

Original Article

Infertility, Infertility Risk Factors and Assisted Reproductive Technologies (Art): Its Awareness, Knowledge, and Perceptions

Ifeoma Christy¹, Emmanuel Ikechukwu², Arazu, Ogonna Winnie³, Urama Chinasa E.⁴, Anaedum, Nkemdirim Immaculata⁵

^{1,3,4}Corresponding Author Department of Economics, University of Nigeria, Nsukka

²Department of Statistics, University of Nigeria, Nsukka,

⁵School of Nursing, Bishop Shanahan Hospital, Nsukka

Abstract - Infertility is viewed as a common issue that involves medical, social, emotional, and psychological attention; this is because infertility, though a medical condition can affect one's social being, bring about emotional and psychological imbalance. Previous studies have shown that there exist unanswered issues as it regards infertility and probable treatment to infertility. We aimed at evaluating and examining through the use of designed and structured questionnaire the university students' awareness, knowledge, and perceptions of both male and female infertility risk factors, possible causes of infertility in both sexes, and their knowledge of possible assisted reproductive technology treatments available so as to bring about fertility. One thousand and eighty University students were recruited, and thus they completed a questionnaire regarding infertility, infertility risk factors, and ART considering their awareness, perceptions, and knowledge. From the study, it was discovered that most university students are still unaware of the causes of infertility and infertility risk factors. Most of the respondents still associate infertility with "enemies of progress and witchcraft". Their knowledge of ART was encouraging, but it was discovered that they were not totally aware of the different types of ART treatments. Their knowledge of IVF was more than other treatments for both sexes. It is also important that in tackling the issue of infertility, our youths, especially students, should be sensitized and also have the knowledge, perception, and awareness of what infertility is all about so as to avoid falling prey or victim to the infertility trap. We also recommend that the assistance of persons such as healthcare workers, social workers, spiritual/religious leaders should be sought and involved in infertility education programs so that the issue of infertility and childlessness would be erased from our world as a whole.

Keywords - infertility, infertility risk factors, university students, ART, awareness, perception, knowledge

I. INTRODUCTION

In the present era, infertility is viewed as a common issue that involves medical, social, emotional, and psychological attention; this is because infertility, though a medical condition can affect one's social being, bring about emotional and psychological imbalance. Infertility thus can be defined as the inability to conceive after having regular unprotected sex for at least a year, or one can define it as the biological inability of an individual to contribute to conception. A woman can also be referred to as being infertile if she cannot carry a pregnancy to its full term, approximately 38 to 40 weeks. Infertility is a global public health problem that affects more than 10 percent of the world's population (Van 2007). In Nigeria alone, 40 to 45 percent of all consultations in gynecological clinics are infertility-rated. Thus 25 percent of Nigerian couples suffer infertility (Medical World Nigeria 2013).

Infertility affects both men and women, yet women, particularly developing countrywomen, may bear the sole blame for barren marriages: in many areas, infertility is a socially acceptable basis for divorce by the husband (European Collaborative Study 1992; Landesman et al. 1996; Mandelbrot 1996). A WHO study of 5,800 infertile couples seeking help at 33 medical centers in 22 developed and developing countries discovered that men were either the sole cause or a contributing factor to infertility in more than half of couples. Overall, the studies found that female causes accounted for between 25 to 37 percent of infertility worldwide (with larger proportions in sub-Saharan Africa and Southeast Asia), male causes accounted for between 8 to 22 percent, and both male and female causes accounted for between 21 to 38 percent (Cates and Mckenna 1984).

It is of utmost importance that one knows that there exist infertility risk factors for both males and females; the age factor, tobacco use, alcohol use, overweight and underweight factor, and so on are common risks for both sexes likewise according to



(Foster et al. 2008), (Adamson and Baker 2003)(Phillips et al. 2013), and (Paavonen 2012), they referred to those risks that are associated to both male and female as genetic abnormalities, hormonal imbalances, congenital/infectious malformations of the reproductive tract. The risk of infertility increases with the advanced age of the female partner (>35 years) (Adamson and Baker 2003; Foster et al. 2008; Tough et al. 2007). Female infertility may present anovulation, obstructed fallopian tubes, endometriosis, or uterine abnormalities (Adamson and Baker 2003; Foster et al. 2008; Tough et al. 2007). Male factor infertility, according to Adamson and Baker (2003), is characterized by diminished production of morphologically normal, motile sperm.

Surgery, hormonal administration, and assisted reproductive technologies are ways by which infertility can be addressed and treated. Assisted reproductive technology (ART) is the technology used to achieve pregnancy in procedures such as fertility medication, artificial insemination, in vitro fertilization, and surrogacy. It is a reproductive technology used basically and primarily for infertility treatments. ART includes in vitro fertilization-embryo transfer (IVF-ET), gamete intra-fallopian transfer (GIFT), zygote intra-fallopian transfer (ZIFT), and frozen embryo transfer (FET). The success rate of the ART depends on the woman's age.

The aim of this paper is to evaluate and examine through the use of designed and structured questionnaire the university students' awareness, knowledge, and perceptions of both male and female infertility risk factors, possible causes of infertility in both sexes, and their knowledge of possible assisted reproductive technology treatments available so as to bring about fertility.

II. LITERATURE REVIEW

A. Causes of Infertility

The causes of Infertility can be preventable and non-preventable; preventable causes can be categorized as infectious-sexually transmitted diseases such as gonorrhea, syphilis, chlamydia, etc., infectious and parasitic diseases such as tuberculosis, schistosomiasis, malaria and sickle cell disease, health care practices and policies such as unhygienic obstetric practices, septic abortion, and their complications, postpartum and post-oral complications. Exposure to potentially toxic substances in the environment that is arsenic, aflatoxins, and pesticides, and diet, that is, tobacco, caffeine, and alcohol. Cultural and social factors: female genital mutilation, early age at marriage or sexual intercourse, and multiple sex partners. The WHO multinational study found that 64 percent of infertile women in sub-Saharan Africa had diagnoses that could be attributed to infection, about double the

rate of other regions. According to Andrology-Australia (2014), it is estimated that causes of infertility between both partners (male and female) are 27 percent, 15 percent for no known cause of infertility between both partners, 38 percent infertility are caused by the female partner while only 20 percent are caused by the male partners. Andrology-Australia went further in explaining that causes of male fertility can be broken down into five parts: sperm production problems, blockage of sperm transport, sexual problems (erection and ejaculatory problems), hormonal problems, and sperm antibodies (Roupa Z., Polikandrioti M., Sotiropoulou P., Faros E., Koulouri A., Wozniak G. 2009) carried out a study consisting of 110 infertile women who sought medical help from an assisted reproductive center for a period of two months, and it was discovered that the causes of infertility in women were mainly caused by fallopian tubes dysfunction which amounted to 27.4 percent followed by infertility of unknown cause (24.5 percent), 20 percent were due to disorders of menstruation, 9.1 percent due to problems of uterus, 2.7 percent for sexual disorders, another 2.7 percent due to age and a very small percentage for ovarian failure due to the daily habits of the participant. (Olooto, Wasiu E., AmballiAdeboyo A. 2012) from their study showed that smoking was seen as a dangerous factor responsible for infertility in both sexes with a percentage of 45.5. (Maheshwari A, Porter M, Shetty A 2008a; Maheshwari et al. 2008b) said that the prevalence of different causes of female infertility is associated with age and that women over the age of 35 are almost twice as likely to be diagnosed with unexplained and tubal factor infertility, compared with women aged under 35. However, diagnosis of ovulatory dysfunction is reduced by a third in women older than 35 years. The most common cause of ovulation failure, according to Balenand Rutherford (2007) which simply means that the ovaries find it difficult to make eggs or make an egg. Balen et al. (2007) called such a situation 'Polycystic Ovary Syndrome (PCOS) where poly means many, so polycystic means "many cysts" and Hull et al. (1985), Cahill and Wardle (2002) said 25 percent of infertility causes in couples are ovulation failure. Since these small cysts, each represent a follicle that couldn't develop the egg found in it due to a complex biochemical situation in the ovaries with PCOS, the development of the follicles is stopped prematurely, resulting in a collection of small follicles and no ovulation occurring (Cedars-Sinai 2008). Causes of infertility in both males and females, according to Hull et al. (1985) and Cahill and Wardle (2002), are sperm defects or dysfunction, which accounted for 30 percent, unexplained infertility (according to Quaas and Dokras 2008) that is, a situation whereby results of a standard infertility evaluation are normal) accounted for 25 percent of causes of infertility in couples, 5 percent for failure or infrequency of sexual intercourse, 20 percent for tubal

infection damage (due to chlamydia infection), 3 percent for cervical mucus defects or dysfunction, and less than 1 percent for uterine abnormalities.

III. ASSISTED REPRODUCTIVE TECHNOLOGIES (ART)

Assisted reproductive technology (ART) is the technology used to achieve pregnancy in procedures such as fertility medication, artificial insemination, in vitro fertilization, and surrogacy. It is a reproductive technology used basically and primarily for infertility treatments. Assisted reproduction is barely 2 decades old; current practices differ remarkably from those used 2 decades ago. Indeed, the advances in basic research and the practical applications of the research that has been performed since the first successful in vitro fertilization (IVF) in 1978 (Steptoe and Edwards 1978) have given rise to hitherto unthinkable strategies for achieving human reproduction (Steinberg et al. 1998). Innovations in gonadotropin preparations, techniques for culturing gametes and embryos, sperm and embryo cryopreservation techniques, endocrine assays, ultrasound imaging, and laparoscopic surgery all have contributed to the evolution of ARTs (Steinberg et al., 1998). In Nigeria, adoption of children is not widely encouraged and accepted as every infertile couple wants a child or children of their own irrespective of the fact that religion (Christendom) believes that nothing is wrong with adoption. In most low and medium-income countries, Nigeria inclusive, it is believed that parenthood is mandatory, that every man must father a child biologically, and every woman must conceive, carry the pregnancy to its full term, and bore the child naturally. It was on the verge of trying to solve the problem of infertility that the "Assisted Reproductive Technologies" was introduced with all its varieties. According to Fadare and Adeniyi (2016), the first successful in vitro fertilization (IVF) baby in Nigeria was in the year 1978. A lot of new methods of Assisted Reproduction have been developed and used routinely. According to Fadare et al. (2016), recent developments in Assisted Reproductive Technology (ART) include Intracytoplasmic Sperm Injection (ICSI), Preimplantation Genetic Diagnosis (PAD), and Cryopreservation. The first 'test-tube baby' was delivered in 1989 at the Lagos university teaching hospital, and since then, many more IVF clinics have been established in Nigeria (Fadare et al., 2016). The first baby in Nigeria by 'frozen egg' was recorded by the Bridge Clinic, Lagos, on February 16th, 1999, with the delivery of a male child through the Cryopreservation method (a process whereby cell and tissues are cooled to a sub-zero temperature to stop the biological activity and preserve the cells for future use). According to Weinerman (2018), as regards IVF, she noted that the children born via the method are in their late 30's, but there is utmost need to assure infertile couples that the ART method is safe.

However, there are ways and methodologies, according to Weinerman (2018), that should be put in place to bring about the needed safety and thus improvement in the practices. One of the methodologies employed was on reduction of multiple gestations, and another was on giving priority to the intrauterine environment (Weinerman 2018).

Streeter & Deaver (2018) played the same script as Weinerman (2018) by employing mixed methods to address infertility in women by the ART therapy, although they focused on engaging the participants in 6 individual ART therapy sessions that at the end was geared towards improving ART, ART practices and reducing levels of depression (Streeter and Deaver 2018). These recent improvements have led to an increase in the number of ART clinics. Thus, the exact number of these clinics is not known because of constant proliferation, but data from 2013 showed about 30 located mainly in the major cities of Lagos, Abuja, and Port Harcourt. Presently, IVF is mainly private sector driven, with over 80% of the market carrying out basic IVF, and some have recently commenced more advanced procedures such as ICSI and PGD. Most of these centers are owned and operated by Nigerians with some technical, collaborative support from institutions from Europe and the United States of America. Despite the proliferation of IVF clinics in Nigeria, there is no regulatory body to oversee and set standards for the practice of assisted reproduction in Nigeria (Fadare et al., 2016). Presently, IVF clinics are now located not only in major cities of Lagos, Abuja, and Port Harcourt but have extended their services to cities such as Enugu, Delta, Abia, and Benin, respectively. The only problem associated with IVF is making it affordable to the low-income earners who barely can afford three square meals. The cost of IVF ranges from \$2000 to \$5000 in Nigeria. It is interesting to note that ART has, however, solved the problem of infertility despite its high cost. Assisted Reproductive technology has been reported to relieve more than 50 percent of infertility cases (Cooke 2007). However, to set up this technology in the developing world is capital intensive and to access the treatment is reciprocally expensive. These pose barriers to the spread of ART treatment in the developing world where this technology is mostly needed. On the contrary, in the developed countries, ART treatment has made a substantial contribution to the alleviation of the infertility burden.

IV. METHODS AND MATERIALS

A. Participants

The study was carried out in the southeastern part of Nigeria, precisely Enugu state, and the participants were undergraduate students of the University of Nigeria, Nsukka campus. A summary of the research study was provided to the participants. The survey took place during the first semester

2017/2018 academic session from November 2017 to March 2018. The University of Nigeria, Nsukka campus comprises of faculties of Agricultural Sciences, Arts, Biological Sciences, Education, Engineering, Pharmaceutical Sciences, Physical sciences, Social sciences, and Veterinary medicine. The ages of the participants were between 18 to 25 years.

V. DATA COLLECTION AND QUESTIONNAIRE ITEMS

A total of 1080 questionnaires were administered since a total number of 120 undergraduate students were sampled from each faculty. The questionnaire administered comprises sections on awareness, knowledge, and perception towards infertility, infertility risk factors, and Assisted Reproductive Technologies (ART). Data such as age, gender, faculty, religion, desire for children, marital status were also collected. Students were asked the definition of infertility so as to ascertain their knowledge; the next section of the questionnaire was fashioned towards gathering demographic information about the students. The second section or part of the questionnaire was on infertility risk factors and probable causes of infertility. The third part of the questionnaire was on ART. All the questions were arranged sequentially so as to gather information on the students' knowledge, perception, and awareness of infertility, risks, and ART.

VI. DATA ANALYSIS AND RESULTS

A. Basic knowledge about infertility

It was discovered from the survey that only 10 percent of the male respondents and 15.2 percent of the female respondents believed that infertility is a disease. When students were asked about the most fertile time for a woman to conceive during her menstrual cycle, 22.4 percent of the male respondents and 42.5 percent of the female respondents correctly ticked that the most fertile time in a woman's menstrual cycle is the middle of her menstrual cycle. When students were asked if they were aware that there was a marked decrease in a woman's fertility between the ages of 35 and 39, it was also discovered that only 4.1 percent of the male and 4.3 percent of the female respondents were aware of the age range as regards marked decrease in the woman's fertility, showing that age can definitely affect fertility. As regards their awareness and knowledge concerning who is responsible for infertility, it was discovered from the survey that the majority of the respondents, especially female respondents (82.4 percent), were of the opinion that infertility could be caused by both males and females while the male respondents (42.7 percent) believed that female should be held responsible for infertility. When the respondents were asked what action would they take if they (couple) discovered that they are

infertile, 52.6 percent of the male respondents opted for surrogacy while 73.7 percent of the female respondent bought the idea of adoption, as regards separation, the male respondents (63.3 percent) believed that if the problem was from the woman, there should be separation, but if the infertility was caused by both, there shouldn't be separation. 65.1 percent of the female respondents believed that there shouldn't be separated if the problem was from the man and if from both, there still shouldn't be separation, but adoption was far preferred to surrogacy. When the idea of using ART were placed before them, both sexes accepted it (male: 81.7 percent, female: 92.3 percent).

Table 1. Characteristics Of The Participants

Parameter	Total N=1080	(percentage%) (100)
Gender		
Male	450	41.7
Female	630	58.3
Religion		
Christianity	653	60.5
Islam	307	28.4
Others	120	11.1
Marital status		
Single	950	60.5
Married	117	28.4
Others	13	1.2
Ethnic group		
Yoruba	253	23.4
Hausa	497	46.0
Ibo	115	10.6
Others	215	19.9

B. Perception, Knowledge and Awareness of Causes of Infertility and Infertility Risk Factors

Table II below shows the knowledge, perception, and awareness of causes of infertility and infertility risk factors. It was discovered from the survey that both sexes knew that biological risk factors such as low sperm count (abnormal sperm production), irregular menstrual cycle, blocked (faulty) fallopian tube can positively be linked with infertility when they were faced with their knowledge as regards sexually transmitted infection (STI). Only 56 percent of the male respondents and 53 percent of female respondents did not know that STI in men could cause infertility. Forty-three percent of males and 47.3 percent of females did not know that STI in women could also cause infertility.

Table 2. Knowledge, Perception, and Awareness Of Causes Of Infertility And Infertility Risk Factors

Question	Responses N	Male response N (%)	Female response N(%)
Biological Risk Factors			
Can an irregular menstrual cycle cause infertility?	Yes	268(59.5)	389(61.7)
	No	122(27.2)	209(33.2)
	I don't know	60(13.3)	32(5.1)
Can low sperm count or abnormal sperm production cause infertility?	Yes	386(85.8)	525(83.4)
	No	28(6.2)	69(10.9)
	I don't know	36(8)	36(5.7)
Can STI in males cause infertility?	Yes	194(43.1)	241(38.3)
	No	252(56)	334(53)
	I don't know	4(0.9)	55(8.7)
Can STI in females cause infertility?	Yes	192(42.7)	222(35.3)
	No	194(43)	298(47.3)
	I don't know	64(14.3)	110(17.4)
Can a faulty/blocked fallopian tube cause infertility?	Yes	331(73.6)	557(88.4)
	No	81(18)	46(7.3)
	I don't know	38(8.4)	27(4.3)
Lifestyle Risk Factors			
Can smoking in both sexes cause infertility?	Yes	279(62)	409(64.9)
	No	149(33.1)	193(30.6)
	I don't know	22(4.9)	28(4.5)
Can previous contraceptive pill use in females cause infertility?	Yes	252(55.9)	430(68.2)
	No	155(34.5)	129(20.5)
	I don't know	43(9.6)	71(11.3)
Can previous condom use in males cause infertility?	Yes	94(20.9)	221(35.1)
	No	347(77)	401(63.6)
	I don't know	9(2.1)	8(1.3)
Can the intake or consumption of alcohol by both sexes cause infertility?	Yes	235(52.2)	296(47)
	No	137(30.4)	282(44.8)
	I don't know	78(17.4)	52(8.2)
Spiritual/Mythical Risk Factors			
Can infertility be linked with God's will/spiritual factor?	Yes	252(56)	334(53)
	No	172(38.2)	254(40.3)
	I don't know	26(5.8)	42(6.7)
Can infertility be linked with witchcraft/enemies of progress?	Yes	194(43.1)	282(44.8)
	No	144(31.9)	209(33.2)
	I don't know	113(25)	139(22)

C. Lifestyle risk factors

Respondents were also asked if they knew that contraceptive pills could affect fertility, it was discovered that over 50 percent of both respondents approximately knew that contraceptive pills used by women could affect fertility, and 52.2 percent of male respondents and 47 percent of female respondents were aware that alcohol intake or consumption could cause infertility. As regards smoking, both sexes believe that smoking can affect fertility, and also 77 percent of the male respondents and 63.6 percent of the female respondents don't believe that the use of a condom by men can cause infertility.

D. Spiritual/Mythical risk factors

Respondents believed highly that infertility was the will of God for some humans, while some believed that it was caused by witchcraft, witchcraft, or enemies of progress. Above 50 percent (precisely 56 percent for male and 53 percent for female) believed that it was spiritual, that is, God's will, while less than 45 percent (precisely 43 percent for male and 44.8 percent for female) of the respondents believed that witchcraft could also be responsible while 22 percent of female and 25 percent of male were neutral as regards spiritual/mythical risk factors.

E. Knowledge and Awareness of ART and Other Possible Treatment Options

When respondents were asked about their knowledge and awareness of ART as a treatment for infertility, it was discovered that some of the respondents were aware, but it was discovered that the knowledge of IVF was more than any other type.

Table 3. Knowledge and awareness of assisted reproductive technology (art)

Method	Responses N	Male response N(%)	Female response N(%)
Can In Vitro Fertilization (IVF) act as a remedy or treatment option for infertility?	Yes	380(84.4)	488(77.5)
	No	63(14)	104(16.5)
	I don't know	7(1.6)	38(6.0)
Can the Cryopreservation method (frozen egg) act as a treatment option for infertility?	Yes	93(20.7)	199(31.6)
	No	336(74.7)	342(54.3)
	I don't know	21(4.7)	89(14.1)
Is Intracytoplasmic sperm injection (ICSI) a remedy or treatment option for infertility?	Yes	201(44.7)	233(37)
	No	186(41.3)	362(57.5)
	I don't know	63(14)	35(5.6)
Can fertility drugs be used as treatment options for infertility?	Yes	287(63.8)	312(49.5)
	No	105(23.3)	265(42.1)
	I don't know	58(12.9)	53(8.4)
Can surgery act as a treatment option for infertility?	Yes	218(48.4)	339(53.8)
	No	186(41.3)	221(35.1)
	I don't know	46(10.2)	70(11.1)
Can Hormonal injections be used to remedy infertility?	Yes	319(70.9)	404(64.1)
	No	116(25.8)	211(33.5)
	I don't know	15(3.3)	15(2.4)
Can traditional herbs act as a treatment option for infertility?	Yes	322(71.6)	414(65.7)
	No	105(23.3)	181(28.7)
	I don't know	23(5.1)	35(5.6)
Can prayers be seen as a possible treatment option for infertility?	YES	310(68.9)	445(65.9)
	NO	83(18.4)	123(19.5)
	I DON'T KNOW	57(12.7)	62(9.8)

VII. CONCLUSION

From the study, it was discovered that most university students are still unaware of the causes of infertility and infertility risk factors. Most of the respondents still associate infertility with "enemies of progress and witchcraft". Their knowledge of ART was encouraging, but it was discovered that they were not totally aware of the different types of ART treatments. Their knowledge of IVF was more than other treatments for both sexes. It is also important that in tackling the issue of infertility, our youths, especially students, should be sensitized and also have the knowledge, perception, and awareness of what infertility is all about so as to avoid falling prey or victim to the infertility trap. We also recommend that the assistance of persons such as healthcare workers, social workers, spiritual/religious leaders should be sought and involved in infertility education programs so that the issue of infertility and childlessness would be erased from our world as a whole.

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