

Thesis and Antithesis of Infertility in Nigeria: A Review and Implications on Medical Laboratory Science Practice

Joel Akinlabi Oke*¹, Augustine Anayochukwu Onyeaghala^{2,3} and Rotimi Ayodeji Dada⁴

1. School of Medical Laboratory Science, University College Hospital, Ibadan.
2. Department of Chemical Pathology, University College Hospital Ibadan
3. Department of Medical Laboratory Science, Lead City University, Ibadan.
4. Unit of Medical Microbiology and Parasitology, School of Medical Laboratory Science, University College Hospital, Ibadan.

ABSTRACT

Infertility is a global reproductive health issue. Like many other health challenges, Africa still takes the largest share of the burden of infertility. Despite several scientific reports on infertility, describing the culprits, risk factors and mechanisms of intervention throughout the world, there are still pseudoscientific perspectives about infertility in Nigeria. The beliefs on the causes of infertility which are more cultural and religious in origin have not been scientifically proven. However, these perspectives might have some significant effects on the approach to manage infertility issues in the country. Currently, scoping reviews examining the cultural and religious beliefs of infertility and its implication on Medical Laboratory Science practice are depleted. This paper closes the gaps in this regard.

Key words: Infertility, Nigeria, Pseudoscientific, Thesis and Antithesis, Scientific

***Correspondence:** +2347035739078; **Email:** haykayoke@gmail.com ORCID:

Author's contributions: This work was carried out and approved in collaboration between all the authors, who take responsibility for its accuracy and integrity. AAO and RAD conceptualized the study; JAO performed literature search, JAO, AAO and RAD contributed in discussions; JAO drafted the manuscript; AAO supervised the study; JAO, AAO and RAD wrote the final manuscript; AAO, JAO and RAD proof read the final version for publication.

Received: March 03, 2020; **Accepted:** June 08, 2020; **Published:** June 30, 2020.

Citation: Oke JA, Onyeaghala AA and Dada RA. Thesis and Antithesis of Infertility in Nigeria: A Review and Implications on Medical Laboratory Science Practice. *J Med Lab Sci*, 2020; 30 (2): 18-37

INTRODUCTION

Infertility is a disorder of the reproductive system, and both male and female have been reported as culprits. Meanwhile, the role of either male or female factor in union varies from one case of infertility to another, as it could either be male factor, female factor, or both in different infertility cases (1).

Literatures have revealed that, it is expected of 50% of women to conceive naturally within 3 months of regular unprotected intercourse, 75% within 6 months, 80-90% within 12 months and about 5% within 18 to 24 months, provided no form of pregnancy preventive measures is used (2, 3).

Inability of couples to achieve conception after a minimum of one year of sexual exposure without the use of contraception is clinically referred to as infertility, meanwhile, epidemiological and demographical definitions have adopted minimum of two and five years respectively. (1, 4, 5, 6). Primary and secondary sub-classification of infertility have been identified and described (6). Primary infertility is described as absence of a live birth by women of reproductive age who desire child and had been in union for at least five years, while secondary infertility is absence of a live birth by women of reproductive age who had been in union for at least five years since their last live birth (6).

The socio-cultural and psychological distress on victims of infertility cannot be overemphasized, especially among populations such as Nigeria where

children are seen as the main reason for marriage (7, 8, 9). Studies have revealed that women suffer the adverse effects of infertility more than men; ranging from partner to family abuse, depression, isolation and stigmatization from society amongst others (9, 10).

Also, infertility has been implicated as one of the causes of polygamy and broken marriages, however, rarely as reason for child adoption in the traditional African society (11).

Study Objective

There is ongoing increase of literatures on infertility in various context, this review looked at some of the scientific and pseudoscientific perspectives of infertility in Nigeria, and correlated these to the impacts on approach to infertility issues, with the aim to linking infertility as a social health issue of public health significance to the practice of Medical Laboratory Science, and stressing the need for community enlightening on infertility issues.

Materials and Methods

Literatures search on infertility in relation to the knowledge and implications, causes, epidemiology, social and religious beliefs, diagnosis and remedy was done using google, google scholar and pubmed. Used articles were got between July, 2019 and February 2020. Ninety-two of the articles that discussed infertility in relation to the context of the topic were documented in this review.

Table 1: List of some of the studies done in the last 10 years on infertility in Nigeria.

Topic of Study	Author	Year
Perceived Causes of Infertility and Its Psychosocial Effects among Women with Infertility Attending Gynaecology Clinic in Usmanu Danfodiyo University Teaching Hospital, Sokoto.	Isah <i>et al.</i> (12)	2010
Clinical Pattern and Major Causes of Male Infertility in Nnewi, South East Nigeria: A Five-Year Review.	Nwajiaku <i>et al.</i> (21)	2012
A review of Female Infertility; important etiological factors and management.	Olooto <i>et al.</i> (33)	2012
The profile of infertility in a teaching Hospital in North West Nigeria.	Panti and Sununu (17)	2014
The effect of native culture and religious beliefs on human infertility and assisted reproductive treatment: A focus on the Ijebu people of Nigeria.	Aluko-Arowolo and Ayodel (91).	2014
Male infertility in Nigeria: A neglected reproductive health issue requiring attention.	Uadia and Emokpae (22)	2015
The incidence of abortion in Nigeria.	Bankole <i>et al.</i> (82)	2015
Knowledge of infertility among infertile women in Bauchi, Northern Nigeria.	Dattijo <i>et al.</i> (80)	2016
Social meaning and consequences of infertility in Ogbomoso, Nigeria.	Fehintola <i>et al.</i> (84)	2017
Pattern of infertility among infertile couple in a secondary health facility in Delta State, South South Nigeria.	Odunvbu <i>et al.</i> (18)	2018
Effect of senescence on some apoptosis and oxidative stress markers in infertile normozoospermic and oligospermic men: A cross-sectional study.	Emokpae and Chima (51)	2018

EPIDEMIOLOGY

In a systematic analysis of health surveys done to assess global pattern of infertility which used 190 countries and territories with couples between the ages of 20–44 years, global incidence of 48.5 million of infertility was reported (6). However, majority of those who suffer infertility has been reported to live in the developing countries (12) and this affects one of every four couples (6).

In Africa, studies have shown variation in prevalence from region to region, and highest incidence has been recorded in the “infertility belt of Africa”. Some of

the countries in this “infertility belt of Africa” include Senegal, Ghana, Cameroon, Gabon, Democratic Republic of Congo, Chad, Kenya, Uganda and Equatorial Guinea (13). Paradoxically, Nigeria, which is the most populous country with the largest economy in Africa (14) is also included in this infertility belt.

In about two decades ago, a demographic and health survey by Erickson and Brunette (15) reported variation in infertility rates across ethnic groups in Nigeria. A prevalence rate of 13.5 to 14.3% was reported for Hausa, Fulani and Kanuri (Northern Nigeria), while 14% was reported for

the Yoruba (Southwest), 10% for the Tiv, 10.5% for the Nupe and 6.9% for the Chambas (Middle Belt). In Eastern block of Nigeria 19.1% was reported for the Igbos and 16% for other ethnic groups of the Cross Rives State.

In the same vein, institutional-based studies in the last decade have also reported varying degree of incidence across Nigeria. In a study in 2007, Abiodun *et al.* (16) reported 4% incidences of infertility in Ilorin which falls in the North-central of Nigeria. In Sokoto, (Northwest) 15.7% was reported (17), and 15.4% in Abakaliki (Southeast) (9). Meanwhile, prevalence was higher in Delta State (South-Sout) with 32% in an institutional-based study done in 2015 (18) and 48.1% in Osogbo (Southwest) (19).

It is also worthy of note that secondary infertility predominates in Africa, and this has been attributed to high incidence of sexually transmitted diseases, complications of unsafe abortions, and puerperal sepsis (20, 21).

THESIS OF INFERTILITY IN NIGERIA

There are several scientific reports on infertility, describing the epidemiology, the culprits, risk factors and various mechanisms of intervention throughout the world. However, there are pseudoscientific perspectives which are more of cultural and religious beliefs with varying degree of impact on the approach to infertility issues in Nigeria. Therefore, focus in this report is on scientific reports and the contrary opinions from the general population about infertility in the country with the aim of spotting these pseudoscientific beliefs with some of the effects on approach to infertility issues in the country, and the implications on Medical Laboratory Science practices.

The Scientific Position about the Culprits in Infertility

The African socio-cultural settings focus on the females as culprit in infertility cases (22). Daniels (23) reported that men sexual organ is likened to a ‘mechanical instrument’ which will serve its purpose in reproduction except it is not working. Based on this, men were assumed to have elementary role in human reproduction while women were considered to play primary role, therefore, problems of fertility were typically assumed to originate from women in union. In the same vein, Ima-Abasi *et al.* (24) in 2018 reported that larger percentage of their study population believed that males contribute significantly to the state of infertility; Be it as it may, 31% believed that attaining an erection could be equated with being fertile for males. Meanwhile, scientific studies had established that, either of the couple plays significant role in infertility cases. Generally, male factor was reported to be responsible for approximately 40–50% of all infertility cases in Nigeria (22). In the Southeastern Nigeria, a study reported 42.4% of male factor of infertility (25). Also, in Kano, Northern Nigeria, a study on 500 males investigated for infertility reported 40.8% prevalence of male factor of infertility (26), while 34.5% was reported in Calabar (8).

However, infertility was reported as reason for about 40% of all gynecological consultations in Maiduguri, North-Eastern Nigeria (27), meanwhile, 25.8% female factor was reported in a study of 314 infertile couples carried out in Nnewi and Awka, Southeastern Nigeria (25). Another study in Delta state, reported female

factors contributing 31.1%, and 40.6% for male, while both factors and unexplained infertility accounted for 15.6% and 13% respectively (18).

The Scientific Position about the Main Causes of Infertility

The etiology of both male and female infertility is multi-factorial and this could be genetic, endocrine disorders, physical abnormalities, injuries, drugs, genital tract infections, radiation, and toxins. At times the origin may be unknown and literatures have reported these factors in Nigeria (22).

Infections

Reports across the country have shown that previous exposure of females to Sexually Transmitted Infections (STIs) and infections after unsafe abortions or childbirth are the main causes of infertility in females (28, 29). The STIs when left untreated could lead to chronic pelvic inflammatory disease (PID) which in turn could cause damage to fallopian tubes, ovaries and endometrium with damages ranging from abscess formation, adhesions, scarring, tubal blockage, inflammation, cysts formation and masses (8). A typical example is infection by *Chlamydia trachomatis* which has been reported to evoke pathologic immune response and causes PID, ectopic pregnancy and infertility (30). In males, STIs had been reported as the major cause of damage to genital tract, and contributing negatively to the

overall sperm quality such as sperm motility, speed, density, morphology and liquefaction (26, 31). This oftentimes lead to abnormal seminal indices like changes from normospermia (Sperm count ≥ 20 million per milliliter) to oligospermia (Sperm count < 15 million per milliliter), azospermia (Absence of spermatozoa in the ejaculate), asthenozoospermia (Reduced sperm motility $< 40.0\%$), teratozoospermia (Reduced sperm morphology $< 4.0\%$) and oligoasthenoteratozoospermia (All variables: count, motility, and morphology are abnormal.) (31, 32).

Hormonal Abnormalities

The hypothalamus, through the release of gonadotrophin releasing hormones, controls the pituitary gland which directly or indirectly controls most other hormonal glands in the human body i.e. regulations at the hypothalamus-pituitary-gonadal axis (33, 34, 35).

Thus, alterations in the chemical signals and receptors of the hypothalamus-pituitary-gonadal axis often results in infertility in both sexes, as a result of disorders such as hypogonadotropic hypogonadism, hypergonadotropic hypogonadism, gynaecomastia and impotence in males. Menstrual irregularities, amenorrhea and premature ovarian follicle could occur in females, and defects in androgen actions and hyperprolactinemia in both parties (34, 35, 36).

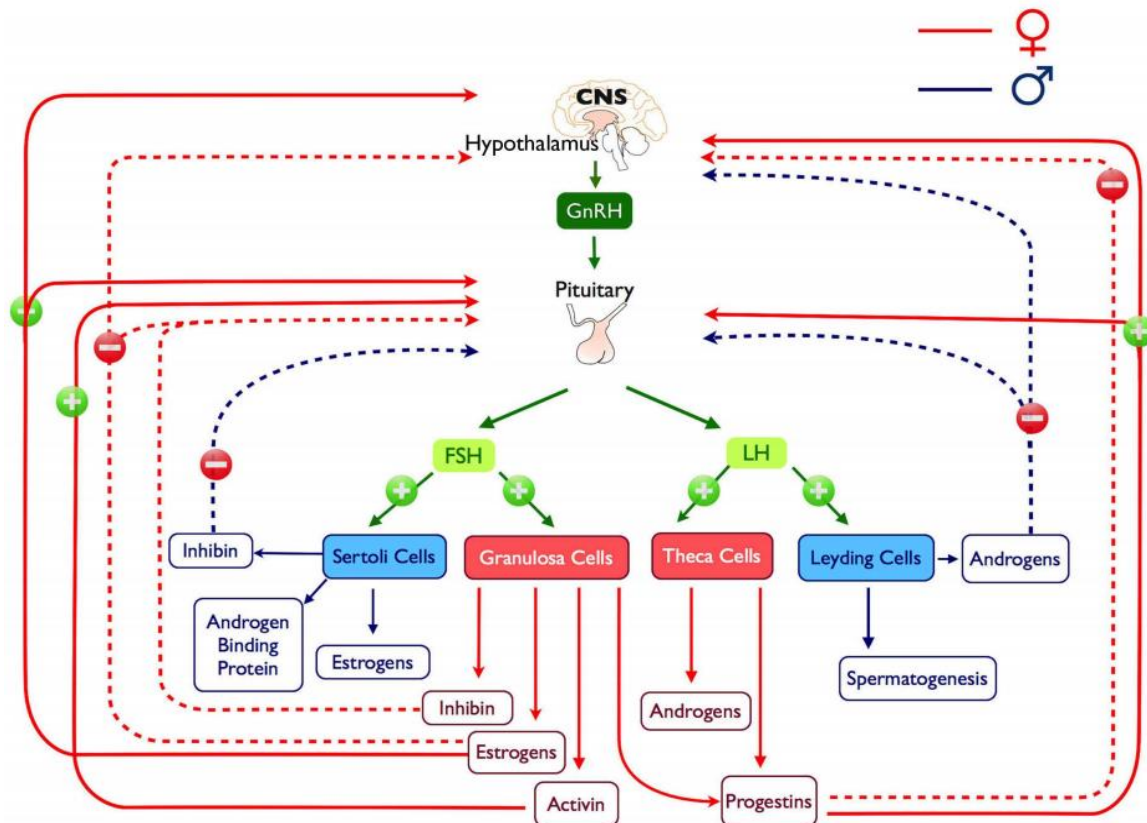


FIGURE 1: Representation of the Hypothalamus-Pituitary-Gonadal axis, positive and negative feedback loops and products (37). The broken arrow-head line: Negative feedback loop. Unbroken arrow-head line: Positive feedback loop and products.

Congenital

In Mullerian agenesis, the vagina or the uterus fails to develop and thus causing infertility (38). Furthermore, erectile dysfunction (ED) had been reported as one of the contributory factors to male infertility in Nigeria with prevalence of 50.7% (39).

Environmental Pollutants

Exposures to pesticides have been reported to affect the male reproductive system by mechanisms to reducing the weight of testes, epididymis, seminal vesicle, ventral prostate, seminiferous tubule with damages in spermatogenesis and sperm DNA (40). It also causes degeneration and changes in the levels of hormones such as

testosterone, follicle-stimulating hormone (FSH), luteinizing hormone (LH) and affects the antioxidant enzymes in testes. Inhibited testicular steroidogenesis has also been suggested as other possible mechanisms by which pesticides affect fertility (40). Other toxins such as glues, volatile organic solvents, carbon monoxide, sulfur dioxide and nitrogen dioxide had been implicated as well in infertility (41, 42). Metals such as lead, mercury, cadmium, arsenic and aluminum have been reported to impact fertility negatively (43). Suggested mechanism of interference of these metals is either by causing hypothalamic-pituitary axis disruption or by directly affecting spermatogenesis, resulting in impaired

semen quality in males. Other suggested mechanism for Cadmium stated disruption of the blood-testis barrier via specific signal transduction pathways and signaling molecules (44, 45). It was showed by Choy *et al.* that high concentrations up to 40.6 mmol/L of total mercury measured in whole blood resulted in <50% of progressive motility, <14% of normal morphology and of sperm concentration (46). Another study also reported that lead exposure induce childless rather than delayed pregnancy (47).

Age and Weight

Fertility has been reported to decline with increase in age in both sexes. Studies have shown different factors associated with aging in men that could affect fertility as contrary to the belief of many, especially in Nigeria that aging plays little or no significant role on male fertility as compared to female, perhaps for dearth of data and awareness in that regard.

Some of the factors where aging has been implicated in male reproduction include, sperm DNA damage and other genetic abnormalities, sex hormone irregularities which may in turn impact testicular function, as well as poor sperm indices (48, 49, 50 51). Although, some aged men can father children. Howbeit, these factors have been reported to be related to tendencies of increase oftenness of congenital birth defects, abortion, fetal death, and prolonged time to achieve conception, especially with men of age 50 years and above, as relatively compared to young men (51, 52). Reports have shown that the level of testosterone decreases as men age, also, significant sperm DNA damage has been reported to occur in men after 40 years of age (48, 50). In the same vein, 81% of variation in ovarian reserve has been attributed to

increase in age in females (49), and increased risk of fetal loss, and preterm delivery (52).

Excessive weight loss or weight gain had also been implicated in infertility (53, 54). The adverse effect was reported to be mainly related to disorders of sex hormone secretion and/or metabolism, and in turn lead to a condition of relative hyperandrogenism and anovulation in obese women, and hypotestosteronemia in obese men (55, 56). The reproductive hormonal profiles of most obese men has been found to deviate from the normal, and obese men tend to present with elevated estrogen, low testosterone and FSH levels (57). Also, obesity has been reported to be associated with anovulation and an increased risk of miscarriages (58). Similarly, underweight men were reported to likely have markedly decreased sperm function and have low circulating testosterone levels as compared to normal weight subjects (59), while, another report said too little body fat in women could lead to menstrual irregularities due to insufficient estrogen (33).

Nutrition and Life Style

Accumulation of reactive oxygen species without adequate antioxidants has been reported to play notable role in the pathological processes involving the female reproductive tract, and affect sperm motility, decreasing membrane integrity and DNA damage (60, 61). On the uses of illicit drugs, there seems to be dearth of data on the effects on human fertility, probably because of the characteristics of the population being studied. Notwithstanding, it has been implicated in infertility together with tobacco smoking and alcohol abuse (62, 63, 64).

Genetic and Other Factors

Several kinds of chromosomal abnormalities like deletion, inversion, mutation, aneuploidy, and translocation has been reported to be associated with infertility (64). In Nigeria a study showed that the frequency of chromosomal translocations was 2.1% in infertile men (65). In the same vein, genetic damage in sperm can occur at several levels, all of which have the potential to cause infertility in men (66). Also, Genetic background characterization done in Nigeria have shown that 39.5% of the normospermic males have reduced cytosine adenine guanine (CAG) repeats, and 26% of the infertile subjects have moderately increased CAG repeats (38).

Anti-sperm auto-antibodies is another implicated factor in infertility. In study of a group of infertile men in Calabar, Nigeria, circulating anti-sperm auto-antibodies were found in 44% and non-agglutinating cytotoxic antibodies in 2% (67). Also, high concentration of aflatoxin was reported in another group of infertile men as it was observed that the consumption of native diets containing this contaminant might predispose to male infertility in Nigeria (68).

Tuberculosis and mumps have also been implicated in infertility which usually cause inflammation of the testicles (orchitis), menstrual irregularity and pregnancy loss (69, 70).

Scientific Diagnostic Tools of Infertility

Approach to infertility treatment and interventions starts with complete medical history, physical examination of the couple, with lifestyle history (33), and continues with the highlighted tests and others that are not listed in this report.

Female Screening

Basal Body Temperature Charting (BBT) could be a simplest test to start with for ovulatory evaluation (71).

Imaging Test for Female

Imaging examination is useful to assess uterus and fallopian tubes using ultrasound, Hysterosalpingography, hysteroscopy, fertiliscopy, laparoscopy and magnetic resonance imaging (MRI) (22).

Ultrasonography and Laparoscopy are performed to identify and evaluate ovarian follicular development and irregularities related to ovulation (22). Hystero-salpingogram (HSG) is used to diagnose intrauterine structures and lesions, and evaluate status of the tubes in the proximal, distal, and intra-pelvic region (22).

Hysteroscopy is used for tubal catheterization to open the blocked tubes, and visualize the internal structure of the tubes, and functional status of the fallopian tubes (72).

Laboratory Assay for Female

Endometrial Biopsy at post-ovulatory has been reported as the gold standard for diagnosing luteal phase defect, endometritis, and confirming serum progesterone testing (36).

Urinary Luteinizing Hormone (LH) detection is done to predict LH surge, and ovulation. Follicle Stimulating Hormone (FSH) and Estradiol (E2) levels approaching 20mIU/ml was reported to be associated with markedly decreased pregnancy rates (22).

Anti-sperm Antibody Tests is another helpful tool in patients with shaking sperm motion on the semen analysis, post-coital test, or a history of testicular operation or injury (22). Endo-cervical and high vagina specimen culture for isolation of some pathogens like *Escherichia coli*, and *Candida species* among others is used

to rule out infections of the genital tract. Also, diagnosis of pathogens like *Trichomonas vaginalis*, *Chlamydia trachomatis*, *Treponema pallidum*, *Neisseria gonorrhoeae*, and *Mycoplasma* amongst other infections is used to rule out STIs (22).

Male Screening

Tests on males are to assess spermatogenesis and quality of sperm, thus, semen analyses, biochemical assay of seminal plasma and other assays are used as essential tools in male infertility cases (66, 73).

Imaging Test for Male

Color Doppler Ultrasound is used to evaluate intra-scrotal defects like varicocele, testicular tumors, and testicular micro-calcifications (22, 71).

Laboratory Assay for Male

Semen Analyses starts with patient preparation in order to produce suitable specimen for the assay in the clinical laboratory (32, 71).

Sperm function tests uses the Hamster Egg Penetration Assay (HEPA) and the Hemizona Assay (HZA) to assess the ability of sperm to penetrate the ovum (71).

Assessment of serum FSH and LH levels is essential in order to rule out gonadotrophic hypogonadism or hypogonadotrophic hypogonadism (34, 36).

Other Microbiological assay uses urethra swab culture and urine analyses to rule out untreated urinary tract infections and sexually transmitted infections (71).

Testicular biopsy is often done in clients with azoospermia, but having normal testicular volume and FSH levels (71).

Additional tests like karyotype is indicated when there are suspected

chromosomal abnormality, and seminal plasma fructose is done as well to assess the status of vas deferens (71). In addition, sperm DNA damage analysis could be done to assess possible damage to sperm DNA in infertile male with normal standard sperm parameters (72).

Serum FSH, testosterone, and prolactin assay are done to rule out hormonal dysfunction (22, 34 71).

Scientific Remedy to Infertility

Remedies to infertility depend on the cause, duration, partners' age and personal preferences which range from prevention, early diagnosis and treatment of infections implicated in infertility, to management of hormonal imbalances. Similarly, sophisticated interventions like surgical and assisted reproductive technology techniques which include Intra-uterine Insemination (IUI), In-Vitro Fertilization (IVF), Zygote Intra-fallopian Transfer (ZIFT), or gamete transfer amongst others are being used as remedy for infertility (28, 75, 76, 77). Gestational carriers, and child adoption have also been introduced (71, 78).

THE ANTITHESIS OF INFERTILITY IN NIGERIA

As contrary to the scientific view of infertility, this review looks at other perspectives in Nigeria which are more of cultural and religious beliefs, but do have great impact in the people's approach to infertility issues. Studies carried out covering Southern, Western, Northern and Eastern Nigeria among the Yoruba, Hausa, Igbo and other tribes revealed some of these, as infertility is considered spiritual and non-natural than medical or physical (9, 79, 80).

The Pseudoscientific Perspectives about Causes of Infertility

Induced abortion was believed to be the major cause of infertility among women emphasizing uterine damage. Nevertheless, other explanations given to support this view are cultural based (79). Although induced abortion is not legalized in Nigeria except when performed to save a woman's life, yet it is a common practice as an estimated 610,000 induced abortions were earlier reported to be performed yearly according to Henshaw in 1998 (81). The induced abortion is done when there is incidence of unwanted pregnancy and the prevalence is still on the high side as 1.25 million induced abortions were reported in 2012 (82). Meanwhile, the induced abortion which has continued to be a public health issue evokes, and at the same time suffers social, political, legal, ethical, cultural and religious sentiments in countries such as Nigeria where it is not legalized (82, 83).

The cultural perspective about role of induced abortion in infertility believes that, there is certain number of children a woman is destined to bear. So, if the woman has carried out induced abortion it is possible the woman will be a victim of infertility especially if she has been destined to bear only one child (79).

It is also believed that uterine damage can occur during abortion procedure resulting in bleeding into the womb, and leading to formation of fibroid. This fibroid is believed to cause infertility either by blocking the uterus and preventing entrance of the sperm, or causing 'hotness in the woman's body' which in turn will lead to watery of the ejaculate, thus infertility (79).

Apart from induced abortion, the use of orthodox contraceptives (pills, intrauterine contraceptive device, and injectable) is believed by many to cause

damage to the womb and makes menses irregular hence infertility (79).

In addition, multiple sex partners is implicated in infertility in both male and female subjects; as having multiple sex partners is believed to lead to contracting infectious disease like gonorrhoea. Chronic gonorrhoea is thought to make the womb hot, and leads to watery and spilling of semen out of women's vagina (a condition known as "eda" in Yoruba dialect, a local language in Nigeria) and hence infertility. Men with chronic gonorrhoea are also believed to have "hot body" (i.e. continuous high body temperature) and this can cause watery sperm which in turn leads to infertility (79).

Another implicated factor in infertility in Nigeria is the belief about the existence and role of witchcraft and evil spirit (Described in local terms in Nigeria as "oso, aje, emere, ogbanje"). It is believed that these set of people (witches and wizards) do all sorts of evils, and can cause a man or woman to be either infertile or cause repeated miscarriage in women. Another belief is that if women were possessed with evil spirits, such women might not have children in the real world but have children in the spirit world. It is believed as well that, if a foetus is possessed by evil spirit during pregnancy, it can cause repeated miscarriage because the same child is trying to come back to the world (17, 79, 84).

Other Nigerians believe the diviners/spiritualists (known in local dialect as 'babalawo') could put spells on women or men forbidding them to give birth. It is also believed that people do consult these spiritualists to put such spell on someone that offended them (79).

Also, curses by ancestors or deities on either or both partner in union because of violation of family taboos is another common cause of infertility as believed by some Nigerians (17, 79). Some people also thought that infections by helminthes can cause infertility; narrating that the worms, thought to have sharp teeth (called 'Aran-ginisa' in local dialect), and assumed to reside in the womb could compete with foetus causing recurrent miscarriages and infertility (79).

Another common belief about the causes of infertility is spiritual husbands/wives, and dreams of having sexual intercourse during sleep. The explanation of this belief has it that anyone as victim of either spiritual husband or wife will not be allowed by the spiritual husband/wife to give birth in the physical world as the victim will either suffer recurrent miscarriages, or no conception at all. It has been reported that victims often consult the traditionalist, the church, and Islamic religious leaders for deliverance (9, 17, 79).

Perceptions about the Remedy for Infertility

It has been observed in this report that the approach to infertility issues is being influenced by what the victims believed about the causes and the remedies. Therefore, the choice of whichever approach could be driven by self-convictions, family, and at times community's general beliefs, so, the choice could be traditional, orthodox medicine, or spiritual intervention.

Orthodox Medicine Care Consultation

Orthodox medicine care consultations by Nigerian infertility victims for testing and other interventions might appear as basic step as it is expected in

the scientific approach to infertility issue, but the pseudoscientific beliefs cannot be excluded.

Studies have revealed that couples sought help from either native doctors, prayer groups, or previously used traditional medications before orthodox medicine care consultations (17). One of the stated mindset for orthodox medicine care consultation by some is for 'washing or cleaning of womb' (i.e. dilation and curettage) which they assumed to be necessary to either prevent infertility or used as one of the ways to cure infertility as womb would be free to receive foetus after the procedure (79).

Consultation of Native Doctors and Prayer Groups

Traditionalist/spiritualist are often consulted by victims for interventions in infertility cases and the use of concoctions, herbal soups, special soap, black powder and many other preparations are used in management of infertility. Also, "Ifa" Priest that uses divination to find out the causes, associated factors and solutions to infertility issues are often consulted by victims (79, 85). Meanwhile, some prefer special prayers by religious leaders in Church and Mosque, who organize special programmes and prayer sessions as way of solving infertility issues (79).

Taking precautions in order to avoid either miscarriage or assumed possession of the foetus by evil spirit has been considered as well, as a major way of preventing infertility. Based on this, pregnant women are to take precautions which are termed literally as 'tying of pregnancy' i.e. preventing the pregnancy from aborting. Some of these preventive measures to be taken by pregnant women include; avoiding walking either between 12pm to 3pm,

or walking late night. This act is assumed to prevent foetus from being possessed by evil spirit which might cause miscarriage or deformity of the foetus. Also, wearing of enchanted ring on finger, and attaching of safety pin to underskirt by pregnant women are also part of the stated preventive measures (9, 79, 86).

DISCUSSION

The Pseudoscientific Ideas about Infertility in Nigeria and Impacts on Approach to Infertility

Despite the scientific facts about infertility, the pseudoscientific perspectives of the people about infertility in Nigeria remain a yet to be resolved erroneous ideas. Some of these cultural and religious beliefs as stated above are seen contributing negatively to the approach to infertility issues directly or indirectly in the country. Some infertile couples chose to seek help from native doctors and prayer groups rather than orthodox medicine care where some of the causes or risk factors of the infertility might have been detected and addressed on time (17, 87). Other infertile couples that seek orthodox medicine care would have sought remedy for infertility issues from either native doctors or prayer groups; moreover, some run both the native doctors or prayer groups and orthodox medicine consultations together (88).

Panti and Sununu (17) in their study also noticed delay in seeking medical assistance by the infertile couples with 53% of the participants seeking medical help after 5 years in infertility. Some of the pseudoscientific perspectives are believed to have been responsible for the delay in seeking medical care, just as Bukar *et al.* (89) related the delay in presentation of infertile couples to the appropriate health care facility to the

prior consultation of traditional healers and non-specialist.

It was also noted that 23.7% male partner participants of a study declined to submit themselves to semen analysis. The study stated the perception of female partners as the only culprits in infertility issues, fear of stigmatization or previous conception with other partner(s) in polygamous settings as possible reasons for the male partners to have declined to do semen analysis (17). Also, another study reported 32.5% of 83 male participants who refused to do seminal fluid analysis on the ground of recently impregnating other wives or girlfriends, or simply that nothing is wrong with them (90), and this affirm the fact that infertility is still being considered women's problem in Nigerian. In another study, Aluko-Arowolo and Ayodele (91) also noted the unsupportive impact of culture/tradition and religion on the general acceptance of assisted reproductive treatment as remedy to infertility in Nigeria.

The Pseudoscientific Ideas about Infertility in Nigeria and Implications on Medical Laboratory Science Practice

As earlier mentioned in this report that African socio-cultural settings focus on the females as culprit in infertility cases, literatures have also established this fact in Nigeria (21, 22, 24). Nieuwenhuis *et al.* (92) in their study noted that little is known about treatment seeking behavior of infertile men and women in Sub-Sahara Africa. Nonetheless, as many reports have shown that women suffer social and psychological impact of infertility more, therefore, one could infer that women would present themselves for evaluation first, or readily as compared to men counterparts in infertility cases.

As part of the evidences that support readiness of infertile women to seek remedy as compared to men, literatures reported that some husbands were reluctant and some decline medical examination. Olatunji and Sule-Odu (90), reported that 56 out of 83 (67.5%) husbands who came with their wives for infertility treatment agreed to do seminal fluid analysis and 27 others refused. In another report, 47 out of 198 male partners declined semen analysis (17).

Meanwhile, managing both couple concurrently would have given room for quick asses and management of what the cause(s) of the infertility might be especially in cases where the culprits are the husbands. In this case, it is not impossible that female clients would have erroneous impressions, and such signal being sent to the community as failure of the medical intervention in infertility when a woman would have been reported negative for possible risk factors of her infertile condition. Also, this could provide base for some of the pseudoscientific ideas in the community and faulting undergoing laboratory testing and other medical examinations as possible way out of infertility.

Looking at combining consultation of medical care with traditional healers by victim of infertility as reported in literatures (87, 88, 92), one could infer that there would be conflict of interest, as a result of the information from both care givers that would not be in agreement. This might confuse clients and make them not to keep appointments with the medical health care provider either for the series or repeated laboratory tests as may be necessary for diagnosis of the infertility or monitoring of infertility managements.

Another possible implication of the pseudoscientific ideas of the general populace on medical laboratory science practice is aftermath of the complications that could occur when victims delayed in seeking medical care. Literatures have reported delay by infertility victims in seeking medical care due to various reasons (17, 89, 92). In this instance finding the root cause of the infertility when the victims eventually present themselves at the hospital might have been compounded by the complications. A simple illustration in this regard is possible complications of untreated STIs that could lead to PID, which might in turn cause fallopian tube scaring or tubo-ovarian abscess(30). In this case, the more the complication the complex the selected tests and period, which may in-turn pose some challenges on the client's capacity as regards the cost, the convenience in term of schedule/periods of appointment with the laboratory, or prolonged time of establishing diagnosis and management of the client. Meanwhile, the overall inference of some clients could be that medical intervention has failed in infertility rather than blaming the complications that has set in as a result of the delay in consulting medical care by the victims.

CONCLUSION

Socio-cultural and religious beliefs are held in high esteem in Nigeria with divers effects on various health issues, to the extent of negating and neglecting obvious basic health principles which most times aggravate cases like infertility. Meanwhile, evidences gathered from literatures have shown that it is not enough to figure out infertility only on self, community or regional beliefs, but should be

addressed holistically with a view to establishing scientific facts.

To this end, good health education is needed for all and sundry to be able to distinguish between risky behaviors from healthy ones in order to address and institute the right corrective measures to all issues pertaining to infertility.

REFERENCES

1. Dyer S. J. Infertility-related reproductive health knowledge and help-seeking behavior in African countries. *ESHRE Monographs*, 2008; 1: 29-33.
2. Kamel R. M. Management of infertile couple: an evidence-based protocol. *Reprod. Biol. and Endo*, 2010; 8(1):21.
3. Padubidri V. G. and Daftary S. N. The pathology of conception in: Howkins & Bourne (Eds): *Shaw's Textbook of Gynaecology*, 15th ed. New Delhi: Elsevier, A Division of Reed Elsevier India Private Limited. India. 2011, p. 197-220.
4. World Health Organization. The epidemiology of infertility: report of a WHO scientific group (meeting held in Geneva from 30 June to 4 July 1975).
5. World Health Organization. The reproductive Health Indicators: guidelines for their generation, interpretation and analysis for global monitoring. 2006. World Health Organization.
6. Mascarenhas M. N., Flaxman S. R., Boerma T., Vanderpoel S. and Stevens G. A. National, regional, and global trends in infertility prevalence since 1990: a systematic analysis of 277 health surveys. *PLoS Med*, 2012; 9(12): e1001356.
7. Megafu U., Okoye I. J., Ofodile A. and Affam A. Therapeutic insemination of semen: Ultrasonic monitoring of ovarian follicular growth. *Ori. J. Med*, 1995; 7: 32-37.
8. Ekwere P. D., Archibong E. I., Basse E. E., Ekabua J. E., Ekanem E. I. and Feyi-Waboso P. Infertility among Nigerian couples as seen in Calabar. *Port Harcourt Med. J.* 2007; 2: 35-40.
9. Umeora O. U. J., Igberase G. O., Okogbenin S. A. and Obu I. D. Cultural misconceptions and emotional burden of infertility in South East Nigeria. *Inter. J. Gyn. and Obst*, 2009; 10(2): 123-134.
10. Yildizhan R., Adali E., Kulusari A., Kurdoglu M., Yildizhan B. and Sahin G. Domestic violence against infertile women in a Turkish setting. *Int. J. Gyn. and Obst*, 2009; 104(2): 110-112.
11. Oguntoyinbo A. E., Amole A. O. D. and Komolafe O. F. Sonographic assessment of fallopian tube patency in the investigation of female infertility in Ilorin, Nigeria. *A. J. Repro. Health*, 2001; 100-105.
12. Isah B. A., Yahayah M., Panti A. A., Abubakar S., Shehu A., Bello A. S. and Abdulaziz M. D. Perceived Causes of Infertility and Its Psychosocial Effects among Women with Infertility Attending Gynaecology Clinic in Usmanu Danfodiyo University Teaching Hospital, Sokoto. *IOSR J. Dent. and Med. Sci*, 2018; 17(11): 26-30.
13. Okonofua F. and Odunsi K. (Eds.). *Contemporary*

- Obstetrics and Gynaecology for Developing Countries. W. Heal. and Act. Res. ctr, 2003; 126-156.
14. Amao O. B. and Okeke-Uzodike U. Nigeria, Afrocentrism, and Conflict Resolution: After Five Decades-How Far, How Well? A. St. Quart, 2015; 15(4): 1.
 15. Ericksen K. and Brunette T. Patterns and predictors of infertility among African women: a cross-national survey of twenty-seven nations. Soc. Sci. and Med, 1996; 42(2): 209-220.
 16. Abiodun O. M., Balogun O. R. and Fawole A. A. Aetiology. Clinical features and treatment outcome of intrauterine adhesion in Ilorin, Central Nigeria. W. A. J. Med. 2007; 26(4):298-301.
 17. Panti A. A. and Sununu Y. T. The profile of infertility in a teaching Hospital in North West Nigeria. Sah. Med. J, 2014; 17(1): 7-11.
 18. Odunvbun W. O., Oziga D. V., Oyeye L. O. and Ojeogwu C. L. Pattern of infertility among infertile couple in a secondary health facility in Delta State, South South Nigeria. Tropical. J. Obst. and Gyn, 2018; 35(3): 244-248.
 19. Adeyemi A. S., Adekanle D. A. and Afolabi A. F. Pattern of gynaecological consultations at Ladoke Akintola University of Technology Teaching Hospital. Nig. J. Clin. Prac, 2009; 12(1):47-50.
 20. Ezeh A. C., Mberu B. U. and Emina J. O. Stall in fertility decline in Eastern African countries: regional analysis of patterns, determinants and implications. Phil. Tran. Roy. Soc. B: Biol. Sci, 2009; 364(1532): 2991-3007.
 21. Nwajiaku L. A., Mbachu I. I. and Ikeako L. Prevalence, Clinical Pattern and Major Causes of Male Infertility in Nnewi, South East Nigeria: A Five Year Review. Afr. Med. J, 2012; 3(2): 16-19.
 22. Uadia P. O. and Emokpae A. M. Male infertility in Nigeria: A neglected reproductive health issue requiring attention. J. Bas. and Clin. Repro. Sci, 2015; 4(2):45-53
 23. Daniels C. R. Exposing Men: The Science and Politics of Male Reproductive Health. Oxford University Press, Inc. 198 Madison, Avenue, New York, New York. 2006, p. 31-34.
 24. Ima-Abasi E. B., Edoise M. I., Ayodele O., Edem D. U. and Paul D. E. Knowledge, Perceptions and Attitudes towards Male Infertility: A Cross Sectional Survey in a Tertiary Institution in South-Southern Nigeria. Int. J. Dent. and Med. Sci. Res, 2018; 2(4): 22-28.
 25. Ikechebelu J. I., Adinma J. I., Ori E. F. and Ikegwuonu S. O. High prevalence of Male Infertility in Southeastern Nigeria. J. Obst. Gyn, 2003; 23(6):657-659.
 26. Emokpae M. A, Uadia P. O, Sadiq N. M. Male infertility: Semen Quality and Infection in Kano, Nigeria. J. Med. Bio. Res, 2005; 4:199-201.
 27. Idrisa A., Kawuwa M. B., Habu S. A and Adebayo A. E. A. Prolactin levels among infertile women in Maiduguri, Nigeria.

- Tropical J. Obst. and Gyn, 2003; 20(2):97-100.
28. World Health Organization. Sexually transmitted and other reproductive tract infections: a guide to essential practice (No. Sexually transmitted diseases). 2005, Geneva: World Health Organization.
29. Omo-Aghoja L. O., Okonofua F. E., Onemu S. O., Larsen U. and Bergstrom S. Association of Chlamydia trachomatis serology with tubal infertility in Nigerian women. *J. Obst. and Gyn. Res*, 2007; 33(5): 688-695.
30. Mneon S., Timms P., Allan J. A., Alexander K., Rombauts L., Horner P., Keltz M., Hocking J. and Huston W. M. Human and pathogen factors associated with Chlamydia trachomatis-related infertility in women. *Clin Micro. Rev*, 2015; 28(4):969-985.
31. Emokpae M. A., Uadia P. O. and Sadiq N. M. Contribution of bacterial infection to male infertility in Nigerians. *Onl. J. Heal. and All. Sci*, 2009; 8(1):1-5.
32. World Health Organization. (2010). WHO Laboratory Manual for Examination and Processing of Human Semen.
33. . Olooto W. E., Amballi A. A. and Banjo T. A. A review of Female Infertility; important etiological factors and management. *J. Micro. Bio. Res*, 2012; 2(3): 379-385.
34. Tietz N. W. Tietz Fundamentals of Clinical Chemistry in: Carl .A. B., Edward R. A., David E. B., Barbara G. S. (Eds) 6th ed. An Imprint of Elsevier Inc. Philadelphia, USA. 2008; p. 780-801.
35. Emokpae M. A., Uadia P. O., Omale-Itodo A. and Orok T. N. Male infertility and endocrinopathies in Kano, Northwestern Nigeria. *An. Afr Med*. 2007; 6(2): 64.
36. Emokpae M. A., Uadia P. O., Mohammed A. Z. Hormonal evaluations and endometrial biopsy in infertile women in Kano, Northern Nigeria: A comparative study. *An. Afr. Med*, 2005; 4(3): 99-103.
37. Duran-Pasten M. L. and Fiordelisio T. GnRH-Induced Ca²⁺ signaling patterns and gonadotropin secretion in pituitary gonadotrophs. Functional adaptations to both ordinary and extraordinary physiological demands. *Fron. In. Endo*, 2013; 4:127.
38. Akinloye O., Gromoll J., Nieschlag E. and Simoni M. Androgen receptor gene CAG and GGN polymorphisms in infertile Nigerian men. *J. Endo. Invest*, 2009; 32(10): 797-804.
39. Shaeer K. Z. M., Osegbe D. N., Siddiqui S. H., Razzaque A., Glasser D. B. and Jaguste V. Prevalence of erectile dysfunction and its correlates among men attending primary care clinics in three countries: Pakistan, Egypt, and Nigeria. *Int. J. Imp. Res*, 2003; 15(S1):S8-S14.
40. Strohmmer H., Boldizsar A., Plöckinger B., Feldner-Busztin M. and Feichtinger W. Agricultural work and male infertility. *A. J. In. Med*, 1993; 24(5): 587-592.
41. Sokol R. Z., Kraft P., Fowler I. M., Mamet R., Kim E. and Berhane K. T. Exposure to environmental ozone alters

- semen quality. *Env. Health. Pers*, 2005; 114(3): 360-365.
42. Mendiola J., Torres-Cantero A. M., Moreno-Grau J. M., Ten J., Roca M., Moreno-Grau S. and Bernabeu R. Exposure to environmental toxins in males seeking infertility treatment: a case-controlled study. *Repro. Bio Online*, 2008; 16(6): 842-850.
43. Chan L. M., Chalupka S. M. and Barrett R. Female college student awareness of exposures to environmental toxins in personal care products and their effect on preconception health. *Work. Health and Safety*, 2015; 63(2): 64-70.
44. Ugwuja E., Ugwu N. C. and Ejikeme B. N. Prevalence of low sperm count and abnormal semen parameters in male partners of women consulting at infertility clinic in Abakaliki, Nigeria. *Afr. Repro. Health*, 2008; 12(1): 67-73.
45. Hjollund N. H. I., Bonde J. P. E., Jensen T. K., Henriksen T. B., Andersson A., Kolstad H. A. and Olsen J. Male-mediated spontaneous abortion among spouses of stainless steel welders. *Scand. J. Wor., Env. and Health*, 2000; 26(3): 187-192.
46. Choy C. M. Y., Lam C. W. K., Cheung L. T. F., Briton-Jones C. M., Cheung L. P. and Haines C. J. Infertility, blood mercury concentrations and dietary seafood consumption: a case-control study. *An. Int. J. Obst. and Gyn*, 2002; 109(10): 1121-1125.
47. Sallmen M., Lindbohm M. L., Anttila A., kyyronen P., Taskinen H. and Hemmininki K. Time to pregnancy among the wives of men occupationally exposed to lead. *Epidemiology*, 2000; 11(2): 141-147.
48. Stewart A. F. and Kim E. D. Fertility concerns for the aging male. *Urology*, 2011; 78(3): 496-499.
49. Wallace W. H. B. and Kelsey T. W. Human ovarian reserve from conception to the menopause. *PloS One*, 2010; 5(1): e8772.
50. Varshini J., Srinag B. S., Kalthur G., Krishnamurthy H., Kumar P., Rao S. S. and Adiga S. K. Poor sperm quality and advancing age are associated with increased sperm DNA damage in infertile men. *Andrology*, 2012; 44: 642-649.
51. Emokpae M. A. and Chima H. N. Effect of senescence on some apoptosis and oxidative stress markers in infertile normozoospermic and oligospermic men: A cross-sectional study. *Int. J. Repro. BioMed*, 2018; 16(7): 435-442.
52. Alio A. P., Salihu H. M., McIntosh C., August E. M., Weldeselasse H., Sanchez E. and Mbah A. K. The effect of paternal age on fetal birth outcomes. *Am J Men's health*, 2012; 6(5): 427-435.
53. Linné Y. Effects of obesity on women's reproduction and complications during pregnancy. *Ob. Rev*, 2004; 5(3):137-143.
54. Chavarro J. E., Toth T. L., Wright D. L., Meeker J. D. and Hauser R. "Body Mass Index in Relation to Semen Quality, Sperm DNA Integrity and Serum Reproductive Hormone Level among Men Attending an Infertility Clinic". *Fertility and Sterility*, 2010; 93(7): 2222-2231.

55. Pasquali R. "Obesity and androgens: facts and perspectives". *Fertility and Sterility*, 2006; 85(5): 1319-1340.
56. Jungheim E. S. and Moley K. H. Current knowledge of obesity's effects in the pre and periconceptional periods and avenues for future research. *A. J. Obste. and Gyn*, 2010; 203(6):525-530.
57. Sharma A, Ansari A. S. and Lohiya N. K. Impact of Body Mass Index (BMI) on sperm functional parameters and serum hormonal profile of infertile males. *In. J. Health. Sci. and Res*, 2015; 5(2): 315-323.
58. Ogbuji Q. C. Obesity and Reproductive Performance in Women. *A. J. Repro. Health*, 2010; 14(3):143-151.
59. Kort H. I., Massey J. B., Elsner C. W., Mitchell-Leef D., Shapiro D. B., Witt M. A. and Roudebush W. E. Impact of body mass index values on sperm quantity and quality. *J. Andrology*, 2006; 27(3): 450–452.
60. Agarwal A., Gupta S. and Sharma K. R. Role of oxidative stress in female reproduction. *Repro. Biol. and Endo*, 2005; 3(1): 28-49.
61. Makker K., Agarwal A. and Sharma R. Oxidative Stress and Male Infertility. *India J. Med. Res*, 2009; 129(4): 357.
62. . Dechanet C., Anahory T., Mathieu Daude J. C., Quantin X., Reyftmann L., Hamamah S. and Déchaud H. Effects of cigarette smoking on reproduction. *Hum. Repro. Update*, 2010; 17(1): 76-95.
63. Sharma R., Biedenharn K. R., Fedor J. M. and Agarwal A. Lifestyle factors and reproductive health: taking control of your fertility. *Repro. Biol. and Endo*, 2013; 11(1): 66.
64. Sharma A. Male Infertility; Evidences, Risk Factors, Causes, Diagnosis and Management in Human. *An. Clinical. and Lab. Res*, 2017; 5(3):188.
65. Agbaje I. M., Rogers D. A., McVicar C. M., McClure N., Atkinson A. B., Madlidis C. and Lewis S. E. M. Insulin dependent diabetes mellitus: Implications for male reproductive function. *Hum. Repro*, 2007; 22(7): 1871-1877.
66. Lewis S. E. M. and Aitken R. J. "DNA damage to spermatozoa has impacts on fertilization and pregnancy". *Cell and Tissue. Res*, 2005; 322(1): 33-41.
67. Akinloye O., Gromoll J., Nieschlag E. and Simoni M. Androgen receptor gene CAG and GGN polymorphisms in infertile Nigerian men. *J. Endo. Inves*, 2009; 32(10): 797-804.
68. Ibeh I. N., Uraih N. and Ogonar J. I. Dietary exposure to aflatoxin in human male infertility in Benin City, Nigeria. *In. J. Fertility and Menopausal. Study*, 1994; 39(4): 208-214.
69. Mesbah N. and Salem H. K. Genital Tract Infection as a Cause of Male Infertility. *Gen. Infection and Infertility*, 2016; 5:63-68.
70. Ghosh K. and Chowdhury J. R. Tuberculosis and Female Reproductive Health. *J. Post Graduate Med*, 2011; 57(4): 307.

71. Anwar S. and Anwar A. Infertility: A review on causes, treatment and management. *Wom. Health and Gyn*, 2016; 2(6): 40-45.
72. Saleh RA, Agarwal A, Nelson D R, Nada EA, El-Tonsy MH, Alvarez JG, Anthony J, Thomas Jr. and Sharma RK. Increased sperm nuclear DNA damage in normozoospermic infertile men: a prospective study. *Fertility and sterility*, 2002; 78(2), 313-318.
73. Bosteels J, Weyers S, Puttemans P, Panayotidis C, Van Herendael B, Gomel V, D'Hooghe T. The effectiveness of hysteroscopy in improving pregnancy rates in subfertile women without other gynaecological symptoms: a systematic review. *Hum. Repro. Update*, 2009; 6(1): 1-11.
74. Jungwirth A, Giwercman A, Tournaye H, Diemer T, Kopa Z, Dohle G and EAU Working Group on Male Infertility. European Association of Urology guidelines on Male Infertility: the 2012 update. *European Urology*, 2012; 62(2): 324-332.
75. Agawal A., Deepinder F., Cocuzza M., Agawal R., Short R. A., Sabangh E. and Marmar J. L. Efficacy of varicocelectomy in improving semen parameters: new metal-analytical approach. *Urology*, 2007; 70(3): 532-538.
76. Kumar R Surgery for azoospermia in Indian patient: why is it different? *Ind. J. Uro*, 2011; 27(1):98-101.
77. Bello F. A., Akinajo O. R. and Olayemi O. In-vitro fertilization, gamete donation and surrogacy: Perceptions of women attending an infertility clinic in Ibadan, Nigeria. *A. J. Repro. Health*, 2014; 18(2): 127-133.
78. Nguetack C. T., Ourtching C., Gregory H. E. and Priso E. B. Knowledge, Attitudes and Practices of Infertile Women on Child Adoption in Douala (Cameroon). *Open J. Obst. Gyn*, 2014; 4:1065-1071.
79. Koster-Oyekan W. Infertility among Yoruba women: Perceptions on causes, treatments and consequences. *Afr. J. Repro. Health*, 1999; 3(1): 13-26.
80. Dattijo L., Adreadis N., Aminu B., Umar N. and Black K. Knowledge of infertility among infertile women in Bauchi, Northern Nigeria. In. *J. Women. Health and Repro. Sci*, 2016; 4(3):103-109.
81. Henshaw S. K., Singh S., Oye-Adeniran B. A., Adewole I. F., Iwere N. and Cuca Y. P. The incidence of induced abortion in Nigeria. In. *Fam. Plan. Perspectives*, 1998; 24 (4): 156-164.
82. . Bankole A., Adewole I. F., Hussain R., Awolude O., Singh S. and Akinyemi J. O. The incidence of abortion in Nigeria. In. *Perspectives on Sexual and Repro. Health*, 2015; 41(4): 170-181.
83. Omo-Aghoja L. O., Omo-Aghoja V. W., Feyi-Waboso P. and Onowhakpor E. A. The story of abortion: Issues, controversies and a case for the review of the Nigerian national abortion laws. *East. Afr. J. Pub. Health*, 2010; 7(4): 333-341.
84. Fehintola A. O., Fehintol, F. O., Ogunlaja O. A., Awotunde T. O., Ogunlaja I. P. and

- Onwudiegwu U. Social meaning and consequences of infertility in Ogbomoso, Nigeria. *Sudan J. Med. Sci*, 2017; 12(2): 63-77.
85. Maclean U. Folk medicine and fertility: aspects of Yoruba medical practice affecting women. In: Mac-Cormack C. P (Eds). *Echnography of Fertility and Birth: Academy Press*, 1982, p. 161-179.
86. Adetunji J. A. Preserving the pot and water: a traditional concept of reproductive health in a Yoruba community, Nigeria. *Soc. Sci. and Med*, 1996; 43(11): 1561-1567.
87. Araoye M. O. Epidemiology of infertility: Social problems of the infertile couples. *West Afr. J. Med*, 2003; 22(2): 190-196.
88. Audu BM, Massa AA, Bukar M. Clinical presentation of infertility in Gombe, North-Eastern Nigeria. *Tropical J. Obst. and Gyn*, 2003; 20(2):93-96.
89. Bukar M, Audu BM, Usman H A and Massa AA. Health seeking behavior of infertile women in Gombe, North Eastern Nigeria. *Tropical. J. Obst. and Gyn*, 2012; 29(1):83-87.
90. Olatunji AO. and Sule-Odu A. O. The Pattern of Infertility Cases at University Hospital. *West Afr. J. Med*, 2003; 22(3): 205-207.
91. Aluko-Arowolo SO and Ayodele SJ. The effect of native culture and religious beliefs on human infertility and assisted reproductive treatment: A focus on the Ijebu people of Nigeria. *Afr. J. Soc. Sci*, 2014; 4(4): 88-102.
92. Nieuwenhuis SL, Odukogbe A. TA, Theobald S and Liu X. The impact of infertility on infertile men and women in Ibadan, Oyo State, Nigeria: a qualitative study. *Afr. J. Repro. Health*, 2009; 85-98.