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REVIEW ARTICLE

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INFERTILITY: AN OBSERVATIONAL STUDY FROM THE WORK OF YAMOAH J (1989) TO MODERN TIMES

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ABSTRACT: Objectives: The aim of this study was to assess and compare scientific output of research on infertility with modern day works as against a project work done by Yamoah 1989 on infertility using a case study from two health centers using herbal and orthodox medicines in the treatment of infertility inn Kumasi, Ashanti region of Ghana on the year 1989. **Method:** Research publications on infertility from 2011 to 2024 were retrieved from the Web of Science Core Collection (WoSCC). Pub med, Google scholar. In all about 120 articles, books and conference materials on modern day infertility diagnosis, treatment and recommendations were used. Bibliometric analyses were performed using VOSviewer software. **Results:** Out of the total of 120 articles related to the study of infertility, the researchers saw a sharp rise in the number of publications on the subject matter from 2013 to 2023 with a stable trend. The study conducted by Yamoah J in 1989 revealed no significant variation in the incidence of infertility among the months of any particular year. **Conclusion:** The researchers agree with the modern-day clinical work on infertility as done by some researcher. The researchers admit the fact as shown in epigenetics that the environment is a predictor to either infertility or fertility and with life style changes, especially avoidance of sedentary life style becomes a major intervention to break the barriers of infertility in both male and females.

Keywords: Infertility, Incidence, Genes, Epigenetics, Sexually Transmitted Diseases

INTRODUCTION

Can what a man eats affect the health of a future son that he dreams of having? The short answer is YES. The conduit for the effect is none other than the tiny sperm that he makes. Even more fascinating is how this actually happens, because it's not through the canonical genetic inheritance pathways that are used to determine things like sex or eye color. Instead, less well known routes are taken, and these are termed epigenetic. Infertility is a disease of the male or female reproductive system defined by the failure to achieve a pregnancy after 12 months or more of regular unprotected sexual intercourse. Infertility is a medical condition that can cause psychological, physical, mental, spiritual, and medical detriments to the patient. The unique quality of this medical condition involves affecting both the patient and the patient's partner as a couple. To understand infertility, one must understand normal fecundability, the probability of achieving pregnancy in one menstrual cycle by females and the ability of males of produce motile and fertile sperms to impregnate females. In many cultures, the ability to produce children is an important sign of an individual's worth. Children are referred to as the charm of life and clearly have socio – cultural value is seen as an important source of security especially in old age [1]. Couples want sons who can inherit their lands, possessions and names; they want children to care for them in old age and in some religions, to pray for them after their death. Thus, the problem of infertility is unbearable to many couples, if not all [2].

Demographic terms of infertility

The definitions of infertility used by demographers, clinicians, epidemiologists and others often differ from each other and therefore make data from different sources hardly comparable. But working and popular usage definitions related to couples and individuals for the types of infertility in the community have been proposed and in accordance, infertility may be defined as any of the following (where applicable), with particular reference to the woman.

i. Primary infertility: the woman has never conceived, despite exposure to conditions suitable for pregnancy for a period of at least two years.
ii. Secondary infertility: the woman has previously conceived by subsequently is unable to conceive despite exposure to pregnancy for a period of at least two years.
iii. Pregnancy wastage: the woman is able to conceive but unable to produce a live birth. Loss of pregnancy is classified as abortion of still birth before or after 28 weeks of pregnancy respectively.
iv. Infant and child mortality: all deaths of live born children before their first or between their first and fifth birth- days respectively.
v. Unproven infertility: the woman virtually is not at risk of conception but considers herself infertile. The reason may be biological (breast-feeding problem or contraception) or circumstantial (low coitus frequency, partner temporarily absent or otherwise).
vi. Infecundity: the inability to conceive or to be impregnated.
vii. Sterility: the complete and permanent inability to conceive even after treatment.
viii. Childlessness or Barrenness: the woman has not produced any children, whether due to infecundity, pregnancy wastage, contraception, induced abortion or sterility.

While demographers distinguish between infertility and childlessness, this report follows medical and popular usage, which equates the two. Beside these generalized definitions of infertility, the term may still be defined in two broad ways as:

i. Biological or Involuntary infertility which refers to the situations where the inability to bear a child is not a self-imposed one (e.g. as due to contraception) but is due to many causes such as physiological disorders and /or disturbances and psychogenic or psychological problems.
ii. Non- biological or voluntary infertility which comes as a result of a persons or couples deliberate action or attempt to stop, hinder or prevent unwanted pregnancy. This can be through the use of contraception by induced abortion etc. This type of infertility is also called socio-economic infertility.

Pathophysiology of Infertility
Anovulation

Ovulatory disorders make up 25% of the known causes of female infertility. Oligo-ovulation or anovulation results in infertility because no oocyte is released monthly. Without an oocyte, there is no opportunity for fertilization and pregnancy. To help with treatment and further classification, the World Health Organization subdivided ovulatory disorders into 4 classes:

a. Hypogonadotropic hypogonadal anovulation: Hypothalamic amenorrhea
b. Normogonadotropic normoestrogenic anovulation: Polycystic ovarian syndrome (PCOS)
c. Hypergonadotropic hypoestrogenic anovulation: Premature ovarian failure

1. Hyperprolactinemic anovulation: Pituitary adenoma

Hypothalamic amenorrhea or functional hypothalamic amenorrhea (FHA) is associated with eating disorders and excessive exercise, which results in a decrease in hypothalamic GnRH secretion. The decreased caloric intake, associated weight loss, or excessive exercise leads to elevated cortisol, which causes a suppression of GnRH. The decreased or absent pulsatility of GnRH results in a decrease in the release of gonadotropins, follicle-stimulating hormone (FSH), and luteinizing hormone (LH) from the anterior pituitary gland. These 2 deficiencies result in abnormal follicle growth, anovulation, and low estrogen levels. The FSH and LH have variations ranging from normal to low, but the hormone ratio resembles a prepubertal female, with FSH higher than LH. The most common type of Normogonadotropic normoestrogenic anovulation is PCOS. PCOS accounts for 80% to 85% of all anovulatory patients and affects 8% of all reproductive-aged females.

PCOS can be diagnosed using the Rotterdam criteria, which requires at least 2 of the 3 below-listed criteria in the absence of other pathological causes:

2. Oligo ovulation/anovulation

Clinical signs of hyperandrogenism or serological elevations of androgens

Polycystic ovaries demonstrated with ultrasound

Infertility caused by PCOS is thought to be associated with a dysfunction in developing a mature follicle, leading to anovulation. The FSH and estrogen are being within normal laboratory limits. The LH can either be normal or elevated. The pathophysiology behind PCOS and infertility is not well understood; classically, abnormal pulsatility of GnRH is described as a possible underlying cause. Correlating the high number of arrested follicles and polycystic-appearing ovaries is the elevation of the anti-Mullerian hormone (AMH).

3. Hypergonadotropic hypoestrogenic anovulation

It is the category of premature ovarian insufficiency and ovarian resistance associated with females' age. As mentioned before, a woman's age affects fertility due to a well-studied phenomenon of a steady decline in the quality and quantity of the patient's oocytes. In quantity, the female fetus at 20 weeks gestation has roughly 6 million follicles. The newborn has approximately 1 million follicles. At the onset of puberty, the number of follicles decreases to 300,000. The rate of follicle loss continues throughout a woman's life and increases in rate around her mid-thirties. External factors are also associated with decreased follicular quantity. The most notable and

highly researched is cigarette smoking. Fecundability and follicular quantity are both inversely proportional to the amount of cigarette smoking. Early menopause (under 40 years old) is also associated with cigarette smoking; there is a more than 30% increase in early menopause among ever-smokers.

4. Ovarian quality is also essential to overall fertility

The loss of the oocyte quality throughout a woman's life is associated with meiotic nondisjunction, resulting in aneuploidy. This is thought to be related to accumulated damage throughout life and age-related changes in the granulosa cells. As women age, there is a significant increase in the number of meiotic nondisjunction events and corresponding aneuploid or chromosomally abnormal oocytes and embryos. Primary ovarian insufficiency (POI) is defined as hypergonadotropic hypogonadism before the age of 40. This disease is characterized by a lack of folliculogenesis, a decrease in estrogen, loss of oocytes, and infertility. The most common cause of POI is Turner syndrome, monosomy of the sex chromosomes leading to a 45X karyotype. Further discussion of Turner syndrome is outside the scope of this manuscript.

Trends in the Incidence of Infertility

Large numbers of people are affected by infertility in their lifetime. Around 17.5% of the adult population, roughly 1 in 6 worldwide experience infertility, showing the urgent need to increase access to affordable, high-quality fertility care for those in need [3]. The new estimates show limited variation in the prevalence of infertility between regions. The rates are comparable for high-, middle- and low-income countries, indicating that this is a major health challenge globally. Lifetime prevalence was 17.8% in high-income countries and 16.5% in low- and middle-income countries.

The link between infertility and psychology

The reason why psychology attracts more and more attention to infertility is that, on the one hand, the development of assisted reproductive technology is more and more mature and the patients' psychology is concerned. The issues stem from the feasibility of Screening Patients, the emotional situation they go through before, during and after In vitro Fertilization in daily Clinical Practice. On the other hand, the reason may be a change in the model of modern-day medicine where investigations into infertility stems from the roots, that is genetic makeup and chromosomes before histology and cytology takes place. Psychogenic diseases caused by various psychological and social causes have also become rampant in dealing with infertility. The modern medical model has been transformed into the "Bio-Psycho-Social Medical Model", and psychological factors cannot be under rated in modern day infertility treatment procedures. From (Yamoah 1989) [4], researchers saw that, ethnic and racial differences in infertility have been observed. For example, the work of Yamoah J cited a report from 1983 [2] where by in the Equateur Province of Zaire childlessness among women aged 45 - 49 varies from about 6% among the Ngbaka and Batwa-Batshwa people to 65% among the Mbelo. In the U.S. showed that about twice as many non-contracepting black couple s as white couples had not achieved pregnancy in In the U.S. a 1976 survey the previous year, i.e. 18.4 compared with 9.1%.

According to work of (Yamoah 1989) [4], an association of factors such as Sexually Transmitted Diseases (STDS) and infertility has been found in several communities as contained in separate reports from the studies of both. (Arya and Taber 1975) [5], and (Arya and Bennett 1976) [6] on the causes of infertility in Uganda and that revealed a correlation between STDs and infertility. An earlier work by (Gresh et al., 1972) [7] also in Uganda gave evidence to same. Generally, where STDS are common, the incidence of the STDs is increased with increased frequency of sexual activity, and with multiple sexual partners often associated with migration of men to urban areas and their subsequent return to rural homes. Polygamy, which are so characteristic of urban life may have a similar effect of increasing the spread of STDs and thus contribute to high infertility values.

In support to (Yamoah 1989) [4] unpublished work on incidence of infertility done as a project work for academic degree at the School of Biological Sciences, Kwame Nkrumah University of Science and Technology, the Loma Linda University center for fertility and IVF emphasized in their research findings in 2024 that Sexually transmitted diseases can directly or indirectly cause infertility in women and in men. When STDs are left untreated, infections can develop that cause infertility by moving up the reproductive system and spreading to the woman's uterus, ovaries and fallopian tubes causing damage, scarring or inflammation. The two major causes of STD-related infertility are pelvic inflammatory disease (PID) and damage to the fallopian tubes. This has also been grounded and sealed by the work of (Smolarczyk *et al.,* 2021) [8] in which their findings revealed that the number of sexual transmitted infections (STIs) is rising worldwide. Screening programs (using sensitive and specific diagnostic methods), fast and effective treatment of detected cases, and proper prophylaxis should be implemented to avoid possible complications due to STIs such as fertility related issues and adverse pregnancy outcomes.

(Yamoah 1989) [4] noted and observed in his project work that Pelvic Inflammatory Disease (PID), genital tract infection or injury to the reproduction system may be affected by the local birth, abortion and other health treatment practices, use of indigenous contraceptives or abortifacients and less commonly by ritual separations on the genital tract such as female circumcision. This observation by (Yamoah 1989) [4] is confirmed and has been better explored and detailed by the work of (He, Wang, & Ren 2023) [9]. The authors findings were that pelvic inflammatory diseases and ectopic pregnancy were interrelated and a case of public health issue among reproductive women since it can cause permanent infertility.

Male Infertility

In recent past, andrology, the study of male infertility, scarcely existed as a medical specialty because infertility was regarded as a problem for only females. Thanks to current enlightened social attitude of some men, medical programs and development in science, infertility is now seen as a problem for both males and females. Indeed, knowledge of male reproductive process is fast improving, constantly bringing many facts to light. Hindrances to this progress are partly because men are less likely to seek full medical examination and treatment, and partly because treatment for male infertility are still largely unsuccessful since diagnosis of the male infertility is not a straight forward and objective tests are available at only a few infertility centers [2]. Such tests are even very expensive, laborious, difficult to interpret and not applicable to all cases. Thus, the contribution of male factors to fertility may often be underestimated since investigations concentrate more on women than men. In many cases, men are examined only when all possible female factors have been considered and ruled out [2].

Gynecologists are mostly not knowledgeable about male infertility and often refer men to Urologists, who may also have only limited knowledge of male infertility, while many men may refuse infertility examinations completely because they believe that sexual potency is proof of fertility [2]. For all these reasons, knowledge about male infertility and its treatment lags behind female infertility. Generally, male factors are known to cause infertility in about 30% of all infertile couples and to contribute to infertility in 20% [2].

Main causes of Male Infertility as of 1980s

The main causes of male infertility are as complex as the male reproductive process itself.

1. Disorders in sperm production and/or blockage of sperm ducts

Recent researches indicate that male infertility is most often caused by one of two conditions which are disorders in sperm production and/or blockage of sperm ducts [2]. Both result in poor semen quality – semen that contains too few sperms and/ or abnormal sperms with less common situation being sexual malfunction that prevents ejaculation of semen [2].

(a) Characteristics of Semen

Based upon sperm duct disorders, most men who seek medical help are classified as either azoospermia i.e. having a low concentration of sperm in semen. Subfertility is generally defined as a sperm count below 20 million sperms per milliliter of semen. Many men with low sperm counts also have a high proportion of abnormally shaped sperms or of sperms that do not move normally. In some cases, the reasons for poor semen quality can be determined but in others usually classified as "idiopathic Oligospermia", the poor semen quality is without apparent cause [2]. In many developing and some developed countries, one of the most commonly identified causes of poor semen quality is genital infection, usually due to Sexually Transmitted Diseases (STDs) [2]. When untreated, these infections can lead to complete blockage of sperm ducts, causing azoospermia.

(b) Sperm duct characteristics from infections

In men, most untreated genital infections, often due to STDs cause infertility by creating inflammation or blockage in the upper reproductive tract. These infections begin in the urethra (termed urethritis) and if not adequately treated, they may spread to the vas defers. In some cases, this infection reaches the epididymis (termed epididymitis), which is a more serious condition than urethritis.

Most men with epididymitis are temporarily sub fertile simply from the infection itself. In addition, these infections cause scarring that partially or completely blocks sperm transport. Untreated urethritis leading to epididymitis is not common in many developed countries since most men who report symptoms immediately are treated promptly with antibiotics. However, 1n many developing countries the commonest complication in men are urethritis and epididymitis and studies have shown that, an estimated value of between 1-3% of men with five or more episodes of gonococcal infection (an STD) develop bilateral epididymitis [2].

In a sample population in Teso, a district in Uganda-Africa, Arya and Taber (1975) [5] found evidence of acute or chronic epididymitis in 27.9% of men and bilateral epididymitis is in 6% of men, In all they found that nearly 44g of those with bilateral epididymitis of ages over 30 years were childless. This is because many men are not treated for most STDS for months or even years and so STDs associated problems leading to infertility are common. According to (Arya and Bennett 1976) [6], when the prevalence rates of some African countries are compared with those of the developed countries, it is obvious that STDs constitutes a major public health problem especially in developing countries. They found that, for example, the rate for gonorrhea per 100,000 population in Kampala (Uganda) was 10,000 and in Nairobi (Kenya) was 7,000 whiles the corresponding figures for Greater London (Britain) and Atlanta (U.S.) were 310 and 2510 respectively. Generally, sperm duct blockage result in azoospermia [2].

2. Sexually Transmitted Diseases (STDs) and infertility

Notable among the STDs that cause male infertility [2].

These include: -

a. Gonorrhea**:** In men, untreated gonorrhea can lead to urethral abscess, urethral stricture and inflammation of the prostate gland, as well as epididymitis. Many of the complications of gonorrhea can lower sperm counts. Gonorrhea seems to be a more common cause of urethritis is in most developing countries.
b. Chlamydial Infections: Studies in most developed countries show that chlamydia is the chief cause of

non-gonococcal urethritis. Symptoms of this disease usually are less severe than those of gonococcal urethritis and because chlamydial urethritis may develop unnoticed, more cases of epididymitis may be due to chlamydia infections than to gonorrhea.

c. Other non-gonococcal STD like mycoplasmas.

3. Non-STDs and Infertility

Among the non-STDS, the following are also known to cause male infertility [2].

a. Tuberculosis (TB): Urogenital TB causes infertility in men by scarring and blocking the epididymitis or less commonly through infection of the prostate gland, seminal vesicles or vas deferens. Urogenital TB develops following infection of the lungs but with no symptoms until after many years.
b. Filariasis: Some investigators think that an important cause of male infertility is Bancroftian filariasis - a widespread disease in hot humid areas that is caused by a mosquito- borne filarial worm. The parasites concentrate in the genital lymph drainage. Inflammation and swelling may occur in the testes, scrotum, epididymis or vas deferens.
c. Schistosomiasis: In infected men, eggs of schistosomiasis (e.g. haematobiun which is common in most African countries) are frequently found in seminal vesicles and occasionally in other parts or the male reproductive tract. Thus, some investigators have suggested that inflammatory reactions to the parasites eggs could block sperms or lesions could allow sperms to come into contact with the blood supply, causing immunologic infertility, similar to auto-immunologic infertility.
d. Mumps: In post pubertal males, mumps can develop into orchitis (i.e. inflammations of the testes) and in severe cases to later atrophy of the testes leading to permanent infertility.
e. Leprosy: The lepromatous form of leprosy may and develop high levels of sperm antibodies, which may destroy sperm's ability to swim and thus has been implicated in infertility.

D. Other causes of Male Infertility

In addition to the mentioned diseases, a variety of factors may also impair sperm production [2].

Some factors as:

(a) Varicocele: This is a defective testicular vein(s) that cause abnormal blood flow to the testes. This may be improper functioning values in one or more testicular vein(s).

This allows excess venous blood to flow around the testes. Some researchers believe that, this excess blood flow interferes with sperm production by raising the temperature or increasing serum levels of toxic metabolites in the testes and thus create infertile situations.

(b) Hormonal and Genetic Factors: Hormonal imbalances that cause infertility are much less common in males than females. In males, abnormalities in hormonal secretions however have serious consequences and most of these are caused by genetic disorders. For instance, Klinefelter syndrome (a gene tic abnormality) males have low testosterone (reproduction hormone) levels and are azoospermia.

A similar but more serious situation is found in Kallman's syndrome (another genetic abnormality) where pubertal characteristics completely fail to take place. Failure of the hypothalamus or pituitary (parts of the brain) sometimes caused by tumors also can affect Follicle Stimulatory Hormone (FSH) and Luteinizing Hormone (LH) secretions. Since these are major, hormones involved in reproduction, bringing about the production of mature sperms, such tumors as those affecting pituitary secretions can lead to loss of secondary sexual characteristics at puberty, atrophied testes and sometimes impotence.

Occasionally, a man produces antibodies which when present in the semen, reduce the mortality of sperms. These sperm antibodies may be more likely to develop when sperms come into contact with tissues outside the sperm ducts, and the sperms being considered as foreign bodies trigger the production of antibodies from serum of blood. For example, some men who have had vasectomies surgically reversed remain involuntarily infertile.

This is known as auto-immunological infertility, and a large proportion of these men have antibodies to sperms.

(c) Environmental Pollutants: Exposure to toxic substances, radiations or, extreme heat may affect male infertility. Radiations impair sperm production but the effect seems to be temporary in most cases. Exposure to high levels of pesticides reduces sperm count. Occupational exposure to lead can reduce sex drive and sperm count. Extreme heat may reduce male fertility i.e. temperatures usually above body core temperature, since the optimum temperature fort sperm production is about 2% below normal body core temperature. In cryptorchidism, males whose testes remain inside the body cavity instead of descending into the scrotal sacs, no fertile: sperms are produced because of destruction from heat of the body.

(d) Alcohol, Tobacco and Drugs: Alcoholic men often produce less reproductive hormones and the testes as a result may eventually atrophy. Drinking does not seem to reduce fertility in otherwise normal men but in men with borderline sperm counts, it does. Powerful therapeutic drugs such as those used in cancer therapy or for the control of mental disorders often cause temporary or permanent infertility, probably by directly affecting testicular cells. Preliminary reports suggest that heavy marijuana smokers have lower sperm counts, lower sperm mortality and more abnormal sperms than other men do. Cigarettes also probably affect male fertility. Research indicate that cigarettes.

Smokers have fewer motile sperms and more abnormal sperms than non- smokers. Also, in some infertile men, it was observed that semen quality improved markedly when they stopped smoking.

Female Infertility

Female infertility has caused great concern since ancient times. In many parts of the world today, it is still believed that infertility is a condition associated with women only. The cries and desperation of the unfortunate women who cannot meet this cultural definition of feminine womanhood by becoming mothers is very alarming.

Main causes of Female Infertility

Generally, female factors probably account for about 50-70% of all infertility [2]. The immediate causes of female infertility are fairly well known. They involve most structural and physiological abnormalities in most parts of the female reproductive system.

These include the following, according to Population Report (1983) [2].

a. Fallopian tubes blockage (Tubal blockage) from Pelvic Inflammatory Disease (PID).
b. Ovulation disorders
c. Uterine complications, Uterus abnormalities and cervical abnormalities.

Usually, whenever the health care is poor, a large proportion of female infertility is caused by tubal infection (blockage) and/or chronic pregnancy wastage, which account for a great toll of all secondary infertility cases [2].

A. Fallopian tubes blockage (Tubal blockage)

Garcia *et al* in 1977 found in a study involving 500 infertile females in Mexico that 23% of the causes of infertility were from tubal blockage while the other also found in a similar study carried out in Nigeria that 25% was from tubal blockage [2]. Generally, the major cause of fallopian tubal blockage leading to infertility is Pelvic inflammatory disease (PID) - an infection often originating in the cervix that ascends to the upper reproductive tract PID can lead to fluid-filled swellings, adhesions, scaring and other permanent damage to the fallopian tubes. Westrom 1980, [10] found that, there is a link between PID and infertility and that the more episodes of PID, the greater the risk of infertility. Women with PID are known to be infertile during the infection and more likely to become permanently infertile if the disease is severe and treatment is delayed.

In Uganda, researcher reported that between 22% and 30% of gynecological admissions were for acute PID. The association between PID and infertility is very high especially if the woman has suffered multiple episodes of PID. Westrom 1980, [10] again expressed a link between PID and ectopic pregnancy. According to him, ectopic pregnancy often leads to rupture of the fallopian tube-a lifelong threatening emergency that usually requires surgical removal of the tubes and can therefore lead to permanent infertility. Generally, the major sources of PID include:

(a) STDS and Non-STDS

According to Population Report (1983) [2], notable infections which are the common causes of PID – related infertility include:

i. Gonorrhea: Worldwide, gonorrhea is almost certainly the most common preventable cause of PID and tubal infection, and the disease is highly contagious.
ii. Chlamydial infection: This also causes tubal infertility when the disease causing organisms live within the cells of the cervix and damage them.

Other STDS like Mycoplasmas, Genital herpes etc. Other diseases which are non-STD are also known to cause female infertility. Such disease includes Tuberculosis (TB), Schistosomiasis, Malaria, and Toxoplasmosis.

(b) Postpartum infections

Postpartum infections cause much tubal secondary infertility. Obstetric difficulties such as prolonged or obstructed labour and so to the risk of infection. It may be more common where nutritional deficiencies early in a woman's life result in a small pelvis. Ritual female circumcision, common in some African and Middle Eastern countries often cause scaring of the external genitalia and thus, the risk of tearing during childbirth [2]. This may also contribute to postpartum infections which lead into PID with resulting infertility.

(c) Post abortion infections

Post abortion infections, usually following induced abortions are important causes of infertility. Reports on Complications of Abortion in Developing countries revealed that from 30 to 55 million abortions are signals estimated to take place annually throughout the world [11], the general observation was that incidence of abortion seem to be increasing as more women try to avoid unwanted births. Because abortions performed by untrained practitioners are often insanitary or incomplete, infection is common [2].

A survey conducted in the south-eastern regions of Ghana in 1983 shows that in the early 1970s provide persuasive evidence that abortion is not uncommon outside major urban centers in most developing countries. In interviews of over 300 women and men living in a town of 4,000 inhabitants, it was found that 150 respondents described 53 different abortifacients and abortion techniques [2]. Spontaneous abortions may result in infections whiles improperly performed abortions also can physical injury leading to infertility [2].

B. Ovulation disorders

An important cause of female infertility is ovulation disorders. Infrequent ovulation or the absence of ovulation (anovulation) is the most common cause of infertility [2]. Ovulation disorders result from disruption of the Hypothalamus-pituitary- ovarian axis, the complex feedback system of hormonal signals necessary for normal menstruation cycles and the maintenance of pregnancy by releasing the oocyte for potential conception. Nakamura et al in 1971 reported that 10% of most infertility cases are due to ovulation disorders while Barten in 1978 reported 12% as being due to ovulation disorders [2].

Among the causes of ovulation, disorders are the following [2]:

(a) Hyperprolactinemia - A high serum concentration of the pituitary hormone prolactin can inhibit ovulation possibly by blocking various ovarian hormone receptors and thus causing a hormonal imbalance.

(b) Polycystic Ovarian disease - often called stein-Leventhal syndrome, inhibits ovarian function. It is characterized by enlarged ovaries with many follicular cysts, amenorrhea, abnormal hair growth and obesity. Almost all women with polycystic ovarian disease are completely infertile

(c) Thyroid gland disorders disrupt the hypo-thalamus – pituitary –ovarian axis. Too little thyroid hormone results in too much circulation of estrogen - a hormone that stimulates the hypothalamus to produce gonadal hormones. In both cases, the effect of estrogen on the hypothalamus is absent, and ovulation is prevented so that there is no chance of fertilization.

d) Stress may disrupt ovulation by affecting the autonomic nervous system, which in turn affects endocrine (hormonal) system.

C. Uterine complications, Uterus abnormalities and cervical abnormalities

The uterus of many females may be distorted or the uterine lining (endometrium) inadequate or infected, preventing implantation or survival of a fertilized egg while the cervix may be malformed, infected or secrete abnormal mucus, preventing sperms from reaching the upper reproductive tract. Some infertile women may produce antibodies that immobilize sperms in the cervix or cause sperms to stick together - often called “hostile cervical mucus" [2].

Some congenital uterine and cervical abnormalities cause infertility, e.g. cervical stenosis, a small cervical canal and septate uterus, a uterus which has been divided into two ion chambers are two common types of such abnormalities, while the endometrial tissue growths on the ovaries, fallopian tubes and other reproductive parts causing adhesion of the affected areas also prevent conception. According to studies by Ledward in 1980, uterine and cervical factors together contribute 4% of all infertility cases [2].

D. Other Causes of Female Infertility

A variety of factors occasionally causes female infertility. These include environmental pollutants, alcohols, Drugs and Tobacco. Lead poisoning both reduces the ability to conceive and increases pregnancy wastage [2]. Evidence is mounting that drugs can cause difficulty in conception. A study of women failing to conceive five years after going off the pill shows 11% smokers and 5% non-smokers according to World Health Organization [12]. Certain over-the-counter, prescription and illicit drugs may lower a woman's fecundity e.g. habitual use of narcotic drugs is believed to inhibit regular ovulation whiles some powerful drugs used to treat serious illnesses such as cancer and chronic kidney disease can stop ovulation completely.

Studies on smoking of tobacco have revealed that it probably increases the risk of spontaneous abortion and the more cigarettes smoked per day, the greater the risks [13]. Severe malnutrition and anemia are known to delay menarche and. increase pregnancy wastage, prematurity and still births or susceptibility to diseases that cause infertility [12].

E. Age and Female Infertility

Female infertility is linked with age. A Woman's reproductive life begins at menarche and ends at menopause.

Demographers’ measure fertility rate in terms of woman's age represented between 15-44 years or sometimes 49 years [2]. Medical research has revealed that, the female’s natural fertility varies considerably after menarche and towards menopause, where hormonal patterns may be quite irregular. Studies by World Fertility Survey (WFS) have revealed that, reproduction or fertility is best between 18 and 30 years [2], and indicated that the risk of female infertility increase more sharply at age 35-39.

Summary and critique on etiology of infertility as discussed by Yamoah (1989)

Looking at the observations, research findings on etiology of infertility among males and females as discussed above in the unpublished work Yamoah J in 1989, in contrast to modern day causes, there is no deviation but rather several other extrinsic an intrinsic etiology spanning from biochemical, psychosocial and physical causes has emerged in the modern-day etiologies. This is well crafted in the work of (Walker *et al.,* 2022) [14] that did extensive clinical research about female infertility and their work brought up many of the causes of infertility as stated by [4].

Lifestyle Changes and infertility

Women with extremes in body mass index (BMI) frequently present with infertility and ovulatory dysfunction. Women

with a BMI of less than 17 kg/m^2 with a history of intense exercise regimens or women with eating disorders are likely to develop hypogonadotropic hypogonadism, which causes decreased pituitary gonadotropin secretions. In The United States, controlled ovarian stimulation using exogenous gonadotropins is used to induce ovulation; however, in Europe, women who fail to respond to therapy can receive pulsatile GnRH therapy. One study demonstrated the importance of behavioral change in inducing ovulation. Of the women who received individual-directed therapy to correct energy deficiencies or behavior problems, 87% resumed regular ovarian function to correct the abnormal BMI. Women with a BMI greater than 27 kg/m^2 with anovulation can improve ovulation with weight loss alone. Multiple studies have shown that losing 10% of body weight restores normal ovulation in 50% to 100% of women in less than 1 year. Even though weight loss is important for many aspects of a patient's life, one study showed that obese women who received counseling and interventions for weight loss before infertility treatment did not have higher pregnancy or live birth rates compared to obese women who had infertility treatment without weight-loss interventions. Therefore, a specific BMI is not required to initiate fertility treatment.

The Central Dogma of Biology

The central dogma of molecular biology states that DNA code for RNA, which codes for proteins. Protein is what makes up the structure of our bodies and keeps things working. DNA is, traditionally speaking, the molecule of heredity that passes from parents to offspring.

Epigenetic variations

Epigenetics is the study of heritable variations in genes that do not involve changes to the DNA sequence. Think about it this way: Although every cell in your body has identical DNA, each cell acts differently. Some are liver cells; others are brain cells or skin cells.

There are two reasons that cells can take on different jobs in the body:

1) Not all genes present in a cell are working all the time, and

2) The complement of genes that are working at any one time differs between them, depending on the organ in which they find themselves.

Epigenetics explains why a nose is not an eye and vice versa, despite all cells having identical copies of DNA. So, epigenetic changes are both natural and common occurrences that drive both normal development and also diseases like cancer, autoimmunity and infertility, to name a few. Another need-to-know fact about epigenetics is that, unlike with classical genetic mutations, a cell's gene expression patterns can change over time and are influenced by age, environment, lifestyle and illness. And, like genetic mutations, epigenetic gene patterns can be passed on to offspring, and this is where our sperm story takes shape.

Implications of Epigenetics on Infertility

Several scientific studies have interrogated different genomic regions and have found that epigenetic changes, including both DNA methylation and histone modifications are associated with male infertility. This association between epigenetic profile and infertility appears to exist even when the semen parameters (*i.e.,* count, morphology, and motility) are normal. Reading out the epigenetic pattern in sperm DNA presents a particularly interesting opportunity for diagnosing male infertility in cases of unexplained infertility.

Genetics and epigenetics of infertility etiologies and epigenetics of fertility treatment affect implantation and placentation, which affect short- and long-term maternal and fetal/childhood outcomes.

The variation of Mice and Men

In a recent research work published in nature, male mice were fed high-fat diets, and their sperm examined for epigenetic marks. These marks were compared to mice fed normal diets. Then, both groups of mice were allowed to mate and the health of the male offspring compared. The offspring of mice fed high-fat diets had impaired metabolic health (glucose intolerance and insulin resistance) whereas the offspring of normally fed mice did not. The researchers examined how this could happen and showed that the disease risk was passed to offspring through changes in sperm RNA (mtRNA) and not DNA, which means that this is an epigenetic and not a genetic process. The findings showed an essential linkage between the mice with human genome data, they showed similar epigenetic signatures between the metabolically challenged mice and childhood obesity in humans.

Recommendation and Conclusion

Most lifestyle factors are theoretically modifiable habits that can be reversed with strong determination by affected subjects. Both modern day medical practice centers and others such as the accredited herbal medicine centers that treats infertility and which most Africans are used to, should as a matter of urgency add education of life style changes, sedentary life style changes to their treatment since it has shown in epigenetics that the environment plays a key factoring the cause of infertility and also fertility. Public enlightenment by health care providers will go a long to increasing the knowledge and improve the awareness of the population since most are not aware of the potential consequences of lifestyle habits on infertility. Counseling of infertile couples may enhance awareness of the risk of lifestyle behaviors and facilitate appropriate lifestyle changes that might improve reproductive health.

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