Original Article

Assisted Reproductive Technology: The Perspectives of Religious Leaders in Ogun State, South-Western Nigeria

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Abstract

Background: Infertility is a disease of the male or female reproductive system defined by the failure to achieve a pregnancy after 12 months or more of regular unprotected sexual intercourse. Prevalence is about 30.3% in Africa. In Nigeria, it is associated with emotional crises and stigmatization. Consequently, couples seek orthodox and non-orthodox treatment including assisted reproductive technology (ART) to achieve conception. ARTs have helped with about 50% of infertility cases in the Western world. However, it is yet to achieve the same feat in Africa and this has been attributed to religious hindrances among other factors. The study aims to assess the awareness, knowledge, and beliefs of religious leaders on ART. **Materials and Methods:** A descriptive cross-sectional study using questionnaires was carried out among randomly selected religious leaders above the age of 18 years using a multistage sampling technique. Data from the questionnaires were analyzed using SPSS version 22.0. Level of statistical significance was set at $P < 0.05$. **Results:** The results showed that 77.7% agreed ART is used to manage infertility, 88.2% agreed that ART can sometimes fail, and 92.3% believed their faith permits ART. All the religious platforms accepted ART. The male respondents agreed to accept adults born through ART to lead prayers in churches, mosques, and traditional settings unlike their female counterparts. **Conclusion:** Majority of followers of Christianity, Islam, and traditional religions are aware of, and accept some, but not all ARTs, and will accept children born through ART into their congregations.

Keywords: Assisted reproductive technology, infertility, *in vitro* fertilization, perspective, religious leader

Introduction

Infertility affects couples from all works of life with a varying prevalence across the world; however, a rate of 30.3% has been reported for Africa.[1] In sub-Saharan Africa, including Nigeria, male contribution had been estimated to range from 30% to 50%.[2] In most communities in Nigeria, having children is a social and cultural obligation.[3] Couples affected by infertility pursue different modalities of treatment ranging from spiritual and traditional healthcare to orthodox, medical and biotechnological interventions like artificial reproductive technology.[4]

The birth of Louise Brown, the first baby born from *in vitro* fertilization (IVF) showed the world the glaring possibility of achieving pregnancy and childbirth through methods initially thought impossible.[5] ARTs including IVF with fresh or frozen embryos as well as intra-cytoplasmic sperm injection (ICSI), have come into increasing use in Western nations since the late 1970s,[6] solving more than 50% of infertility cases.[7] There were initial doubts, refusal, and finally acceptance of this new innovation.[5] Just when people were beginning to align their socio-cultural and religious mindset to accept ART,

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scientists went further by providing solutions to infertility by incorporating gamete donation and surrogacy.

A couple with an inherent problem with their gametes (sperm or egg or both) or a genetic disorder that could be inherited by the child may decide to use donor(s). ART refers to all forms of treatment or procedures that include *in vitro* handling of human oocytes or embryos for establishing pregnancy and it includes: IVF, gamete intra-fallopian transfer (GIFT), zygote intra-fallopian transfer (ZIFT), tubal embryo transfer, gamete and embryo cryopreservation, gamete and embryo donation, and gestational surrogacy.[6] IVF is an ART procedure that involves extra-corporeal fertilization of an egg harvested from the woman and fertilized with sperm outside the body to achieve conception before the transfer of the embryo back to the uterus.[8] ART is now universally popular and major indications for its use are: treatment of infertility, gender selection, avoidance of chromosomal abnormality using pre-implantation genetic diagnosis (PGD or PIGD), and self-imposed single parenthood.[9] Religious beliefs regarding ART vary across different religious cultures. Sunni Islam allows ART in the context of marriage and medical justification without any third-party involvement such as gamete donation and surrogacy.[9] Shias are more lenient as they accept gamete donation, donor insemination, and surrogacy.[10,11]

Some Christian churches are opposed to ART but some are more fiercely opposed than others.[5] Roman Catholics disapprove of all forms of assisted reproduction though intrauterine insemination (IUI) but would accept semen collected via sexual intercourse while rejecting artificial insemination with donor sperm and surrogacy.[12] Eastern Orthodox churches allow IUI with the husbands' semen but kick against IVF and other forms of ART involving gamete and embryo donation as well as surrogacy.[13]

Historically, child-bearing is seen as an important parental role and infertility is culturally distasteful among African communities.[4] Infertility has implications beyond childlessness as it has significant emotional, psychological, and spiritual effects on couples who most of the times are under immense pressure from family, friends, and neighbors. The cumulative effects of infertility can lead to aggressive sometimes deleterious health-seeking behavior ranging from spiritual, traditional and orthodox medical care including ART.[4] Gamete donation and surrogacy provide a relatively novel alternative for infertile couples but their socio-cultural and religious acceptability is oftentimes a hindrance. There are few literatures assessing the perspectives of spiritual leaders on ART. Their views shape the ways and thinking of the majority of the people. It is in this light that the present study seeks to "Assess the awareness, knowledge, and beliefs of religious leaders on ART including gamete donation and surrogacy" and by so doing have a better understanding from the perspective of the religious leaders.

Materials and Methods

Study area

Abeokuta is the capital city of Ogun state and is located in the South-Western part of Nigeria. It is situated 74km North of Lagos on the east bank of Ogun River.[14] The city is famously known for its traditional style of hand-woven cotton cloth known as "Adire," which is dyed with locally produced indigo.

Abeokuta has a population of about 557,000 people[15] with most of its inhabitants being "Egba," a sub-group of the Yoruba people; other tribes include Hausa and Igbo. Abeokuta town is made up of two local government areas: Abeokuta North and Abeokuta South. The predominant religions are Christianity and Islam although a certain level of traditional religion is still being practiced. Christianity was brought into Abeokuta by the Baptist and Anglican missionaries from Great Britain in the 1840s[14,16] whereas Islam was introduced in the course of commercial exchange between the Egbas, Arab traders, and Malian Muslims. According to a recent survey, the proportion of the Muslim population in Nigeria is found to be 53.5%, Christian 45.9%, and other Traditional religions 0.6%.[17]

Study design

This is a descriptive cross-sectional study that was conducted in Abeokuta. The questionnaire measured the awareness, knowledge, and beliefs of religious leaders on different types of ART.

Study population

This study was carried out among religious leaders in Abeokuta who are above the age of 18 years and in the mainstream Christian, Islamic, and Traditional sects.

Sample size determination

The minimal sample size for the study was determined using the Leslie Fischer's formula[18]

$$n = \frac{z^2 pq}{d^2},$$

n—minimum sample size, z—standard normal deviation set at 1.96 for 95% confidence interval, p—prevalence of infertility in a previous study (30.3%)[1] (the prevalence of infertility in a rural community, south-west, Nigeria), $q = 1 - p$, d—desired level of precision (0.05)

$$n = \frac{(1.96)^2 \times 0.303 \times 0.697}{(0.05)^2},$$

n = 325, 10% non-response = 325/0.9 ≃ 363.

Sampling technique

A multistage sampling technique was employed.

Stage 1: Selection of religious communities; a simple random sampling technique was used to select 1/3 of all

the three main religious bodies that is Christian, Muslim, and traditional sects.

Stage 2: Proportional allocation of samples to the selected religious organization.[19]

$$\text{Proportional allocation} = \frac{\text{Population of selected communities}}{\text{Total population of communities}} \times \text{Sample size.}$$

Using the proportional allocation formula, proportion of Muslim 53.5% = 194; Christian 45.9% = 167, and Traditional religion 0.6% = 2.[17]

Clustered sampling technique was used for the selection of final respondents from all the categories of religious groups.

Stage 3: Selection of respondents; the first respondent was selected using simple random sampling technique, subsequently, the calculated sampling interval was used to determine the selection of respondents until all samples proportionally had been completed. Where a selected respondent refuses to participate in the study, the next number was picked and the sampling interval was maintained until all samples were completed.

Data collection instrument

A semi-structured interviewer-administered questionnaire was used to collect data. The questionnaire was designed to elicit information on the socio-demographic characteristics, awareness, knowledge, and beliefs of religious leaders on ART including gamete donation and surrogacy.

Data collection and analysis

The research instrument was pretested among religious leaders in Sagamu town, about 54 kilometers south of Abeokuta. This was to ensure the validity and reliability of the instrument. The pretested instrument was analyzed and necessary modifications made. Knowledge of respondents was assessed through a 3-point Likert scale measurement: agree, disagree, and don't know. The adopted Likert scale was used in developing a 7-point knowledge score.[20] All positive knowledge statements were allotted 1 point while all negative knowledge statements were allotted 0. Scores <4 and >4 were categorized as "Poor Knowledge" and "Good Knowledge" respectively.[20]

Four research assistants who were fluent in English and Yoruba (the local language) were recruited and trained for a period of two days. A Yoruba version of the questionnaire was prepared for the uneducated respondents to reduce the inter-observers' variation in interpretation during the interview.

Each questionnaire was checked on the field for completeness. They were later sorted, cleaned, coded, and entered into a computer. Analysis was performed using the IBM/Statistical Package for Social Sciences (IBM/SPSS) version 22 software (IBM Corp., Armonk, NY, USA). The analysis consisted of descriptive and inferential statistics (Chi-square test) with the level of significance set at $P < 0.05$.

Ethical considerations

Ethical approval for the study was obtained from the Ethical Review Committee, Ogun State Ministry of Health with Ethical approval number—HPRS/381/457. Permission was sought from the heads of the various religious bodies. The purpose and benefits of the study were explained accordingly. Informed written consent was also obtained (signature or thumbprint) from the study subjects before conducting interview. Confidentiality of information provided was maintained.

Results

Table 1 shows that three hundred and sixty-three (363) religious leaders participated in this study. The mean age of the respondents was 49.2 ± 12.2 years. Majority of the respondents were men accounting for 272 (74.9%) of the total respondents, similarly most of the respondents 194 (53.5%) were Muslims. In addition, majority of the religious leaders had tertiary education 223 (61.4%), whereas 108 (29.8%) had secondary education only seven (2.0%) had additional faith-based qualifications. Majority of the respondents 232 (63.9%) had spent 5–10 years as religious leaders in their various denominations. The mean duration of marriage was 15.8 ± 9.9 years while the mean number of children had by the respondents was 3.7 ± 2.4. The awareness of religious leaders is illustrated in Table 2: 26 (62.3%) of the religious leaders were aware of where the ART services are provided; of this number 170 (75.2%) were aware of where gamete donation is done; 99 (43.8%) reported being aware of where surrogacy services are provided while majority of the respondents 216 (59.5%) had never seen a baby born through ART.

Figure 1 shows the knowledge assessment of the respondents, 62% agreed surrogacy is a method used in ART, 78% agreed ART sometimes uses donated eggs or sperm, 67.2% agreed IVF involved fertilization of female egg and male sperm in the laboratory to form an embryo and then inserted back. About 49.3% disagreed when asked if ART involved having sexual intercourse to be able to conceive, 47.4% agreed ART can be used to treat low sperm count in males, and 88.2% agreed ART can sometimes fail when used.

Table 3 shows that almost all religious leaders 335 (92.3%) believed their faith permits ART. About 302 (22.9%) were in support of IVF, ICSI accounted for 278

Table 1: Social demographic characteristics of respondents

Variables	Frequency (n = 363)	Percent (%)
Age		
<35	43	11.8
35–49	151	41.6
50–64	127	35.0
>64	42	11.6
Mean ± SD	49.2 ± 12.2	
Gender		
Male	272	74.9
Female	91	25.1
Religion		
Islam	194	55.4
Christianity	167	45.9
Traditional	2	0.6
Religious denomination/sect (n = 168)		
Pentecostal	50	29.8
Celestial	41	24.4
Jehovah witness	31	18.5
Catholic	19	11.3
Anglican	14	8.3
Cherubim and Seraphim	8	4.8
The Apostolic Church	3	1.8
Baptist	2	1.2
Years as a religious leader		
<1	10	2.8
1–4	65	17.9
5–10	232	63.9
>10	56	15.4
Number of followers		
<100	53	14.6
101–200	137	37.7
201–300	121	33.3
301–400	28	7.7
401–500	14	3.9
>500	10	2.8
Marital status		
Single	34	9.4
Married	307	84.6
Divorced	10	2.8
Widowed	11	3.0
Separated	1	0.3
Years in marriage (n = 307)		
0–5	46	15.0
6–11	80	26.1
12–17	60	19.5
18–23	65	21.2
>23	56	18.2
Mean ± SD	15.8 ± 9.9	
Ethnicity		
Yoruba	263	72.5
Hausa	48	13.2
Igbo	32	8.8
Others	19	5.5

Table 1: Continued

Variables	Frequency (n = 363)	Percent (%)
Number of children		
0–2	99	32.1
3–5	160	52.1
>5	48	15.6
Mean ± SD	3.7 ± 2.4	
Educational status		
No formal education	3	0.8
Primary	22	6.1
Secondary	108	29.8
Tertiary	223	61.4
Others	7	2.0

Table 2: Awareness of religious leaders on ART, gamete donation, and surrogacy

Variables	Frequency (n = 363)	Percentage (%)
Have you heard of ART before		
Yes	344	94.8
No	19	5.2
Knowledge score		
Good		74
Fair		15
Poor		11
** Through which medium/media		
Health workers	310	22.2
Family/friends	280	20.0
Television	236	16.9
Social media	210	15.0
Radio	190	13.6
Newspapers/magazine	171	12.3
** Awareness of ART type(s)		
IVF	336	30.3
ICSI	215	19.4
Surrogacy	210	19.0
Gamete donation	180	16.2
GIFT	87	7.9
ZIFT	80	7.2
	Yes	No
Aware of where service is provided	226 (62.3)	137 (37.7)
Place offers gamete donation (n = 226)	170 (75.2)	56 (24.8)
Place offers surrogacy service (n =226)	99 (43.8)	127 (56.2)
Seen baby born through ART (n = 363)	147 (40.5)	216 (59.5)
Involved gamete donation (n = 147)	65 (44.2)	82 (55.8)
Involved surrogacy (n = 147)	21 (14.3)	126 (85.7)

**Multiple responses allowed

(21.1%), GIFT accounted for 228 (17.3%), while the least supported was surrogacy which accounted for 1 19 (9.0%).

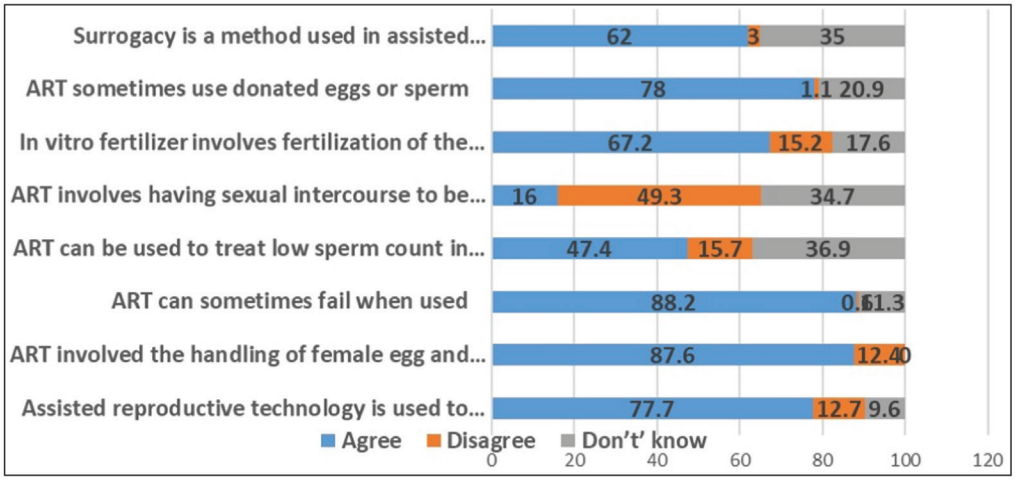

Figure 1: Knowledge questions on ART, gamete donation, and surrogacy

Table 3: Beliefs of religious leaders regarding ART, gamete donation, and surrogacy

Variables	Frequency	Percentage (%)
Religion permits ART		
Yes	335	92.3
No	22	6.1
Not sure	6	1.7
If yes, what type		
IVF	302	22.9
ICSI	278	21.1
GIFT	228	17.3
ZIFT	214	16.3
Gamete donation	175	13.3
Surrogacy	119	9.0
Ever preached about ART, gamete donation and surrogacy		
Yes	240	66.1
No	123	33.9
Frequency of preaching (n = 240)		
Once in a month	52	21.7
Once in a year	118	49.2
Once in 2 years	66	27.5
Once in 5 years	4	1.6
Belief any of the following is / are sin(s)m		
Surrogacy	138	45.0
Gamete donation	112	36.5
IVF	28	9.1
ICSI	15	4.9
GIFT	7	2.3
ZIFT	7	2.3
** Accept children born through ART into your congregation		
	Yes	No
ICSI	338	17.4
GIFT	335	17.3
ZIFT	324	16.7
Gamete donation	320	16.5
Surrogacy	314	16.2
IVF	307	15.8

Table 3: Continued

Variables	Frequency	Percentage (%)
** Appoint adults born through ART to lead prayers in your church or mosque		
	Yes	No
ICSI	346	17.6
IVF	345	17.6
GIFT	331	16.9
ZIFT	324	16.5
Gamete donation	317	16.1
Surrogacy	300	15.3

**Multiple responses allowed

Respondents agreed that children born through ICSI 338 (17.4%), GIFT 335 (17.3%), and ZIFT 324 (16.3%) methods of ART will be accepted into their congregation. Association between selected sociodemographic variables and belief on ART is shown in Table 4, the age of respondents and their belief in ART was statistically significant at a P value of 0.018, also religion was found to be statistically significant with belief in ART at a P value of 0.001 similarly denomination and belief in ART was also found to be statistically significant at a P value of 0.001. Table 5 shows that religion and accepting children delivered through ART were statistically significant at a P value of 0.004, similarly years as a religious leader and accepting children delivered through ART also was statistically significant at a P value of 0.001. Table 6 shows that appointment of adults delivered through ART to lead prayers and years as a religious leader was statistically significant at a P value of 0.001, similarly appointment of adults delivered through ART to lead prayers and number of followers was also statistically significant at a P value of 0.004.

Discussion

Religion plays a major role in people's attitudes toward ART and various religions have reacted in diverse ways to it, ranging from total acceptance to total rejection.[5] Respondents were drawn from the major religious bodies

Table 4: Association between selected demographic variables and belief on ART

Variables	Does your religion permits ART				Have you ever preached about ART, gamete donation, and surrogacy		
	Yes *N* (%)	No *N* (%)	Not sure *N* (%)	*P* value	Yes *N* (%)	No *N* (%)	*P* value
Age				0.018			0.002
<35	36 (9.9)	5 (1.4)	2 (0.6)		18 (5.0)	25 (6.9)	
35–49	134 (36.9)	13 (3.6)	4 (1.1)		101 (27.8)	50 (13.8)	
50–64	123 (33.9)	4 (1.1)	0 (0.0)		94 (25.9)	33 (9.1)	
>64	42 (11.6)	0 (0.0)	0 (0.0)		27 (7.4)	15 (4.1)	
Gender				0.080			0.430
Male	249 (68.6)	20 (5.5)	3 (0.8)		181 (49.9)	91 (25.1)	
Female	86 (23.7)	2 (0.6)	3 (0.8)		59 (16.3)	32 (8.8)	
Religion				0.001			0.223
Christianity	141 (38.8)	21 (5.8)	6 (1.7)		116 (32.0)	52 (14.3)	
Islam	191 (52.6)	1 (0.3)	0 (0.0)		121 (33.0)	71 (19.6)	
Traditional	3 (0.8)	0 (0.0)	0 (0.0)		3 (0.8)	0 (0.0)	
Denomination				0.001			0.002
Celestial	38 (22.6)	1 (0.6)	2 (1.2)		28 (16.7)	13 (7.7)	
Catholic	1 (0.6)	18 (10.7)	0 (0.0)		6 (3.6)	13 (7.7)	
Pentecostal	45 (26.3)	2 (1.2)	3 (1.8)		33 (19.6)	17 (10.1)	
Anglican	13 (7.7)	0 (0.0)	1 (0.6)		10 (6.0)	4 (2.4)	
Baptist	2 (1.2)	0 (0.0)	0 (0.0)		1 (0.6)	1 (0.6)	
Jehovah witness	31 (18.5)	0 (0.0)	0 (0.0)		29 (17.3)	2 (1.2)	
Cherubim & Seraphim	8 (4.8)	0 (0.0)	0 (0.0)		7 (4.2)	1 (0.6)	
Apostolic church	3 (1.8)	0 (0.0)			2 (1.2)	1 (0.6)	
Years as a religious leader				0.062			
<1 year	7 (1.9)	2 (0.6)	1 (0.3)		5 (1.4)	5 (1.4)	0.060
1–4	57 (15.7)	7 (1.9)	1 (0.3)		39 (10.7)	26 (7.2)	
5–10	219 (60.3)	10 (2.8)	3 (0.8)		151 (41.6)	81 (22.3)	
>10	52 (14.3)	3 (0.8)	1 (0.3)		45 (12.4)	11 (3.0)	
Number of followers				0.216			0.264
<100	44 (12.1)	7 (1.9)	2 (0.6)		32 (8.8)	21 (5.8)	
101–200	125 (34.4)	8 (2.2)	4 (1.1)		99 (27.3)	38 (10.5)	
201–300	117 (32.2)	4 (1.1)	0 (0.0)		79 (21.8)	42 (11.6)	
301–400	26 (7.2)	2 (0.6)	0 (0.0)		14 (3.9)	14 (3.9)	
401–500	13 (3.6)	1 (0.3)	0 (0.0)		9 (2.5)	5 (1.4)	
>500	10 (2.8)	0 (0.0)	0 (0.0)		7 (1.9)	3 (0.8)	

in Nigeria with Islam 55.4%, Christianity 45.9%, and traditionalist 0.6% with a mean age of 49.2±12.2 years. A similar study in Ghana[21] reported age range between 20 and 59 years with most of the respondents between the 30–49 age bracket.[21] Majority of the respondents had tertiary education 61.4%, and only 7 (2.0%) had additional faith-based qualifications. Education of a religious leader is important, as this gives them a broader perspective and deeper understanding of concepts such as infertility.[22]

This study found knowledge of ART among our respondents to be 94.8%, knowledge about IVF was 30.3%, ICSI was 19.4%, surrogacy was 19.0%, and the least knowledge was for ZIFT at 7.2%. This is similar to the findings of Orhue and Aziken[23] who also reported IVF as having the highest knowledge among participants in their study. Preference for this technology they suggested could be related to the level of awareness and non-complex nature of this procedure which is also widely adopted in Europe and the USA.[24]

The knowledge of procreation from the perspective of Christian and Islamic faiths are similar due to their preconception of a common creator of the universe (God)[25] and this explains why majority of the religious leaders in these sect embrace ART.[26] Ott[22] reported that Jewish and Christian scriptures present procreation as a mark of religious duty that Adam and Eve were told to be fruitful and multiply (Gen 1:28), the Qur'an also describes Allah as the one who bestows children or chooses to leave women barren (Qur'an 42.49–50).[22,27]

Specific knowledge assessment in this study revealed that 62% knew surrogacy is a method of ART, 78% knew ART sometimes uses donated eggs or sperm, 67.2% knew IVF involves fertilization of female egg and male sperm in the laboratory to form an embryo and then reintroduced to

Table 5: Association between socio-demographic variables and accepting children delivered through ART

Variables	Can you accept children delivered through the following mean(s) into your congregation						
	IVF	ICS	GIFT	ZIFT	Gamete donation	Surrogacy	*P*-value
Age							0.381
<35	40 (13.0)	38 (11.2)	38 (11.3)	38 (11.7)	39 (12.2)	37 (11.8)	
35–49	121 (39.4)	140 (41.4)	138 (41.2)	131 (40.4)	132 (41.3)	130 (41.4)	
50–64	109 (35.5)	119 (35.2)	118 (35.2)	115 (35.5)	111 (34.7)	109 (34.7)	
>64	37 (12.1)	41 (12.1)	41 (12.2)	40 (12.3)	38 (11.9)	38 (12.1)	
Gender							0.050
Male	222 (72.3)	253 (74.9)	250 (74.6)	243 (75.0)	239 (74.7)	233 (74.2)	
Female	85 (27.7)	85 (25.1)	85 (25.4)	81 (25.0)	81 (25.3)	81 (25.8)	
Religion							0.004
Christianity	146 (47.6)	153 (45.3)	151 (45.1)	149 (46.0)	152 (47.5)	147 (46.8)	
Islam	158 (51.5)	182 (53.8)	181 (54.0)	173 (53.4)	166 (51.9)	164 (52.2)	
Traditional	3 (1.0)	3 (0.9)	3 (0.9)	2 (0.6)	2 (0.6)	3 (1.0)	
Denomination							0.615
Celestial	35 (24.0)	38 (24.8)	38 (25.2)	38 (25.2)	39 (25.7)	37 (25.2)	
Catholic	15 (10.3)	15 (9.8)	13 (8.6)	13 (8.7)	14 (9.2)	14 (9.5)	
Pentecostal	44 (30.1)	46 (30.1)	46 (30.5)	45 (30.2)	45 (29.6)	44 (29.9)	
Anglican	14 (9.6)	14 (9.2)	13 (8.6)	12 (8.1)	13 (8.6)	12 (8.2)	
Baptist	2 (1.4)	2 (1.3)	2 (1.3)	2 (1.3)	2 (1.3)	2 (1.4)	
Jehovah witness	26 (17.8)	27 (17.6)	28 (18.5)	28 (18.8)	28 (18.4)	27 (18.4)	
Cherubim & Seraphim	8 (5.5)	8 (5.2)	8 (5.3)	8 (5.4)	8 (5.3)	8 (5.4)	
Apostolic church	2 (1.4)	3 (2.0)	3 (2.0)	3 (2.0)	3 (2.0)	3 (2.0)	
Years as a religious leader							0.001
<1 year	10 (3.3)	9 (2.7)	8 (2.4)	7 (2.2)	7 (2.2)	8 (2.5)	
1–4	60 (19.5)	61 (18.0)	60 (17.9)	59 (18.2)	59 (18.4)	57 (18.2)	
5–10	185 (60.3)	215 (63.6)	214 (63.9)	205 (63.3)	202 (63.1)	198 (63.1)	
>10	52 (16.9)	53 (15.7)	53 (15.8)	53 (16.4)	52 (16.3)	51 (16.2)	
Number of followers							0.243
<100	48 (15.6)	50 (14.8)	48 (14.3)	47 (14.5)	48 (15.0)	49 (15.6)	
101–200	116 (37.8)	125 (37.0)	126 (37.6)	125 (38.6)	124 (38.8)	119 (37.9)	
201–300	95 (30.9)	112 (33.1)	112 (33.4)	105 (32.4)	104 (32.5)	103 (32.8)	
301–400	25 (8.1)	27 (8.0)	26 (7.8)	25 (7.7)	23 (7.2)	23 (7.3)	
401–500	13 (4.2)	14 (4.1)	13 (3.9)	12 (3.7)	12 (3.8)	11 (3.5)	
>500	10 (3.3)	10 (3.0)	10 (3.0)	10 (3.1)	9 (2.8)	9 (2.9)	

the uterus. Islam recognizes infertility as a crucial difficulty and encourages its believers to pursue legal treatment, as it would with any type of illness.[28] A study done in Ecuador[29] reported that despite the existence of strong Catholic sentiments for both patients and practitioners, this did not influence the acceptance of IVF, necessitating the recruitment of more religious leaders to aid in the enlightening the citizens on ART.[29] Good knowledge was also noted in a study among Ghanaians.[21]

This study also explored the relevance of various technological methods and the beliefs of different religious bodies on the acceptance of these methods and found that almost all religious leaders 92.3% acknowledge that their faith permits ART and 66.1% had preached in support of ART in the last year. Surrogacy 45.0% and gamete donation 36.5% top the list of ART methods believed to be sinful among our study population. This is contrary to the views of Larijani and Zahedi,[30] who opined that surrogacy is not permitted for most Sunni jurists. According to them it would be illegitimate because it involves a third party which the husband was not legally married to, and would be deemed as violating Islamic Laws.[30,31] Another study done in Iran was of the opinion that in Islam, reproduction outside of marriage is considered adultery (Zina), which is strictly forbidden in Islam. Another study noted that there is the potential for incest among the offspring of unknown donors.[30] The views of the Roman Catholic Church were more exertive in a report entitled "Respect for Human Life and the Dignity of Procreation" which states that "Children are a gift and a blessing from God and that although science makes some things possible it does not make them right. Consequently, all forms of ART and surrogate motherhood are not accepted and are considered sinful.[20,32]

Table 6: Association between socio-demographic variables and appointment of adults delivered through ART to lead prayers

Variables	Can you appoint adults born through the following mean(s) to lead prayers in your church or mosque?						
	IVF	ICS	GIFT	ZIFT	Gamete donation	Surrogacy	*P*-value
Age							0.478
<35	42 (12.2)	41 (11.8)	38 (11.5)	37 (11.4)	39 (12.3)	37 (12.3)	
35–49	142 (41.2)	141 (40.8)	136 (41.1)	133 (41.0)	132 (41.6)	125 (41.7)	
40–64	119 (34.5)	123 (35.5)	117 (35.3)	114 (35.2)	108 (34.1)	105 (35.0)	
>64	42 (12.2	41 (11.8)	40 (12.1)	40 (12.3)	38 (12.0)	33 (11.0)	
Gender							0.391
Male	258 (74.8)	260 (75.1)	248 (74.9)	243 (75.0)	235 (74.1)	219 (73.0)	
Female	87 (25.2)	86 (24.9)	83 (25.1)	81 (25.0)	82 (25.0)	81 (27.0)	
Religion							0.000
Christianity	158 (45.8)	156 (45.1)	152 (45.9)	150 (46.3)	153 (48.3)	149 (49.7)	
Islam	184 (53.3)	187 (54.0)	176 (53.2)	171 (52.8)	162 (51.1)	149 (49.7)	
Traditional	3 (0.9)	3 (0.9)	3 (0.9)	3 (0.9)	3 (0.9)	2 (0.7)	
Denomination							0.454
Celestial	39 (24.7)	39 (25.0)	38 (25.0)	38 (25.0)	39 (25.5)	37 (24.8)	
Catholic	16 (10.1)	15 (9.6)	13 (8.6)	13 (8.7)	14 (9.2)	14 (9.4)	
Pentecostal	48 (30.4)	47 (30.1)	47 (30.9)	46 (30.7)	46 (30.1)	45 (30.2)	
Anglican	14 (8.9)	14 (9.0)	13 (8.6)	12 (8.0)	13 (8.5)	12 (8.1)	
Baptist	2 (1.3)	2 (1.3)	2 (1.3)	2 (1.3)	2 (1.3)	2 (1.3)	
Jehovah witness	28 (17.7)	28 (17.9)	28 (18.4)	28 (18.7)	28 (18.3)	28 (18.8)	
Cherubim & Seraphim	8 (5.1)	8 (5.1)	8 (5.3)	8 (5.30	8 (5.2)	8 (5.4)	
Apostolic church	3 (1.9)	3 (1.9)	3 (1.9)	3 (2.0)	3 (2.0)	3 (2.0)	
Years as a religious leader							0.001
<1 year	10 (2.9)	9 (2.6)	7 (2.1)	7 (2.2)	7 (2.2)	8 (2.7)	
1–4	62 (18.0)	62 (17.9)	59 (17.8)	59 (18.2)	60 (18.9)	57 (19.0)	
5–10	219 (63.5)	222 (64.2)	212 (64.0)	205 (63.3)	198 (62.5)	189 (63.0)	
>10	54 (15.7)	53 (15.3)	53 (16.0)	53 (16.4)	52 (16.4)	46 (15.3)	
Number of followers							0.004
<100	51 (14.8)	50 (14.5)	48 (14.5)	48 (14.8)	48 (15.1)	45 (15.0)	
101–200	130 (37.7)	129 (37.3)	124 (37.5)	123 (38.0)	124 (39.1)	120 (40.0)	
201–300	115 (33.3)	116 (33.5)	110 (32.2)	106 (32.7)	101 (31.9)	98 (32.7)	
301–400	26 (7.5)	27 (7.8)	26 (7.9)	25 (7.7)	23 (7.3)	22 (7.3)	
401–500	13 (3.8)	14 (4.0)	13 (3.9)	12 (3.7)	12 (3.8)	10 (3.3)	
>500	10 (2.9)	10 (2.9)	10 (3.0)	10 (3.1)	9 (2.8)	5 (1.7)	

With regards to acceptance into the congregation, this study found that 17.4%, 17.3%, and 16.3% of the religious leaders will accept children born through ICSI, GIFT, and ZIFT into their congregation, respectively. Similarly, the study found ICSI 17.6%, IVF 345 17.6%, GIFT 16.9%, and ZIFT 16.5% of adults born through these ART methods will be appointed to lead prayers in either churches or mosques, the least permitted adult to lead prayer was surrogacy with 15.3%. The views expressed by most respondents were at variance to write-ups by renowned scholars, Qiao *et al.*[33] who opined that the practice of IUI, IVF, ICSI, cryopreservation, and PGD are allowed in China, but certain procedures are prohibited such as sex selection without medical indication, surrogate motherhood, embryo donation, gamete donation and human reproductive cloning.[33] Mansooreh *et al.*[34] reported that the Islamic Sunni sect does not accept the engagement of a third-party gamete, or its product of conception, in a similar respect. Inhorn[35] noted that several religious decrees or fatwas—mainly considered as the ethical regulations among Muslims—have been issued by Sunni institutions in the United Arabic Emirates, Qatar, Kuwait, and Saudi Arabia, which mostly supports IVF treatment, while prohibiting third-party ARTs in those Muslim societies.[35] Similar to findings from this study many Shi'a Muslims also hold a liberal view towards modern ARTs and allow certain flexibility and pragmatism towards the third-party egg, sperm, embryo and uterus donation.[36] It is reported in the early 1990s in Iran, Ayatollah Khamenei, the supreme leader, decreed a positive fatwa and allowed infertile couples to use all forms of donor technologies.[37]

Furthermore, Olorunfemi *et al.*[38] in Benin City, South-south, Nigeria reported that religion, level of education, and cultural background were the variables that could affect the acceptability rate of babies produced by ART in their study; our study found male gender, and leadership

of 5–10 years in religious setting as variables associated with acceptability and allowing adults born through ART to lead, this is also in agreement with Chamsi-Pasha and Al-Bar[39] which stated that all ARTs are allowed, provided that the source of the sperm, ovum, and uterus comes from a legally married couple during the span of their marriage.

This study found that the level of knowledge and believes of leaders with more than 10 years leadership experience were more predisposed to accepting children delivered through ARTs, despite the fact that the area covered by the study is dominated by Muslims and Christian some of whose faith contradicts the use of ARTs in the treatment of infertility. It was a surprise, that most of them consented to accept and allow children born from ART to lead their congregation. Nevertheless, this study was faced with some limitations that subsequently influenced the outcome of our findings such challenge is the understanding of the various forms of ARTs by our respondent especially when there was no previous training of the religious leaders on this very critical but important field of knowledge.

Conclusion and Recommendation

There are increasing knowledge, awareness, and acceptance of ART as shown by the fact that majority of our respondents especially Muslim clerics and Protestant Christians agreed to accept and allow children born through ART into their congregation and in some places allow such children to lead the congregation, this will likely get better overtime as more individuals and religious leaders accept ARTs as a solution to infertility. We, therefore, recommend more enlightenment through social media, print media, advocacies as well as outreaches among the local population and community to further understand the science behind ART which will ultimately aid the spiritual leaders proffer the right and appropriate methods for their followers to ensure spiritual, moral and family harmony.

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Conflicts of interest

There are no conflicts of interest.

Authors' contribution

O.S. Jimoh (guarantor): concept, design of study, literature search, literature search.

A.K. Ahmed (guarantor): design of study, manuscript draft and definition of intellectual content.

H.O. Jimoh-Abdulghaffaar: manuscript draft, statistical analysis and revision.

M.A. Adeniyi: manuscript preparation, editing, analysis and interpretation of data.

I.A. Egua and A.O. Animashaun: data collection, and analysis.

A. Ahmed and S. Gwadabe: manuscript editing and review.

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