Evaluation of Age and BMI as Predictors of the Outcome of Art Among African Population in Kano, Nigeria

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Abstract

Infertility is a global problem, with the situation being worse in some areas of the developing world due to sociocultural reasons. Although, invitro fertilization (IVF) is believed to be the goal standard management for infertility, it is shown to be hindered by high failure rate, which may be as a result of both male and female factors. The aim of this study was to determine the factors associated with success rate of IVF at a private health facility in Kano state, Nigeria. It is a 2-year retrospective study (1st April 2017 to 31st March 2019) of Assisted reproductive procedures carried out in Getwell Women and Children Hospital, Kano. The case files of couples who undergone the procedure was evaluated. In this study, males contribute to 40% of infertility while proportion of female factor was 38%. Both the couple were affected in 11% and up to 4% were unexplained diagnosis. Following IVF treatment 46 couples, 16(34%), successfully conceived and had a normal live delivery of a term pregnancy. Age, male BMI were found to negatively affect the outcome of ART and the cut off value of age and BMI for maximal chance of live birth was 30 years and 25kg/m^2 respectively. It was established that, advanced age and high BMI negatively affects the outcome of IVF.

Keywords: Assisted Reproduction, Kano, Northwest Nigeria.

INTRODUCTION

Infertility is a global problem, and its prevalence varies between developed and developing countries. The absolute number of couples affected by infertility increased from 42.0 in a million 1990 to 48.5 million in 2010 (Mascarenhas *et al.,*2012). It has been reported that up to 30% of the couples are infertile in some areas of the developing world (Ombelet *et al.,* 2008). Infertility poses a public health concern and is associated with social, economic, and psychological disturbance which goes beyond childlessness for the couples. It has been shown that women in our society bear most of the brunt of infertility because it is culturally regarded as a taboo (Tabong and Adongo, 2013). It is a significant cause of marital disharmony and separation and personal misery. In many of these communities, women are stigmatized, isolated, and become targets of psychological abuse or domestic violence, even if infertility is due to male partner (Araoye, 2003)These stigmata are prevalent in low resource countries, particularly in sub-Saharan Africa (Araoye, 2003; Cong,2016).

Infertility may emanate from Male (male factor infertility MFI) or female (female factor infertility FFI), and sometimes both couples might have a problem (Cong,2016). Most cases of MFI are due to moderate to severe abnormal sperm parameters, while FFI can be a result of anatomical, hormonal, and genetic anomalies (Ombelet et al., 2008). Tubal blockage is by far the most frequent causes of infertility among females in developing societies, which can be effectively managed with assisted conception services by Invitro fertilization and embryo transfer (IVF, ET) or Intracytoplasmic sperm injection (ICSI). Because of the financial implication, most couples accepted infertility as the will of God and completed their life tenure without having a child. (Ombelet et al., 2008; Giwa-Osagie, 2004).

Assisted reproductive technology refers to any treatment or procedure that involves the in vitro handling of human oocytes and sperm or embryos to establish a pregnancy (Zegers-Hochschild et al.,2009; Sunderam *et al.,* 2015). Since the first successful IVF procedure in 1978, the use of ART has expanded to become commonplace around the globe. It also remains out of reach of many infertile couples as the service is mostly in private sectors, even though few public tertiary institutions offer relatively affordable ART procedures of recent (Chambers *et al.,* 2009; Luke, 2011). Presently there are millions of babies born worldwide by this technique. The procedures of assisted reproduction include; In-vitro fertilization and embryo transfer (IVF and ET), Intracytoplasmic sperm injection (ICSI), Sperm/Oocyte/ Embryo donation, Zygote intrafallopian transfer (ZIFT), Gamete intrafallopian transfer (GIFT) and Surrogacy.
The biggest setback in ART services is high failure rate. As a result, research in the field of IVF is still yield new findings worldwide. Theses findings are often used in developing standard operation procedures and guidelines. Therefore, the need to a diverse research into the area. It has been documented that age and BMI are some of the factors that negatively affect the outcome of IVF but there is paucity of data from the study population.

MATERIALS AND METHODS

The study was a 2-year retrospective study (1st April 2017 to 31st March 2019) of assisted reproductive procedures carried out where the case files of individuals with infertility was examined. A prior consent was obtained and ethical approval was also gotten from the kano state ministry of health. The protection of personal data and confidentiality was ensured

Stimulation protocol.

A transvaginal ultrasound scan was done before commencing the stimulation to ascertain the endometrial thickness and antral follicular count (AFC), long acting Gonadotrophic hormone releasing hormone (GnRH) agonist protocol was used. The human menopausal

gonadotrophin was used for the stimulation at the dosage of 75-225iu daily. A serial alternate day transvaginal ultrasound scan was done from day 6 of stimulation to ascertain ovarian response and human chorionic gonadotrophin (hCG) was given as a trigger 36 hours before oocyte retrieval. Day three transfer was done for all the patients, and a maximum number of three (3) embryos were transferred. Luteal support was given using progesterone analogue (cyclogest) and pregnancy test was carried out after two weeks.

DATA ANALYSIS

Data was obtained from patient's case notes using a proforma and summarized with Microsoft excel. The SPSS version 21.0 was used for data analysis. Frequency distribution table was used to describe the categorical variables, Chi-square test of association was used to determine the relationship between the outcome of IVF and age, BMI, and Occupation. Binary regression model was used to determine the combined effect of age and BMI on the outcome of ART. ROC was used to evaluate the sensitivity and specificity of age and BMI in predicting the outcome of IVF. Results were presented in tables and figures and statistical significance was set at $P \leq 0.05$.

RESULTS

The age of the female partners ranges between 19 to 46years with a mean age of 30.12 ±6.9years. The study comprised of predominantly Hausa (89%), and Muslims (96%), at secondary level of education (88%). Majority were full-term housewives (91%) while the remaining were civil servants. (Table 1). This slightly varies from other study where the lower sex groups seldom present for assisted reproductive services as revealed in research carried out in the United Kingdom in 2014 where the largest cohort receiving IVF treatments were women between 18 and 34, accounting for 43.4% of all cycles compared with 37% of those between 35 and 40 years (Piercea and Mocanu, 2018)This also varies from the study by Omokanye, *et al* (2017) in Ilorin, Nigeria, where the age range of patients offered IVF services were 22–52 years with a mean age of 36.1 ± 6.6 years and mean duration of infertility of 7.3 ± 5.8 years. The younger age population in our study is attributed to was observed to be due higher proportion male factor infertility where husband opted for IVF services after there were counselled understanding that they cannot achieve spontaneous conception due to poor seminal fluid analysis parameters.

Table 1. Socio demographic characteristics of study participants

Item	Frequency (%)
Age range	
19-24	14(29.4)
25-34	17(37.4)
35-46	15(33.3)
Education level	
Secondary	41(89)
Post-secondary	5(11)
Religion	
Islam	44 (96)
Christianity	2(4)
Occupation	
Housewife	41(89)
Civil Servant	5(11)
Tribe	
Hausa	41(89)
Yoruba	3(7)
Igbo	2(4)
Total	46

Description of Infertility Among the Study population.

About (74%) presented with primary infertility with a duration of between 2-20years with a mean duration of 7.5years while the remaining has secondary form of infertility. Male factor contributed 40%, female factor 38%, combine factors 18%, and unexplained contributed only 4%. Severe Oligospermia is the leading cause of male infertility (72%) and tubal factor as the leading cause of female infertility (63%) (table 2). This is in keeping with majority of both international and local literature where most of couple requiring ART services are those with primary infertility. As shown by This may be attributed to the cause of infertility. A study from Northeastern Nigeria also identifies primary infertility (58.7%) as the main type of infertility among couples that presented for assisted reproduction (Omokanye, *et al* 2017). This study has shown a relatively long duration of infertility which differs form the finding by Boeri et al (2019). The longer duration is not unconnected to the unavailability of the services in the community in the past and also majority can not afford treatment in another country due to financial implications. Furthermore, the distribution of infertility among couple where male factor has the highest proportion might not be unconnected to the fact that males in the locality tend to take their health issue more seriously and are more yielding if the problem is from them, if the wife is the source of the problem, it is more likely that the husband will just marry another wife. This finding is not far from what was documented by (Cooper *et al.,* 2009)

Type of Infertility	Frequency (%)
Primary	34(74%)
Secondary	12(26)
Form of Infertility	
Male factor	18(40%
Female factor	17(38%)
Combined	8(8%)
Unexplained	2(4%)

Relationship between cumulative live birth (CLBR) following IVF with age BMI

The cumulative live birth following IVF was obtained among 16 (34.7%) patients out of 46 IVF treatment offered. This is lower than 41/104 (39.4%) reported by (Omokanye et 2017) in Ilorin Nigeria, but higher than 16.2% and 18.3 reported in Nnewi and Benin city (Orhue, et al.,2012; Ikechebelu, et al 2016) This outcome was significantly associated with Age and BMI with p value less 0.05 and 95% confidence interval. Binary logistic regression shown that, Age can be used to predict the outcome of IVF with (OD=0.834, 95% CI 0.725-0.961, p=0.01) while BMI is not predictor of the outcome of IVF (OD=0.927, 95%CI 0,742-1.157, p=0.5) However, the combined effect of age and BMI can be used to predict outcome of IVF with 71% accuracy.Receiver Operator Characteristic (ROC) curve (figure 1) revealed a much higher chance of successful IVF treatment when woman BMI is less than or equal to 24.18 and age of less than or equal to 30 years. The outcome. A number of individual studies have shown the predictive power of age and BMI on the outcome of IVF cycles (Goswami, & Nikolaou, 2017; Crosby et al., 2018; Liao et al., 2019) However, this is the first study which revealed the recommended cut off value for age and BMI where the favorable outcome is more likely following IVF treatment. The implication of these findings is for the better preparation and evaluation of other risk for women who are more than 30 years with BMI more than 25 in Kano Nigeria.

Relationship between cumulative live birth (CLBR) following IVF with age BMI

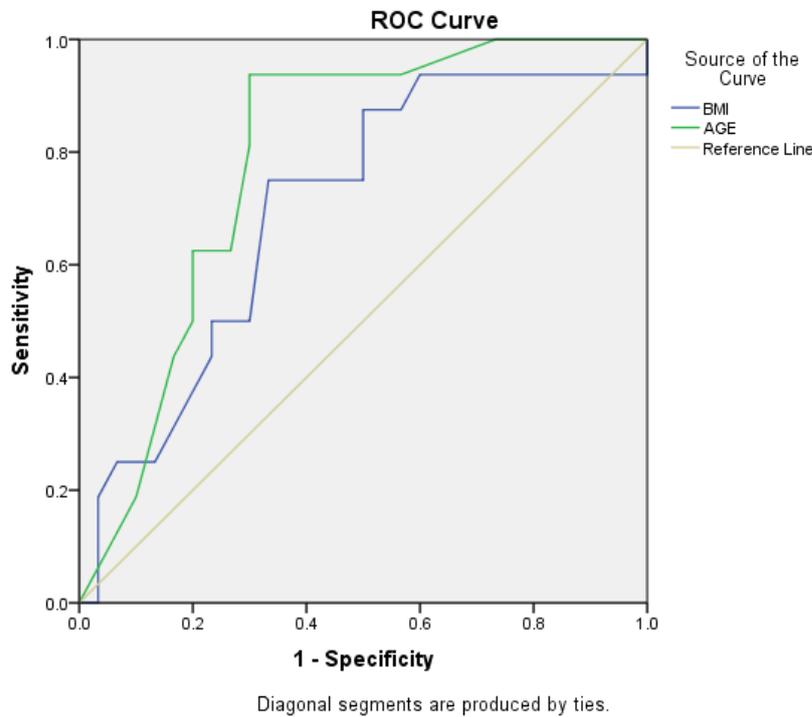| Age Range	Successful	Failed	χ^2	P
18 To 25	8	6	7.934	0.02
25 To 34	7	11		
35 To 50	1	13		
Total	16	30		
BMI				
Normal	12	11	6.26	0.04
Overweigh	3	12		
Obese	1	7		
Total	16	30		

BMI- Body Mass index

Figure 1: Cut-off values for age and BMI in predicting live birth following IVF

Variable	Cut-off values	Sensitivity	Specificity
BMI (kg/m^2)	24.18	0.75	0.67
AGE (Years)	30	0.94	0.7

CONCLUSION
This study has shown the importance of normal weight for women who wishes to undergo IVF cycle, and recommends a better evaluation and a closer monitoring approaches to omen beyond 30 years with BMI greater than 25 kg/m^2

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