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Knowledge, Perception, and Factors influencing the use of Assisted Reproductive Technology among Women in Lagos, Nigeria

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Background: Assisted Reproductive Technology (ART) consists of procedures that involve the invitro handling of both human oocytes and sperm or of an embryo, to establish a pregnancy. Also, ART has been reported to reduce the burden of more than 50% of infertility cases. The aim of this study was on knowledge, perception and factors influencing the use of ART among women in Lagos. **Methods:** A descriptive study that used a multistage sampling method. Simple sampling method was used to select two from five divisions in Lagos state and three comprehensive primary health centres each from the two divisions. A convenient sampling method was used in selecting 330 women that participated in the study. Data were analyzed with Statistical Package for Social Science (SPSS) version 22. Descriptive and inferential statistical methods were used for the presentation of results at a significant level of $p \leq 0.05$. **Results:** Mean age of the respondents was 30.40±7.21 years, 75.8% were married, 52.2% do not know ART while 68.0% have a negative perception towards ART. There is a significant association between the age of respondents and their awareness of ART ($p = 0.01$). Also, there is a significant association between the educational level of the respondents and their perception of ART ($p = 0.01$). **Conclusion:** Negative perception and high cost of ART have led to its unacceptance as identified by the study. More emphasis should be on the benefit of ART in the communities. With reduced cost, a woman that needs ATR may have access to it.

Keywords: *Knowledge, Perception, Assisted Reproductive Technology, Women*

Introduction

As many as one in six couples will encounter problems with fertility, infertility is considered one of the critical issues in couple's lives and it is estimated to affect as many as 186 million people worldwide, although male infertility contributes to more than half of all the cases of childlessness, infertility remains a woman's social burden. In Nigeria, studies have shown that tubal problems secondary to sexually transmitted diseases, postpartum pelvic infections, unsafe abortion, genital mutilation, childhood marriage and its complications are some common factors that cause female infertility. Unfortunately, areas with the highest rate of infertility are often those with poor access to assisted reproductive technology (Inhorn & Patrizio, 2015). Infertility refers to the failure to achieve a clinical pregnancy after regular unprotected sexual intercourse for 12 months, (Kara, 2016). Assisted reproduction technologies offer a chance at parenthood to couples, who until recently would have had no hope of having a "biologically related "child (Lukman, Abdulwaheed, Kabir, Sekinat, Sikiru & Ganiyu, 2017).

According to Zakariya, (2018), there are several different views of ART. Assisted reproductive technology has been reported to reduce more than 50% of infertility cases. However to set up this technology in the developing world is capital intensive and to access the treatment is reciprocally expensive, these poses barriers to the spread of assisted reproductive technology treatment in the developing world where these technologies are mostly needed. On the contrary, in developed countries, assisted reproductive technology treatment has made a substantial contribution to the alleviation of infertility burden (Adesiyun, *et al*, 2011.)

The first test-tube baby delivered in Nigeria took place at Lagos University Teaching Hospital in 1989 and since then, much more in-vitro fertilization clinic has been established. The exact number of these clinics is not known because of constant proliferation, but data showing the invitro fertilization clinic from 2013 showed about 30 clinics are located in major cities of Lagos, Abuja and Port Harcourt (Fadare & Adeniyi, 2015). Despite breakthroughs recorded from assisted reproductive technologies, several barriers militate against its acceptability in our environment (Lukman, *et al*, 2017). The greater percentage of those who experience infertility are poor and assisted reproductive technology is still not readily covered by the premium health insurance schemes in Nigeria (Olugbenga, Adebimpe, Olarenwaju, Babatunde & Oke, 2014). In all Local Government Areas of Lagos state, when infertility occurs, couples seek various treatments, including ART. Assisted Reproductive Technologies is a novel technology that raises several challenges with which society has to cope (Olugbenga, Adebimpe, Olarenwaju, Babatunde & Oke 2014). According to Osian, Afemikhe, Olorunfemi, & Eweka (2019) in their study women had low knowledge and negative perception of ART in Benin City Nigeria. Hence, determining the level of awareness, perceptions and factors influencing the use of ART practices among childbearing age in Lagos would be useful in sensitizing and planning public enlightenment programs on advanced infertility treatment.

This study will make the respondent have knowledge of ART and know the factors influencing the use of ART. Creating awareness on ART at PHCs will improve the perception and understanding of women of childbearing age on ART in Lagos state. The implementation of this study will decrease the rate of childlessness among women of childbearing age in Lagos by increasing their rate of utilization of ART among the people that need it.

The various steps used for ART include;

Fertilization and Embryo Culture: After the eggs are retrieved, they are examined in the laboratory for maturity and quality. Mature eggs are placed in an in-vitro fertilization culture medium and transferred to an incubator to await fertilization by the sperm. Sperm is separated from semen usually obtained by masturbation, a special condom used during intercourse or alternatively from the testicle, epididymides and Vas Deferens (Keane *et al*., 2017).

Embryo Transfer: During embryo transfer, the physician identifies, the cervix using a vaginal speculum. One or more embryos suspended in a drop of culture medium are drawn into a transfer catheter with a syringe on one end, the tip of the transfer catheter should be guided gently through the cervix and places the fluid containing the embryos should be placed in the uterine cavity. According to Rosenwaks & Perceiva (2017), Intra-cytoplasmic sperm injection is process of injecting a single spermatozoon into the cytoplasm of the oocyte.

Gamete intrafallopian transfer (GIFT): This procedure involves the collection of multiple eggs form the ovaries. The eggs are placed into a thin flexible tube along with the sperm to be used. The gametes are then injected into the fallopian tube through laparoscopy (Harper, *et al*, 2017).

Zygote Intra Fallopian Transfer: This is the combination of in-vitro fertilization and

gamete intrafallopian transfer. Eggs are stimulated and collected using in-vitro fertilization methods, then the eggs are mixed with sperm in the laboratory fertilized eggs are then laparoscopically returned to the fallopian tube and it is moved into the uterus and develops into a fetus (Hussein, 2016).

Cryopreservation: Embryo cryopreservation; when extra embryos remain after the embryo transfer, they may be cryopreserved for future transfer cryopreservation makes future assisted reproductive technology cycles simple, less expensive and less invasive than the initial in-vitro fertilization cycles. Since the woman does not require ovarian stimulation or egg retrieval (American Society for reproductive medicine, 2015).

Oocyte Donation: According to Mahajan (2017), the use of donor oocytes has expanded the scope of assisted reproductive technology for women with poor oocyte quantity and quality. Invited fertilization with oocyte donation is considered to give better implantation, pregnancy and live birth rate.

Oocyte Sharing: Oocyte sharing involves a woman sharing some of her eggs with another patient in exchange for free or reduced, cost fertility treatment. If the number of eggs recovered is lower or of poor quality both donor and recipient's cycles may be compromised with neither having sufficient good quality embryos to transfer or cryopreserve, necessitating a fresh in-vitro fertilization cycle with its inherent cost (Mahajan, 2017).

Oocyte Banking: The availability of frozen oocytes and the success of oocyte vitrification has added to convenience, increasing the number of cryopreserved cycles (Mahajan, 2017).

Assisted Hatching: According to Hussein (2016), the process of assisted hatching refers to procedures done to the zona pellucid; the zona pellucid is the shell that surrounds the egg. Assisted hatching is a micro-manipulation procedure in which a hole is made in the zone pellucid just before embryo transfer to facilitate hatching of the embryo.

Gestational surrogacy: Surrogacy is when a woman carries a baby for a couple who are unable to conceive or carry a child themselves for medical or physical reasons. The intended parent(s) are person or persons who become the legal parent(s) of a child born through surrogacy (Nygren & Andersen, 2015).

Traditional Surrogacy: This is a pregnancy where the surrogate is genetically related to the baby and becomes pregnant through artificial insemination. While this used to be common, most surrogacy arrangements today involve host surrogacy (Nygren & Andersen, 2015).

Host surrogacy: This is when in-vitro fertilization (IVF) is used, either with the eggs of the intended mother or with donor eggs. The surrogate mother, therefore, does not use her own eggs and is genetically unrelated to the baby. There are three stages to 'host' surrogacy:

-**Egg Donation:** The female intended parent, or an egg donor, undergoes special procedures to extract a number of eggs.

- **Fertilization:** The eggs are fertilized with sperm in the laboratory, resulting in embryos.

- **Embryo Transfer:** The embryo is transferred into the uterus of the surrogate mother.

The Embryo Transfer can be transferred to the surrogate either 'fresh' or after having been de-frosted from storage. For a fresh embryo transfer, the cycles of the surrogate mother and the egg donor must be synchronized, and this is done using hormone medications. In cases where embryos have been frozen already and the de-frosted embryos are being transferred, the surrogate mother is provided with hormone medications to 'ready' the lining of her uterus. (Nygren & Andersen, 2015). Today assisted reproductive technology can be used not only to eliminate infertility but also for purposes of embryo research and pre-implantation genetic diagnosis (Niekerk, 2017).

Methods and Materials

This was a quantitative study that utilized a multi-stage sampling method and self – structured questionnaire constructed after the literature review in collection data. Stage 1; Out of the five administrative divisions in Lagos state, viz: Ikeja, Badagry, Lagos, Epe and Ikorodu, two were selected Ikeja & Ikorodu using simple random sampling (Balloting). Stage 2; Six out of twelve comprehensive primary health centres (Palm Avenue, Ayantuga and Alausa from Ikeja; Ipakodo, Igbogbo and Isuwu primary healthcare centre from Ikorodu) were selected by simple random sampling (Balloting). Stage 3; Convenient sampling method was used for the selection of 330 participants. The Cochran formula for calculating sample size for a descriptive study was used. That is;

$$\mathbf{n_o = z^2pq/d^2}$$

Where: n_o= minimum sample size
z= confidence interval set at 1.96 for 95% confidence level
p= prevalence of women satisfied with the knowledge of Assisted Reproductive Technology 83.0%. [Pourrmasum *et al*., 2016). 83.0%. [Pourrmasum *et al*., 2016)

q is given as =1-p, (1-0.83)=0.17

d is the degree of precision = 0.05

$$\text{Therefore } n_o = \frac{1.96 \times 1.96 \times 0.83 \times 0.17}{0.05 \times 0.05}$$

$$= \frac{0.5420}{0.0025}$$

$$= 216.8$$

For a population of less than 10,000, the sample size is

$$n = \frac{n_o}{1 + \frac{(n_o - 1)}{N}}$$

Where n_o= 216.8

N= estimated population =300

$$n = \frac{216.8}{1 + \frac{(216. - 1)}{300}}$$

= 301.1
Ten percent attrition 30.1 + 301.1 = 331.1
approximately 332

A self-structured questionnaire with four sections a) socio-demographic variables b) awareness on ART, c) perception toward ART, d) factors influencing the use of ART was self-administered, but some of the respondents were assisted (explanation) to fill theirs. The pre-test of the questionnaire was carried out among 20 childbearing women from Oke-letu PHC in Ikorodu and the reliability co-efficient score r = 0.71. Numeric rating scales were used for knowledge and perception.

The correct answer to the questions on knowledge and perception were given 1 while the wrong answer was given 0. The scores were converted to a percentage, 0% to 49% were low or negative while 50% to 100% were high or positive knowledge and perception respectively. Two research assistants were used in administering the questionnaire and the return rate was 97.5%. Data were analyzed electronically with the use of SPSS computer software version 20. All descriptive data were presented in tables, charts, mean and standard deviation, while inferential data were tested with Chi-square and regression at a significant level of p = 0.05.

Ethical Consideration: Ethical approval was from the Health Research Ethical Committee of Lagos University Teaching Hospital (LUTH) with the number ADM/DCST/HREC/APP/3759. The respondents were made to understand that they can decide not to participate in this study and that their information would be treated with optimum confidentiality. The informed consent form was given to each respondent.

Results

A total of 322 copies of the questionnaires out of 330 copies were found adequate for analysis giving a return rate of 97.5%.

Table 1: *Socio-Demographic Characteristics among Participants*

Variables	Frequency (n=322)	Percentage %
Age (in Years)		
15-20	32	9.9
21-25	46	14.3
26-30	50	15.5
31-35	138	42.9
36-40	38	11.8
41-45	18	5.6
Mean ±SD = 30.40±7.21 years		
Marital Status		
Single	22	6.8
Married	244	75.8
Divorced	48	14.9
Widowed	8	2.5
Separated	0	0
Educational Level		
None	4	1.2
Primary	42	13.0
Secondary	142	44.1
Tertiary	134	41.6
Ethnicity		
Yoruba	162	50.3
Igbo	86	26.7
Hausa	6	1.9
Others	68	21.1
Religion		
Christianity	266	82.6
Islam	56	17.4
Others	0	0

The mean years of the respondents were 30.40±7.21 years, (75.8%) were married only (41.6%) had tertiary education. The majority of the respondents (50.3%) were from the Yoruba ethnic group, and (82.6%) were Christians.

Table 2: *Knowledge on Assisted Reproductive Technology among Participants*

Variables (n=322)	Frequency	Percentage %
Have you heard of ART?		
Yes	236	73.3
No	86	26.7
Source of Information		
Health facility	108	33.5
Mass media	80	24.8
Internet	34	10.6
Family relation	14	3.7
School	86	28
What is ART?		
Achieving pregnancy normally	120	37.2
Achieving pregnancy with the help of drugs only	114	35.4
*Achieving pregnancy with the help of drugs and technology	88	27.3
Have you or any of your relation undergone assisted reproductive technology treatment?		
Yes	12	3.7
No	310	96.3
Is conception made possible through ART?		
*Yes	168	52.2
No	154	47.8
ART can be used for		
Male infertility only?	0	0
Female infertility only	186	57.8
*Male and female infertility	136	42.2
Which of the following is a type of ART methods		
Normal fertilization	206	64.0
*In vitro fertilization	116	36.0
ART treatment can fail to produce pregnancy?		
*Yes	174	54.0
No	148	46.0

*correct answer

The majority of the respondents (73.3%) reported they have heard about ART and the source of information for (33.5%) was the health facility, (27.3%) were aware that ART is achieving pregnancy with the help of drugs and technology. Only (3.7%) of the respondents reported that they or any of their relationships have undergone ART treatment, (52.2%) agreed that conception is made possible through ART and (42.2%) reported that ART can be used for male and female infertility, while (36.0%) were aware that in-vitro fertilization is a type of ART.

Table 3: *Perception towards Assisted Reproductive Technology among Participants*

Statement n = 322	**SA (%)**	**A (%)**	**N (%)**	**D (%)**	**SD (%)**
Women assisted to conceive through assisted reproductive technology are not respected in the society.	46(14.3)	126(39.1)	76(23.6)	42(13.0)	32(9.9)
Do you agree that babies born through assisted reproductive technology are artificial babies?	48(14.9)	178(55.3)	32(9.9)	50(15.5)	14(4.3)
Assisted reproductive technology can lead to fetal malformation.	34(10.6)	146(45.3)	104(32.3)	20(6.2)	18(5.6)
Mothers believe that children born through assisted reproductive technology are not their biological children.	68(21.1)	64(19.9)	76(23.6)	92(28.6)	22(6.8)
Do you agree that assisted reproductive technology can result to multiple gestation?	94(29.2)	100(31.1)	66(20.5)	48(14.9)	14(4.3)
Children conceived through assisted reproductive technology are dull compared to children conceived naturally.	36(11.2)	114(35.4)	116(36.0)	48(14.9)	8(2.5)
Children born through assisted reproductive technology are believe to bring bad luck to the family.	56(17.4)	120(37.3)	88(27.3)	38(11.8)	20(6.2)

The majority of the respondents have a negative perception of ART by agreeing or strongly agreeing to the statement in table 3. Only (14.9%) of the respondents disagreed that children conceived through assisted reproductive technology are dull compared to children conceived naturally. However (37.3%) respondents agreed that children born through assisted reproductive technology bring bad luck to the family.

Table 4: *Factors influencing the use of Assisted Reproductive Technology*

Items n = 322	**Yes (%)**	**No (%)**
High cost can lead to the unacceptance of assisted reproductive technology.	288(89.4)	34(10.6)
Does your religion or culture hinder the use of assisted reproductive technology?	128(39.8)	194(60.2)
Does your spouse support the use of assisted reproductive technology?	120(37.3)	202(62.7)
Poor health facility impairs the use of assisted reproductive technology.	220(68.3)	102(31.7)
Poor knowledge on assisted reproductive technology hinders its acceptance.	190(59.0)	132(41.0)
The fear of fetal malformation and complications due to assisted reproductive technology can hinder its acceptance.	186(57.8)	136(42.2)

The majority of the respondents (89.4%), (62.7%) and (68.3%) of the respondents indicated that the identified factors influence their use of ART. However, to (60.2%) and (62.7%) of the respondents, some of the factors cannot hinder their use of ART.

Table 5: *Logistic regression testing the significant influence of the factors on the use of ART*

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	df	Sig.
		B	Std. Error	Beta		
1	(Constant)	-2.347	1.276	3.381	1	.066
	High cost can lead to unacceptance of ART	-272	1.126	.058	1	.809
	Does your religion or culture hinder the use of ART	1.325	.802	2.731	1	.098
	Does your spouse support the use of ART	1.184	.806	2.157	1	.142
	Poor health facility impairs the use of ART	.064	.680	.009	1	.926
	Poor knowledge on ART hinders its acceptance	-067	.647	.011	1	.918
	The fear of fetal malformation and complications due to ART can hinder its acceptance	-460	.656	.492	1	.483
a. Dependent variable: Use of ART						

There is no significant association between the factors and the participant utilization of ART with $p \geq 0.05$. The factors have no influence on the women utilization of ART.

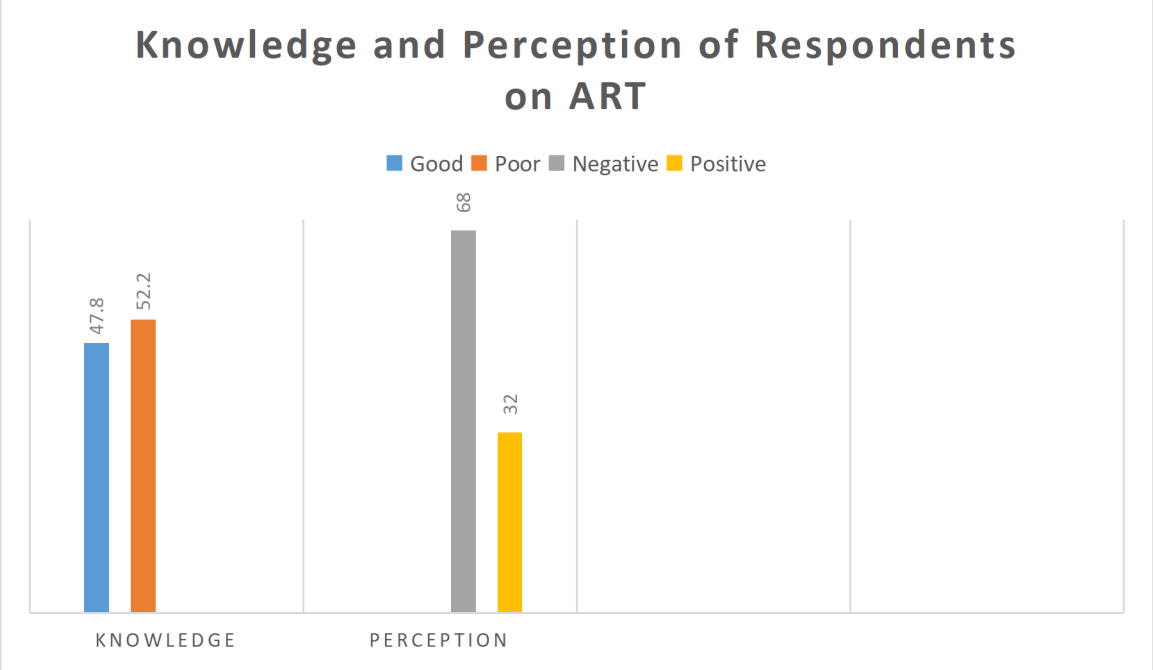

Figure 1: *Overall knowledge and perception on Assisted Reproductive Technology among participants*

Figure 1 showed that the majority of the respondents (52.2%) were not aware of assisted reproductive technology. Also, majority of the respondents (68.0%) have a negative perception towards ART.

Discussion

The respondents were within the childbearing age. The majority were married, with secondary education and were Christians. This result is similar to the study by Osian, Afemikhe, Olorunfemi & Eweka (2019) on knowledge and perception of assisted reproductive technology among women attending the University of Benin Teaching Hospital, Benin City, Nigeria 2018. Their respondents were characterized by women in the young adult age group. More than two-thirds of the women were married. Moreover, about two-thirds of their respondents had a previous university education, and Christianity was the dominating religion. Also another study by Allot, Payne & Dann (2013) on midwifery and assisted reproductive technologies in New Zealand revealed that most of their respondents were between the ages of 30-40 years and the majority were Christian.

The respondents who were aware of ART were below average. This could be related to the majority of the respondents having only secondary education. Also not having adequate education both in schools, hospitals and primary health centres, on ART, because the people to provide the education in these areas were deficient or see it as not important. This is supported by Azuike, Ikechebelu & Nnebue (2012) study in Osun with 48% level of awareness, also Okwelogu, Bello, Akinajo & Olayemi (2014) in Nigeria with 37.6% awareness level. Similarly, Iliyasu, Galadanci, Abubakar, & Bashir (2013) found that 36.1% of respondents were aware of assisted reproductive technology and only 7.6% were willing to accept it.

However other studies (Omokanye, Olatinwo, Durowade, Raji, Biliaminu & Salaudeen 2017, Osian, Afemikhe, Olorunfemi & Eweka 2019, Pourrmasumi, Mostaghaci, Sabeti & Ardian, 2016) found that most respondents were aware of ART. This could be because most of their respondents had more than secondary education and the environment where the studies took place.

In the current study majority of the respondents have a poor perception of ART. This could be related to their belief that assisted reproductive technology can lead to fetal malformation. The result is similar to that of Iliyas, Galadanci, Abubakar, & Bashir (2013) on the perception of infertility and acceptability of assisted reproduction technology in northern Nigeria where their respondent had a poor perception of IVF. The current findings were not supported by Osian, Afemikhe, Olorunfemi, & Eweka (2018) study on knowledge and perception of assisted reproductive technology among women attending the University of Benin Teaching Hospital, Benin City, Nigeria, which revealed that the respondents had a good perception of ART. Moreover, a study conducted on heterosexual English-speaking couples was carried out in 2014 to assess the perception of infertile couples about the impact of lifestyle behaviours on IVF success at the Birgham and Women's Hospital. The study identified that patients with higher levels of education ($P < 0.001$) and good income ($P < 0.01$) were less likely to consider lifestyle impactful on the success of IVF however, they discovered that sex, infertility diagnosis and socioeconomic factors impact the success of IVF (Hawkins, Rossi, Correia, Lipskind, Hornstein, Missmer, *et al* 2014).

This study discovered that the high cost of ART can lead to unacceptance, hence the majority of the respondents, identified it as a major factor influencing the use of assisted reproductive technology, followed by poor health facility. This is supported by Giwa-Osagie, Ogunyemi, Emuveyan & Akinla (2012), in their study on etiologic classification and socio-medical characteristics of infertility in 250 couples in Northern Nigeria, which revealed that only 2.7% of their subjects could afford assisted

reproductive technology, this implies that high cost of ART is a major factor that influences its use in the health facility.

The findings of this study disagree with a study conducted by Omokanye *et al*., (2017) on assisted reproduction technology: Perceptions among infertile couples in Ilorin, Nigeria, which revealed that about 63% of patients could afford assisted reproductive technology in their study, this mean that high cost is not a factor influencing the use of ART. This could be because a majority of their respondents have not had children after some years in marriage. Meanwhile, the study further stated that their local experience had shown that following counselling and referral for ART in infertile couples, those patients who have the financial capacity tend to present at the clinic whereas the converse is the case for those who cannot afford it.

The result of this study showed that there is a significant relationship between the age of childbearing women and their awareness of assisted reproductive technology with $p = 0.001$. This result agreed with the findings of Adebiyi *et al*., (2011) on awareness and perception of assisted reproductive technology practice amongst women with infertility in Northern Nigeria which also showed a significant relationship between respondents' age and their knowledge on assisted reproductive technology. The result of the study also showed there is a significant relationship between the educational level of women of childbearing age and their perception about assisted reproductive technology with $p = 0.001$. There is no significant association between the factors and the participant utilization of ART with $p \geq 0.05$.

Conclusion

There is a need to create awareness about assisted reproductive technology at the PHCs in our communities by the Community Health Nurses through health education.

Recommendations

Awareness of ART should be created through health education and public enlightenment in our communities, primary health centres and hospitals. The use of assisted reproductive technology should be taught in secondary schools to improve knowledge of assisted reproductive technology early before marriage. Government should make assisted reproductive technology accessible, available and affordable for couples at a cost-effective rate.

Conflict of Interest

The authors declare no conflict of interest in connection with this study

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