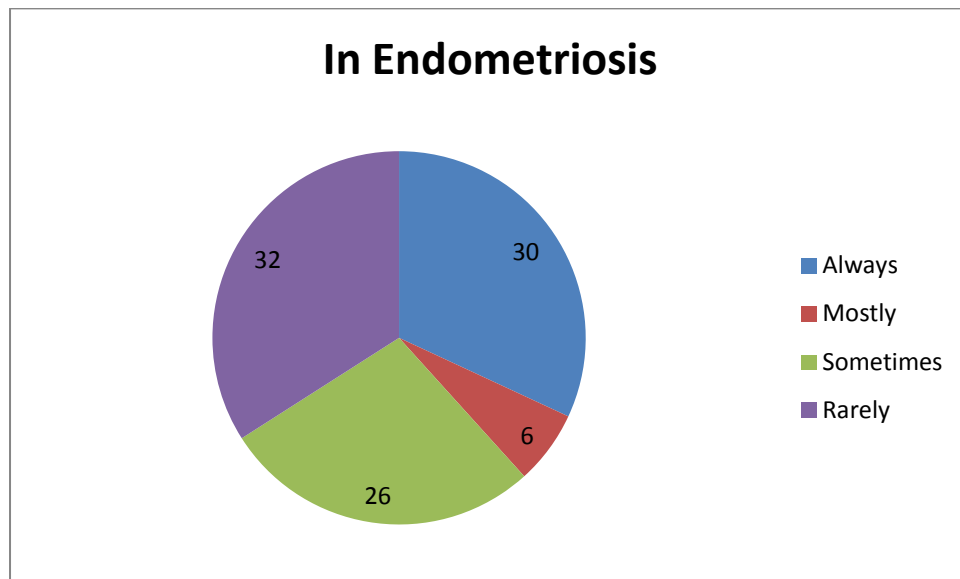


Fig 21- Breakup of frequency in which antioxidant & vitamin combination is prescribed in endometriosis

OBSERVATIONS:

- 30 out of 94 (31.9%) gynaecologists ALWAYS prescribe antioxidant & vitamin combination
- 6 out of 94 (6.3%) gynaecologists MOSTLY prescribe antioxidant & vitamin combination
- 26 out of 100 (27.6%) gynaecologists SOMETIMES prescribe antioxidant & vitamin combination
- 32 out of 100 (34%) gynaecologists RARELY prescribe antioxidant & vitamin combination

INFERENCE: Majority of the gynaecologists RARELY prescribe antioxidant & vitamin combination in Endometriosis

d) In PID

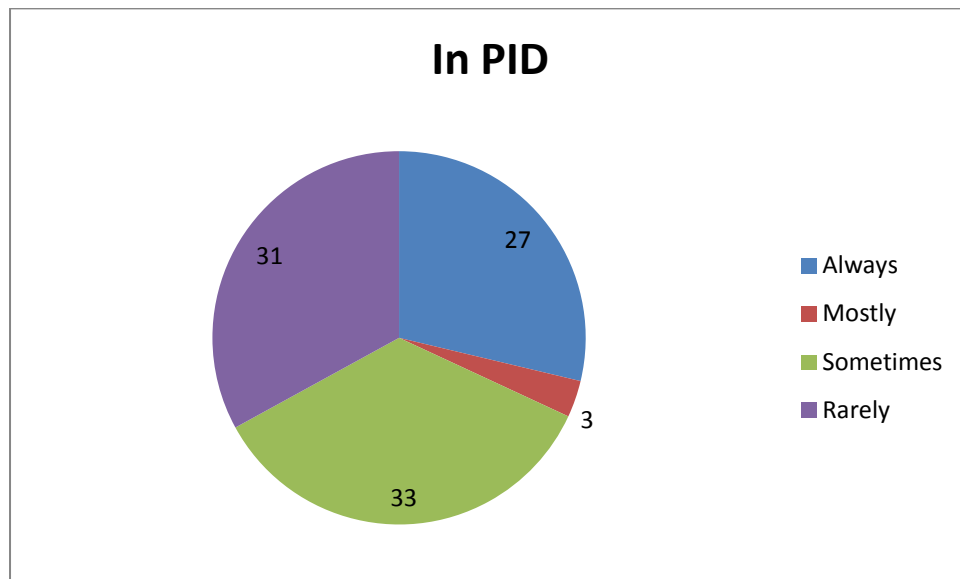


Fig 22- Breakup of frequency in which antioxidant & vitamin combination is prescribed in PID

OBSERVATIONS:

- 27 out of 94 gynaecologists (28.7%) ALWAYS prescribe antioxidant & vitamin combination
- 3 out of 94 gynaecologists (3.1%) MOSTLY prescribe antioxidant & vitamin combination
- 33 out of 94 gynaecologists (35.1%) SOMETIMES prescribe antioxidant & vitamin combination
- 31 out of 94 gynaecologists (32.9%) RARELY prescribe antioxidant & vitamin combination

INFERENCE: Majority of gynaecologists SOMETIMES prescribe antioxidant & vitamin combination in PID

e) In Recurrent pregnancy loss

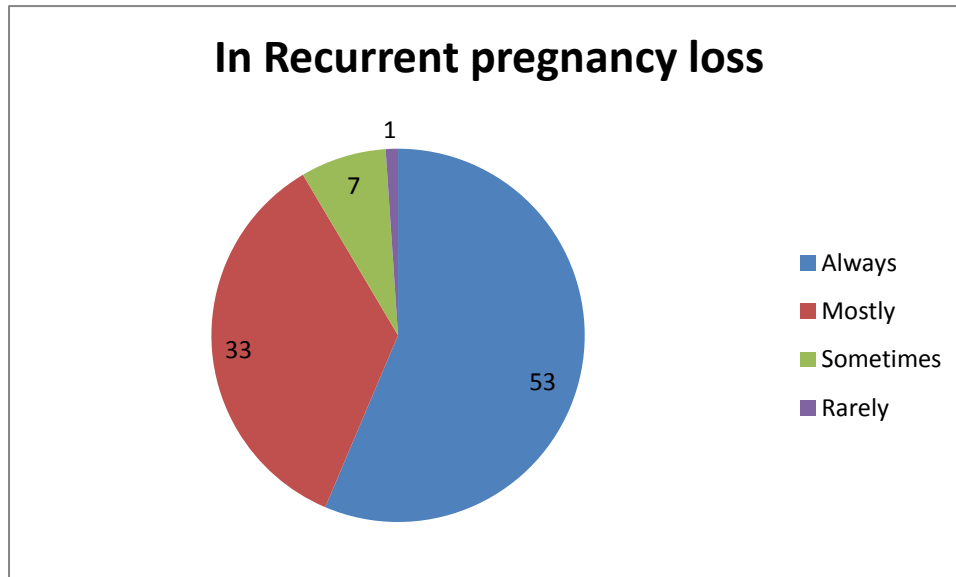


Fig 23- Breakup of frequency in which antioxidant & vitamin combination is prescribed in recurrent pregnancy loss

OBSERVATIONS:

- 53 out of 94 (56.3%) gynaecologists ALWAYS prescribe antioxidant & vitamin combination
- 33 out of 94 (35.1%) gynaecologists MOSTLY prescribe antioxidant & vitamin combination
- 7 out of 94 (7.4%) gynaecologists SOMETIMES prescribe antioxidant & vitamin combination
- 1 out of 94 (1.04%) gynaecologists RARELY prescribe antioxidant & vitamin combination

INFERENCE: Majority of gynaecologists ALWAYS prescribe antioxidant & vitamin combination in Recurrent pregnancy loss

f) In Age related decline in fertility

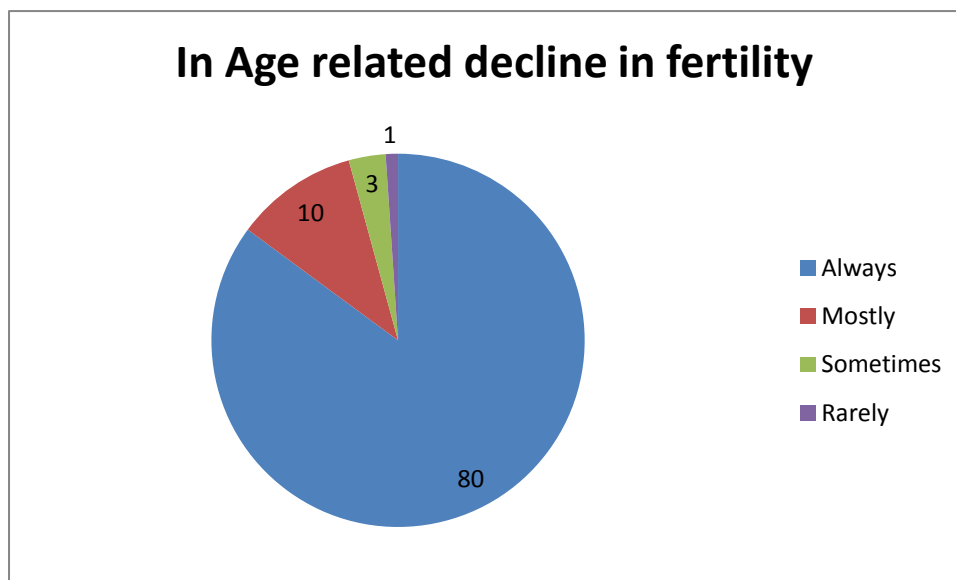


Fig 24- Breakup of frequency in which antioxidant & vitamin combination is prescribed in age related decline in fertility

OBSERVATIONS:

- 80 out of 94 (85.1%) gynaecologists ALWAYS prescribe antioxidant & vitamin combination
- 10 out 94 (10.6%) gynaecologists MOSTLY prescribe antioxidant & vitamin combination
- 3 out of 94 (3.1%) gynaecologists SOMETIMES prescribe antioxidant & vitamin combination
- 1 out of 94 (1.04%) gynaecologists RARELY prescribe antioxidant & vitamin combination

INFERENCE: Majority of gynaecologists ALWAYS prescribe antioxidant & vitamin combination in Age related decline in fertility.

g) Before going for an IVF treatment

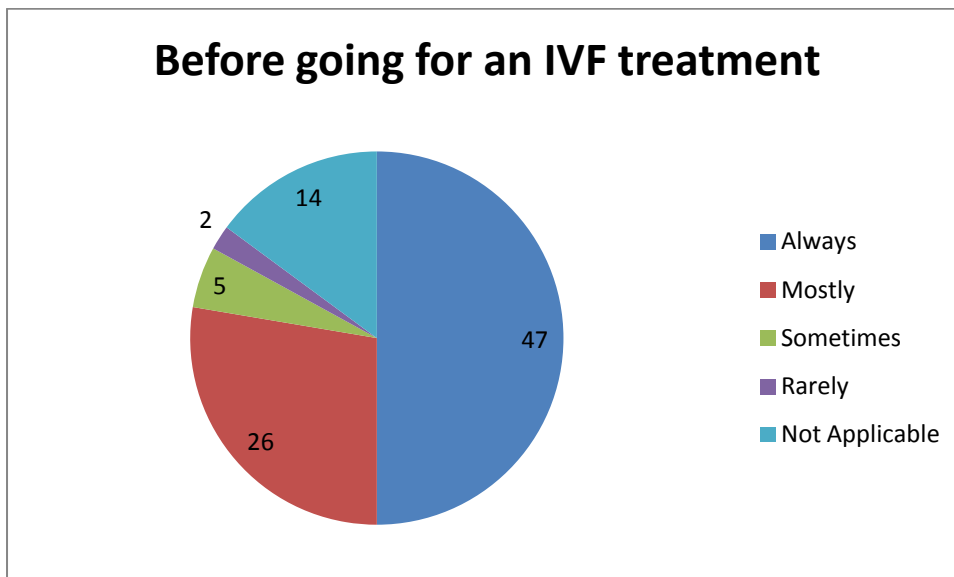


Fig 25- Breakup of frequency in which antioxidant & vitamin combination is prescribed before going for an IVF treatment

OBSERVATIONS:

- 47 out of 94 (50%) gynaecologists ALWAYS prescribe antioxidant & vitamin combination
- 26 out of 94 (27.6%) gynaecologists MOSTLY prescribe antioxidant & vitamin combination
- 5 out of 94 (5.3%) gynaecologists SOMETIMES prescribe antioxidant & vitamin combination
- 2 out of 94 (2.1%) gynaecologists RARELY prescribe antioxidant & vitamin combination
- 14 out of 94 (14.8%) gynaecologists said they do not conduct IVF so prescribing antioxidant & vitamin combination is not applicable

INFERENCE: Majority of gynaecologists ALWAYS prescribe antioxidant & vitamin combination before going for an IVF treatment.

h) As Preconception treatment

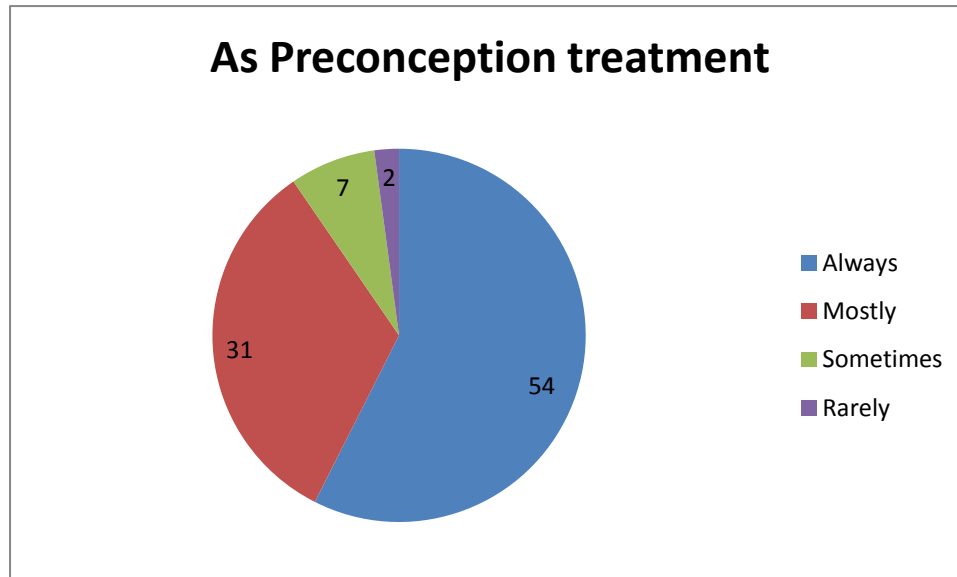


Fig 26- Breakup of frequency in which antioxidant & vitamin combination is prescribed as preconception treatment

OBSERVATIONS:

- 54 out of 94 (57.4%) gynaecologists ALWAYS prescribe antioxidant & vitamin combination
- 31 out of 94 (32.9%) gynaecologists MOSTLY prescribe antioxidant & vitamin combination
- 7 out of 94 (7.4%) gynaecologists SOMETIMES prescribe antioxidant & vitamin combination
- 2 out of 94 (2.1%) gynaecologists RARELY prescribe antioxidant & vitamin combination

INFERENCE: Majority of the gynaecologists ALWAYS prescribe antioxidant & vitamin combination as preconception treatment

i) In TB cases

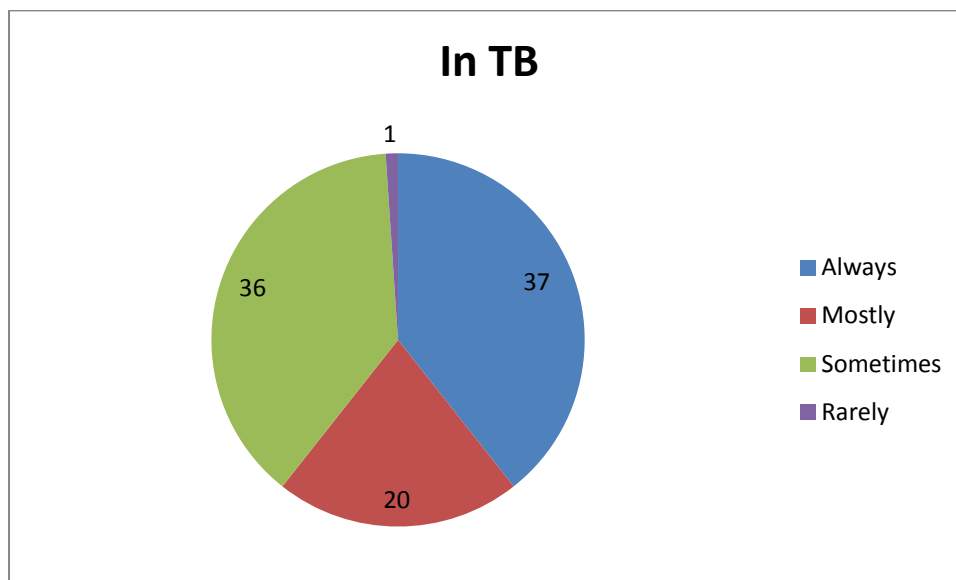


Fig 27- Breakup of frequency in which antioxidant & vitamin combination is prescribed in TB patients.

OBSERVATION:

- 37 out of 94 (39.3%) gynaecologists ALWAYS prescribe antioxidant & vitamin combination
- 20 out of 94 (21.2%) gynaecologists MOSTLY prescribe antioxidant & vitamin combination
- 36 out of 94 (38.2%) gynaecologists SOMETIMES prescribe antioxidant & vitamin combination
- 1 out of 94 (1.04%) gynaecologists RARELY prescribe antioxidant & vitamin combination

INFERENCE: Gynaecologists prefer prescribing antioxidant & vitamin combination ALWAYS and SOMETIMES

8) Duration of antioxidant & vitamin combination treatment for female infertility

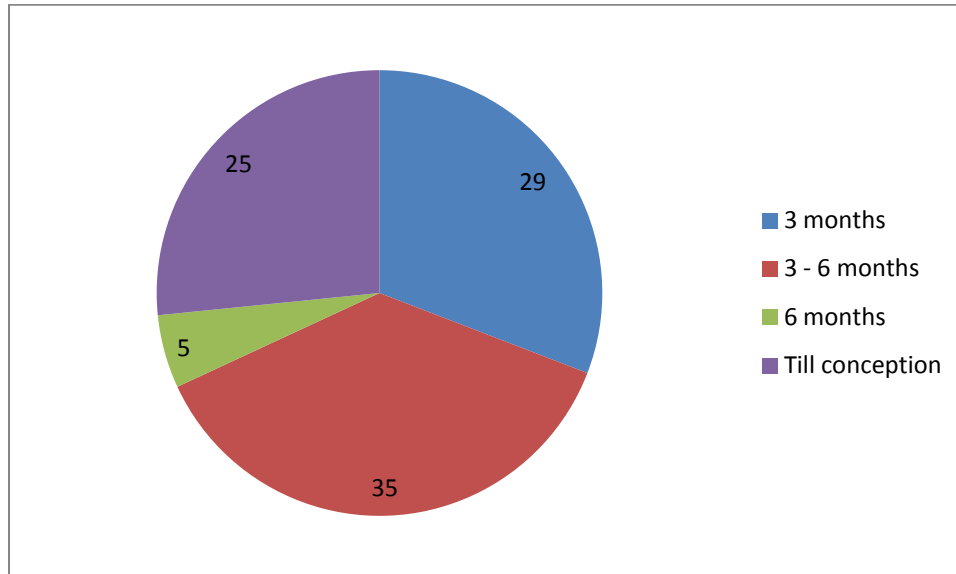


Fig 28- Breakup of duration for which antioxidant & vitamin combination is prescribed

OBSERVATIONS:

- 29 out of 94 (30.8%) gynaecologists prescribe antioxidant & vitamin combination minimum for 3 MONTHS
- 35 out of 94 (37.2%) gynaecologists prescribe antioxidant & vitamin combination for about 3 – 6 MONTHS
- 25 out of 94 (26.5%) gynaecologists prescribe antioxidant & vitamin combination TILL CONCEPTION
- 5 out of 94 (5.3%) gynaecologists prescribe antioxidant & vitamin combination minimum for 6 MONTHS

INFERENCE: Majority of the gynaecologists prescribe antioxidant & vitamin combination for about 3 – 6 months

9) **Important components of antioxidant & vitamin combination for female infertility**

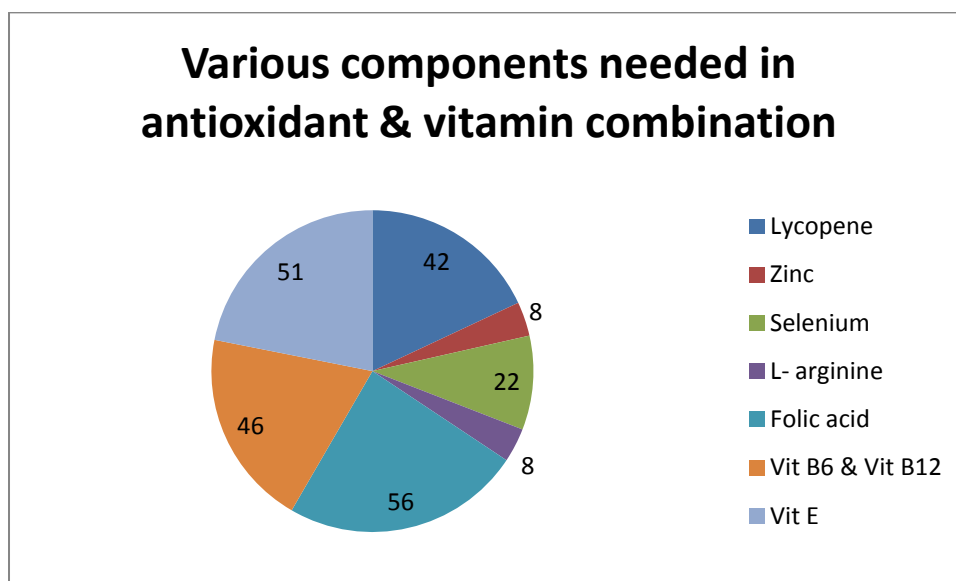


Fig 29- Breakup of various components needed in antioxidant & vitamin combination

OBSERVATIONS:

- 56 gynaecologists said FOLIC ACID is an important component of antioxidant & vitamin combination
- 51 gynaecologists said Vitamin E is an important component of antioxidant & vitamin combination
- 46 gynaecologists said Vitamin B6 & Vitamin B12 is an important component of antioxidant & vitamin combination
- 22 gynaecologists said Selenium is an important component of antioxidant & vitamin combination
- 8 gynaecologists said L- arginine is an important component of antioxidant & vitamin combination
- 8 gynaecologists said Zinc is an important component of antioxidant & vitamin combination

INFERENCE: Majority of gynaecologists considered Folic Acid, Vitamin E, Vitamin B6 & Vitamin B12 and Selenium to be the important components of antioxidant & vitamin combination

10) Main benefits expected from the use of antioxidant & vitamin combination in female infertility.

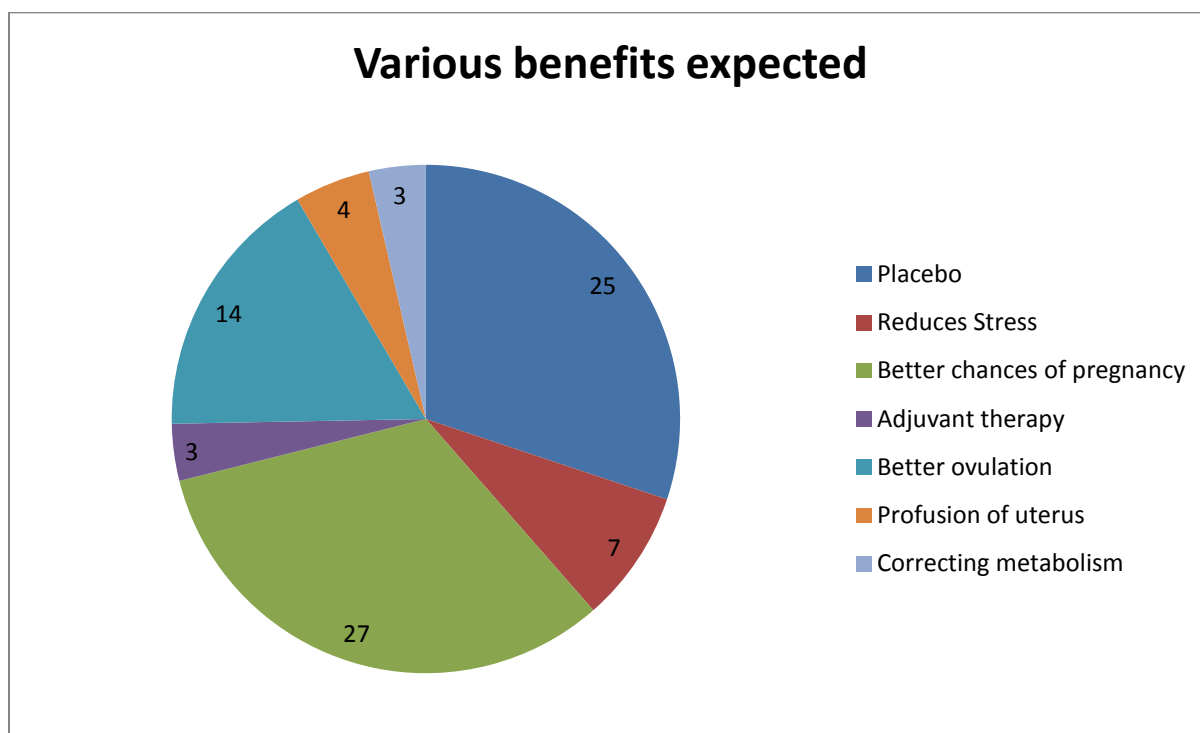


Fig 30- Breakup of various benefits expected from the use of antioxidant & vitamin combination

OBSERVATIONS:

- 27 out of 94 gynaecologists said antioxidant & vitamin combination result in better chances of pregnancy
- 25 out of 94 gynaecologists said antioxidant & vitamin combination act as placebo
- 14 out of 94 gynaecologists said antioxidant & vitamin combination result in better ovulation
- 7 out of 94 gynaecologists said antioxidant & vitamin combination helps in reducing stress.
- Some of the gynaecologists also mentioned benefits such as profusion of uterus, correcting metabolism, adjuvant therapy.

INFERENCE: Majority of the gynaecologists consider antioxidant & vitamin combination to be helpful in achieving pregnancy.

11) Prescribing antioxidant & vitamin combination to both the partners simultaneously.

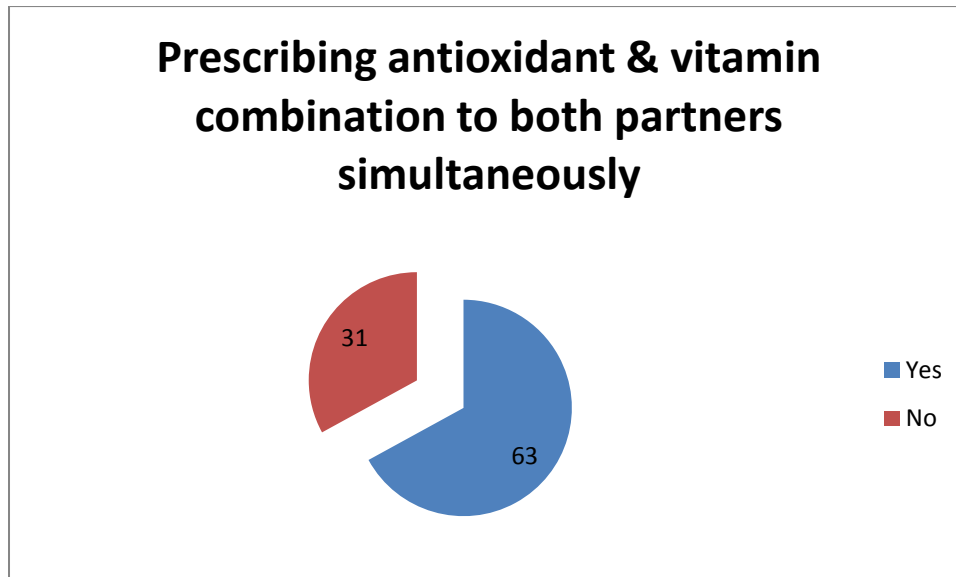


Fig 31- Breakup of response for prescribing antioxidant & vitamin combination to both partners simultaneously

OBSERVATIONS:

- 63 out of 94 gynaecologists said they DO prescribe antioxidant & vitamin combination to both partners simultaneously if male is also having fertility problem or the couple is over aged.
- 31 out of 94 gynaecologists said they DO NOT prescribe antioxidant & vitamin combination to both partners simultaneously

INFERENCE: Majority of the gynaecologists do prescribe antioxidant & vitamin combination to both the partners simultaneously.

12) Prescribing pattern of antioxidant & vitamin combination, when prescribed to both the partners.

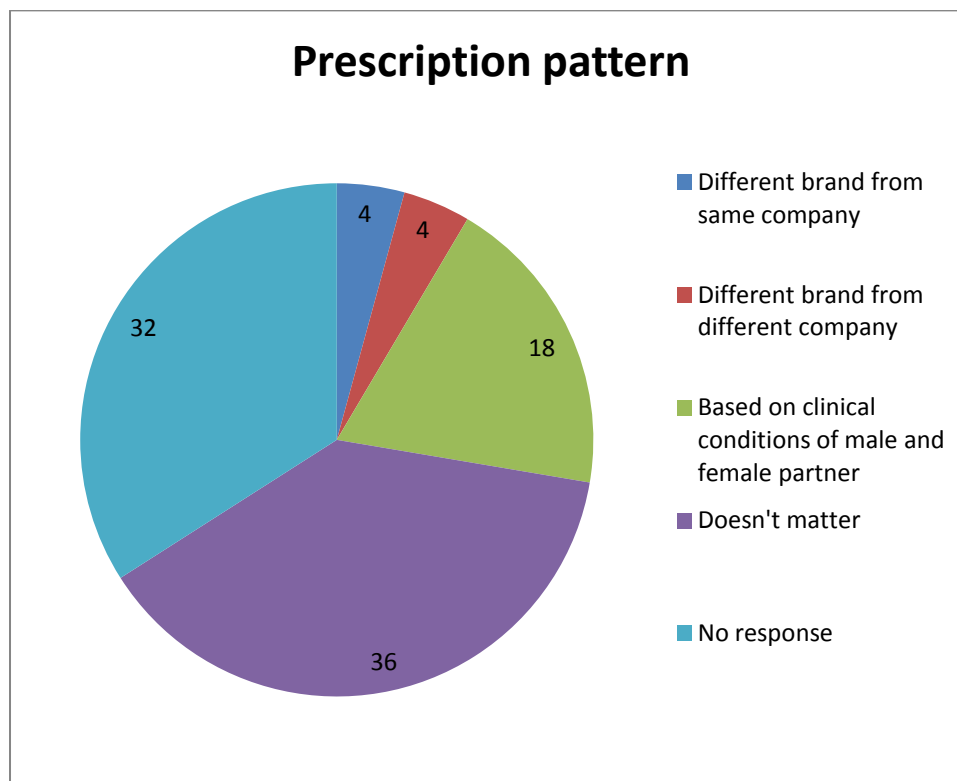


Fig 32- Breakup of prescription pattern of antioxidant & vitamin combination when prescribed to both the partners simultaneously

OBSERVATIONS:

- 4 out of 94 gynaecologists prefer different brand from same company as easy to remember
- 4 out of 94 gynaecologists prefer different brand from different company as its better to keep them separate
- 18 out 94 gynaecologists said they prescribe based on clinical conditions of male and female partner
- 36 out of 94 gynaecologists said it doesn't matters which brand only the brand should be good, economical
- 32 out of 94 gynaecologists gave no response

INFERENCE: Majority of the gynaecologists said it doesn't matters which brand only the brand should be good and economical.

13) Indications other than female infertility in which antioxidant & vitamin combination can be prescribed.

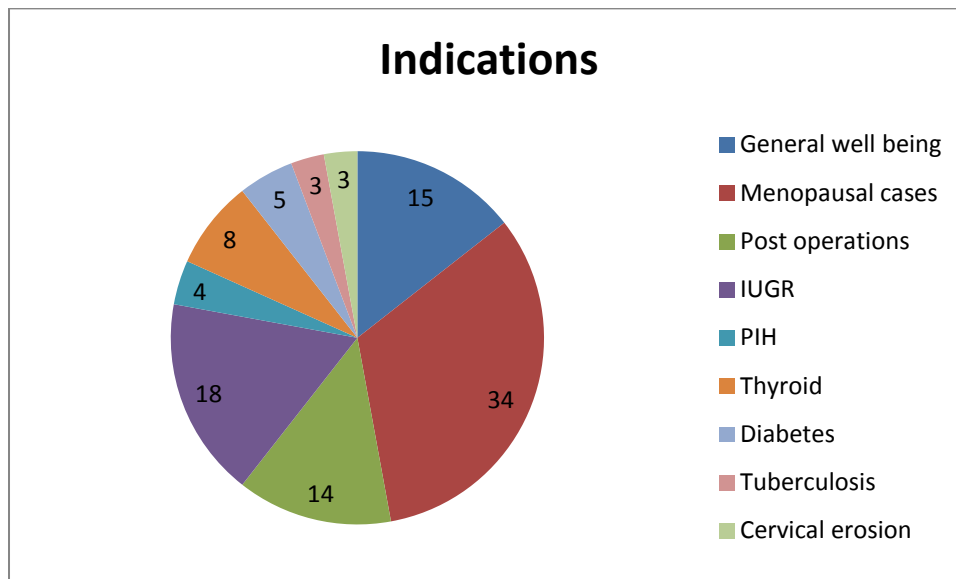


Fig 33- Breakup of various indications in which antioxidant & vitamin combination can be prescribed

OBSERVATIONS:

- 34 out of 94 gynaecologists said antioxidant & vitamin combination can be prescribed in menopausal cases
- 18 out of 94 gynaecologists said antioxidant & vitamin combination can be prescribed in IUGR
- 15 out of 94 gynaecologists said antioxidant & vitamin combination can be prescribed for general well being
- 8 out of 94 gynaecologists said antioxidant & vitamin combination can be prescribed in thyroid
- 5 out of 94 gynaecologists said antioxidant & vitamin combination can be prescribed in diabetes
- 3 out of 94 gynaecologists said antioxidant & vitamin combination can be prescribed in tuberculosis
- 3 out of 94 gynaecologists said antioxidant & vitamin combination can be prescribed in cervical erosion

INFERENCE: Majority of gynaecologists said antioxidant & vitamin combination is useful in menopausal cases and IUGR.

14) Prescribing antioxidant & vitamin during pregnancy.

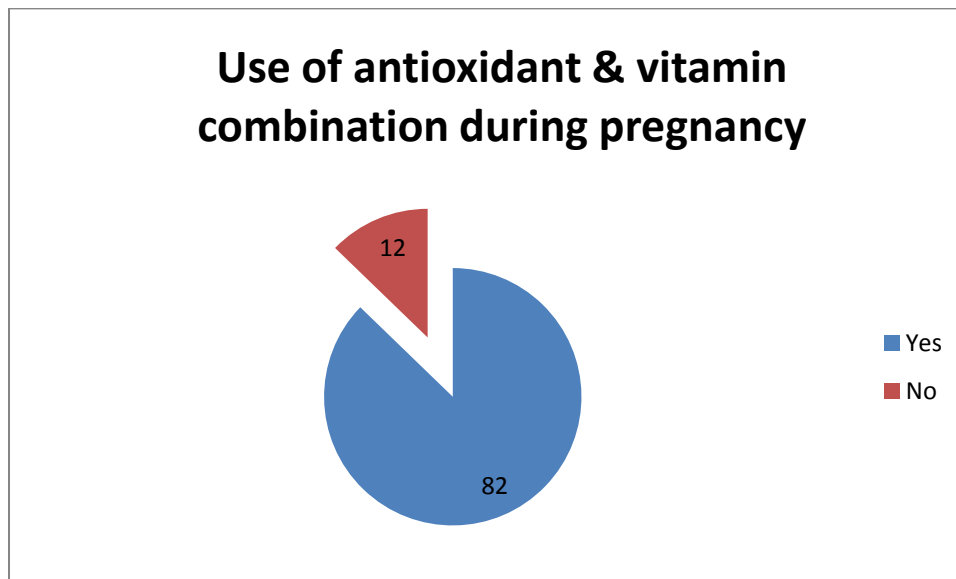


Fig 34- Breakup of response for use of antioxidant & vitamin combination in pregnancy

OBERVATIONS:

- 82 out of 94 gynaecologists DO prescribe antioxidant & vitamin combination in pregnancy
- 12 out of 94 gynaecologists DO NOT prescribe antioxidant & vitamin combination in pregnancy

INFERENCE: Majority of gynaecologists do prescribe antioxidant & vitamin combination in pregnancy.

15) Ready to prescribe a formulation having more potent antioxidant ASTAXANTHIN, along with other vitamins and minerals.

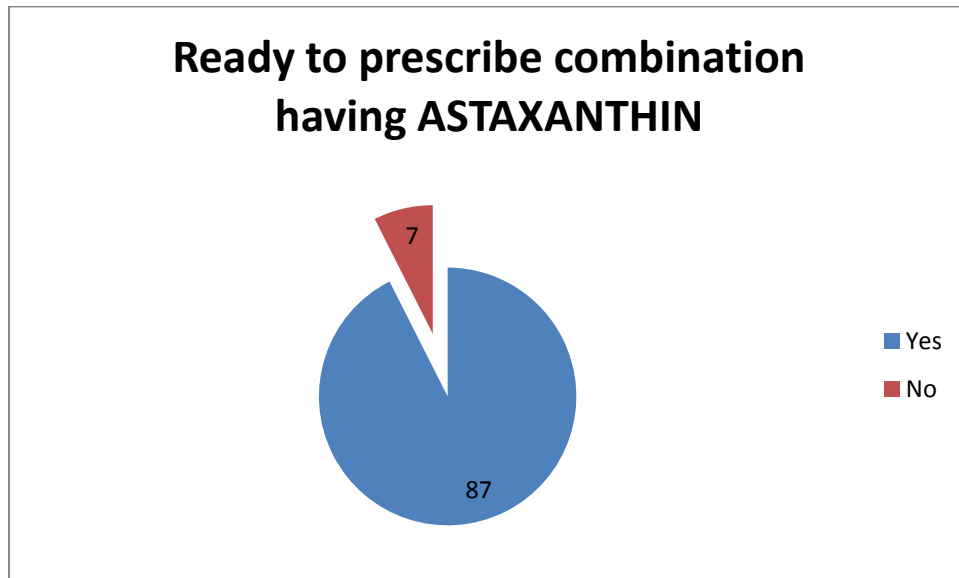


Fig 35- Breakup of response for prescribing combination having Astaxanthin

OBSERVATIONS:

- 87 out of 94 gynaecologists are ready to prescribe combination having astaxanthin if it is safe and economical
- 7 out of 94 gynaecologists refused to try combination having astaxanthin

INFERENCE: Majority of gynaecologists are willing to prescribe combination having astaxanthin if it is safe and economical.

CONCLUSIONS

- + Prevalence of infertility is quite high in the society.
- + Although the numbers of male infertility cases are increasing, but still female infertility cases are very high in number forming the bulk of infertility cases.
- + There are various causes of female infertility of which ovulation and unexplained are the major ones.
- + Gynaecologists follow many options for treatment of infertility of which ovulation induction, surgery and IVF are major ones.
- + Increase in oxidative stress is regarded to be one of the major reasons for increase in female infertility cases.
- + Antioxidant & vitamin combination is often prescribed to reduce oxidative stress and gain fertility in females.
- + Antioxidant & vitamin combination is always prescribed in unexplained infertility, PCOS, recurrent pregnancy loss, age- related decline in infertility, as a preconception treatment, before going for an IVF treatment. They are also prescribed in endometriosis, PID and tuberculosis.
- + Antioxidant & vitamin combination is mostly prescribed for 3 – 6 months.
- + Folic acid, Vitamin B6, Vitamin B12, lycopene, Vitamin E and selenium are the components which are regarded to be most important in a antioxidant & vitamin combination.
- + Better chance of pregnancy and mental satisfaction are expected from the use of antioxidant & vitamin combination.
- + Antioxidant & vitamin combination are prescribed to both the partners simultaneously most of the time.
- + Antioxidant & vitamin combination can be very useful in menopausal cases & IUGR cases also.
- + Antioxidant & vitamin combination are often prescribed in pregnancy also.
- + Gynaecologists are willing to prescribe a combination having potent antioxidant, astaxanthin along with other vitamins and minerals.

RECOMMENDATIONS

- + Market potential of antioxidant & vitamin combination is promising.
- + There is a need to create awareness for the use of antioxidant & vitamin combination not only to treat female infertility; but also for general well being of girls in adolescent age.
- + Antioxidant & vitamin can be shown to be useful in menopausal and tuberculosis cases.
- + A combination having astaxanthin, which is safe and economical can make a very strong presence in antioxidant & vitamin combination market.

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