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Original Research Article

Any help for the helpers? Determinants of female infertility in oocyte donors

Ese W. Omonigho[1], Okorie C. Anya[1]*, Ibilolia J. Kalio[1], Chidinma V. Keke[2], Kayode I. Adisa[2], Aminat A. Seriki[3], Gift I. Iheabunike[3], Stephen S. Hati[4]

[1]Department of Fertility and Reproductive Medicine, Primecare Fertility Clinic, Garki Area 8, Abuja, Nigeria
[2]Department of Embryology, Primecare Fertility Clinic, Garki Area 8, Abuja, Nigeria
[3]Department of Nursing, Primecare Fertility Clinic, Garki Area 8, Abuja, Nigeria
[4]Department of Quality Control and Assurance, Primecare Fertility Clinic, Garki Area 8, Abuja, Nigeria

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***Correspondence:**
Dr. Okorie C. Anya,
E-mail: anyaoc@primecarefertility.com

ABSTRACT

Background: Female infertility is a national problem for the family, and one of the major causes is ovarian dysfunction. Ovarian function can decline with increasing age and other factors, and this can affect oocyte quality. One of the ways to manage it is through oocyte donation; however, some oocyte donors also suffer from ovarian dysfunction. The aim of this study was to identify the determinants of infertility in young, unmarried females, with the aim of planning treatment strategies that may help reduce the burden of infertility.
Methods: The study enrolled 335 individuals who presented for oocyte donation. The number of people who had their oocyte donation program cancelled due to fertility-related issues was analysed, and simple descriptive statistics were used for analysis.
Results: Of the 330 participants, the age range was between 21 and 27 years, with a mean age of 23 years. About 19% of the participants had their oocyte donation program cancelled, and out of this proportion, 47% of them experienced poor ovarian response to stimulation with either a low anti-mullerian hormone level or a low antral follicular count on day 2 of their menstrual cycle.
Conclusions: Identification and early management of this population of young females can invariably reduce the burden of infertility in the future.

Keywords: Female infertility, Oocyte donation, Poor ovarian response, Reproductive health, Sustainable developmental goals, Universal heath coverage

INTRODUCTION

According to the American Society for Reproductive Medicine, infertility is defined as a disease, condition, or status characterized by any of the following: inability to achieve a successful pregnancy based on a patient's medical, sexual, and reproductive history, age, physical findings, diagnostic testing, or any combination of those factors. The need for medical intervention includes, but is not limited to, the use of donor gametes or donor embryos in order to achieve a successful pregnancy, either as an individual or with a partner. And finally, in a situation where patients have regular, unprotected intercourse without any known etiology for either partner suggestive of impaired reproductive ability, evaluation should be initiated at 12 months when the female partner is under 35 years of age and at 6 months when the female partner is 35 years of age or older.[1] This definition, which is a committee opinion published in 2023, is encompassing and covers all aspects of infertility.

Infertility is generally due to a dysfunction of the reproductive system, which can affect the male, the female, or both of them.[2] There is a paucity of data that reflects the true prevalence of female infertility in Nigeria, but there are a couple of institution-based studies that report the prevalence of female infertility in the various geopolitical zones of the country. One study done in south-western Nigeria involving four major hospitals in that region reported an average prevalence of female infertility of 51.5%,[3] with another 10-year study done in south-eastern Nigeria that involved four major hospitals reporting an average prevalence of female infertility of 10% per year, with a range of 7.1% to 17.1%.[4] In northern Nigeria, yet another study was done that reported the prevalence of female infertility in two major centers at 23.9%.[5]

One of the major causes of female infertility is ovulatory disorders which constitutes about 25% of causes of infertility, and among these disorders includes, anovulation due to hypothalamic amenorrhoea, polycystic ovarian syndrome (PCOS), premature ovarian insufficiency or failure, pituitary adenoma, and even ovarian resistance due to advanced age of the woman.[6] There has also been found to be an inverse relationship between the age of a woman and the quantity and quality of her oocytes or eggs, hence with advancing age, the quantity and quality of a woman's eggs depreciates. Environmental factors and social habits such as smoking have also been implicated to further worsen the depreciation.[7] All these conditions lead to the production of no oocytes or oocytes with very poor quality, which will either not get fertilized by sperm cells, or will be fertilized by sperm cells only to produce poor quality embryos that might find it difficult to implant into the prepared endometrium.

Oocyte or egg donation is a third-party treatment option used in so many fertility centres for infertile women with poor egg quality, and it involves the use of another female's oocytes, which are of better quality, to fertilize with the sperm cells of the infertile woman's partner. The first oocyte donation was performed in Austria in 1983, and since then it has become a regular practice in assisted reproductive technology (ART).[8] Oocyte donation is majorly indicated for women with poor oocyte quality, women advanced in age, and those with ovulatory causes of infertility. Beside these major indications, it can also be used for women who are carriers of genetic abnormalities to avoid passing these defective genes down to their offsprings.[9] The process of oocyte donation involves screening the potential donor through a medical interview that involves the following: taking a medical and reproductive history, a psychological evaluation, a physical examination, imaging of her internal reproductive organs, and subjecting her to a series of laboratory screenings too. Laboratory tests included are infectious disease screening, blood group and genotype determination, and genetic screening.[9]

In our fertility center, called Primecare Fertility Clinic, located in Abuja, Nigeria, we offer third-party programs for ART treatments, which include oocyte donation. It was observed that not all voluntary oocyte donors were able to successfully donate their oocytes.

This study was carried out for the purpose of highlighting the major reasons why oocyte donor programs were cancelled and also determining the proportion that was linked to female infertility disorders. This is in order to evaluate the infertility profile amongst female oocyte donors and provide a basis for planning that will meet the essential package for women's sexual and reproductive health and rights (SRHR), universal health coverage (UCH), and the sustainable development goal (SDG) through fertility treatment centers.

METHODS

A descriptive retrospective case study involving the collection and analysis of data collected during the screening of consenting female oocyte donors was carried out between January 2021 and June 2022 at Primecare Fertility Clinic, Abuja, Nigeria.

Donor selection criteria

For a candidate to be permitted to proceed with oocyte donation in our center, she must prove to be between 21 and 30 years old. Acceptable proof includes national identification cards, a driver's license, a national passport, and a declaration of age certificate. The potential donor must also provide us with the name, contact information, and address of a next-of-kin who is aware of the program she is embarking on. She must not have undergone any form of ovarian stimulation in the past three months, and finally, an informed consent form must be signed after satisfactory proof of understanding.

Exclusion criteria

Oocyte donors whose health records contained information that was vague or poorly documented were excluded from the study.

Screening procedure

The potential donor undergoes a screening process that includes detailed biodata information and then a reproductive, medical, surgical, family, and social history. There is a thorough physical and pelvic examination, which is concluded by a trans-vaginal ultrasound scan. The major focus of the ultrasound scan was ovarian assessment.

If the findings are satisfactory at this point, she proceeds to the laboratory, where a couple of investigations are carried out for her. This includes a pregnancy test, blood group and genotype, hormone profiling, and infectious disease screening like human immunodeficiency virus

(HIV) serology, hepatitis B serology, hepatitis C serology, and syphilis screening.

Any deficiencies or abnormalities in any of the processes mentioned above will usually lead to the cancellation of the oocyte donation cycle.

Data collection and analysis

The data for this study was extracted from the oocyte donation register of Primecare Fertility Clinic, and the information of all the females who presented to this medical facility from January 2021 to June 2022 was assessed. The age of the donors was the variable that was analyzed, with major attention given to the proportion of cancelled programs and the reason for their cancellation.

All the data obtained was analyzed using IBM SPSS Statistics 29.0.1.1 and presented by simple descriptive statistics using frequencies and the measures of central tendency like the mean and range.

RESULTS

A total of 330 participants were involved in this study, and the age range was between 19 and 27 years, with the mean age of 23 years. Of the total, 81% (266) of the participants successfully completed the oocyte donation program, while 19% (64) of the participants had their oocyte donation program cancelled.

Amongst the 64 participants who had their oocyte donation program cancelled, 67% (43) of them were due to fertility-related issues, while 33% (21) of them were due to non-fertility-related issues. Some of the reasons for cancellation due to non-fertility issues include; positive serum pregnancy tests, voluntary withdrawal from the oocyte donation program, positive HIV serology, or hepatitis B surface antigen serology, amongst others (Table 1).

Table 1: Results of laboratory investigation done during the screening process.

Serum pregnancy test	Positive	Negative	Percentage
	12	318	3.6
Anti-mullerian hormone (AMH)	<1 ng/ml	>1 ng/ml	
	18	312	5.4
Prolactin level	>40 ng/dl	<40 ng/dl	
	0	330	0
VDRL	Positive	Negative	
	0	330	0
HIV testing	Positive	Negative	
	5	325	1.5
Hepatitis B/ hepatitis C viral serology	Positive	Negative	
	4	326	1.2

For the fertility-related issues, the most common cause was the presence of a simple ovarian cyst, which was 47% (20) of the participants. This was followed by a low anti-mullerian hormone (AMH) level with a poor response to ovarian stimulation on day 9 of the stimulation cycle, 42% (18), then a low antral follicular count on day 2 of the stimulation cycle with a poor response to ovarian stimulation on day 9 of the stimulation cycle, 5% (2). The remaining 6% was due to the presence of a complex ovarian cyst, the presence of mildly enlarged ovaries with corpora luteal cysts, and the presence of an endometrial (chocolate) cyst (Figure 1).

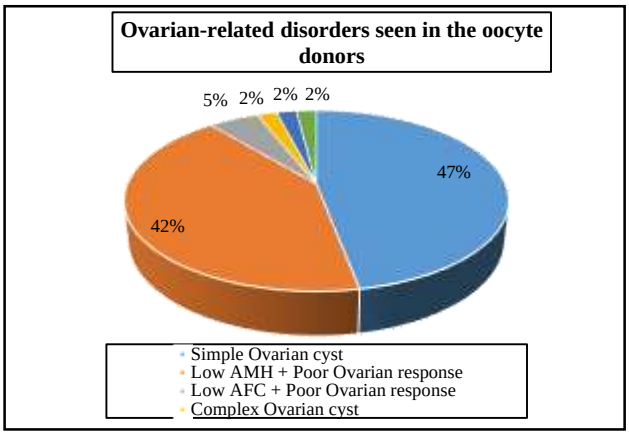

Figure 1: The different proportions of the various ovarian-related disorders seen in the oocyte donors which can predispose them to female infertility in the future.

DISCUSSION

The prevalence of infertility in women increases with age, but there are still some cases of infertility in younger women. In women aged 15 to 34 years, the prevalence of infertility has been found to be about 7.3% to 9.1%, and the age range of the participants in this study falls within this category.[6] The participants of this study were not married; hence, they cannot be considered cases of infertility. But if they decide to get married, the reasons for the cancellation of their oocyte donation program will probably be a possible reason for a case of infertility in their marriage, and this was a major concern for them. Ovulatory disorders were also found to be the most common cause of infertility in women, 25%, and the most common reason for fertility-related issues for the cancellation of the oocyte donation program in this study was the presence of simple ovarian cysts.[6] There is a paucity of data that reports that simple ovarian cysts can cause female infertility directly, and the reason for the cancellation of the oocyte donation program in this group of participants was solely a hospital-based protocol based on a series of studies. One of the studies was done by Rafael et al, which showed that the number of ampoules used for induction and the number of days of induction were higher in the presence of an ovarian cyst.[10] The participants of concern were the 47% who were poor

responders with either a low anti-mullerian hormone level or a low antral follicular count.

The aim of this study was to determine the potential causes of infertility in these young oocyte donors in order to provide fertility treatment centres with information that can be used as a basis for planning strategies that can be used to help these individuals. In most parts of Nigeria including the north central region where this study was carried out, it is quite uncommon for unmarried females to visit reproductive or fertility clinics for a fertility work-up, in order to assess fertility status or rule out potential causes of infertility. There are a couple of reasons that might be responsible for this which include; ignorance of their rights, fear for the financial implication, and possibly their religious and cultural views. According to the United Nations Human Rights (UNHR) report of 2022, access to reproductive health is a global rights and includes the right to know their bodily integrity, right to be sexually active, and the right to when and by what means to have children.[11] This is further supported by the United Nations Sustainable Developmental Goals (SDGs), precisely the goal 3.7, which states that by 2030 all concerned countries should ensure universal access to sexual and reproductive health-care services, including for family planning, information and education, and the integration of reproductive health into national strategies and programmes.[12]

On the other hand, the World Health Organization (WHO) collaborated and supported the United Nations Sustainable Development Goals with a proposal for Universal Health Coverage (UHC), which means that all people have access to the full range of quality health services they need, when and where they need them, without financial hardship. Achieving UHC was one of the targets the nations of the world set when they adopted the 2030 Sustainable Development Goals (SDGs) in 2015.[13] According to a study done by Ogundeji et al, which aimed to assess Nigeria's preparedness to finance and drive the universal health coverage (UHC) agenda within the context of changing health conditions and resource needs associated with the disease, demographic and funding transitions.[14] It concluded that there were major gaps in the knowledge and capacity for UHC advancement in Nigeria due to multiple reasons, which include poor knowledge of demographic transitions, poor capacity for health insurance implementation at sub-national levels, low government spending on health, poor policy implementation, and poor communication and collaboration among stakeholders.

It can be safe to say that the absence of UHC in Nigeria currently coupled with the ignorance of the United Nations Human Rights and Sustainable Development Goals amongst these young, unmarried females are major contributing factors that deter this target population from visiting reproductive clinics for routine fertility assessments, which can help in the early detection of determinants of infertility in the future. The fertility centers that offer third-party services like oocyte donation programs are those who have the opportunity to come into contact with this target population and are in a better position to provide solutions to the above-listed problems.

Some strategies that can be adopted include extensive reproductive health education, which should include education on the UN Human Rights and SDG report. Fertility centers with good capacity can also work together with health maintenance organizations (HMOs) to provide affordable insurance plans for the target population, with the sole focus being on preventive and screening services. If, for some reason, early treatment is required, there can be collaborations between fertility centers and non-governmental organizations (NGO) concerned with women and reproductive health to reduce the cost of treatment to the barest minimum. Some cost-effective treatment strategies that can be used to manage suboptimal ovarian reserve in this target population are not limited to but include dehydroepiandrosterone (DHEA) and melatonin supplementation, or the use of adjuvants like co-enzyme Q10 and testosterone gel.[15,16] At the initial level, these young women can be offered these supplements and subjected to routine fertility clinic checkups, but when they eventually get married and are at risk of infertility, more advanced treatment options can be used to improve their chances of conception.

The major limitation of this study was that only an ovarian assessment was done for the oocyte donors. Female infertility can be caused by several other factors which include tubal factors, uterine factors, and even medical conditions, but the focus of this study was the ovarian factors seen in young women that can predispose them to infertility in the future.

CONCLUSION

Female infertility, or infertility in general, is usually a diagnosis made after a couple has experienced difficulty conceiving. However, the factors and disorders that predispose to infertility, especially in women, can be present many years before they get married. One major strategy for curbing the incidence of female infertility is to pay early attention to the reproductive health of the young women in the community, which starts with a robust reproductive health education program and is then followed by access to affordable healthcare. All this can be achieved through effective collaboration among various concerned agencies, which can altogether reduce the incidence of female infertility.

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