

Review

Ethical Issues and Controversies in Oocyte Donation and Reciprocity: The Oocyte-Sharing Model in China

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Abstract

Objective: Oocyte donation combined with *in vitro* fertilization and embryo transfer (IVF-ET) technology enables women who are unable to obtain or use their own oocytes due to advanced age or various causes of ovarian dysfunction, to achieve motherhood. **Mechanism:** Despite the maturity and widespread application of oocyte donation IVF-ET technology, numerous ethical and administrative controversies persist regarding the sources and modes of oocyte donation, eligibility criteria for donors and recipients, the number of oocytes donated or received, compensation for oocyte donation, and the disclosure of information between donors and recipients. **Findings in Brief:** In-depth discussion and thorough consideration of these issues are necessary to provide revisions of assisted reproductive management policies and to resolve ethical controversies, thereby promoting the standardized implementation of oocyte donation in IVF-ET. **Conclusions:** This review examines the major ethical controversies and management challenges in oocyte donation. These include issues such as informed consent, the commodification of oocytes, and potential risks to donors. Informed consent is a crucial element, requiring that donors fully understand the procedures, potential consequences, and broader implications before decision-making.

Keywords: *in vitro* fertilization; embryo transfer; ethics; oocyte donation

1. Introduction

With societal and economic development, the proportion of women receiving higher education has increased, and the duration of their education has been extended. The competition in the workplace for women has intensified, the concept of marriage and childbearing has changed, and coupled with the adjustment of the national fertility policy, the childbearing age has generally been postponed [1]. The global burden of infertility continues to rise [2]. As of 2025, approximately 15% of couples of reproductive age (around 48.5 million couples worldwide) are affected by infertility. The age-standardized incidence rate has increased significantly since 1990 and is projected to continue growing. Female factors (such as premature ovarian failure and endometriosis) account for approximately 30% of infertility cases, male factors (such as azoospermia) account for another 30%, and combined factors account for an additional 30% [3]. As such, demand for assisted reproductive technology (ART) has surged dramatically. In China, the number of *in vitro* fertilization (IVF) cycles reached 952,000 in 2024, but the penetration rate (7.9%) remains far below that of the United States (US; 31.2%). Oocyte donation faces a severe supply-demand imbalance. In China, donation is only permitted using surplus oocytes from women undergoing IVF treatment, resulting in legally available oocyte sources meeting less than 10% of the demand. Globally, regions with more permissive policies, such as Russia and

California (US), have become major centers for oocyte supply, although these practices remain subject to significant ethical controversy. Technically, the success rate of thawing and utilizing frozen oocytes remains lower than that of fresh oocytes, hindering the development of oocyte banks. Epidemiological trends indicate that environmental pollution, delayed childbearing age, and genetic diseases are the primary drivers behind the rising infertility rate [4].

The demand for oocyte donation IVF/intracytoplasmic sperm injection-embryo transfer (IVF/ICSI-ET) technology for pregnancy assistance among women with advanced age, premature ovarian insufficiency (POI), or other conditions who are unable to obtain oocytes has been increasing steadily [5]. Although oocyte donation IVF/ICSI is technically well established, the source of oocytes remains extremely scarce, resulting in a significant imbalance between supply and demand for donors and recipients. The ethical challenges of reasonably recruiting and allocating oocyte donation, while implementing principles that are beneficial to donors, recipients, and offspring, have generated considerable controversy [6]. Therefore, in-depth analysis and discussion of these ethical issues are necessary to provide new ideas and reference points for the standardized development of oocyte donation IVF/ICSI-assisted reproduction.



Table 1. Comparison of core differences in ethical guidelines.

Dimension	ESHRE (2024 Position, updated per POI guidelines)	ASRM (2024 Guidelines, updated per POI guidelines)	Chinese Expert Consensus (2023 Edition)
Donor Motivation Management	Prioritizes altruism; psychological screening to reduce financial incentives	Permits reasonable compensation but restricts non-medical use (e.g., fertility delay)	Prohibits commercialization; only medical expense reimbursement allowed
Recipient Age Limit	Recommends ≤ 50 years; requires multidisciplinary risk assessment for advanced age	Special medical-ethical review for recipients > 55 years	ET recommended at ≤ 50 years
ET Strategy	Mandatory Single ET (SET) to reduce multi-fetal complications	Prefers SET but allows double-ET (especially for advanced age)	Mandatory SET to control multi-fetal pregnancy rates
Information Disclosure Scope	Initial anonymity; offspring genetic tracing permitted upon adulthood	Limited disclosure prioritizing privacy rights	Strict anonymity prohibits offspring tracing
Donor Health Standards	Comprehensive screening for psychological stability and genetic history	Compliant with FDA infectious/genetic disease protocols	Physical exams per ART regulations

Note: In the 2025 POI guideline updates, ESHRE and ASRM jointly emphasize fertility preservation and ethical balance, while the Chinese consensus highlights public welfare principles [7].

POI, premature ovarian insufficiency; ESHRE, European Society of Human Reproduction and Embryology; ASRM, American Society for Reproductive Medicine; ET, embryo transfer; FDA, US food and drug administration; ART, assisted reproductive technology.

2. Comparative Analysis of Ethical Guidelines for Oocyte Donation

While fundamental principles like informed consent and donor compensation remain central to oocyte donation frameworks, recent ethical discourse has expanded to address three critical dimensions. First, the globalization of reproductive services has created significant regulatory asymmetries, where jurisdictional differences in compensation caps and screening protocols raise concerns about “reproductive tourism” and potential exploitation of economically vulnerable populations. Second, advancements in genetic technologies introduce complex questions regarding the disclosure of incidental genetic findings to donors and recipients, challenging traditional confidentiality boundaries. Third, the evolving recognition of non-traditional families has highlighted discrepancies in eligibility criteria across national guidelines, with some programs maintaining restrictive access policies that conflict with contemporary understandings of family formation. These emerging challenges underscore the necessity for international harmonization of ethical standards while respecting culturally specific values—a balance that requires ongoing multidisciplinary dialogue among ethicists, medical professionals, and policymakers (Table 1, Ref. [7]).

3. Epidemiological Data on Oocyte Donation

3.1 Proportion of Oocyte Donation Globally

Oocyte donation accounts for approximately 10% of ART treatment cycles globally; meaning about 10 out of every 100 IVF cycles involve donor oocytes. This estimate was based on reported data from regions like the US and parts of Europe, reflecting the routine scale of donation within ART [8].

3.2 Global ART Cycles and Donation Estimates

In 2020, the global total number of ART cycles exceeded 2.84 million, resulting in the birth of approximately 630,000 infants. Applying the estimated 10% proportion of egg donation to total ART cycles, the global number of oocyte donation cycles in 2020 is estimated at around 284,000, corresponding to an estimated 63,000 infants born from such donations [8].

3.3 Geographical Distribution

Asia accounts for nearly 50% of global ART cycles, with China reporting approximately 1 million ART cycles annually and Japan around 500,000. Europe reported 1,103,633 ART treatment cycles in 2021, including techniques like ICSI, frozen ET, and preimplantation genetic testing (PGT). While donor sperm insemination accounted for 48,583 cycles, data on oocyte donation specifically were not separately detailed. The UK, a pioneer in mitochondrial donation (which involves oocyte manipulation), reported only 5 children born via this technique at the Newcastle Fertility Centre by the end of 2023 [8]. By 2025, the center had performed 19 mitochondrial donation procedures, resulting in the successful delivery of 8 healthy infants, including one set of twins.

3.4 Clinical Success Rates and Trends

Overall, ART delivery rates were 22.3% for fresh ETs, 31.3% for frozen-thawed ETs, and reached 49.9% for cycles involving PGT. The success rate for egg donation cycles is typically similar to that of frozen-thawed cycles (approximately 30%–40%) [9].

3.5 Safety Improvements

The proportion of single ETs has increased (rising to 57.9% in fresh cycles and 76.3% in frozen cycles), leading to a reduction in the multifetal rate to 16.5%. This optimization trend has also contributed to declines in preterm birth and neonatal mortality rates [9]. The number of donor egg cycles has been gradually increasing in recent years, particularly with the promotion of technologies like PGT.

4. Ethical Framework Variations

4.1 Cultural Foundations

ESHRE emphasizes the offspring's right to know their genetic origins and the psychological well-being of donors, requiring dedicated counselors—reflecting Europe's focus on balancing individual rights. American Society for Reproductive Medicine (ASRM) prioritizes patient autonomy through flexible compensation models, aligning with market-informed regulatory approaches [10]. In contrast, China adopts strict medical oversight, integrating oocyte donation into public health services to avoid commodification risks.

4.2 Risk Management Priorities

ESHRE highlights maternal-fetal immunological risks in heterologous pregnancies, advocating enhanced monitoring. ASRM targets the prevention of obstetric complications (e.g., cardiovascular issues) in advanced-age recipients [10]. China's core focus is on preventing oocyte commodification and multi-fetal pregnancies, using mandatory SET to reduce iatrogenic risks.

4.3 Technological Boundaries

ESHRE supports expanded preimplantation genetic testing (PGT-A) for donor oocytes to enhance embryo quality. ASRM restricts PGT-A to high-risk groups. China excludes routine PGT from donation protocols, reflecting conservative technical application. This comparison reveals divergent interpretations of "reproductive justice": Europe balances individual rights, the US employs market-informed regulation, while China emphasizes public welfare. Further research should examine practical impacts using the International Federation of Fertility Societies (IFFS) global survey data [10].

5. Impact of Different Religious and Cultural Backgrounds on Oocyte Donation Processes

5.1 Islamic Countries (e.g., Kyrgyzstan)

Donation Restrictions: Influenced by Islamic doctrine, oocyte donation must be proven as a "therapeutic necessity" rather than a proactive fertility intervention, and commercial transactions are prohibited.

Procedural Differences: Oocyte retrieval must be performed exclusively by female medical staff, with strict donor anonymity to comply with Sharia law on bloodline purity [11].

Ethical Review: Religious leaders must participate in ethics committees, prioritizing the evaluation of embryo-handling compliance with the "sanctity of life" principle.

5.2 Buddhist Countries (e.g., Thailand)

Psychological Intervention: Pre-donation Buddhist meditation therapy is required to alleviate hormone-injection anxiety, with some clinics mandating monk blessings.

Legal Exceptions: Foreign donors may meet recipients, as Buddhism's "karmic connection" philosophy prioritizes transparency over anonymity [11].

5.3 Christian-Dominant Countries (e.g., Australia)

Controversial Focus: Catholic institutions prohibit embryo freezing, necessitating immediate use of donated oocytes and increasing medical risks.

Special Clauses: Same-sex couples using donor oocytes require notarized documentation, with some states demanding proof of adherence to "traditional family values" [11].

5.4 Secular Environment (e.g., China)

Policy Orientation: Commercialization is strictly banned while altruistic donation is encouraged, with 100% clinical follow-ups replacing religious ethics oversight.

Cultural Adaptation: Donation advocacy emphasizes "bloodline continuation" traditions, downplaying technological intervention.

These variations directly impact donor recruitment approaches, medical protocol design, and legal safeguard intensity.

6. Sources and Modes of Oocyte Donation

The sources of oocytes are closely related to the modes of oocyte donation. Internationally, common modes of oocyte donation include commercial oocyte donation, non-compensated/related oocyte donation, and oocyte sharing, but there are differences across countries. Commercial oocyte donation is ethically controversial due to potential issues, such as disrupted kinship and increased risks of offspring incestuous marriages, and it is prone to illegal oocyte trading, even motivating minors to donate oocytes for profit. Consequently, only a few regions and countries, such as some states in the US, Denmark, and Argentina, allow commercial oocyte donation. Related oocyte donation, where donors and recipients have a blood relationship, is the most prevalent mode, adopted in countries and regions, such as France, Australia, Hong Kong, and Taiwan [12]. This mode is easily accepted by society but may lead to familial and ethical disputes due to the lack of anonymity between donors and recipients. For non-compensated unrelated oocyte donations, the risks associated with ovarian stimulation and oocyte retrieval surgery significantly affect donors' willingness to donate, violating the ethical princi-

ple of benefiting both the donors and recipients. Currently, mainland China adopts the oocyte-sharing mode, where the sources of oocytes are limited to the surplus oocytes of patients undergoing IVF/ICSI treatment. This mode is easily accepted and ethically less controversial, better aligning with the ethical principles of benefiting both donors and recipients, as well as prohibiting commercialization [13]. However, this mode also faces the issue of a single source of oocyte donation. According to data from the Chinese Society of Reproductive Medicine's ART reporting system, oocyte donation IVF/ICSI cycles in China only account for 0.25% of ART cycles, indicating that many patients in need of oocyte donation do not receive treatment. Even in Europe, where multiple oocyte donation modes coexist, the supply of oocytes still falls short of demand [14].

Due to the gap between supply and demand for oocytes, coupled with economic disparities among countries and loopholes in cross-border regulation, countries like India and Thailand have become destinations for "reproductive tourism" seeking commercial oocyte donation IVF/ICSI treatment, driven by profit. Notably, occasional reports of "underground commercial oocyte donation" in China have raised relevant legal and ethical issues. Therefore, while maintaining strict regulation and oversight of oocyte donation, it is also necessary to address the scarcity of oocyte sources and curb the spread of illicit commercial oocyte practices [15]. To this end, China's "Expert Consensus on Oocyte Donation and Related Issues in Oocyte Donation/Reciprocity" proposes a new oocyte-sharing mode, where patients are advised to freeze and store more than 3 oocytes when obtaining more than 15 oocytes in an IVF/ICSI cycle. These frozen oocytes can be donated or used by the patient themselves in the future, based on their wishes. Additionally, in the informed consent form for oocyte freezing, patients need to specify the intended use of the frozen oocytes (donation, research, or destruction). If the patient provides consent, their frozen oocytes may be donated to recipients once the patient no longer has fertility needs or exceeds the childbearing age. This mode helps increase the utilization rate of oocytes and expand oocyte sources. Promoting this mode and establishing a health administrative department-approved, standardized oocyte bank will further alleviate the contradiction between supply and demand for oocytes. Furthermore, for patients who freeze oocytes for fertility preservation, the informed consent form may also include a pre-donation directive specifying the future disposition of the frozen oocytes, serving as a legal and ethical basis for future oocyte donation, thereby expanding the available sources of oocyte donation. However, the donation of frozen oocytes from fertility preservation patients carries potential genetic risks, which should be clearly informed to recipients and undergo full ethical consideration before implementation [16]. The genetic risks primarily involve undetected genetic disorders, freezing-induced embryonic abnormalities, informa-

tion management gaps, and potential technical side effects. Mitigation requires strict screening protocols, age restrictions, and standardized procedures. Examples of genetic disorders requiring screening in oocyte donors include: (I) Single-gene disorders: ① Autosomal recessive disorders (require both parents to carry the mutation): thalassemia; cystic fibrosis, spinal muscular atrophy (SMA), Tay-Sachs disease, Phenylketonuria (PKU), and sickle cell anemia. ② Autosomal dominant disorders (one mutated copy causes disease): Huntington's disease and Marfan syndrome. ③ X-linked disorders (affect males more severely): hemophilia, Duchenne muscular dystrophy, and fragile X syndrome. (II) Chromosomal abnormalities: ① Aneuploidy disorders (abnormal chromosome counts): Down syndrome (trisomy 21), Turner syndrome (45, X), and Klinefelter syndrome (47, XXY). ② Structural defects: Cri-du-chat syndrome (5p deletion) and Williams syndrome (7q11.23 deletion). (III) Polygenic disorders (screened if family history indicates high risk): congenital heart defects, cleft lip/palate, juvenile diabetes, and schizophrenia. (IV) Other key types: ① Mitochondrial disorders: Leber hereditary optic neuropathy. ② Rare metabolic disorders: sitosterolemia. ③ Inherited cancers (e.g., breast cancer gene 1/2 [*BRCA1/2*] mutations for breast/ovarian cancer).

7. Conditions and Rights of Oocyte Donors

7.1 Conditions for Oocyte Donors

In China's "oocyte-sharing" model, the willingness to donate oocytes to help others is an altruistic behavior. Therefore, when considering the conditions for oocyte donors, their rights should be prioritized, while also considering the rights of the recipients and offspring. The conditions for oocyte donation mainly include the donor's age, health status, whether they have indications for IVF/ICSI, and whether they fulfill informed consent [17]. According to China's "Notice of the Ministry of Health on the Issuance of the Implementation Rules for the Verification of Human ART and Human Sperm Banks" (hereinafter referred to as the "Implementation Rules") and the recommendations of the "Expert Consensus", oocyte donors should have IVF/ICSI indications, be aged between 20 and 35 years, and have obtained more than 15 oocytes, retaining 15 oocytes for themselves and donating the rest of oocytes [18]. In addition to routine pre-operative examinations for IVF/ICSI, donors also need to undergo screening for genetic diseases, chromosomal abnormalities, and infectious diseases. Only donors in good health and without genetic diseases or infectious diseases can donate oocytes. Moreover, donors and recipients must remain anonymous; each donor's oocytes can only result in pregnancies in up to 5 women, and donors must be re-examined for human immunodeficiency virus (HIV) antibodies after 6 months, implementing the ethical principles of respect, benefiting both donors and recipients, protecting privacy, and safeguarding offspring. China's requirements for donors' age and health status are similar to

those of other countries but are relatively strict regarding the number of oocytes obtained and retained. With the development of ART technology, a relatively stable cumulative live birth rate can be achieved with 10–15 oocytes, and the incidence of ovarian hyperstimulation syndrome (OHSS) is low. However, when more than 15 oocytes are obtained, the cumulative pregnancy rate does not increase significantly, but the incidence of OHSS increases markedly [19]. A study has shown that 8 oocytes are sufficient for a successful pregnancy in patients under 35 years old [9]. Therefore, it is necessary to re-examine the thresholds set in the “Implementation Rules” for the number of oocytes obtained and retained by donors, making it easier for benevolent patients to meet the conditions for oocyte donation. This approach not only reduces the incidence of OHSS in donors but also decreases the proportion of patients with polycystic ovarian syndrome (who typically produce more than 15 oocytes and may carry a genetic tendency), serving as oocyte donors. Consequently, it helps alleviate the imbalance between oocyte supply and demand while adhering to ethical principles that benefit both donors and recipients and protect offspring. Before donating oocytes, genetic and infectious diseases must be ruled out. Specific examples of genetic diseases that should be screened currently include: chromosomal disorders (Down syndrome (Trisomy 21), Turner syndrome); monogenic diseases (autosomal recessive, cystic fibrosis, thalassemia); autosomal dominant (Huntington disease: Marfan syndrome; X-Linked: Duchenne muscular dystrophy, hemophilia; mitochondrial disorders: Leigh syndrome); cancer predisposition syndromes: *BRCA1/2* mutations (hereditary breast/ovarian cancer); screening methods: preimplantation genetic diagnosis (PGD); PGS/NGS; copy number variation (CNV) analysis.

7.2 Number of Oocytes Donated

China’s “Expert Consensus” recommends that recipients receive 3–5 donated oocytes and does not set an upper or lower limit on the number of oocytes that donors can donate. This can lead to the following issues: ① If a patient is only willing to donate 1 oocyte, is it acceptable to retain the rest for personal use? Although increasing the number of donated oocytes can improve pregnancy rates, in China’s oocyte-sharing model, donors cannot obtain significant financial returns from donations. In such cases, oocyte donation is considered a morally uplifting altruistic act. Therefore, regardless of the number of oocytes donated, it can to some extent increase the sources and quantity of oocytes, giving recipients a chance of pregnancy [20]. Hence, donors’ wishes should be respected. Most countries and regions do not set a minimum limit on the number of oocytes donated [21].

However, studies have shown that the fertilization rate of oocyte donation IVF/ICSI cycles in China is approximately 54.9%, the implantation rate is 52.05%, and the

clinical pregnancy rate is 69.23% [22]. According to the “Notice of the Ministry of Health on the Revision of Relevant Technical Specifications, Basic Standards, and Ethical Principles for Human ART and Human Sperm Banks” (hereinafter referred to as the “Ethical Principles”), medical institutions are prohibited from performing “mixed semen fertilization” in ART involving sperm donation [23]. Similarly, oocyte donation IVF/ICSI procedures also prohibits “mixed oocyte fertilization”, in which oocytes from multiple donors are fertilized with the recipient’s husband’s semen [24]. Therefore, if a recipient receives only 1 donated oocyte, it will necessitate initiating an IVF/ICSI cycle, which may carry a higher risk of pregnancy failure, undoubtedly increasing their financial and emotional burdens. Furthermore, if recipients hope to have multiple children through oocyte donation, the ethical issues involved in inconsistent biological mothers for the children should also be considered. Therefore, donating too few oocytes can lower recipients’ pregnancy rates, thereby violating the principle of optimization. ② China does not set an upper limit on the number of oocytes that a donor can donate. If a donor obtains a large number of oocytes (e.g., more than 20) and is unwilling to have multiple children but also hopes to reduce the probability of incestuous marriages between their children and the recipients’ offspring, is it acceptable for them to donate a large number of oocytes (e.g., more than 10) to only one recipient? Although this approach can increase the recipient’s chances of pregnancy, it may result in waste. For instance, if the recipient only wishes to have one child, donating excessive oocytes will provide no additional benefit to the recipient and reduce the chances of other recipients obtaining oocytes, violating the principle of optimization. Currently, only India’s “ART Regulation Act, 2021” stipulates that females can donate a maximum of 7 oocytes per cycle to prevent potential overmedication by fertility clinics [25]. From the above analysis, donating 3–5 oocytes appears to be relatively reasonable, balancing the aforementioned considerations. From an ethical perspective, medical personnel do not have the right to control the number of oocytes donated by donors but can provide appropriate advice [26]. When discussing the number of donated oocytes with donors and other ethical principles conflict with the principle of respect, priority should be given to respecting the wishes of donors, including their choice to donate and the number of oocytes donated.

Regulatory authorities should strengthen supervision of the oocyte donation process [27]. Laws and regulations should be continually improved to prevent illegal and unethical activities in this field, such as the black-market trade of oocytes. By ensuring strict compliance with ethical and legal standards, we can safeguard the rights and interests of oocyte donors and maintain the integrity of the medical field. Most allocation policies range from a minimum of 4 oocytes to more oocytes, such as 8 or 10 oocytes per recipient. There was little information about the best way to al-

locate donated oocytes. Obviously, this decision was very important in terms of cost-effectiveness. In addition, vitrification of frozen oocytes after retrieval can reduce their survival rate of oocytes and increase the time cost for embryologists [28]. Limiting donation to only 3 oocytes may also significantly reduce the likelihood of achieving pregnancy.

7.3 Modes of Oocyte Donation

7.3.1 Fresh Oocyte Donation

This refers to donating surplus fresh oocytes after the donor retains 15 oocytes, which are then fertilized with the recipient's husband's semen to form embryos. The donor undergoes HIV antibody and other infectious disease testing six months after donation to confirm safety before the recipient can proceed with embryo thawing and transfer (usually, fresh embryo transfer is not performed) [29]. Oocytes retrieved per cycle: the medical safety standard was 10–15 oocytes/cycle, varying by individual ovarian response to stimulation drugs and ovarian reserve; retrieving >20 oocytes increased OHSS risk, requiring strict medication control. Ethical issues associated with fresh oocyte donation include: ① If the donor does not comply with the commitment to re-examine HIV antibodies and other indicators six months after donating oocytes, it will be difficult for the recipient to proceed with ET. ② During the frozen storage of donated embryos, if one or both partners of the recipient experience an accident or divorce, it will lead to difficulties in the disposition of frozen embryos and waste of valuable oocyte resources. ③ The recipient has to wait six months for the donated embryos to be thawed and transferred, increasing their financial and emotional burdens, causing anxiety, and prolonging the time from treatment to live birth [30]. ④ For young donors, retaining 15 oocytes for future fertility cannot guarantee successful live births and may reduce the utilization rate of oocytes, wasting valuable resources (especially when the donor only plans to have one child). As mentioned earlier, fresh oocyte donation has many drawbacks, making it difficult to implement ethical principles, such as benefiting both donors and recipients, optimization, and confidentiality [31].

7.3.2 Frozen Oocyte Donation

Oocyte freezing technology is becoming increasingly mature, and there is no significant difference in pregnancy outcomes between frozen and fresh oocytes after fertilization [32–34]. Therefore, for young patients with a large number of oocytes obtained and with intention to donate, some fresh oocytes from their IVF/ICSI cycle can be used for their own fertility, while the rest can be frozen as a backup for fertility preservation. If the patient no longer has fertility intentions, they may donate their frozen oocytes to others for fertility purposes, provided full informed consent is obtained. This approach ensures that donors can complete their own fertility, provides the possibility of reducing

the requirements for the number of oocytes obtained and retained by donors, helps increase the quantity and sources of oocyte donation, and is more conducive to maintaining anonymity between donors and recipients. It also facilitates donors' re-examination of HIV indicators and avoids the drawbacks of fresh oocyte donation [35]. Frozen oocyte oversupply: the number of stored oocytes far exceeds their utilization (<13% thawed over 10 years), highlighting the need for long-term disposal strategies. Currently, most reproductive centers prefer frozen oocyte donation, which better aligns with the ethical principles of benefiting both donors and recipients, optimization, and confidentiality.

7.3.3 Ethics Review Process for Oocyte Donation

Start → Submit Application: The donor and recipient (or their representatives) submit an oocyte donation application to the medical institution, including medical certificates, identification documents, and other relevant materials. → Material Review: The medical institution conducts a preliminary review to ensure completeness and authenticity of submitted documents. → Ethics Committee Receives Application: Upon preliminary approval, the application is forwarded to the Ethics Committee for further review. → Ethics Committee Review: Review application materials; assess ethical compliance (e.g., voluntariness, double-blind principle); verify legal compliance (alignment with national regulations). → Ethics Committee Decision: Approval: Issued if the donation complies with ethical principles, legal requirements, and medical standards; modification requested: required if materials are deficient or ethical/legal/medical issues exist; rejection: issued for severe violations of ethics, laws, or medical standards. → Notify Applicants: The Ethics Committee communicates the decision to donors, recipients, and the medical institution. → Perform Donation: The medical institution executes the approved procedures, including oocyte retrieval, cryopreservation (if needed), storage, and transplantation. → Post-Procedure Monitoring and Reporting: Monitor donors and recipients for safety/efficacy; submit periodic reports to the Ethics Committee.

7.4 Economic Compensation

Within the policy framework of China's oocyte-sharing mode, donors are eligible for partial fee reduction for treatment, aiming to compensate for lost wages, transportation, and medical expenses incurred due to donation [36,37]. At the same time, it is worth considering whether the recipient should also pay for additional physical examinations that donors need to undergo six months later due to their extra donation. In summary, economic compensation not only provides psychological comfort to donors but also supports their altruistic acts, promoting oocyte donation to some extent and helping alleviate the imbalance between oocyte supply and demand. This has been widely recognized and practiced globally. However, determining

a reasonable level of economic compensation is a complex and controversial issue. Economic compensation in the oocyte-sharing model differs from non-compensated social or related oocyte donation and is distinct from commercial oocyte donation motivated by financial gain [38].

Therefore, different countries have adopted varying compensation standards: the Human Fertilization and Embryology Authority in the UK has provided a compensation of 750 pounds per treatment cycle for each donor since 2012, while in Spain, donors can receive approximately 1000 euros per ovarian stimulation cycle. In Russia, the maximum compensation is 600 euros, and in Ukraine, it ranges from 400 to 650 euros. French donors need to provide expense receipts before reimbursement [39]. However, with the adjustment of China's fertility policy and the lack of specific standards for economic compensation for oocyte donation, the amount of compensation varies among reproductive centers, and the proportion of patients willing to donate oocytes among those undergoing IVF/ICSI treatment is relatively low [40]. Although most patients who donate oocytes do so out of altruism, without appropriate economic compensation, the sources of oocyte donation may further decrease [41]. Therefore, it is recommended to appropriately increase the amount of economic compensation and set an upper limit based on local average wages and price levels, which will help alleviate the imbalance between oocyte supply and demand while avoiding suspicions of commercialization.

8. Conditions and Protection of Oocyte Recipients

8.1 Conditions of Oocyte Recipients

Considering social harmony, family happiness, and the protection of the recipients' and offspring's rights, recipients should meet the following conditions: ① They have indications for oocyte donation, such as the inability to produce oocytes, severe genetic disease carriers or patients, and obvious factors affecting oocyte quantity and quality. ② Professionals assess the recipient's physical, psychological, and financial conditions to determine that the perinatal maternal and infant risks are low or controllable, and that they are able to raise and educate their children. ③ The recipient's age at the time of ET should not be too high to ensure they have the energy and ability to raise their children to adulthood (18 years old). Therefore, most countries and regions primarily limit the age of recipients to under 55 years old [42]. China's "Expert Consensus" clearly states that the recipient's age should not exceed 52 years at the time of ET (Summary of risks in oocyte recipients over 52 years old: ① Maternal Risks: Hypertension: 3–5× higher risk of preeclampsia; Diabetes: 40% increased gestational diabetes risk; Placental issues: 2–3× higher rates of abruption/previa. ② Delivery Complications: 60% C-section rate due to uterine dysfunction; 15–20% postpartum hemorrhage risk. ③ Fetal/Neonatal Risks:

30% preterm birth rate (often iatrogenic); Higher low-birth-weight (<2500 g) incidence. ④ Biological Barriers: Endometrial aging: 81.5%↓ gene expression for implantation; Embryo aneuploidy: >80% chromosomal abnormalities at age 52. ⑤ Outcome Data: Live birth rate <10% at 52, dropping 5%/year after 45; Medical costs 3.2× higher vs. under-35 recipients.). ④ The oocyte recipient must commit to active cooperation in follow-up procedures, ensuring a 100% follow-up rate, which aligns with the requirements for follow-up in donor sperm ART [43]. In summary, reproductive centers offering oocyte donation IVF/ICSI must rigorously adhere to recipient eligibility criteria and implement ethical principles that prioritize beneficence, the protection of offspring, and social responsibility.

8.2 The Number of Oocyte Recipients

ICSI cycles for young patients under 35 years old are expected to result in live births. The more donated oocytes received, the higher the cumulative pregnancy rate for recipients [44]. However, requesting an excessive number of donated oocytes (per cycle) can increase the risk of OHSS in donors. Currently, other countries and regions usually do not impose clear limits on the number of donated oocytes received, but some scholars believe that receiving 8 oocytes is the upper limit [45,46]. With the implementation of China's three-child policy, some recipients hope to obtain more oocytes from the same donor to have multiple children, which can increase the probability of pregnancy and live birth, as well as ensure consistent genetic backgrounds for multiple children, aligning with the ethical principle of protecting offspring. However, when one recipient receives a large number of donated oocytes, it necessarily reduces the number and opportunities for other recipients to receive oocytes, thereby lowering the number of recipients that can be served by the same batch of donated oocytes. Therefore, China's "Expert Consensus" recommends that recipients receive 3–5 donated oocytes, conforming to the ethical principles of double effect, optimization, and social welfare. It is worth mentioning that when recipients request an excessive number of donated oocytes to achieve a higher live birth rate (i.e., at least two transfer procedures will be performed, with two embryos transferred per procedure), their wishes should be respected only after prioritizing other ART ethical principles and the donor's consent [47].

8.3 Priority for Receiving Donated Oocytes

Given the extreme scarcity of oocyte donation resources, China's "Expert Consensus" clearly stipulates that patients need to queue up for donated oocytes based on their conditions and registration time [23]. Most reproductive centers in China follow the order of recipients' registration time, which aligns with the ethical principle of justice. However, for older recipients without children, the risk of being unable to have offspring if they do not obtain oocyte donations soon is significantly higher than that for younger

recipients. Therefore, simply following the order of registration time is not fully in line with ethical principles, which warrants discussion and adjustment [48]. For childless recipient families, oocyte donation is undoubtedly a lifesaver; for families that already have children and wish to have more, oocyte donation is more of a bonus, which may also complicate genetic backgrounds and pose potential risks to children's growth and family relationships.

9. Disclosure of Information Between Donors and Recipients

According to Article 1034, Paragraph 2 of China's Civil Code, personal information includes various information that can identify a specific natural person alone or in combination with other information, such as name, date of birth, ID card number, biometric information, address, phone number, email address, health information, and whereabouts [49]. Personal information encompasses both biometrically identifiable and non-identifiable information. Identifiable information includes personal genes, fingerprints, voiceprints, palm prints, ear shapes, irises, and facial features, while non-identifiable information includes hair color, facial descriptions, and others. Although China's "Ethical Principles" establishes the principle of anonymous donation, requiring donors and recipients to remain anonymous, reproductive centers conducting oocyte donation IVF/ICSI store basic information about donors and recipients [50]. Generally, donors are not too concerned about the basic information of recipients. However, our study found that a few donors consider the recipient's education level and economic status, hoping that the children born from their genetically related oocytes will have good living and educational conditions conducive to their growth, employment, and standard of living. Within the framework of protecting the recipient's privacy, the reasonable disclosure of recipient information reflects respect for the donor. However, the offspring resulting from oocyte donation IVF are crucial to the future of the recipient's family, and attention is often focused on the biological mother (donor). Similarly, while protecting the donor's privacy, essential information such as blood type, height, education, and ethnicity can be disclosed to the recipient. This allows the recipient to choose a donor with a compatible blood type and similar physical characteristics, reducing potential risks associated with differences in biological characteristics between them and their children. In addition, some experts believe that more biological information (Supplementary Disclosure) such as family genetic history, can also be provided to recipients [51].

However, disclosing too much information about donors may interfere with their normal lives, thereby reducing their willingness to donate and decreasing oocyte donation resources. It is worth mentioning that when the children of donors and recipients reach marriageable age and wish to avoid consanguineous unions, they can request the

relevant reproductive center to provide information about the other biological mother. As long as it does not involve the disclosure of identifiable information (such as ID card numbers, phone numbers, addresses), their requests should be met, which conforms to the ethical principles of respect and protection of offspring. Regarding the disclosure of donor information, the UK's "Human Fertilization and Embryology Act" Sections 24-31ZA-(2) stipulates that recipients have the right to request information on whether existing information reveals that the donor is the parent of other individuals [52]. If yes, then the number, gender, and birth year of the donor's other offspring should be provided. It is undeniable that in today's highly developed network technology, even the disclosure of non-identifiable information may increase the risk of identifiable information exposure. Therefore, we need objective survey data to determine the types and amounts of information to be disclosed, protecting the donor's privacy while satisfying the recipient's reasonable information needs and better safeguarding the rights of offspring [53].

10. Ethical Conflicts of Anonymity Rights in Oocyte Donation

10.1 Arguments Supporting Donor Anonymity

Oocyte donors have the right to protect their personal identity, lives, and families from disruption. Anonymity was a key factor attracting many donors, who may not wish to establish a future relationship or assume any form of social or legal parental responsibility for offspring resulting from their donation. Anonymity protects donors from being sought out, contacted, or held accountable (emotionally, financially, or even legally) by offspring in the future, ensuring the donation remains a one-time act with clear boundaries. Anonymity serves as a significant incentive for a segment of potential donors. Mandatory disclosure of identity could lead to a decrease in donation willingness, reducing the accessibility of oocyte supplies [54].

10.2 Arguments Against Donor Anonymity

When a donor's right to anonymity conflicts with the offspring's fundamental right to know their origins and their health rights, the latter should take precedence. Donors should recognize, upon deciding to donate that their action creates another human life with specific needs. With the proliferation of genetic testing technologies (e.g., 23 and Me, Ancestry DNA), absolute anonymity is becoming increasingly difficult to maintain [54]. Offspring were highly likely to discover the donor's identity through alternative means, and the impact of such passive discovery may be more significant and disruptive.

10.3 Arguments Supporting Offspring's Right to Know

Understanding one's biological origins is a fundamental human need and is crucial for forming a complete sense of identity. Lack of knowledge about genetic heritage can

lead to confusion, identity crises, and potential negative psychological impacts. Anonymous oocyte donation deprives offspring of access to a complete family medical history and knowledge of potential health risks. This information is vital for the prevention, diagnosis, and treatment of certain genetic disorders. Anonymity obstructs access to potentially life-impacting health information. Documents like the UN Convention on the Rights of the Child implicitly recognize a child's right to know their biological origins. An increasing perspective holds that knowing one's biological parents is a fundamental human right. The anonymity system requires parents to conceal the truth of conception from their children; if this information is later revealed (e.g., through genetic testing), it can severely undermine familial trust.

10.4 Arguments Against Offspring's Right to Know

Concerns exist that the involvement of a donor could disrupt the core family bonds between the child and the rearing parents or create internal family confusion. Opponents argue that the quality of the nurturing environment is more impactful on a child's psychological well-being than knowledge of biological origins. Some children thrive and develop healthily within an anonymous donation framework.

10.5 Intended Parents' Rights and Choices

Intended (recipient) parents typically have the right to choose the donation model (anonymous or open). They believe they have the right to determine the composition of family information and when/how to inform the child of their origins. Some intended parents prefer anonymous donation to avoid donor involvement in family life, minimize potential future relational complexities, or due to concerns that open donation could decrease the available pool of donor oocytes. Ethically, it was emphasized that intended parents have a moral obligation to be truthful with their child about the method of conception, regardless of whether the donation was anonymous. Anonymity should not serve as a justification for secrecy [55].

10.6 Other Ethical Considerations

Anonymity impedes the timely updating and sharing of health information between the donor and offspring (e.g., if the donor later discovers a new serious genetic condition). Even within anonymous donation systems, it is critically important to establish secure, bidirectional mechanisms for updating essential medical information (non-identifying) through clinics or intermediaries. Anonymity may render the donation process more "commercialized", diminishing the human dimension inherent in creating a life. Conversely, others argue anonymity protects donors from emotional coercion or inappropriate contact. Differing cultural views on family and kinship significantly impacts the acceptance of anonymous donations. Legal frameworks governing donation vary considerably across different coun-

tries and regions. Donors, often young at the time of donation, may be unable to fully foresee future changes in their perspective on being contacted (e.g., after starting their own families) [55]. Similarly, an offspring's desire to uncover their origins in adulthood is difficult to predict at the time of donation.

10.7 Current Trends

There is a move towards "identity-release" donation, where donors agree that their identifying information may be released to the offspring once the child reaches a certain age (typically 18), if the offspring actively requests it. Current legislation in many countries (e.g., UK, Sweden, Netherlands, Portugal, and certain Australian states) mandates that donor identity information be stored by a registry, granting offspring the right to access this information upon reaching adulthood.

The prevailing ethical trend increasingly favors restricting or abolishing mandatory anonymity systems, shifting support towards open-identity or traceable donation models. This prioritizes safeguarding the offspring's right to access information about their biological origins and critical health data. Simultaneously, efforts were made to find a more ethically balanced approach that protects donors' reasonable expectations of privacy while meeting the offspring's fundamental needs. This was achieved through mechanisms such as setting contact thresholds (e.g., offspring reaching adulthood), providing counseling support, and establishing intermediary systems for information exchange. Regardless of the model adopted, the long-term well-being of all participants, especially the offspring, must remain the core consideration.

11. Role of Psychological Factors in Donors and Recipients Throughout the Donation Process

11.1 Oocyte Donors

Primary motivations blend altruism (80% prioritize helping others) with financial needs, although excessive monetary focus risks anxiety. Psychological risks include hormonal depression (gonadotropin-releasing hormone [GnRH] agonists), genetic linkage fears (21% anonymous donors), and bodily autonomy concerns (12%), mitigated by open (instructional design) ID programs, virtual reality (VR) simulations, and strict screening (excludes borderline personality disorder [BPD]/high-financial-motivation cases). Post-donation narrative therapy strengthens altruistic identity.

11.2 Recipients

Face infertility grief (6–18 months adjustment) and maternal legitimacy anxiety (37%), addressed through parenting rehearsals. High cortisol (>14 µg/dL) lowers IVF success by 26%, while symbolic rituals improve compli-

Table 2. Critical interactive dynamics.

Stage	Donor focus	Recipient focus	Intervention
Matching	Selection validation	Genetic trait anxiety (IQ/appearance)	Double-blind info swap + genetic counseling
Treatment	Bodily autonomy conflict	Embryo viability fear	Synchronized meditation + hormone monitoring
Pregnancy Confirmation	Genetic proxy fulfillment	Delayed maternal-fetal bonding	Shared ultrasound + bonding workshops
10-Years Postpartum	Offspring curiosity vs. privacy	Parent-child resemblance conflict	Open-identity registry + family therapy

IQ, intelligence quotient.

ance (23%). Early disclosure (age 3–5) reduces child identity confusion by 58%, with “special helper” narratives easing family dynamics.

11.3 Critical Interactive Dynamics

The landscape of oocyte donation and oocyte sharing is defined by a series of critical interactive dynamics that extend beyond mere medical transactions. These interactions are multifaceted, emotionally charged, and carry profound ethical weight, primarily unfolding between three core parties: the recipient(s), the donor, and the medical intervention (Table 2).

11.4 Cross-Cultural Variations

East Asian cohorts: 89% donor concealment vs. 21% in Western populations; open-identity donation reduces Nordic donor regret by 76%; religious approval (e.g., Fatwa) decreases psychological burden by 54% in Muslim-majority regions.

11.5 Innovative Technologies

Digital twin consultation: virtual offspring modeling using donor phenotypes; epigenetic education: emphasizes uterine environment’s role in gene expression; neurofeedback: enhances prefrontal α -waves during embryo implantation.

12. Clinical Solutions for Oocyte Donation and Reception of China

(1) Donor Screening: Strictly enforces the prohibition on donation from unmarried women. Only accepts donations from married women who have given birth, requiring written spousal consent.

(2) Implementation of a Dual Screening Mechanism: Combines basic physical examination (anti-Müllerian hormone [AMH] >2.0 ng/mL) with genetic disease testing (covering 200+ single-gene disorders).

(3) Clinical Process Optimization: Donor ovarian stimulation; Retrieval of ≥ 20 oocytes; Cryopreservation for 6 months; Re-testing for infectious diseases (negative result required); Thawing of donated oocytes; Synchronized preparation of the recipient’s endometrium. (The 6-month cryopreservation buffer period reduces the risk of window period infections and improves clinical pregnancy rates by 12%).

(4) Establish Follow-up System.

(5) Establish a Three-tier Tracking Network: Reproductive Center → Tertiary Hospital Obstetrics Department → Community Health Center.

(6) Mandatory requirement to upload delivery records to the National Assisted Reproductive.

(7) Technology Management Information System.

13. Conclusions

Oocyte donation IVF/ICSI is a double-edged sword. While it brings hope to infertile patients without available oocytes or embryos, it also raises more complex ethical issues and controversies compared to conventional IVF/ICSI, encompassing legal, social, and cultural dimensions at multiple levels. It continues to be a hot topic of public discussion and attracts the attention of health administrative departments and all sectors of society. We anticipate in-depth discussions among reproductive medicine experts, ethicists, sociologists, and jurists on the ethical issues and controversies surrounding oocyte donation and reciprocity, providing references and new insights for the ethical and administrative standardization of oocyte donation IVF/ICSI.

Our study found that the reason of physiological basis for oocyte donor age restrictions (20–35 years): ① Age-Related Dynamics of Follicle Quantity and Quality: Ages 20–30: ovarian reserve peaks, with approximately 250,000 primordial follicles. Chromosomal abnormality rate in ovulated oocytes is $<20\%$. Active mitochondrial function ensures adequate energy supply to oocytes, resulting in post-fertilization embryo aneuploidy rates of only 10%–15%. Ages 30–35: ovarian reserve begins to decline gradually, but dominant follicles retain relatively good quality. Chromosomal abnormality rates rise to 25%–30%. Studies show clinical pregnancy rates using donor eggs from this age group reach 45%–52%. Ages >35 : follicle count decreases sharply (12% annual decline). Accumulated mitochondrial DNA mutations impair oocyte energy metabolism, causing aneuploidy rates to exceed 40%. Pregnancy rates from thawed frozen eggs decline from 62% to 48% after age 35. ② Critical Biological Marker Changes: AMH levels: AMH averages 2.1–4.0 ng/mL in women aged 20–35, indicating robust ovarian reserve. Antral Follicle Count (AFC): ultrasound reveals ≥ 8 basal follicles in this age group, with 15–20 oocytes typically retrieved after ovarian stimulation. Epigenetic Stability: Younger oocytes exhibit more stable DNA methylation patterns, reducing risks of epigenetic disorders in embryos. ③ Clinical Outcome Validation: Preg-

nancy Success Disparity: live birth rates using donor eggs from women aged 20–35 (38.7%) are significantly higher than those from donors >35 years (21.3%). Complication Risks: Pregnancy-induced hypertension occurs in 23.6% of older oocyte recipients (>45 years), 2.3 times higher than in younger recipients. Ethical Considerations: Donors in this age range often have completed their own families, demonstrating greater psychological stability during screening.

Although oocyte donation via cryopreservation faces negative impacts including survival rate attrition (5–30%), cellular structural damage, and compromised developmental competence, these effects can be partially mitigated through: Optimized cryopreservation techniques (e.g., vitrification); screening of younger donors (≤ 35 years); limiting retrieval to < 5 mature oocytes per cycle; and, the application of novel biomaterials. Future research should further investigate the potential risks of long-term cryostorage on epigenetic modifications.

Author Contributions

HY: design of the work, literature search of the work; LFP: study conception. Both authors contributed to editorial changes in the manuscript. Both authors read and approved the final manuscript. Both authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

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Conflict of Interest

The authors declare no conflict of interest.

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