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The Possible Dangers of Prenatal Nonmedical Sex Selection in regard to *in vitro* Fertilization

Falicia Elenberg[1] and **Edmund G Howe III**[2*]

[1]*8311 Aqueduct Rd, Potomac, MD 20854, USA*

[2]*Professor of Psychiatry, Professor of Medicine, Senior Scientist, Center for the Study of Traumatic Stress (CSTS), Uniformed Services University of the Health Sciences, USA*

Article Info

***Corresponding author:**
Edmund G Howe III
Professor of Psychiatry
Professor of Medicine
Senior Scientist, Center for the Study of Traumatic Stress (CSTS)
Uniformed Services University of the Health Sciences
Bethesda, Md.
USA
Tel: 301-295-3097
E-mail: edmund.howe@usuhs.edu

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Abstract

In the United States, people who use artificial reproductive technologies have the option of choosing the sex, for nonmedical purposes, of the child they would like to conceive. This is in sharp contrast to many areas of the world in which this practice has been banned. In this paper, the process of prenatal sex selection is explained and compared to other forms of sex selection. Policy regarding nonmedical sex selection in the U.S. is then contrasted to that of other countries, followed by a discussion of the ethical considerations of this practice with a particular focus on the potential dangers it could pose to women. The paper then ends with policy and regulation recommendations as well as an examination of how sex selection relates to larger conversations regarding abortion, genetic engineering, and cloning.

Keywords: Gender Equality; Sex Selection; Ethics; Artificial Reproductive Technology; *in vitro* Fertilization.

Introduction

In the U.S., parents who undergo *In-Vitro* Fertilization (IVF) can choose the embryo they want to implant based on the sex of that embryo. There are many considerations that arise from this fact, and when examining this phenomenon from an ethical and feminist perspective, certain complicated concerns become apparent.

IVF is a form of assistive reproductive technology in which sperm taken from a male are combined in a laboratory dish and allowed to fertilize one or more egg cells taken from a female. The fertilized eggs may then become a healthy embryo which is transferred into the uterus of a female, and if it properly implants itself into the womb, a pregnancy can result [1].

There are generally two ways in which patients can select for the sex of their child prenatally. One way involves technology known as Microsort, in which sperm is separated based on density, and then patients decide whether they want the X (female) chromosome carrying sperm or the Y (male) chromosome carrying sperm to be used to fertilize the egg. This method is roughly 90 percent accurate in yielding females from the X sample and roughly 81 percent accurate in yielding males from the Y sample [2]. Another method for prenatal sex selection revolves around direct genetic testing of the embryo. Patients who produce multiple viable embryos, and who have pre implementation genetic testing conducted, can choose which embryos to implant based on the results. Couples may also decide to have this genetic screening done so they can choose embryos that do not have specific harmful genetic conditions [1].

Female infanticide, the deliberate killing of newborn female children, has been a long-standing issue and is viewed as being the result of patriarchal societies creating a bias against women [3]. Although the choosing of the sex of an embryo in IVF does not result in taking the life of any infants, to some parents being allowed to choose male embryos over female embryos constitutes an almost preemptive and somewhat analogous situation to female infanticide. Even if one answer to this is no, ethical concerns remain in regard to allowing discrimination by sex, even if it applies to cells not yet constituting people. Western countries often see other countries as more likely to engage in dubious ethical practices, such as prescribing insufficiently tested new medicine previously, or even engaging is sexist practices like surgery on women's genitals for social reasons, but we, in this case, may be seen at least as ignoring one of our own.

The goal of this paper is to explore the possible consequences of sex selection in IVF and to offer solutions and recommendations. We will cover how European and other countries' laws differ from U.S. laws in regard to sex selection. We will also examine how the process of sex selection is actually practiced in the U.S. We will then discuss the complicated ethical issues that arise from prenatal sex selection and the impact that this discussion could have on the conversation regarding abortion. Finally, we will end this paper by suggesting policy that could help prevent problematic ethical issues and consider how this conversation ties into the larger pictures of genetics, reproduction, and female rights.

Laws and Practices regarding Sex Selection

In the last few decades there have been numerous international conferences, which among their many goals, sought to safeguard human, and more specifically, women's rights. Many of these conferences directly addressed the concept of sex selection before birth. During the 1990s, declarations from both the International Conference on Population and Development and the World Conference on Women regarded prenatal sex selection as an act of violence against women, a form of discrimination, and unethical, and these declarations called upon the international community to prevent this [4,5].

Interestingly, around this same time in the U.S., the institutional review board of the fertility clinic, the Genetics & IVF Institute, approved the trial of Microsort, the prenatal sex selection method mentioned earlier. They cited the main purpose of using this method as being in favor of family balancing, a practice in which families can choose a gender less represented among the children they already have [4]. This highlights just the beginning of a long history of contrasting views and approaches the U.S. has taken to implement pre-natal sex selection as compared to other countries around the globe, and it sheds light on the role that private for-profit fertility clinics play in this context.

In the 1980s the UK distinguished between medical and non-medical sex selection. Medical sex selection was defined as being used for the purpose of avoiding sex linked diseases (diseases whose genetic variants are located on sex chromosomes and therefore have different heritability patterns depending on a person's sex), whereas non-medical sex selection was defined as being based on preference or any other non-medical motivation. The UK has since banned the latter, as did China, India, Europe, Australia, and Canada. The U.S., on the other hand, has an absence of such regulations, and thus, non-medical sex selection is permitted [4].

The important question to ask at this point is how many people in the U.S. actually engage in this practice? The answer, of course, is difficult to know. Between 1995 and 2010, 4,610 couples used Microsort for nonmedical sex selection [4,6]. This number is significant in that thousands of individuals are affected, but it should also be noted that this number accounts for a tremendously small proportion of births in the U.S. As for the other method of sex selection, which relies on Preimplantation Genetic Diagnosis (PGD), less is known about the number of couples who have used it for the purposes of nonmedical sex selection. While the Centers for Disease Control and Prevention (CDC) have conducted studies on the usage of PGD and found that between 2005 and 2014 between 4 and 6 percent of IVF cases utilized this testing, those studies do not include reasons for use [4,7]. That being said, it is known that some IVF clinics specifically advertise nonmedical sex selection, and the prevalence of this is increasing. In a 2018 interview with CNBC, Dr. Steinberg, who works at one of these clinics, said that roughly 85 percent of his patients come to him specifically to choose the sex of their baby [8].

It must be noted that the use of assistive reproductive technology in the United States is still fairly uncommon, with only between 1 and 2 percent of infants born in 2017 in the U.S. having been conceived in this manner. Nevertheless, that number is essentially double what it had been a decade before, and its use only continues to grow [9]. Therefore, while nonmedical sex selection may only comprise a proportion of IVF cases, and while IVF cases only comprise a small proportion of overall conception, we do know that the number of nonmedical sex selections that have occurred is noteworthy, being in the thousands, and could conceivably increase in the future.

Ethical Considerations of Sex Selection

One of the most glaring ethical concerns is the question of whether prenatal sex selection constitutes discrimination and is a violation or possibly even in some cases, on the other hand, an expansion of women's rights. Sex selection, especially in the form of infanticide, is typically an expression of the lower value that is afforded to girls in certain societies. Surely there are cases of prenatal sex selection where this is not reflected, either because a female embryo is chosen over a male's or because the family has some other reason aside from value for choosing a male embryo over a female (i.e. medical reasons, the family only has females and wants a male as well, the family would prefer to choose the order of the genders but still want both, etc.). Yet there still might be reason for concern that this bias against, and devaluing of women, can easily be manifested in sex selection. Manifested and accepted here, this sexist-based determination can then blend into and bleed over culturally into other areas.

There exists significant evidence that parents in the U.S. have long shown a preference for conceiving male children over female children. Between 1941 and 2011 Gallup interviewed American parents and asked them if they could only have one child, which sex would they prefer; 40 percent of respondents said they would prefer a male, 28 percent said they would prefer a female, and the rest of respondents showed no preference. These results were virtually unchanged during the 60 years of the survey [10]. Furthermore, another study has shown that over the last 60 years, 33.7 percent of parents who had four girls decided to have a fifth child, whereas only 31.5 percent of parents with four boys decided to have a fifth child. Other indications of preference for male children are reflected in higher monetary and time investment by parents in their families when they have sons versus daughters [11].

While there is a lot of evidence of male offspring preference, there also exists some evidence that runs counter to this. For example, one study in 2011 found a slight preference of parents to adopt females over males in the U.S [12]. It should be noted that these results could be impacted by factors unique to choices made when adopting. Additionally, there is no clear evidence of a gender preference thus far in nonmedical sex selection. Yet, given the history of discrimination against females in this country, and given the evidence of long-standing preferences in the U.S. towards conceiving males, there is justifiable reason for concern that girls will be disproportionately discriminated against if nonmedical sex selection continues to be allowed. Further, given that sex selection in the past has constituted a reflection of a lower value assigned to girls, and women in the U.S. are currently assigned a lower value in society as reflected in the gender wage gap (which in 2016 was found in every U.S. state except for the District of Columbia) [13], prenatal sex selection can feasibly serve as a continuation and even exacerbation of this tradition.

The question which then must be asked is how any of this could constitute discrimination unless one defines the embryos as humans, which clearly has large and far-reaching implications for the discussion of abortion. There are two, if not more possible answers to this scenario. The first is that any regulation or law restricting prenatal sex selection should be worded extremely carefully so that it is narrow enough to only include preimplantation instances such as IVF and therefore could not be extended to conversations regarding abortion or other separate matters. The second is that perhaps, a different justification altogether would need to be used to support the implementation of restrictions to sex selection.

One such justification is that sex selection may set the precedence for a slippery slope of what people refer to as "designer babies" and the practice of eugenics. If parents are allowed to choose their embryos based on sex, why can they not create a list of other sets of traits they would like to choose their embryo be based off of? Additional reasons that this could be harmful include the possibility of imposing time and space specific values in our children and future generations based off of the traits we choose. Furthermore, if choosing certain traits over others can prove to be beneficial to the child, these selections would promote inequity in a society with an already large socioeconomic divide, especially given how expensive IVF treatment is. It seems that as a society we should be striving to close the gap rather than reinforcing it in a heritable manner.

While some may consider this a leap, the clinic mentioned earlier in the essay where Dr. Steinberg works, is already starting to advertise cosmetic traits such as eye color to patients [8]. As research is discovering more and more links between genes, traits, and behaviors, it may be increasingly possible that parents will attempt to create "designer babies" by choosing their most favored embryo based on its genetic makeup. Sex selection sets a clear precedent for this. While some may argue that parents should be able to choose the embryo they most want or think will be best off, these types of practices resemble eugenics, which is regarded overwhelmingly as a harmful, negative, and by some, even evil practice.

There do exist ethical arguments in favor of sex selection as well. One such argument is family balancing, a concept mentioned earlier in this paper. Many parents want the opportunity to experience raising children of both genders, and what harm is necessarily done in allowing sex selection if it is shown that parents choose males and females in roughly equal proportions? Furthermore, family balancing might enrich the experience of the future child's siblings by being raised with a child of the other sex. The presence of an opposite sex sibling may allow children to learn more comprehensive social skills that could one day improve their performance in professional settings and in relationships. It may also better prepare them to one day parent children of both sexes. Therefore, one could argue that it is an infringement of personal liberty and possibly a detriment to individuals to not allow parents to choose the sex of their embryos if they so please.

There is no doubt that arguments on both sides of the prenatal nonmedical sex selection debate can be made. Nevertheless, the possible consequences of sex selection, such as its likely perpetuation of gender-based discrimination and the possible precedent it sets for "designer babies" and eugenic approaches, seems all-too-likely to outweigh the possible benefits.

Ways to Address these Ethical Concerns

There are many ways in which policy in the US can address the ethical concerns raised by nonmedical sex selection. The simplest way, of course, is to create legislation that altogether bans the practice of nonmedical sex selection. If this is not possible, however, for reasons such as pushback, less strict laws can be put in place, though they may not be able to address each concern. For example, policy can be enacted that makes it so that sex is the only nonmedical trait which can be used in deciding which embryo to select, thereby lessening the "designer baby" concern. Less strict policy that prevents gender discrimination, however, is more complicated. One could insist that parents provide a reason for wanting sex selection, and if that reason is rooted in discriminatory values, then the request be rejected. Surely, ways to game this process would, however, then be sought. The biggest problem with this approach is that

parents could lie, and this approach might "force" them to do so. Further, decision-makers' biases might be rooted in discriminatory values. Perhaps an ethics review board could rule on cases, but these decisions could also be arbitrary given the vastly different views on these practices.

One overarching challenge to the U.S. implementing embryo selection in IVF is accounting for what happens to the embryos not selected. This could make the conversation around prenatal sex selection inextricable intertwined with the abortion discussion, which is already highly contentious in the U.S. This is one of the main reasons federal legislators have largely steered clear of regulating IVF, and this is not likely to change in the near future. One solution may for policy to provide for unselected embryos to be frozen indefinitely, thereby avoiding the necessary of destruction of embryos by a certain time [14].

Self-regulation may be another option. The American College of Obstetricians and Gynecologists (ACOG) in the past has been openly opposed to sex selection, but its guidance on the matter has been removed and not yet replaced [15]. More definitive guidance from healthcare authorities are needed for clinics to be able to practice self-regulation. Healthcare professionals could then be required by their clinics to follow these guidelines and limit superficial sex selection. While self-regulation may be less effective than legal policy, it still can have an impact on lessening the negative effects stemming from this practice.

Conclusion

With the rise of genetic testing and a deeper understanding of what traits different genes are connected with, the conversation around embryo selection is one that is inevitable. As this paper indicates, this topic can be approached from many perspectives and will have to be approached from all perspectives if fair and comprehensive regulation is to be implemented. These perspectives include religious, cultural, racial, feminist, etc. The conversation is also going to be intertwined with other topics regarding cloning, genetic engineered babies, and abortions conducted post-genetic screening. All of these areas include the bigger question of should individual parents be able to intentionally choose which genes they do or do not want to propagate in society. To a small extent we already practice this naturally when choosing individuals, we want to mate with based on their specific traits, but at the same time there is only a very small amount of genetic information we are able to know based on our observations of individuals. Should this selection process be allowed to transcend the natural? Looking at how these topics are dissimilar, such as active termination of pregnancy versus declining to implant an embryo, or choosing from a set of already made embryos versus cloning or genetic modification, may impact how we approach these topics differently, or maybe their common underlying implications will result in similar, rather than different, approaches.

In 2015, the United Nations General Assembly set out a list of the Sustainable Development Goals that should act as a global blueprint to achieve a better and more sustainable future aimed to be achieved by the year 2030. The United States was among 193 countries that ratified these goals, which includes a commitment to translate the goals into national legislation. The fifth goal in the list is to "achieve gender equality and empower all women and girls" [16]. Gender equality is threatened by many factors in this country, but one that we might be overlooking is prenatal sex selection. In order to make sure that we as a country and as a society are continuing our commitment to fulfill the Sustainable Development Goals, we must ensure that we are providing equal opportunity to both genders, and this perhaps includes equal opportunity to be born.

Disclaimer

The opinions or assertions contained herein are the private views of the authors and are not necessarily those of USUHS.

Conflict of Interest

The authors confirm that there is no conflict of interest regarding this manuscript.

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