

Original Article

Knowledge and perception of assisted reproductive technology among women attending the University of Benin Teaching Hospital, Benin City, Nigeria, 2018

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Abstract

Context: Assisted reproductive technology (ART) is generating different views among women, especially in developing countries, and this has contributed to the low turnout in the utilization of the technology in the area.

Aims: This study examined the knowledge and perception of ART among women that attended a tertiary health facility.

Setting and Design: This cross-sectional study was conducted on women that attended the Obstetrics, Gynaecology, and Fertility clinics in the University of Benin Teaching Hospital, Benin City, Nigeria, 2018.

Materials and Methods: This study was conducted among 348 women through stratified probability sampling method, and a self-structured questionnaire with open-ended and Likert scale questions used as instrument was administered.

Statistical Analysis Used: Data collected were analyzed using descriptive statistics and one-way analysis of variance (ANOVA) at 0.05 significant levels.

Results: The perception of ART had a huge mean of 3.99 (0.50). The result also revealed 73.0% awareness level of ART. Hypotheses testing brought out the mean comparison of perception of ART based on educational level using one-way ANOVA, which showed $F = 0.071$ and $P = 0.552$.

Conclusion: There is a high awareness level but low knowledge about ART; therefore, appropriate policies and programs must be put in place to educate the populace on the importance and success rate of ART.

Keywords: Assisted reproductive techniques, Knowledge, Perception, Women

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INTRODUCTION

Assisted reproductive technology (ART) is an assemblage of a number of techniques and procedures that allow a bypass of the obstacles to achieving pregnancy by the

conventional methods (involving the use of drugs and/or surgery singly or in combination) to allow pregnancy and childbirth to occur where otherwise the chances of pregnancy and childbirth would have been zero.^[1] In India

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as in much of the rest of Asia, childless women are socially stigmatized and face personal and social consequences; therefore, childlessness in India is regarded as a curse.^[2] In 2002, 7.3 million couples were affected by infertility, which has now increased to 48.5 million worldwide.^[3] In 2006, the American Society of Reproductive Medicine reported that the incidence of infertility has continued to rise over the last decade, and it is estimated that it affects at least 11% of couples in the United States and about two million couples seek infertility treatment each year.^[4] Over 30% of couples have been reported to be unproductive in sub-Saharan Africa.^[5] About 50% of infertility cases have been reported to be due to female infertility, whereas the male factor is responsible for about 20%–30% of cases, and the remaining 20%–30% is due to a combination of both.^[6] In Nigeria, the prevalence of infertility is clearly higher than what obtains in the developed world as over 60% of gynecological clinic consultations are infertility related.^[7] If a woman does not become pregnant after treatment with medical and surgical techniques, she may choose to undergo more complex procedures called ART after consulting with her health-care provider and a counselor who will help the client to understand exactly what the treatment will involve and how it might affect her and those close to her now and in future.^[8] Infertility is a stigmatized reproductive health morbidity and a major public health concern in Nigeria.^[5] Millions of people in the world who could not produce their own biological children have been able to do so through the use of ARTs. About three million births have occurred worldwide with the aid of ART within the last 30 years, with the technique enabling infertile women and men including single women and men, lesbian, gay, and transgender couples to form genetically related families.^[9] These novel innovations have changed the human perspective of reproductive health, especially in developed countries.^[2] However, ignorance and myths and misconceptions about the causes and perception of the disease can generate prejudice, stigmatization, and fear toward those affected in developing countries.^[3] Knowledge and perception regarding infertility among selected adult population in Pakistan revealed that there was limited knowledge of infertility as only 25% of the study participants correctly identified when infertility is termed pathological, while the need for seeking alternative treatment for infertility remains a popular option for 28% of the participants as a primary preference and 75% as a secondary preference.^[10] Determining the knowledge and perception of ART treatment among infertile women would provide a useful tool needed for sensitization and planning of public enlightenment programs, advocating support for reproductive health or advanced infertility

treatment, especially where conventional interventions prove abortive.^[11] Despite the acclaimed role of *in vitro* fertilization (IVF) in the management of infertility, the knowledge and perception of the general public in some parts of the world about the procedure and babies born through IVF has been split between acceptance, reservation, and in some instances rejection, particularly in some aspects such as third-party IVF. Religion, culture, personal belief, and cost are some factors that affect the acceptance of IVF by the public.^[12,13] Therefore, knowledge and perception of ART is a major tool to be considered in the effective utilization of the technology.^[14] From this point of view, we aimed to examine the knowledge and perception of ART among women attending the University of Benin Teaching Hospital (UBTH), Benin City, Nigeria, 2018.

MATERIALS AND METHODS

A descriptive cross-sectional survey was conducted in the UBTH, Benin City, Nigeria, in 2018, which enabled the researcher to survey hundreds of patients and get private information during the survey. This is the feature of any empirical study in which the goal is to make inferences about a population from that sample.^[15] Stratified probability sampling method was used; this ensures that subgroups (clinics) of a given population are adequately represented within the whole sample population of a research study and have equal chance of being selected. The clinics namely, Obstetrics, Gynaecology, and Fertility, were stratified, and proportional allocation of questionnaires was given out to Obstetric – 266, Gynaecology – 60, and Fertility – 30 clinics, based on their different capacity, with a summation of 348. Patients who were willing to participate in the study and women who were registered in any of the three clinics were included in the study, whereas patients who could not speak either English or Benin language were excluded from the study. The sample size was calculated using Cochran formula, $P = 70.1\%$, error 5%, and 95% confidence interval, based on a previous similar study.^[16] Ethical approval for this study was obtained from the ethical committees of the UBTH where the study took place, with approval reference of ADM/E22/A/VOL.VII/14556 on 14 December, 2017. The Department of Nursing and the head of Department of Obstetrics and Gynaecology were informed. In line with the Belmont report, the researcher strived to do no harm to the participants. Consent form was given to the participants to seek written consent, and verbal consent was also taken before data collection. The research topic is sensitive; therefore, effort was made to ensure that very sensitive and pertinent questions were avoided as much as possible. Patients were referred to a counselor when the need arises. In order to not exploit

the participants financially and physically, their time of consultation was not encroached into and data collection took place after consultation. Patients who declined inclusion were not penalized.

Data collection instruments were a structured questionnaire and close-ended and Likert-scale questions which covered the objectives of the study. These instruments allowed the researcher to ask the same question, in the same way, in a sequence and an order, to different people and in different places, thus enabling the researcher to reach more participants with divergent opinion at the same time. The questionnaire was prepared with the input of an expert in the field and a statistician to enhance the validity of the instrument. Cronbach's alpha was used to test the reliability of the instrument, and the reliability coefficient in this study was 0.72.

The questionnaire consists of two sections: section A which contains nine questions with options on sociodemographic statistics of respondents and section B which contains ten questions with options on the knowledge of ART that was also analyzed using percentage answers. More than 70% rated excellent knowledge, 60%–69% rated very good knowledge, 50%–59% rated good knowledge, 40%–49% rated poor knowledge, and <39 rated very poor knowledge. The questionnaire for perception was self-developed, which is made up of seven questions with the input of an expert in the field and a statistician to enhance validity of the instrument, and Cronbach's alpha was also used to test the reliability of the instrument, and the reliability coefficient was 0.81. In order to ensure the objectivity of the study, a five-point Likert scale was used to grade the perception of respondents: the respondents' scores were converted to mean and graded as follows: negative perception = mean score below 4.00 and good perception = mean score above 4.00. The data obtained were coded and analyzed using SPSS statistical software version 21.00 (IBM corp. released 2012. Armonk, NY: IBM Corp). Variables and research questions were analyzed using descriptive statistics such as mean, standard deviation, frequency, and one-way analysis of variance (ANOVA).

RESULTS

Demographic characteristics of the women in total from the different clinics are reported in Table 1: the sample was characterized by many of the women in young adult age group, with mean scores of 31.72 (6.33). More than two-third of the women were married and had married for over 6 years, either without a child or with a maximum of one to two children. Moreover, about two-third of the women had previous university education, and Christianity was the dominating religion.

Knowledge information on ART among the women is reported in Table 2: it shows that about two-third of the women had previously heard about ART with excellent scores. In contrary to that, more than half of the women were unable to locate ART centers in Benin city, Nigeria, and about two-third of the women were not aware of the law.

Perception information of ART among the women is reported in Table 3: it shows an overall negative perception with a score of 3.99 (0.05). One-way ANOVA showed that there was no statistically significant difference ($F = 0.701$; $P = 0.552$) in the mean perception score of the women based on their educational background [Table 4].

DISCUSSION

Knowledge plays a major role in decision-making. To be well informed is to be knowledgeable about a fact or a situation. The findings from this study revealed 73.0% awareness level of ART. This proportion is similar to the one reported in 2010 in Zaria where they had an awareness level of 76.5%, but slightly higher than the previous studies reported in 2010 which reported 67.5% awareness level among women in Benin city.^[5,13] In

Table 1: Demographic characteristics of women attending the University of Benin Teaching Hospital, Benin City, Nigeria, 2018

Variables	Attributes	Frequency (n=348), n (%)
Age group (years)	18-25	51 (14.7)
	26-35	226 (64.9)
	36-45	58 (16.7)
	46 and above	13 (3.7)
Marital status	Single	30 (8.6)
	Married	316 (90.8)
	Widow	2 (0.6)
Religion	Christianity	342 (98.3)
	Islam	6 (1.7)
Level of education	None	5 (1.4)
	Primary	8 (2.3)
	Secondary	38 (10.9)
	Tertiary	297 (85.3)
Ethnic group	Bini	124 (35.6)
	Igbo	59 (17.0)
	Esan	50 (14.4)
	Yoruba	28 (8.0)
	Urhobo	18 (5.2)
	Owan	17 (4.9)
	Others	52 (14.9)
Duration of marriage (years)	0-1	90 (25.9)
	2-5	167 (48.0)
	6-10	70 (20.1)
	Above 10	21 (6.0)
Number of pregnancy	1	74 (25.3)
	2	96 (32.8)
	3	64 (21.8)
	≥4	28 (9.6)
Number of children alive	0	129 (37.1)
	1	90 (25.9)
	2	86 (24.7)
	≥3	43 (12.3)

Table 2: Knowledge of assisted reproductive technology among women attending Obstetrics, Gynaecology, and Fertility clinics in the University of Benin Teaching Hospital, Benin city, Nigeria, 2018

Variables	Frequency (%)
Have you heard of ART?	
Yes	254 (73.00)
No	94 (27.00)
How many types of ART do you know?	
0	2 (0.60)
2	185 (53.20)
3	47 (13.50)
4	12 (3.40)
6	8 (2.30)*
Don't know	94 (27.00)
How many ART centers do you know in Benin city?	
1	157 (45.1)
2	79 (22.7)
3	18 (5.2)
4	8 (2.3)*
Don't know	86 (24.7)
Are there side effects with ART that you know?	
Yes	23 (6.6)*
No	325 (93.4)
Do you know that ART can fail?	
Yes	35 (10.00)*
No	313 (90.00)
How many indications for ART do you know?	
0	2 (0.6)
2	145 (41.70)
3	31 (8.90)
4	15 (4.30)
6	7 (2.00)*
Don't know	148 (42.50)
Do you have fertility clinics easily accessible to you?	
Yes	211 (60.60)*
No	83 (23.90)
Don't know	54 (15.5)
What is the success rate for ART?	
10-20	34 (9.80)
20-30	57 (16.40)
30-40	72 (20.70)*
40-50	60 (17.20)
50-60	125 (35.90)
What is your source of ART information?	
Family	70 (24.70)
Friends	87 (30.70)
Health facility	145 (51.20)
Mass media	112 (39.60)
Is there a law governing the practice of ART in Nigeria?	
Yes	133 (38.20)
No	104 (29.90)*
Don't know	111 (31.90)

*Correct answer. ART: Assisted reproductive technology

addition to that, a cross-sectional study in Iran showed that there is a significant relationship between spouse's attitude ($P < 0.01$), relative's attitude ($P < 0.01$), the applied knowledge of ART ($P < 0.01$), and the attitude of infertile couples toward applying ART. However, there was no significant relationship between gender and socioeconomic status toward applying ART ($P > 0.05$). It was then concluded that making a decision and accepting ART can be influenced by couples' attitude, their family's attitude, and applied knowledge of ART.^[8] Furthermore, in a study on knowledge, attitude, and practice on ART, acceptance of gamete donation in IVF was examined on infertile couples in the UBTH.^[13] The study showed that awareness of gamete donation was more among female respondents (67.5%) compared to male respondents (53.8%). However, 40% of the women and 59% of the men were not willing to accept donated gamete, but they were willing to give whoever wants it, with men being more eager to give than women (female 51%, and male 73.7%). The study revealed that knowledge of gamete donation as part of ART was higher among female than male partners, and they were likely to accept donor gametes compared to their male partners. The study, however, failed to identify reasons for its conclusive finding. Not citing the source of information of ART by participants of the study, does not help identify the reason for such diversity in knowledge by both sexes.^[13]

Moreover, a study conducted in 2014 in Osun State reported that the awareness level of ART was 46.0%, with high accessibility rate of 71.6% to fertility clinics but with poor knowledge (20.7%) of success rate.^[17] This result could be attributed to inadequate health education of clients and knowledge deficit of health-care providers in this area of specialty. In 2016, a study by Hannover Medical School, Leibniz, Germany, revealed that the term IVF was familiar to 45% of participants, with more than 39% of the study participants willing to contemplate IVF instead of adoption while 5% of the study participants prefer egg donation, if they were considered to have low ovarian reserve for normal conception.^[18] Irrespective of the sex and level of education, there was an association between

Table 3: The perception of assisted reproductive technology among women attending Obstetrics, Gynaecology, and Fertility clinics in the University of Benin Teaching Hospital, Benin city, Nigeria, 2018

Items	SA, n (%)	A, n (%)	U, n (%)	D, n (%)	Sd, n (%)	Mean (SD)
ART means assisted reproductive technology	247 (71.0)	75 (21.6)	24 (6.9)	2 (0.6)	0 (0.0)	4.63 (0.64)
ART should be considered for infertile couple	186 (53.4)	117 (33.6)	37 (10.6)	8 (2.3)	0 (0.0)	4.38 (0.77)
Couples fear rejection by the society if they use ART	36 (10.3)	96 (27.6)	81 (23.3)	81 (23.3)	55 (15.5)	2.94 (1.24)
Cost of ART is very expensive	165 (47.4)	110 (31.6)	47 (13.5)	22 (6.3)	4 (1.1)	4.18 (0.97)
Cost of ART should be taken care of by the government	86 (24.7)	113 (32.5)	81 (23.3)	58 (16.7)	10 (2.9)	3.59 (1.12)
ART method of conception is safe	124 (35.6)	136 (39.1)	76 (21.8)	12 (3.4)	0 (0.0)	4.07 (0.84)
Media has improved my acceptance of ART	84 (24.1)	132 (37.9)	96 (27.6)	76 (7.5)	10 (2.9)	3.73 (1.00)
Mean						3.99 (0.50)

SA: Strongly agree, A: Agree, U: Undecided, D: Disagree, Sd: Strongly disagree, SD: Standard deviation, ART: Assisted reproductive technology

Table 4: One-way analysis of variance of perception of assisted reproductive technology based on educational level among women attending Obstetrics, Gynaecology, and Fertility clinics in University of Benin Teaching Hospital, Benin-city, Nigeria, 2018

Level of education	Mean (SD)	F	P
None	84.00 (13.65)	0.701	0.552
Primary	75.94 (15.75)		
Secondary	80.20 (12.42)		
Tertiary	79.88 (9.49)		

SD: Standard deviation

a good knowledge about fertility and the possibility of using ART.^[18,19]

Similarly, the high awareness level with low knowledge level of ART is related to the finding of the research carried out in Anambra state in 2015 which reported that some individuals have heard about IVF treatment, do not really know what IVF is all about, or they may likely not be willing to participate in ART process owing to lack of knowledge.^[19] This also supports the finding of a study conducted in 2012 which reported that there is a limited knowledge about infertility in the population and there are a lot of misconceptions and myths in the society.^[10] Similarly, the study also revealed that the respondents had a good perception of ART. This finding corresponds with the study carried out in 2012, wherein the final study population of 490 HIV-positive women living in Ontario Canada indicated that they would like to learn more about fertility technology options.^[20] In another study, they perceived that ART babies are normal babies, ART should be considered for infertile couple, cost of ART is very expensive and that ART method of conception is safe. This finding supports the result of in 2011 which reported that 70.1% and 71.9% of the infertile parents felt the offspring from IVF are normal and acceptable respectively.^[13] Moreover, a study conducted on heterosexual English-speaking couples carried out in 2016 to assess the perception of infertile couples about the impact of lifestyle behaviors on IVF success at the Birgham and Women's Hospital. The paper identified that patients with higher levels of education ($P < 0.001$) and good income ($P < 0.01$) are less likely to consider lifestyle impactful on the success of IVF however, they discovered that sex, infertility diagnosis and socioeconomic factors impact on the success of IVF.^[21] Furthermore, a study carried out in 2010, found that the perception, attitude, and knowledge of infertile women in Benin City, Nigeria, of the causation of infertility and IVF-embryo transfer, the paper identified sociocultural factors and cost as hindrance to IVF treatment uptake or acceptance.^[13] The effect of cost on utilization of IVF by infertile patients was reflected in the profile of IVF patients seen in UBTH. They discovered that 70.1% and 71.9% of

their study participants perceived the offspring from IVF as normal and acceptable respectively while 50.2% and 24% perceived the cost of IVF services as high and would not accept ART because of the cost, respectively.^[16] Finally, this study also found that there is no significant difference in the perception of ART based on the level of education of the women. This implies that the perception of ART is not influenced by the academic background of the women. A shift from the above finding, was in 2014 study and found that positive perceptions among infertile couples of lifestyle behaviors and IVF success.^[21] Their study revealed that patient's education influences the perception of IVF and that their educational level improves their perception of IVF outcomes.^[16] This is also in line with the finding in 2016 who reported positive attitude toward ART among infertile couples in Yazd, Iran.^[8] As against this supportive findings, in 2013 in Northern Nigeria (Kano) reported a negative perception as the respondents perceived infertility as a disease.^[22] This result might have been influenced by the powerful grip of cultural belief, as it affected people's perception in the area.

Nevertheless, this study was faced with some limitation such as information about clients' disease condition and ART procedures are confidential to these clients. Infertility as a stigmatized health condition is a challenge to elucidating facts from these clients.

CONCLUSION

The overall level of knowledge of ART in this study is very low but with a good awareness level. There is need for health-care providers to sensitize the public on the adoption of ART as a way out of infertility. ART is still nascent, thus more research and capacity building for health care providers in this sub-specialty is necessary. This will enable them educate and counsel infertile couples on the implications of ART. There is also need for input from psychologists to enable health care providers in these settings provides more structured psychological care.

Nurses will need to expand their knowledge base in these areas to share appropriate and accurate information with individuals and couples receiving health care services. The provision or assistance of health-care procedures by nurses for individuals undergoing any of these technologies also will require an expanded knowledge of these specialties.

Finally, this study on the perception of ART among women attending Obstetrics, Gynaecology and fertility clinics, will enable healthcare providers know areas of emphasis during counseling of infertile couples, enlighten women

during an in-depth interview on the various types of ART for the purpose of making an informed decision. It will also enhance the nursing education curriculum, and create awareness for students and health care providers. This study will help government appreciate the need for the affordability and accessibility of ART in the country as reflected in the study with most countries subsidizing and making ART available in health facilities.

Conflicts of interest

There are no conflicts of interest.

Authors' contribution

All authors contributed to this research.

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REFERENCES

- Wyndham N, Marin Figueira PG, Patrizio P. A persistent misperception: Assisted reproductive technology can reverse the "aged biological clock". *Fertil Steril* 2012;97:1044-7.
- Mishra K, Dubey A. Indian women's perspectives on reproduction and childlessness: Narrative analysis. *Int J Hum Soc Sci* 2014;4:464-52.
- Fortin C, Abele S. Increased length of awareness of assisted reproductive technologies fosters positive attitudes and acceptance among women. *Int J Fertil Steril* 2016;9:452-64.
- Jodar M, Sandler E, Krawetz SA. The protein and transcript profiles of human semen. *Cell Tissue Res* 2016;363:85-96.
- Adesiyun AG, Ameh N, Avidime S, Muazu A. Awareness and perception of assisted reproductive technology practice amongst women with infertility in Northern Nigeria. *Open J Obstet Gynecol* 2011;1:148-4.
- Agarwal A, Mulgund A, Hamada A, Chyatte MR. A unique view on male infertility around the globe. *Reprod Biol Endocrinol* 2015;13:37.
- Adenike MO, Adebimpe Wasiu O, Olarewaju Sunday O, Olaniyan B. Prevalence of infertility and acceptability of assisted reproductive technology among women attending gynecology clinics in tertiary institutions in Southwestern Nigeria. *Open J Obstet Gynecol* 2014;4:7-1.
- Afshani SA, Abdoli AM, Hashempour M, Baghbeheshti M, Zolfaghari M. The attitudes of infertile couples towards assisted reproductive techniques in Yazd, Iran: A cross sectional study in 2014. *Int J Reprod Biomed (Yazd)* 2016;14:761-8.
- Mamo L. Queering the fertility clinic. *J Med Humanit* 2013;34:227-39.
- Ali S, Sophie R, Imam AM, Khan FI, Ali SF, Shaikh A, *et al.* Knowledge, perceptions and myths regarding infertility among selected adult population in Pakistan: A cross-sectional study. *BMC Public Health* 2011;11:760.
- Eisenman NS. Reproductive and sexual health of adolescents in Mexico: Recommendations for the special rapporteur on the right to education. *Georgetown J Gend Law* 2010;11:835-13.
- Mulder CL, Serrano JB, Catsburg LA, Roseboom TJ, Repping S, van Pelt AM, *et al.* A practical blueprint to systematically study life-long health consequences of novel medically assisted reproductive treatments. *Hum Reprod* 2018;33:784-92.
- Aziken ME, Orhue AA, Kalu OO, Osemwemkha PA. Knowledge, perception and attitude of infertile women in Benin city, Nigeria to the causation of infertility and *in vitro* fertilisation and embryo transfer. *Trop J Obstet Gynaecol* 2010;27:40-5.
- Mneimneh AS, Boulet SL, Sunderam S, Zhang Y, Jamieson DJ, Crawford S, *et al.* States monitoring assisted reproductive technology (SMART) collaborative: Data collection, linkage, dissemination, and use. *J Womens Health (Larchmt)* 2013;22:571-7.
- Newman I, Hitchcock JH. Underlying agreements between quantitative and qualitative research: The short and tall of it all. *Hum Resour Dev* 2011;10:381-98.
- Abieyuwa O, James O, Michael A, Orhue AA. Gamete donation: Knowledge, attitude and perception of infertile couple in a public hospital in Nigeria. *Trop J Obstet Gynaecol* 2011;28:129-33.
- Silva TP, Marques CA, Torreão JN, Araújo MJ, Bezerra LR, Rocha AM, *et al.* Intake and some indicators of the metabolic status of native ewes in pregnancy and supplemented in grazing system. *Afr J Agric Res* 2015;10:200-6.
- Loutfy M, Raboud J, Wong J, Yudin M, Diong C, Blitz S, *et al.* High prevalence of unintended pregnancies in HIV-positive women of reproductive age in Ontario, Canada: A retrospective study. *HIV Med* 2012;13:107-17.
- Doke PP, Mangal DK, Gulati A. Density of *in-vitro* fertilization centers and its correlation with socioeconomic factors in Maharashtra state, India. *Int J Community Med Public Health* 2018;6:342-50.
- Zhang Y, Yudin M, Raboud J, Shapiro H, Margolese S, Loutfy M. Desires, demand, perceptions, and knowledge of assisted reproductive technologies of HIV-positive women of reproductive age in Ontario, Canada. *Int J Fertil* 2011;96:266-538.
- Hawkins LK, Rossi BV, Correia KF, Lipskind ST, Hornstein MD, Missmer SA, *et al.* Perceptions among infertile couples of lifestyle behaviors and *in vitro* fertilization (IVF) success. *J Assist Reprod Genet* 2014;31:255-60.
- Iliyasu Z, Galadanci HS, Abubakar IS, Bashir FM, Salihu HM, Aliyu MH, *et al.* Perception of infertility and acceptability of assisted reproduction technology in Northern Nigeria. *Niger J Med* 2013;22:341-7.