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ISLAMIC ETHICS AND INFERTILITY TREATMENT

THE STRUGGLE TO CONCEIVE: AN ISLAMIC APPROACH

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WISH 2020 Forum on Islamic Ethics and Infertility Treatment

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FOREWORD

Assisted reproductive technologies (ARTs) represent a perfect case to demonstrate that biomedical technologies do not work in a vacuum. In the midst of the expanding pool of ARTs, many aspiring parents struggle to strike a balance between their desire to have children and their concern about possible violations of their core values that help them make sense of their lives. Muslim individuals and societies are no exception in this regard.

Shortly before the establishment of fertility clinics in the Muslim world in the 1980s, Muslim religious scholars and biomedical scientists started interdisciplinary moral deliberations on ARTs. For the WISH Summit 2020, as part of their long-term interest in examining the interplay of biomedical sciences and Islamic ethics, WISH collaborates with the Research Center for Islamic Legislation and Ethics to study some of the challenging moral questions triggered by ARTs.

We hope that this study will provide a wide range of audiences, especially healthcare professionals and policymakers, with a scholarly, informative and practical guide to better understand how ARTs intersect with the moral world in the Islamic tradition. The aim is to help them provide culturally sensitive services that meet the religio-moral needs of Muslim individuals and societies.

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EXECUTIVE SUMMARY

Assisted reproductive technologies (ARTs) have benefited many couples worldwide. Biomedical scientists have been working on medical and scientific issues to improve the safety and efficacy of these new technologies. At the same time, ethicists have been grappling with the related moral complexities and questions to ensure that people who are assisted to have children will not be forced to compromise their core values or principles.

As in other places in the world, many Arab and Muslim countries benefited from the revolution in ARTs. Parallel to these developments, Muslim religious scholars collaborated with biomedical scientists to address the related moral questions from an Islamic perspective. This interdisciplinary collaboration produced a rich religio-moral discourse on ARTs.

This study is aimed at healthcare professionals who work in the ART field, especially those who work in the Muslim world, or who have patients with a Muslim background. The report concludes that, while the questions raised by ARTs inspire diverse opinions across the Islamic moral tradition, there is agreement on some of the major issues.

We hope that this study will benefit healthcare professionals and their patients by helping healthcare policymakers and legislators fill the gaps in existing legislation, and develop regulatory frameworks that align with the religioethical fabric of Muslim societies.

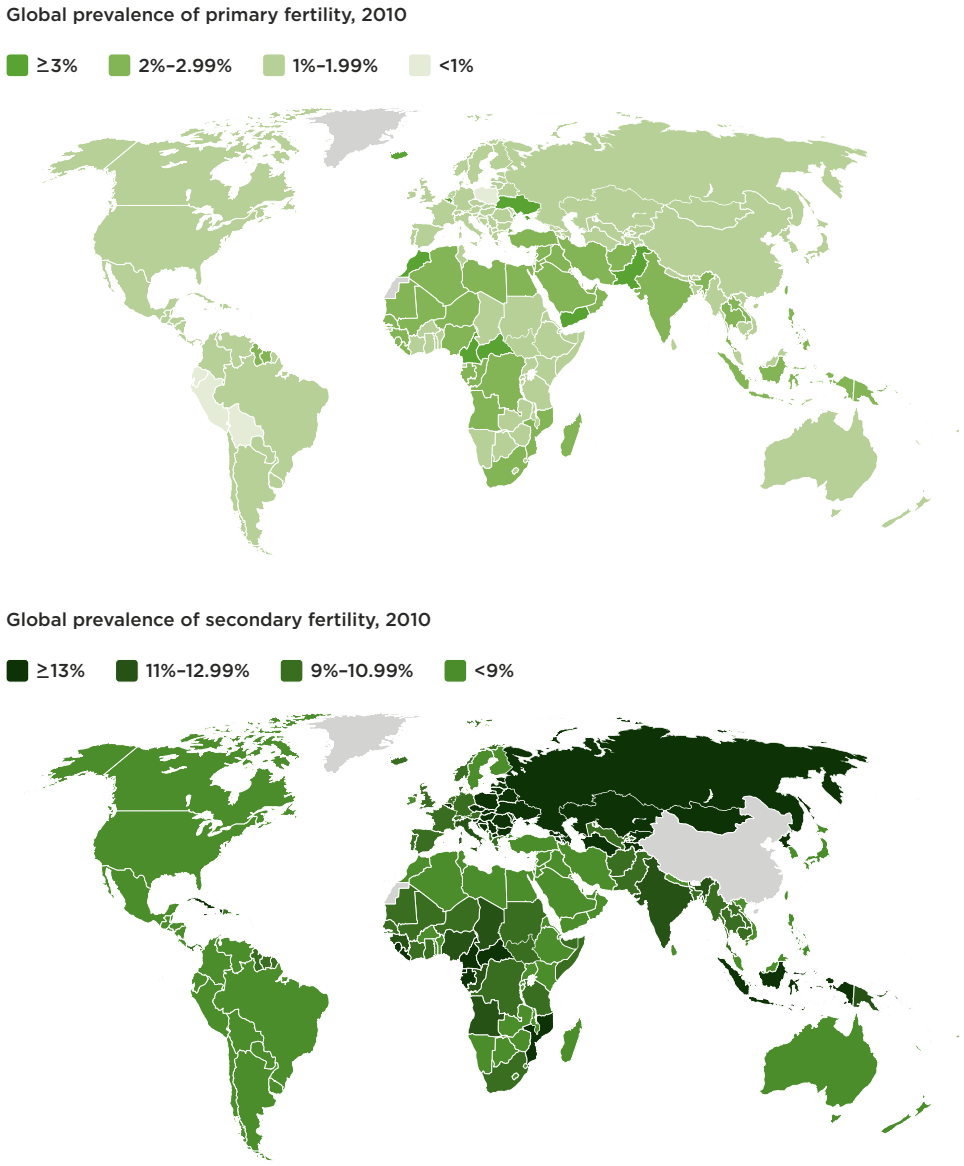
Section 1 of the report gives an historical overview of ARTs in Qatar and the Gulf Region. Section 2 focuses on the Islamic ethical perspectives and delineates the overall moral world of procreation in the Islamic tradition, and examines how far ARTs are compatible with this moral world. Section 3 presents our key recommendations and conclusions.

SECTION 1. HISTORICAL OVERVIEW OF ASSISTED REPRODUCTIVE TECHNOLOGIES (ARTs) IN QATAR AND THE GULF REGION

Infertility is defined as a couple's inability to conceive after a year of trying if the female partner is younger than 35, or after six months of trying in women older than 35.[1,2] Infertility has long been considered a social stigma, with perceptions of social exclusion more significantly pronounced for female partners.[3] Infertility has also been proven to have negative effects on the mental health of those affected, as well as the relationship of the infertile couple.[4,5,6]

Primary infertility, according to the World Health Organization (WHO), is the term used when a woman has never conceived, while secondary infertility refers to the inability to conceive after having at least one successful pregnancy.[7] Worldwide, about 10 to 15 percent of couples experience infertility.[8,9] According to one study published in 2010, about 2 percent of women worldwide aged 20 to 44 years had experienced primary infertility, while 10.5 percent had experienced secondary infertility.[10] However, these rates vary widely by country and region, and are not easily comparable due to differences in the definitions of infertility, and in study populations, which can vary by age range, relationship status and measurement units used.[11] Some regions have a particularly high prevalence of primary infertility, with a low prevalence of secondary infertility, for example, the Middle East and North Africa, and more notably Morocco and Yemen. While other regions have a higher rate of secondary infertility compared to primary, such as Central and Eastern Europe and Central Asia.[12] In Qatar specifically, the prevalence of primary infertility was 2.1 percent and secondary infertility 3.2 percent.[13]

Figure 1. Global prevalence of primary and secondary infertility, 2010



Source: Mascarenhas et al. (2012)[14]

Risk factors

There are a number of factors linked to infertility risk. The most common is age. For women, fertility declines gradually, especially during and after her mid-30s.[15] Age also increases the risk of disease onset in reproductive organs that may cause infertility, such as leiomyoma and tubal disease. Advanced age is also accompanied by significant increases in the rates of aneuploidy and miscarriage.[16] Similarly, male fertility declines with age, though the effect is not considered significant until the age of 40.[17]

Other risk factors for infertility are attributed to genetics, infectious diseases and lifestyle choices. Clinically, infertility can be ascribed to anomalies in the male or female reproductive systems, either individually or together as a couple.

Female infertility can be due to polycystic ovary syndrome, premature ovarian failure, hormonal disorders, endometriosis, congenital uterine anomalies, fallopian tube obstruction and other medical complications, such as thyroid disorders and diabetes.[18,19] Male infertility can be attributed to hormonal imbalances and sperm abnormalities. Environmental exposures and lifestyle choices also play a significant role.

Women who smoke are more likely to experience miscarriages and tubal pregnancies, while men who consume alcohol and/or smoke have, on average, lower sperm counts. The risk of infertility also increases with an increased body weight, history of sexually transmitted infections, and for women who have experienced irregular menstrual periods.[20] Yet about 30 to 40 percent of infertility cases are unexplained. This diagnosis is confirmed when infertility is met by definition, yet all causes have been investigated and ruled out.[21]

Case study 1. Complications caused by cesarean-section scarring

A 44-year-old mother had five children, with four cesarean-section deliveries. Her fifth pregnancy was a result of an IVF treatment that resulted in five embryos: two were transferred and three were frozen for possible future use.

She became pregnant and delivered by cesarean section. The delivery was complicated with severe intraoperative bleeding, with massive adhesions in the abdomen due to multiple cesarean deliveries putting her life at serious risk. After spending a few days in the intensive care unit, she was advised to avoid any future pregnancies. Despite this, she revisited the center a few years later, wanting to use the frozen embryos.

Such a case would question whether there is a medical necessity that justifies denial of providing ART treatment, especially in light of the life-threatening risks.

Medical evaluation of infertility causes

Females: Female medical evaluation and diagnosis of infertility includes ovarian reserve testing by ultrasound assessment of the total antral follicle count, blood test for anti-Müllerian hormone (a marker for assessing ovarian reserve), and follicle-stimulating hormone. Other blood tests are also essential to detect imbalances in certain hormones such as prolactin and thyroid-stimulating hormone.

Diagnostic imaging such as pelvic ultrasound, hysterosalpingogram (also known as the dye test, because it involves a special x-ray using dye to look at the womb and fallopian tubes) and minimally invasive procedures such as diagnostic laparoscopy and hysteroscopy are used to assess any uterine abnormality and tubal factor infertility.

Males: Male evaluation of infertility primarily depends on the result of the semen analysis. In case of an abnormal result, the test must be repeated after a few months to confirm the presence of the abnormality.

Table 1. Basic infertility evaluation

Female		
History		
Physical		
Prepregnancy evaluation		
Additional evaluation for etiology of infertility	Diminished ovarian reserve	• Anti-Müllerian hormone or basal follicle-stimulating hormone plus estradiol • Transvaginal ultrasonography with antral follicle count
	Ovulatory dysfunction	• Ovalutory function test (eg serum progesterone measurement)
	Tubal factor	• Hysterosalpingography • Hysterosalpingo-contrast sonography
	Uterine factor	• Transvaginal ultrasonography • Sonohysterography • Hysteroscopy • Hysterosalpingography
Male		
History		
Semen analysis		

Source: American College of Obstetricians and Gynecologists (2019)[22]

Treatment options

Assisted reproduction is defined as the use of medical technology to enhance fertility through interventions such as pharmaceuticals, surgery and/or lifestyle modification. In the case of decreased ovarian reserve, if there is unexplained infertility, or no pregnancy is achieved after medical intervention, further interventions employed to achieve pregnancy are known as assisted reproductive technologies (ARTs).

ARTs: ARTs include various clinical treatments and laboratory procedures that handle human oocyte (eggs), sperms, ovarian or testicular tissue, or embryos in vitro. The goal of ART is to establish a pregnancy immediately or for the future. The main examples of ART are in vitro fertilization (IVF), preimplantation genetic testing (PGT), embryo cryopreservation, oocyte cryopreservation (OC), and eggs/embryo/or sperm donations.[23]

IVF: IVF involves combining an oocyte with a sperm outside the body, in vitro. The ovaries are first stimulated, then oocytes are aspirated from the ovaries. These are fertilized in the lab, usually resulting in one or multiple embryos that can be frozen and preserved for future use. The embryos with high implantation potential are selected to be transferred to the woman's uterine cavity. Before transfer, there is the option that an embryo can undergo a biopsy for PGT. Pregnancy occurs if the selected transferred embryos become implanted in the lining of the woman's uterus. These steps usually take place at two-week intervals, known as an IVF-cycle. Many couples will need more than one round to achieve a successful pregnancy. Even after several treatments, there is still no guarantee of pregnancy.[24]

Eligibility criteria for IVF treatment in Qatar

Qatari nationals and residents have been eligible for referral to the Assisted Reproduction Center (ARC) for many years. However, in the past it was difficult to implement eligibility rules for Qatari nationals, due to the strong cultural belief that puts no limit on the number of children a woman should have, at any given age. This view was even more popular among the Qatari population as their citizens represent a minority in Qatar compared to other nationalities. This led to an increase in unmet demand for fertility IVF treatments.

Despite modernization of ARC's facilities and services, there are always infertility cases that are not successful with assisted conception. These cases include women older than 45, or men who have an absence of sperm. Other such cases that are clinically considered difficult to treat

and have lower success rates include immunological factors in women, or severe blood disorders that could prevent vascular development of the placenta. Trials of treatment abroad are still being offered by the government for such cases for at least three treatment cycles. Obtaining funding for treatment abroad for IVF treatment remains an accessible choice for this category of Qatari nationals.

Locally in Qatar, all public service providers agree that there should be agreed eligibility criteria for access to the service – similar to international standards and guidelines. As such, priority is given to those aged between 18 and 45 years, and to couples who have no children and have been trying to conceive for the longest time. Clinical criteria include a body mass index of under 35, and fewer than four cesarean sections. It is also necessary for those seeking treatment to show evidence of valid Qatari citizenship or residency.

Case study 2. Hopeful grandparents

A young patient who had her first child through IVF, visited the ARC with her mother who proceeded to talk to the clinician on her daughter's behalf. It was then found that both the daughter and her husband were cognitively impaired. Their first child was cared for by the grandparents who had hopes for another grandchild.

Such a case would raise moral questions about how to serve the best interests of the prospective children and promote their welfare, and whether using ART to procreate meets the 'necessity' requirement.

Gamete or embryo cryopreservation

A woman's reproductive life span is dependent on the number of oocytes she is born with, and is therefore limited.[25] Some medical and genetic conditions might accelerate the loss of oocyte degeneration, and cause a condition usually known as premature ovarian insufficiency, also referred to as early menopause, occurring in women younger than 35. Examples of some medical conditions that may affect young women, children or adolescents and cause loss of ovarian tissue or premature ovarian insufficiency include:

1. Women needing chemotherapy drugs, or receiving pelvic radiation which could also damage the ovaries.

2. Surgical premature removal of the ovaries due to malignancy in the pelvic organs, or to prevent malignancy from occurring in the future (such as in BRCA gene mutation carriers).

3. Hereditary or genetic diseases such as fragile X syndrome or monosomy X syndrome (Turner syndrome).

Freezing or cryopreservation of reproductive tissue such as oocytes gives individuals who are at risk of facing premature loss of reproductive capacity the ability to have a biological child in the future. One ART methodology is the freezing of human eggs to allow them to be used at a later time – known as mature oocyte cryopreservation. Other examples include ovarian tissue cryopreservation and embryos or sperm freezing.[26,27,28]

In addition to medical indications, more recently some international fertility societies have supported planned OC for women who want to safeguard their reproductive options for the future.

Case study 3. Cancer patient

A 39-year-old female patient, living in Qatar with her husband and one child, was diagnosed with breast cancer. She pondered the possibility of freezing her eggs before starting chemotherapy treatment, while her husband was abroad. She was denied the procedure because the physical presence of her husband was required to sign the consent form.

Based on the information outlined in this study, we argue that the woman had the right to freeze her eggs, even without the physical presence of her husband. The husband's consent would be necessary in case of freezing the couple's embryo, rather than the gametes. That is why we would argue that single women could be offered this service once there were well-justified reasons as per the judgment of an ethics committee.

Transplantation of reproductive system

Women with absolute uterus-factor infertility might have the option of uterus transplantation. This condition affects 1 to 5 percent of women and could be the result of congenital anomaly affecting the uterus development (for example, Mayer-Rokitansky-Küster-Hauser syndrome), being born with a non-functional or incompletely developed uterus, suffering trauma or obstetrical complications, or surgical removal due to medical causes such as cancer.[29]

So far, uterine transplantation is considered to be experimental. The first birth from a transplanted uterus occurred in Sweden in 2014. Since then, about 30 uterine transplantation procedures have been performed worldwide, resulting in a total of 11 births. However, all have required the intervention of IVF treatment. The organ used during uterus transplantation can be from living or deceased donors, and each approach has its challenges and strengths.[30]

Ovarian tissue cryopreservation (OTC) is mainly used for fertility preservation in girls and women facing a gonadotoxic treatment (including surgical resection, chemotherapy, radiation). If the woman subsequently becomes menopausal, the cryopreserved ovarian tissue may be transplanted back to regain ovarian function, including fertility. Ovarian transplant from a donor is uncommon in fertility treatment due to the easier use of egg donation.

Preimplantation genetic testing (PGT) and sex selection: PGT is usually performed alongside IVF prior to embryo transfer. It involves screening cells from embryos for various known genetic diseases and chromosomal disorders. PGT includes a group of genetic assays to evaluate embryos before transferring them back to the uterus. There are different types of PGT: PGT-monogenic targets single gene disorders; PGT-aneuploidy screens for aneuploidy (the presence of an abnormal number of chromosomes in a cell) in all chromosomes (autosomes and sex chromosomes); and PGT-structural rearrangements which target embryos at risk of chromosomal gain or loss due to parental structural chromosomal abnormalities. PGT is an extremely useful tool for couples where one or both of the partners are known carriers of an inherited genetic disorder. Depending on the inheritance pattern of the disease, the test can reduce the risk of passing on the genetic disorder to the child. However, similar to any test, there is risk of false negative or false positive results.[31] There is also a small risk of damaging the embryo during the biopsy procedure.

Assisted conception in Qatar and the region: a historical overview

The history of ART dates back to as early as the 1890s, where Professor Walter Heape (University of Cambridge) reported the first known case of embryo transplantation in rabbits.[32] The first IVF pregnancy in humans

was reported in 1973 by professors Carl Wood and John Leeton in Melbourne, Australia. However, unfortunately, this attempt resulted in an early embryo death at less than one week.[33]

Figure 2. Milestones in fertility treatment

Source: Pacific Fertility Center (2015)[34]

The birth of the world's first IVF baby, Louise Brown, took place in Manchester, UK in 1978.[35] Since then, IVF and other related technologies have become increasingly common, with the use of ART services in developed countries increasing at a rate of about 5 to 10 percent annually.[36,37] Worldwide, as of 2009, 3.4 million children had been born using ART methods.

Use of ART in Qatar and the region

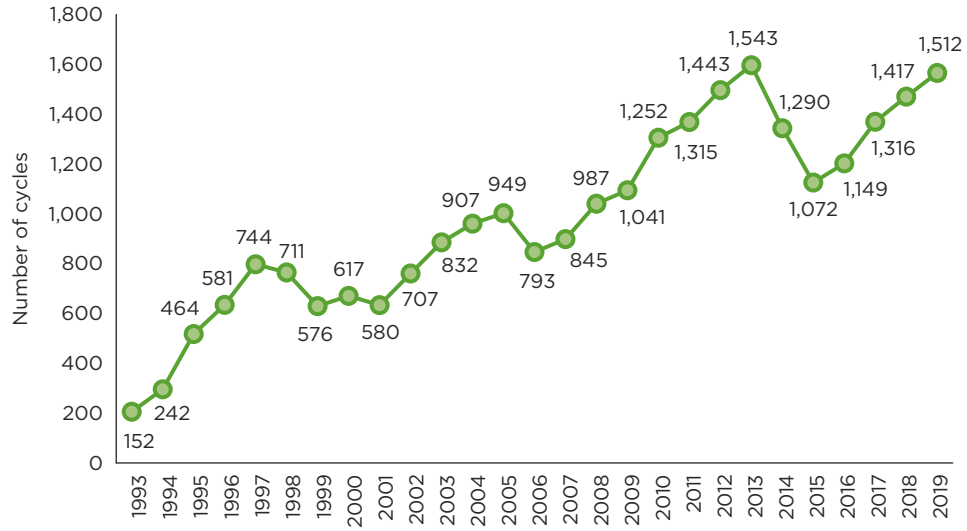
Since the 1980s, a high-tech reproductive revolution has emerged in the Arab world, leading to the development of one of the world's most robust IVF hubs.[38] In 1986, Saudi Arabia, Egypt and Jordan were the first Arab countries to introduce IVF treatment. In 1987, the first Egyptian IVF baby was born, and by the mid 1990s, the Arab world was already experiencing what was described as an IVF 'boom period'.[39] By 1995, IVF was available in all major Arab cities, such as Beirut and Damascus.

Non-Arab Middle Eastern countries are currently leading the regional reproductive medicine industry: Turkey has more than 110 IVF clinics; and Iran has more than 70.[40,41] Iran is the only Middle Eastern nation allowing third-party assisted conception.[42,43]

In the Gulf Cooperation Council, Saudi Arabia was the first to introduce IVF technology to the region in 1986, followed by the United Arab Emirates in 1991.[44] The third to follow was the State of Qatar, which launched its first IVF center on 6 April 1993. ARC was established at Hamad Medical Corporation (HMC), the country's largest governmental healthcare provider. The unit attracted pioneer scientists from around the world to achieve a comparable success rate to international centers. Prior to its establishment, all subfertile couples seeking IVF in Qatar were sent abroad for treatment, which resulted in a substantial economic burden on the government, as well as the expected associated emotional stress on the patients.[45] Initially, infertility therapies were open to all Qatari nationals and residents free of charge. These services were expanded, and it was not until 1996 that the unit implemented a small charge for a portion of the treatment cost for Qatar residents as a subsidized fee.[46] The cost for IVF treatment at the ARC in Hamad Hospital has remained the same to date (QR8,000, or about $2,200 for the first cycle), which is very low compared to costs globally. Nationally, it is considered a negligible fee when compared to the cost of IVF in private centers in Qatar, which start at QR25,000 (about $6,870) and could reach up to QR50,000 depending on the provider.

The first IVF baby in Qatar was born in December 1993, shortly after the establishment of the ARC. In that year alone, there were 152 attempted treatment cycles, which resulted in 14 clinical pregnancies, six deliveries and nine births.[47] The ARC continued to grow and provide world-class services in line with the latest technological and scientific advancements. The center currently performs more than 1,500 cycles a year for female and male infertility, with a success rate that exceeds 50 percent in women younger than 35.

Figure 3. ART cycles from 1993 to 2019 in Qatar



Source: Database of the ARC at HMC

In line with global advancements in the field, the ARC at HMC introduced preimplantation genetic testing free of charge for all Qatari nationals in 2014. This reduced the cost of treatment for those people with genetic diseases who, in the past, had no choice but to seek treatment abroad. The most recent addition to the list of services was the establishment of a fertility preservation program which allows males and females recently diagnosed with cancer to have sperm/egg or embryo cryopreservation prior to chemotherapy. While samples of the embryos requiring testing are currently sent to internationally approved genetics labs, the ARC is establishing its own molecular genetics lab to serve a wider population in need of the service.

In 2016, following the popularity of gender selection procedures, a committee of religious scholars was formed and agreed that the ARC should offer gender selection for medical reasons only.

Ethical considerations

Global ethical concerns

While the field of infertility treatments and ART has advanced rapidly over the years, it has raised a myriad of ethical concerns, depending on culture and context. Some of these issues revolve around the risks of therapies, such as those associated with multiple pregnancies, and the use of selective abortions.[48,49,50] Other ethical considerations are about relatedness, and the definitions of what constitutes a marriage or family. Here, questions arise around the differing opinions on whether or not people find it ethically problematic for children to be born into a family that is perhaps unconventional, where the couple are not considered biological parents and the birth is not 'natural' or unaided.

Multiple gestation pregnancies

The transfer of multiple embryos in IVF treatments increases the chances of multiple birth pregnancies.[51] This is associated with increased social costs and greater health risks to the mother and infant. Single embryo transfer has been shown to inherently decrease the health risks associated with multiple pregnancies.[52] This has resulted in the introduction of legislation and guidelines in many countries that restrict the number of embryos that can be transferred in each IVF cycle, in an attempt to limit this practice.

Preimplantation genetic testing (PGT)

While preimplantation genetic screening and preimplantation genetic diagnosis potentially allow for the characterization of the genetic composition of embryos prior to their transfer, this technology has not yet been fully utilized; however, it is likely to be implemented broadly in the future. The ethical concern tied to PGT revolves around the use of PGT for sex selection, which – although controversial – is currently being practiced.[53,54]

This type of procedure can offer health benefits, such as avoiding a sex-linked disorder. Yet opting for sex selection purely based on parental preference, if practiced on a large scale, is ethically unfavorable and could result in a disproportionate gender balance in countries where one gender is culturally preferred.[55] To date, very little is known about how these ethical and moral concerns have impacted on the take-up and acceptance of these techniques by the public, and what factors account for variations within these public concerns.

Financial impacts and inequitable distribution

The financial aspect of infertility treatment is also another cause of ethical concern, particularly around the inequitable access to care. In most countries, the high cost of these therapies results in their preferential availability to high-income families.[56] Government-aided funding for IVF/ART varies widely among different countries. In the US, for example, there is no federal government reimbursement for IVF treatment, although some insurance mandates are in place for ART within certain states.[57] In many instances, long waiting times for IVF treatment through governmental programs result in couples paying directly for treatment in more expensive private fertility centers.[58] In the UK, for example, only about 25 percent of IVF cycles are publicly funded through the National Health Service.[59]

Fertility preservation

Techniques for freezing sperm and embryos have been well studied and established. Based on current evidence, modern procedures to cryopreserve oocytes are no longer considered experimental. While this technology is currently available in several countries, it remains generally available only to those who can afford it, posing several ethical and social considerations.

Gamete donation

In the Western world, the use of donor gametes – either donor sperm or donor oocytes – is regarded as common practice in ART. While the use of donor sperm began in the 1800s, it was not until the mid-1980s that oocyte donation was introduced.[60] Unlike sperm donation, women donating oocytes are under substantial medical risk as they must undergo an ovarian stimulation process similar to IVF protocols. These risks include ovarian hyperstimulation syndrome, and general associated surgical risks. Informed consent should include counseling options that consider the emotional risks and benefits of donation.[61] It is crucial that women donors participate voluntarily and willingly, without any undue influence or coercion.[62] It is also considered inherently immoral to commodify human gametes, and this presents a strong argument against remunerating oocyte donors[63]

The preservation of donor anonymity presents other ethical and legal issues. There is a delicate interplay between the rights of the donor, the recipient, and offspring.[64] Allowing gamete donors and/or their offspring to break anonymity can provide medical advantages of sharing medical

history in the case of emergencies. Proponents also advocate for the rights of donors and their offspring to meet and develop a social relationship, should they choose to do so.

Embryo donation

Many embryos are never used – for example, excess embryos frozen during IVF cycles – and end up being stored indefinitely. In the US alone, about 400,000 embryos are currently cryopreserved, and many will not be used. There are moral issues around what to do with surplus embryos, and a myriad of laws across different countries governing how human embryos should be handled. Four different strategies have been discussed: thawing and discarding; donating to research; indefinite storage; and donating the embryos to other couples.[65] The ethical use of cryopreserved embryos for the sake of stem cell research has gained particular attention and is the subject of fierce international debate.[66,67]

Case study 4. In search of a compatible donor

A married couple requested preimplantation genetic testing (PGT) of their embryos. They wanted to be able to select an embryo compatible with the genetic characteristics (genotype) of their son who suffered from a bone-marrow disease and was in need of a bone marrow transplant from a compatible donor. A family member and his wife also offered to try a similar treatment to conceive a child who would be a genetic match for the sick boy.

This case raises a series of ethical questions, such as: how many treatment cycles should be permitted until the desired embryo is found? What will happen to the healthy non-matching embryos resulting from these treatments? Is it ethical to discard embryos just because they would not serve the couple's purpose?

Surrogacy and gestational carriers

A surrogate is defined as a woman who agrees to become pregnant using her own oocytes and sperm from a third-party couple. The couple will become the child's parents after birth. In contrast, a woman is considered a gestational carrier if she carries the embryo of a couple who has undergone IVF treatment and relinquishes the child to the same couple after the child is born. Both gestational carriers and surrogates are subject to substantial medical and emotional risks associated with pregnancy and

delivering a baby. Therefore, these procedures and agreements require informed consent as well as intensive counseling that outlines the risks involved versus the benefits.[68]

As with gamete donation, there are ethical concerns around the possibility of commodification of the service. In the US, figures from the year 2008 have shown that the average compensation for a typical gestational carrier is about $20,000. In India, the same service amounts to an average of $4,000.[69] Regulation varies from country to country and even from region to region. Therefore, issues surrounding individual rights, citizenship of offspring, commodification and exploitation remain largely unresolved at a global level.[70]

Case study 5. Surrogate sister

A 35-year-old female with lupus nephritis had two previous successful pregnancies. However, her kidney function deteriorated, and she was deemed clinically unfit for any further pregnancies. She and her husband were interested in trying IVF treatments, with the woman's sister taking the role of a gestational carrier mother. Both women are Muslims and would like to know the Islamic and ethical rules of this process.

SECTION 2. ISLAMIC ETHICAL PERSPECTIVES

As an introductory note for this chapter, we would like to stress that the perspectives outlined below are based on interdisciplinary deliberations hosted by transnational and trans-school Islamic institutions. The participants in these discussions come from different ethnic, educational and denominational backgrounds, including religious scholars and biomedical scientists. Thus, both Sunni and Shia voices are represented in these deliberations, and the work of these institutions received attention from both Sunni and Shia scholars.[71,72] However, the final resolutions or fatwas adopted by these institutions usually represent the mainstream Sunni perspectives because the participating Shia scholars are always in the minority. Although many of the opinions and associated modes of reasoning outlined in this study are supported by both Sunni and Shia scholars, the positions adopted by the majority of Shia scholars can be quite different. For an overview of the Shia perspectives on ARTs, please see Inhorn (2012),[73] Naef (2015),[74] and Abbasi-Shavazi (2008).[75]

Theological background

In the Holy Qur'an (21:89–90)*, the capacity to procreate male and female children is depicted as a God-given gift (*hiba*). These verses also link the inability of some individuals to procreate (infertility) to God's sovereignty over the whole universe, including humans.

Besides these theological underpinnings, the process of procreation is not perceived as an unrestricted automated process that haphazardly takes place at the couple's discretion. As with other moral traditions, Islam has its own moral world that channels and regulates the use of the procreation capacity, or the attempts to restore it when people are infertile. In a famous tradition attributed to the Prophet's wife, ʿĀʾisha**, she explained that children were procreated in the pre-Islamic period (*jāhiliyya*) through four types of relationships or 'marriages' and that eventually only one of these four was recognized by Islam as a 'religiously valid marriage'. It is to be noted that one of the three controversial types, the man–woman relationship, was meant to procreate 'good' children. The married woman

* "To Allah belongs the Sovereignty of the heavens and the earth. He creates whatever He decides; He bestows upon whomever He decides females, and He bestows upon whomever he decides the males. Or He couples them, (both) male and female and He makes whomever He decides infertile. Surely, He is Ever-Knowing, Ever-Determiner" (42:49–50).

** d. 58/678.

would be impregnated by a man (not her husband) known for his strong physical traits and good character so that the prospective child would inherit these aspects from the biological father.[76] Despite the seemingly worthy objective of procreating children with 'good' characteristics, the practice was condemned in Islam because of the incompatibility with its moral world.

Against this background, this section will examine the key moral questions raised by ARTs through the lens of the governing Islamic moral world. For a systematic analysis of the issues, this section is divided into two main parts: the pre-ART moral world of procreation; and the post-ART moral world of reproduction.*

Pre-ART moral world of procreation

In the pre-ART world, the process of human procreation was regulated in the Islamic tradition via a number of determinants. The rationales behind these determinants were meant to create a consistent network and Sharia-compliant system of relationships, associated with rights and obligations assigned to the involved parties – especially parents, their children and the broader familial and social networks. These determinants play a decisive role in judging ARTs from an Islamic perspective.

In the pre-ART era, the Islamic moral world of procreation was premised on three main determinants: marriage; biological/genetic relatedness; and sexual intercourse.**

1. Marriage

When a couple concludes a religiously valid marital contract (*ʿaqd nikāḥ sharʿī*), the children born thereafter will automatically be attributed to the husband in the capacity of the father, and to the wife in the capacity of the mother, unless there is a compelling reason to do otherwise.[77] *Al-firāsh*, which literally means 'anything spread for one to sit or lie upon' and particularly a bed upon which one sleeps, was the technical term used in Islamic literature to denote this marital relationship.[78] In this sense, the husband, wife, or the sleeping bed they share; each of them can be called *firāsh*.***

* To capture the morally significant differences made by the increasingly medicalized process of conceiving children and/or treating infertility, we use 'procreation' for the pre-ART discussions, and 'reproduction' for the deliberations in the post-ART world.

** For extended discussions among Muslim scholars on these aspects and other related issues, see *Al-Mawsūʿa al-fiqhiyya*. Various Muslim scholars (1983–2006).

*** In historical discussions, the scope of this term would also cover the slavery-based relationship. However, in this study, *firāsh* will be used to exclusively mean wedlock.

Within this framework, wedlock (*al-firāsh*) is adopted as the *prima facie* basis for establishing the prospective child's parenthood and further kinship network, with the associated sets of rights and obligations. Whenever doubt exists whether the wife had a sexual relationship with another person other than her husband and thus may have been impregnated by that other person, the child's paternity would still be attributed to the woman's husband. The rationale here is that the child was born in the husband's *firāsh* (wedlock). This mainstream position is premised on a famous tradition attributed to the Prophet Muhammed (Peace and Blessings Be Upon Him) that reads: "The child belongs to the wedlock and stone is for the adulterer". The tradition was interpreted to mean that, in case of an adulterous woman, the woman's husband will still preserve the exclusive right to the child's paternity. As for the adulterous man, he has no rights and will only get 'stone' (in other words, nothing) or, according to another interpretation, will be 'stoned to death', the prescribed punishment for adultery (if the man was married). The fact that the woman committed adultery does not give conclusive evidence that she was impregnated by the adulterous man, even if apparent physical resemblance (*shabah*) was observed between the child and the adulterous man.[79]

This case of doubt, early jurists argued, cannot overrule the undeniable fact of a marital relationship (*firāsh*) between husband and wife. However, if the husband was sure that the child was not his and he did not want to accept the supposed paternity, then he has to engage in a specific judicial process called *liʿān* (mutual oath of condemnation or mutual repudiation). Once the process of *liʿān* is properly executed, the judge will declare irrevocable separation of the married couple, and the child will be attributed to the wife only. Alternatively, neither one of the married couple will be condemned – neither the husband for making a possibly false accusation of adultery (*qadhf*) against his wife, nor the wife for possibly committing the crime of adultery and becoming impregnated by someone other than her husband.[80]

2. Biological/genetic relatedness

Early Muslim jurists were aware of the biological contribution provided by the husband (prospective father) and wife (prospective mother), which shapes the physical makeup of the child.[81] The terminology used in Prophetic traditions is *al-māʾān*, which literally means 'two waters' – interpreted in modern literature[82,83] as the male sperm and female egg.*

* In his famous canonical collection of Prophetic traditions, Imam Muslim b. al-Ḥajjāj (d. 261/875) dedicated a section to this issue under the title "*Bāb ṣifat maniyy al-rajul wa al-marʾa wa anna al-walad makhlūq min māʾihimā* (Chapter on the nature of the man's and woman's fluid (semen) and that the child is created from their two waters)".

Besides marriage, it is clear that this biological/genetic relatedness was a determining factor for establishing the relationship between the prospective child and the married couple.

The role of biological/genetic relatedness in establishing maternity was a straightforward case. In addition to her water or egg, the wife's uterus also contributes to the process of procreation through pregnancy and delivery. At the time of early jurists, it was hardly conceivable that the female's two biological elements (egg and uterus) could be separated from each other. Consequently, pregnancy and delivery were perceived as conclusive evidence that the child is biologically/genetically related to the woman who gave birth. Thus, Muslim jurists agreed that the woman who delivers a baby automatically becomes the child's mother, whether the child was born inside or outside wedlock.[84]

As for paternity, *firāsh* was usually given a much heavier weight than any other factor, including biological relatedness. However, the presence of *firāsh* was considered an insufficient basis for establishing paternity when there was conclusive evidence that the husband could not have impregnated his wife (for example, he was too young to be sexually active, or he lived very far away from his wife and thus sexual conjugation between the couple was empirically inconceivable, and so on), then the presumed *firāsh*-based paternity would be negated because biological relatedness was untenable.[85,86]

Early jurists would sometimes consider biological relatedness as a basis for establishing paternity when *firāsh* was missing, as in the case of having an erroneous sexual relationship (*waṭʾ al-shubha*). Jurists contended that if someone accidentally had sexual intercourse with a woman – for example, mistakenly supposing that she was his wife – then he would be considered the father of the resulting child.[87,88]

3. Sexual intercourse

In the perception of early jurists, sexual intercourse was the self-evident and natural way to get the couple's 'two waters' mixed, to eventually compose the physical makeup of the prospective child. However, available literature shows that some jurists did not discount the possibility of asexual procreation – the possibility of manually inserting (*istidkhāl*) the husband's sperm into the wife's vagina. In response to this scenario, some jurists, and also some physicians, argued that it is purely hypothetical and cannot take place in reality. Other jurists held that it is empirically possible and discussed its religio-moral judgment. They said that *istidkhāl* would be permissible only in exceptional cases, where natural sexual procreation is no longer viable. Some of them added the condition that the sperm

should not have been ejaculated in an illegal way, such as through arousal by illicit sexual intercourse, or masturbation (*istimnāʾ*)*, which some jurists judged as prohibited.[89,90]

There is another point related to the aspect of sexual intercourse, whose relevance will be clear when contemporary jurists discuss the possibility of transplanting sexual organs. As part of their understanding of the virtue of chastity, early Muslim jurists agreed that sexual intercourse should exclusively take place within marriage and that extramarital sex (*zinā*) is viewed as one of the grave sins in Islam. The genitals are instrumental in facilitating sexual intercourse and, because of the intimacy and privacy attached to the sexual act itself, the male and female genitals are termed as *awra mughallaẓa*. This technical term is used by Muslim jurists to refer to the parts of the body that should strictly be covered. No other person is permitted to touch or look at these parts of the body, except one's spouse, or when there is a compelling reason to do so – for example, medical examination mandated by legal authorities.[91]

Post-ART moral world of reproduction

To respond to the complex and multidimensional questions arising from the use of ARTs, Muslim religious scholars had to consult, and sometimes formally collaborate with, biomedical scientists to understand some of ART's scientific and biomedical aspects.

As explained in previous studies published by WISH, the collaboration between religious scholars and biomedical scientists was facilitated through collective religio-moral reasoning (*ijtihād*). The *ijtihād* was institutionalized during the early 1980s through the Islamic Organization for Medical Sciences (IOMS) in Kuwait, the Islamic Fiqh Academy (IFA) and the International Islamic Fiqh Academy (IIFA), both in Saudi Arabia.[92,93]

During the 1980s, these three institutions facilitated intensive deliberations among religious scholars and biomedical scientists on the then new technologies under broad themes such as 'artificial insemination' and 'test-tube babies'. In the 1990s and during the first two decades of the 21st century, these institutions updated their interdisciplinary discussions by addressing more specific issues within ARTs – for example, transplanting reproductive organs, PGT and sex selection. Table 2 gives an overview of the key meetings hosted by these three institutions.

* Muslim jurists disagreed about the religious ruling on masturbation (*istimnāʿ*). The majority of them held that it is prohibited, whereas some jurists, (especially within the Ḥanafī school), said that it is just reprehensible.

Table 2. Interdisciplinary deliberations on ARTs (1982–2013)

No.	Meeting	Place	Date	Organizers
ARTs – overall assessment: conditional approval				
1	5th session	Mecca, Saudi Arabia	3–11 February 1982	IFA
2	*Al-Injāb fī ḍawʾ al-Islām* (Human reproduction in Islam)	Kuwait	24 May 1983	IOMS
3	7th session	Mecca, Saudi Arabia	15–20 January 1984	IFA
4	8th session	Mecca, Saudi Arabia	18–29 January 1985	IFA
5	2nd session		22–28 December 1985	IIFA
6	3rd session	Jeddah, Saudi Arabia	11–16 October 1986	IIFA
7	12th session	Mecca, Saudi Arabia	10–17 February 1990	IFA
Specific ARTs				
8	*Al-ruʾya al-Islāmiyya li baʿḍ al-mumārasāt al-ṭibbiyya* (The Islamic perspective on some medical practices)	Kuwait	18–21 October 1987	IOMS
9	*Ruʾya Islāmiyya li zirāʿat baʿḍ al-aʿḍāʾ al-bashariyya* (An Islamic perspective on transplanting some human organs)	Kuwait	23 October 1989	IOMS
10	6th session (transplanting sexual organs)	Jeddah, Saudi Arabia	14–20 March 1990	IIFA
	Al-Wirātha wa-al-handasa al-wirāthiyya wa-al-jīnūm al-basharī wa-al-ʿilāj al-jīnī: Ruʾya Islāmiyya (Genetics, genetic engineering, human genome and gene therapy: Islamic Perspective)	Kuwait	13–15 October 1998	IOMS
11	11th session (sex selection)	Manama, Bahrain	14–19 November 1998	IIFA
12	18th session (sex selection)	Mecca, Saudi Arabia	8–12 April 2006	IFA
13	19th session (genetic screening)	Mecca, Saudi Arabia	3–8 November 2007	IFA
14	20th session (genetic screening)	Oran, Algeria	13–18 September 2012	IIFA
15	Specialized symposium (genetic screening)	Jeddah, Saudi Arabia	23–25 February 2013	IIFA, IOMS
16	21st session (genetic screening)	Riyadh, Saudi Arabia	18–22 November 2013	IIFA

1. ARTs – overall assessment: conditional approval

The intensive interdisciplinary discussions of the IOMS, IFA and IIFA showed the diversity of positions toward ARTs. However, no one held that ARTs would make the moral world of reproduction irrelevant or outdated, because these technologies are used for the noble aim of treating infertility. There was an overall agreement that ARTs should be examined to see whether the technologies are compatible with the long-established moral world of the Islamic tradition.

In early discussions, a minority of religious scholars held the position that ARTs are inherently incompatible with core values in Islam, and thus concluded that their use should be prohibited. For instance, they argued that the natural process of procreation through sexual intercourse would become a medicalized reproduction, with artificial insemination performed by a physician who is not related to the married couple.

The advocates of this position also expressed their concerns about the possible negative impact of ARTs on the dignity of the prospective child. Such a child may be seen by society as someone who has developed unnaturally – 'in a tube' – and whose lineage could be questioned because of the possibility of mixing up gametes in the fertility clinics.[94,95,96] Over time, however, this position increasingly lost ground.

The overwhelming majority of Muslim religious scholars and biomedical scientists argued that ARTs should be approached as a medical means for treating infertility, making it morally neutral, or even commended. The advocates of this position premised their judgment on the degree of compatibility with the pre-ART moral world of procreation.

Scholars and scientists conceded that ARTs cannot be used without making the reproduction process asexual, thereby thwarting the role of sexual intercourse. The pre-ART concept of *istidkhāl* represented sufficient ground to argue that the idea of asexual reproduction is not alien to the Islamic tradition. This asexual means of having children was even accepted by some early Muslim scholars, as long as the natural sexual means was unsuccessful. This is why they used terms such as 'utmost/absolute necessity' (*ḍarūra quṣwā*), especially in the case of in vitro and not intrauterine fertilization.[97,98] Beyond this point, they agreed that using

ARTs to treat infertility would be permissible under specific conditions, stipulated to make sure that ARTs will affect neither 'marriage' nor 'biological/genetic relatedness'.*

The advocates for marriage and its significance in the moral world of reproduction argued that Muslim scholars throughout history consensually agreed that non-married couples are not permitted to have sex or to procreate. They agreed that ARTs can only be used by a man and a woman who are related to each other through a religiously valid marital contract (*ʿaqd nikāḥ sharʿī*). They added that strict safeguards and rigorous arrangements should be in force to make sure that the gametes and embryos of different couples will not get mixed up. This condition also makes gestational surrogacy impermissible because the surrogate would not be impregnated by her husband in this case. To safeguard the element of biological/genetic relatedness, advocates of this position held that these technologies cannot be used to treat the married couple's infertility by using material (that is, egg, sperm or embryo) provided by a third party.[99,100,101]

The controversial case of polygamy

Despite efforts to make the post-ART modified moral world of reproduction as consistent as possible, some borderline cases proved to be controversial. One of these cases was gestational surrogacy within the context of polygamy, which was discussed by the IFA in 1984 and 1985. In 1984, the IFA found it permissible that the sperm of the polygamous husband will be used to fertilize the egg of one wife, and then this fertilized egg will be carried by his second wife, if the latter volunteered to be the gestational mother. However, the IFA received reservations and objections around the biological/genetic relatedness of the gestational surrogate (second wife) and the prospective child** and so the issue was scheduled for further discussion in 1985. According to the critics of the 1984 IFA fatwa, it is theoretically possible that the embryo transferred to the uterus of the gestational surrogate (second wife) would not result in pregnancy, but she would concurrently get pregnant when her own egg is fertilized by her husband. This situation, they argued, would open the door for a possible misattributed maternity. In the end, the IFA retracted its 1984 fatwa and held that all forms of surrogacy are prohibited, including

* The advocates of conditional approval for ARTs also added a long list of 'extra stipulations' that are not specific to the moral world of reproduction. These extra conditions are meant to regulate the overall process of medical treatment (*tadāwī*), especially when it comes to the cross-gender interaction. Because the use of ARTs entails uncovering a woman's private parts, they stipulated that the treating physician should not be male, unless a female physician was not available. Also, if the treating physician was male, then the woman should be accompanied by her husband or by another woman.

** The Syrian religious scholar, ʿAlī al-Ṭanṭāwī (d.1999) disagreed with this fatwa. For his reservations, see Jundī, Aḥmad al- (1983).

those that take place within polygamy. This position was confirmed by the IIFA in 1986 and by the IFA in 1990, and became the mainstream position adopted by these institutions.[102,103]

Although the question of disputed biological maternity can be settled through DNA testing, the authors of this study support the mainstream position of prohibiting gestational surrogacy within the context of polygamy for further reasons. For instance, polygamy should be seen as composed of distinct marriages, where each wife is related to the husband through her own marital contract, which should remain separate from the other wife's contract. The second wife, acting as a gestational surrogate, will then be seen as providing a third-party contribution to the reproduction process because she is not involved in the first wife's marital contract. Also, the Holy Qur'anic concept of maternity cannot be reduced to the biological contribution of the 23 chromosomes pairs through the woman's egg. Various verses in the Holy Qur'an clearly demonstrate that full maternity cannot be realized away from pregnancy and delivery (see for example, 2:233, 31:14, 46:15). The Holy Qur'anic verse which reads "Verily, their mothers are none except those who gave birth (to) them" (58:02) was interpreted by some religious scholars as conclusive evidence that maternity is not biological but gestational.[104]

2. Specific ARTs

Gamete/embryo cryopreservation

The IOMS (in 1987 and 1989) and the IIFA (in 1990) agreed that ARTs should be meticulously managed to avoid having surplus embryos that will not be used later. Their main concern was that these surplus embryos could be used to illegally impregnate a woman other than the wife who produced the egg. Avoiding the creation of surplus embryos was viewed by the IOMS as the optimal option; but later the IIFA held that it was an obligation. As an alternative, scientists were urged to develop a mechanism to preserve or store the eggs before fertilization, without undermining their viability for future use.[105,106,107] Despite the absence of an explicit reference to the name of the process, one can safely infer that these institutions permit, or even recommend, the cryopreservation of the gametes, (especially the egg), to avoid the dilemma of how to dispose of surplus embryos. According to this view, the disposal of a surplus gamete is, morally speaking, less problematic than the disposal of an embryo.

Building on these discussions, the authors of this study argue that separately freezing female eggs or male sperms, without fertilization, should be the first option in cryopreservation, as long as freezing separate gametes will be effective enough in treating infertility. Some individual

voices in contemporary Islamic bioethics found no difference between freezing the gametes for medical reasons and freezing them for social reasons.[108] According to this perspective, freezing gametes is permissible for patients who undergo treatment that will result in infertility (such as chemotherapy) and for women who want to safeguard their future reproductive options. If this option is unavailable or inefficient for any reason, the second option will be freezing a married couple's embryo. Considering the IOM's and IIFA's position on creating surplus embryos, we recommend that the number of frozen embryos should be minimized to reduce the chance of embryos being preserved that will not be used by the couple for procreation.*

The rationale for prioritization of cryopreservation options is due to the moral status of the gamete, which is lower than that of the embryo. This is because neither the egg nor the sperm will independently develop into a human being without mixing both gametes together through fertilization. Additionally, the process of informed consent will be easier to manage in the case of gametes because only one person will be involved. In the case of embryos, however, both the husband and wife will be involved, and this may increase the possibility of conflicting choices over what to do with the frozen embryos.

Transplanting the reproductive system

IOMS (in 1989) and IIFA (in 1990) categorically prohibited transplanting the reproductive glands (male testicles or female ovaries) responsible for producing the gametes and the sex hormones. Transplanting gonads violates the moral world of reproduction, especially the aspect of biological/genetic relatedness. For instance, transplanting a man's testicles would mean that the prospective child would not be biologically/genetically related to him, but rather to the donor. The same applies to transplanting the ovaries.[109,110]

The discussions on the reproductive organs focused on the uterus, vagina and penis. In principle, none of these three organs would raise concerns about the aspect of biological/genetic relatedness because they do not contain genetic material that can be transferred to the prospective child.

* Some individuals felt that freezing embryos should be categorically prohibited as long as one accepts the idea that surplus embryos should be avoided (Shuwayrikh, ʿAbd al-ʿAzīz al-., 2007). However, we believe that the position adopted by the IOMS and IIFA does not support this presumed correlation. The term 'surplus', in Arabic *zāʾid ʿan al-ḥāja* (literally, redundant), as used in the fatwas adopted by these institutions, indicates that the embryos not used for procreation will either die 'naturally', be terminated, or used for scientific research. Some of the participants in the institutions' deliberations felt that each of these three options entails a moral problem. However, freezing eggs for later use by the married couple to have children, if properly managed, does not necessarily result in having surplus embryos.

However, the final moral position differentiated between the uterus distinct from the vagina and penis. Although not explicitly named in the IOMS and IIFA fatwas,* transplanting the uterus would be permissible under the same conditions that apply to transplanting other human organs. However, transplanting the vagina or penis was explicitly prohibited,[111] with few exceptions.** This prohibition has more to do with sexual intercourse in the moral world of procreation, especially the point related to the technical term of *ʿawra mughallaẓa*. The basic argument here is that, if these two private parts cannot be touched or even seen by someone else than one's spouse, then they cannot be transplanted into someone else's body to facilitate sexual intercourse.[112,113]

Preimplantation genetic testing (PGT) and sex selection

The discussions of IOMS and IFA show that using PGT to select the desired sex of the prospective child seems to be the most controversial use. The less controversial purpose is using this technology to predict certain genetic conditions that children may develop; with the possibility that some of these conditions may be linked to a specific sex. The least controversial purpose is using PGT for treating the aspiring parents' infertility.

On the issue of selecting the desired sex, IOMS concluded in 1983 that it is prohibited to practice sex selection at the national level. However, the opinions of the participants were divided on the possibility of practicing this at an individual level.[114] In 2007, the resolution adopted by the IFA indiscriminately prohibited using ARTs to select a desired sex.*** The resolution underscored the fact that having male or female children is part of what God has destined for his creatures, and this destiny entails nothing

* The statements endorsed by IOMS and IIFA both referred to the IIFA resolution on organ transplantation that was adopted during its fourth session held on 6–11 February 1988. The main theme of the specific conditions was around respecting the human dignity of the donor and receiver, and making a rigorous risk-benefit assessment.

** The Shīʿī scholar Muḥammad ʿAlī al-Taskhīrī, who participated in the 1988 discussions, was of the opinion that transplanting the reproductive glands or organs, including the penis and vagina, does not raise ethical problems. Once the organ is transplanted, he argued, it will be viewed as something that belongs to the recipient and no longer to the donor. The Sunni scholar ʿAbd Allāh Muḥammad ʿAbd Allāh explicitly agreed with him when it comes to transplanting the reproductive glands.

*** It is to be noted that the IFA resolution permitted the use of "natural ways" (*ṭuruq ṭabīʿiyya*) to select the sex of the baby. As examples of these natural ways, the resolution referred to: following a specific diet; regulating the time of intercourse; and influencing body chemistry to create more favorable pH (power/potential of hydrogen) environment for specific sex. (See Al-Majmaʿ al-Fiqhī al-Islāmī, 2010.) Due to the limited scope and size of the present study, we do not have space to go into detail on the discussions about how to differentiate between 'natural' and 'unnatural' ways in this context.

but goodness. The resolution added that a morally committed Muslim should submit to divine destiny and shun the pre-Islamic (*jāhilī*) practice of disdaining female children, which the Holy Qur'an (for example, 16:58–59)* has forcefully condemned.[115] The authors of this study fully support the total prohibition of using any ARTs, including PGT, to select a specific favorable sex. Considering the dominant sociocultural sphere in the Arab and Muslim world, and many other countries worldwide, opening the gate for this practice would entail the danger of making sexist behavior and gender discriminatory acts look less abhorrent because they would be under the guise of modern technologies.

In their discussions on genetics and genomics (1990–2013)**, IOMS, IFA and IIFA included the question of using PGT to screen IVF embryos for genetic conditions. This culminated in a 2013 resolution clearly permitting PGT under the usual ART precautionary conditions to guarantee that the embryos of various couples will not become mixed.[116] The IFA resolution adopted in 2007 stated that, if the genetic condition is linked to a specific sex, then this will be viewed as 'medical necessity', which will permit sex selection in this particular case.[117] We argue that the institutions' resolutions did not pay enough attention to the many complexities and ambiguities inherent to PGT – for example, the varying degrees of symptoms of the predicted conditions and their incurability, the probabilistic nature of test results, and so on. To do justice to these complexities, we recommend a case-by-case approach, where each case will be examined by an interdisciplinary ethics committee to decide what the best practice should be.

Although not explicitly mentioned in the institutional deliberations, using PGT to treat a married couple's infertility seems to be the least controversial purpose of using this technology. It seems that participants in these discussions did not imagine the possibility of using PGT for this purpose. Some of those who objected to using PGT for sex selection, or for preventing genetic conditions, argued that ARTs were permitted solely for the sake of treating infertility, and this does not apply to any of these two purposes.[118] Thus, one can safely conclude that, if PGT can help to achieve favorable results – for example, by decreasing the need of multiple IVF cycles[119] – then it should be permitted under the same conditions that apply to ARTs in general.

* The Holy Qur'anic verses read: "Whenever one of them is given the good news of a baby girl, his face grows gloomy and he suppresses his rage. He hides himself from the people because of the evil of that whereof he has been informed. Shall he keep her with dishonour or bury her in the earth? Certainly, how ill they judge!"

** For a chronological overview of these institutional discussions, see Ghaly M. (2016), pp. 32–33. For more detailed discussions, see Ghaly M. (2019).

SECTION 3. POLICY RECOMMENDATIONS

This study broadly shows that the questions raised by ARTs result in diverse opinions across the Islamic moral tradition. This gives healthcare professionals, their patients and policymakers greater freedom in formulating governing policies, and drafting regulations and laws. In this section we summarize our interpretation of the evidence, and provide our key recommendations and conclusions.

1. **The use of ARTs to treat infertility did not raise problematic concerns for the majority of Muslim scholars.**
   The overwhelming majority of Muslim scholars held that using ARTs to treat infertility does not raise any insurmountable theological or juristic problems. Through a set of conditions and precautions, the use of ARTs can be regulated in a morally acceptable way.

2. **The use of ARTs to have children should be exclusively available for married couples.**
   Male–female sexual relations and procreation should be regulated through recognized marriage. Thus, the artificial insemination of the couple's gametes and implanting the fertilized egg in the woman's uterus should be exclusive to those who have a recognized marital contract.

3. **Third-party reproduction is prohibited.**
   ARTs should not be used to treat the married couple's infertility by having eggs or sperms provided/donated by a third party. So-called third-party reproduction or donor-assisted reproduction is incompatible with the governing moral world of reproduction in Islam.

4. **All forms of surrogacy are forbidden.**
   This applies to both the surrogate who will carry another couple's embryo (gestational surrogacy), and to the woman who will be contributing her own egg (traditional surrogacy). In agreement with the majority of Muslim scholars, we recommend that surrogacy should also be prohibited within polygamy, when the surrogate is the husband's second wife.

5. **Cryopreservation of gametes is morally acceptable, and freezing the married couples' embryos is also possible, but as a second option.**
   In case of medical necessity (for example, cancer patients whose chemotherapy may cause infertility), patients should be given the option of freezing their gametes, even if the patient is currently unmarried. Later use of these frozen gametes for reproduction purposes

should be within a marital contract. In agreement with other voices in Islamic bioethics, we recommend that freezing gametes should also be possible for morally justified social reasons. As for married couples, freezing embryos is, in principle, permissible but should be resorted to only when the option of freezing separate gametes is not available, or when freezing embryos will better serve the purpose of treating the couple's infertility.

6. **Transplanting the uterus is permissible.**
   Organ transplantation is a permissible form of medical treatment, as long as there is good ethical management for the whole process (for example, the human dignity of the donor and the recipient is honored, proper informed consent is present, no commodification of the human body is involved, and so on). There is almost consensus that infertility can be treated by transplanting a uterus into another woman's body.

7. **Infertility should not be treated by transplanting ovary, testicles, penis or vagina.**
   Transplantation of ovary or testicles should be prohibited, because they preserve the donor's genetic material, which will be passed on to the future offspring. Transplantation of these organs would disturb the long-established understanding of parenthood in Islam. The prohibition of transplanting the penis or vagina is due to the moral rules of chastity in Islam, which forbid looking at, touching, or using other people's intimate parts or genitals, especially within the context of sexual intercourse.

8. **All permissible uses of ARTs should be bound by the principle of medical necessity.**
   ARTs should only be used to treat infertility when other less complex interventions are not effective. Hospitals and fertility clinics should develop their protocols, regulations and prioritization policies accordingly. Thus, these technologies should not be used for purposes that fall outside the scope of medical necessity, such as selecting the preferred sex of the child. Also, determining the number of fertilized eggs and those implanted in the wife's uterus should be meticulously regulated to address the medical necessity, without creating other problems such as surplus embryos or multiple pregnancies. ARTs should be provided for married couples who direly need them, and not just those couples who can afford the high cost of this treatment. There should be clear institutional and national guidelines to determine when this medical necessity will cease – for example, after a defined number of cycles, or after having a certain number of children, and so on.

9. **Drafting unified national regulations and/or codified laws is necessary.** To minimize the confusion that many healthcare professionals complain about, we recommend drafting national guidelines, policies or laws to unify ART practices. Qatar and other Muslim-majority countries, which still suffer a legal vacuum in this field, can establish interdisciplinary committees comprising experts in various fields to benefit from the available diversity in the Islamic discourse on ARTs.

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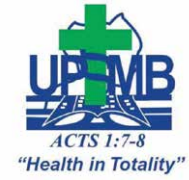
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