Sex Preselection

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Sex selection is the term currently used when the woman with or without her partner tries to dictate the sex of the baby to be born. All children regardless of the beliefs or desires of their parents should enjoy equal legal and social status and full support and love from their parents without discrimination on the basis of sex.

The parenteral desire to choose the child's sex dates from antiquity. The Jewish Talmud advised couples on means to favor the births of male or female children [1].

The Arabs in the pre-Islamic era more than 1400 years ago used to practice infanticide for sex selection. The Holy Qur'an condemned this practice. It says "On the Judgment Day the entombed alive female infant is asked, for what guilt was she made to suffer infanticide" [2]. The Holy Qur'an described the behavior of some fathers when they are told of the birth of their female child "….His face gets dark and he chokes with suppressed agony. Hiding himself from his people being ashamed of the bad news and wonders whether to keep her in hardness or bury her in the dust, how evil is their decision" [3].

Methods for sex selection of the child are rooted in folklore including positioning during intercourse, timing of intercourse in the menstrual cycle, vaginal douching, or intake of certain foods to enhance the conception in one sex or another. In Europe, interest in sex selection is not new. In Europe, for many countries the ability to choose the sex of one's children has been desired by couples [4]. Aristotle advised sexual intercourse in northern wind to get a boy and in southern wind to get a girl. In Germany, a father was advised to take an ax to bed with him if he wanted to conceive a boy [5]. In France, women desiring a boy were provided a diet rich in potassium and sodium and poor in magnesium and calcium concentration [6].

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Millot, the obstetrician of Queen Marie Antoinette of France [7], indicated that it is the last movement of the woman that determines the sex of the child. It is the side on which she lies at ejaculation time that drives the sex of the child: always a boy when she is on the right side and always a girl when she lies on the left side [7]. More scientific means includes the observation that conception close to ovulation, which can be timed by measuring hormones, ultrasonography, or cervical mucus, is more likely to produce boys [8]. This chapter shall discuss sex selection in different cultures, the current available methods of sex selection, and its indications, guidelines, and ethical and legal concerns surrounding sex selection.

Sex Selection Practices in Different Cultures

The desire for sex selection is a reflection of cultures, tradition, religion, civilization, education, and available medical technologies in a given society or community, all of which may influence the morality and mentality of the people in these societies and communities. Interest in sex selection has a long history dating to ancient cultures [9]. Ancient Egyptians believed that women of certain complexion were destined to have boys. Early Greeks believed that tying off the left testicle would produce boys as the male determine sperm were derived from the right testicle.

The Babylonian Talmud advises couples on means that favor the birth of either male or female child (Niddah). The Hebrew Talmud suggested that placing the marriage bed in a north–south direction favored the conception of boys [10].

Arabs more than 1400 years ago, before Islam, used to practice infanticide for sex selection. The Holy Qur'an described this act and condemned it [2, 3].

In China female infanticide was mentioned in the historical records [11]. Sons are important for religious reasons. Chinese culture considers the family as a filial obligation. Only the names of the sons and grandsons are put in the list of the family genogram in the ancestral halls. The Chinese culture considers that the greatest sin of all is the death of a man without having a male son [12]. In old China the traditional cultural norm was to unilaterally divorce women who do not bear a son [13].

In India having more than one daughter was considered as a curse. Sons were important as they provided support for their aging parents [14]. Until recently, daughters did not have a right to inherit any part of the ancestral property of the parents. The prospective husband or his parents among the vast majority of Hindus generally demanded substantial dowries, which created lots of financial and psychological pressures on the wife to be or her family to fulfill their obligations. Recently the country prohibited this practice. Thus in the Indian culture, sex selection was bluntly misused and resulted in huge discrimination against the female child. The proportion of female to males had dropped from 935/1000 in 1981 to 927/1000 in 1991 and in some communities in the northern states of Bihar and Rajasthan to 600/1000 one of the lowest in the world [15].

In Japan the head of the family was always a man who controlled all family affairs. The first son held the right to succeed his father under legal protection. The

low fertility rate in Japan tempted couples to select the sex of the child. Paradoxically the increasing average longevities of men and women in Japan encouraged parents' preference for female offspring to be better taken care of later in life [16].

Methods of Sex Selection

The traditional methods are far from being accurate and have a poor accuracy rate. With the rapid development of technology, more modern techniques became available with a high success rate in choosing the sex of the child. It is now possible to attempt to choose the sex of the baby before fertilization by separating the X and Y chromosome bearing sperm based on the 2.8% difference in their DNA content, using Microsort sperm separation technique. Embryos can be created by intrauterine insemination, IVF, or ICSI. Discarding disfavored sperm is less contentious than sex selection-based abortion and embryo wastage [17–20]. More recently the sex of the embryo could be selected in IVF programs by preimplantation genetic diagnosis (PGD) during IVF or ICSI [21–26].

In (PGD) the sex of the embryo can be diagnosed by using fluorescent in situ hybridization (FISH) or more recently comprehensive chromosomal survey (CCS). FISH identifies only a limited number of chromosomes including X and Y chromosomes by examining one or two cells from a cleaved embryo. CCS ensures transferring euploid embryos only and discard abnormal embryos. CCS examines all the 23 pairs of human chromosomes by examining 5–10 cells from day 5 or day 6 embryo blastocysts. These techniques add more cost to the already high expenses of IVF/ICSI.

CCS adds to sex selection the ability to analyze, select, and transfer to the mother only embryos of the desired sex that have the appropriate number and structure of chromosomes. Furthermore, single nucleotide polymorphism (SNPs) microarray which is associated with a host of physical traits had been proposed to optimize pregnancy outcome of the selected embryos by excluding embryos with gene defects or choosing embryos with specific characteristics.

Preimplantation genetic testing (PGT) for aneuploidy and sex selection using CCS have been proposed to improve IVF success rate. A prospective, randomized, multicentric, multinational study indicated that PGT for aneuploidy by CCS does not substantially increase the live birth rate in women aged 36–40 years and is associated with less cryopreserved embryos [27]. However, some other studies showed the opposite, and the jury is still there. PGT allows not only the choice of the sex of healthy embryos that do not suffer from genetic diseases but also may allow gene editing whether therapeutic to alleviate genetic diseases and pathological conditions or to enhance certain characteristics.

The slippery slope is when gene editing is used to enhance certain characteristics in the chosen embryos such as to achieve athletic success, more intelligence, artistical sensitivity, or talents [28].

Some ART clinics in Europe and the USA promote polygenic risk scores (PRS) as an add-on test on the selected embryos before transfer [29]. Genetic experts have

stated that PRS testing of embryos is unusable, unethical, and impractical. PRS is unproven and unethical and prospected parents should be warned against such practices and given adequate and unbiased information [30].

Sex selection may be performed after occurrence of pregnancy by prenatal sex selection after identification of the sex of the baby by ultrasonography, amniocentesis, or chorionic villous sampling (CVS). Prenatal sex selection will necessitate termination of pregnancy if the undesired sex is diagnosed. This will raise an additional ethical, religious, and in some countries legal concerns.

Indications for Sex Selection

The indications of sex selection are broadly divided into medical and social. There are more than 350 sex-linked diseases in human [17]. Sex selection for medical indications prevents conception in an affected child, whether a male or a female child, and eliminates the birth of a diseased child. Some of the common sex-linked diseases are due to chromosomal abnormalities such as Turner syndrome, Klinefelter syndrome, and fragile X syndrome. Sex-linked diseases may be monogenic diseases due to a specific gene defect as a cause of the disease as cystic fibrosis, sickle all disease, hemophilia, and muscular dystrophy. The social indication of sex selection is to satisfy the desire of the prospective parents. It has been associated with a huge ethical debate, disapproval, and even condemnation and criminalization which varied from one country to another. The disapproval and condemnation are based mostly upon prejudice against the female child and to a lesser extent on the argument that it may lead to disturbance of the global female/male ratio as happened in the past in some regions in India and China.

Treating Different Cases as if They Are Alike in Sex Selection

Dickens et al. reported that in ethical and legal analysis, the principle of justice that like cases be treated alike receives considerable attention. Less attention is given to the ethical injustice of treating different cases as if they are alike and applying an approach to a problem that is appropriate in one setting to a different setting in which that problem does not exist [31].

In China and India, sex selection practices disclose significant son preference resulting in birth ratio imbalance between the two sexes. In India the national sex ratio was 933 females to 1000 males and only 927 females in the age group under 6 years in the year 2001 [32].

In China the issue of sex selection was complicated by the introduction of the one child policy. Couples in the urban areas were usually allowed to have one child. In the rural areas, couples whose first child was a girl were allowed to have a second child after a specific period of time [33]. This encouraged women who got pregnant in a female child to get rid of the female fetus and try again for a male child resulting in a serious imbalance in sex ratio in China [34]. Such policy has been revised

recently because of decline in the fertility rate in China and the loss of the demographic dividend, which previously contributed to the enormous development in China during the past few decades.

In contrast many other countries do not have sex preference. A comprehensive survey in Canada found a large majority of Canadians do not prefer children of one sex or the other. The survey showed that virtually all prospective parents want and feel strongly about having at least one child of each sex [35]. With the recent decline in fertility rate, delay of age of mothers at first child birth [36], and increased expenses of living, such preference of one child of each sex may not be the same today.

In the USA, 90% of couples with two or three children and wanting only one more employed sex selection for the purpose of family balancing [17]. Interesting in both the USA and UK, over half of surveyed couples' selecting their children's sex choose girls [37, 38]. In a survey conducted in Germany, 58% of respondents stated no interest in their children's sex, 30%wished to have an equal number of girls and boys, and 92% found this practice to be unthinkable [39].

In the Middle East, where the population is largely Muslims with Christian minority, women's dignity and her status in the society are often related to her ability to have children in general and particularly sons. Sex selection for social reasons is practiced with some guidelines to avoid discrimination against either sex [40].

Thus there are contrasts in the ethical approaches to sex selection in different countries. In countries where discrimination against the girl child is pervasive, dominant selection of the male child is likely to be practiced. In countries where there is less or no discrimination, couples do not prefer children of either sex. In the latter case, sex selection can be allowed to assist families that want children of both sexes and to fulfill reproductive autonomy of the couples after proper counseling. This raises the question of whether it is just to apply the same ethical and legal approaches to sex selection in these different circumstances [31].

Ethical and Cultural Issues in Sex Selection

The strongest objection to sex selection is its discrimination against birth of the girl child. Selection of a male child appears as a symbol and a cause of the inferior status of and discrimination against the girl child and perpetuates the devaluation of women.

The practice of sex selection, to detect severe sex-linked genetic disorders, using the modern technologies which does not involve abortion or discarding healthy embryos is widely accepted in modern laws and ethical assessments. More contentious but arguably tolerable is sex selection by a couple with one child or two or more children of the same sex, boys or girls, who wish to have only one more child of the other sex [41]. In such cases, sex selection is not based on societal or cultural discrimination against either sex. It satisfies the autonomy of couple's reproductive choice [42]. The procreative autonomy is the right of the person to freely choose his/her/their reproductive performance including his/her/their reproductive potentials.

However, reproductive autonomy is basically a personal decision, yet some would argue that it is not merely so [42]. Reproduction itself is a process which does not involve solely the person or the couple who makes the choice; it involves the other partner; the baby to born and its right for protection, respect, and non-discrimination; the family; the society; and the world at large [42, 43]. Dworkin defined a right of procreative autonomy as "a right of people to control their own role in procreation unless the state has a compelling reason for denying them that control [44]". The decision not to transfer in vitro created embryos is within the unfettered decision of the woman or the couple who produced the germ cells which created these embryos. While the woman is entitled to refuse to implant any embryo, the decision to select between embryos is constrained by mortality. The woman or the couple should not choose between embryos in ways that might constitute unfair discrimination against one sex or another. Such unfair discrimination is likely to occur if selection is performed for the first child in the family or performed in families who have children of both sexes or the choice of one sex only all the time. It is logically argued if contraceptive technology is widely practiced to prevent the conception of both boys and girls, why couples should be denied the use of their procreative autonomy to choose the sex of the baby to be born to increase the gender variety in their families and not for gender discrimination.

The universal prohibition of sex selection, which does not involve abortion, would itself risk prejudice to women in many present societies specially when birth of sons or daughters remain central to women's well-being. Family balancing can be acceptable, for instance, where a wife had borne three or four daughters or sons and it was in her and her family's best interest that another pregnancy should be her last for health, economic, or personal reasons. Employing sex selection in such cases to ensure the birth of a daughter or a son might then be approved, to satisfy a sense of religious or family obligation and to save the woman the increasingly health risk-laden pregnancies. If sex selection is not performed for such couple, it involves prejudice against the woman as she will try repeated pregnancies to fulfill her wish to have a child of the other sex whether a boy or a girl. In some societies, the risk may also be societal as not performing sex selection may lead to divorce, extramarital relation, or separation as the couple's desire is not being fulfilled within their marital relationship.

Almost 20 years ago, the author called for an urgent need for concerned international organizations to issue binding guidelines on sex selection as soon sex selection may become available on the counter, and we become faced with the outcome of its bizarre use. Regrettably this is happening today where many ART clinics in many countries perform sex selection for social indications without ethical guidelines which perpetuates the female child. Practices of sex selection intended to promote gender discrimination are unacceptable independent of cultural, religious, political, and societal demands [9].

Sex selection for medical reasons is universally approved as it alleviates the human suffering and improves the quality of life of the child to be born. Sex selection for social reasons is performed to increase the gender variety in the family and/or restore the sex ratio in the family for various reasons [31, 45–49].

Sex selection for social reasons is surrounded with a huge ethical, legal, religious, cultural concerns, reproductive autonomy, and human right issues. Discussion of sex selection for social indications should take into consideration all these issues before being judgmental on whether to approve or disapprove sex selection for social indications.

Healthcare providers and patients alike, in an era of globalization, move freely around the world. Thus it is common for healthcare providers to provide medical care in reproduction to couples with a different cultural, religious, and ethical background. Moral dilemmas which exist in certain practices as sex selection should not be assumed to be applicable to all [50, 51]. Global bioethics must respect the whole diversity of world views of ethics, both religious and non-religious [52].

Providing quality healthcare service in reproduction which is culturally sensitive and ethically sound to all requires healthcare providers and institutions to be aware of these different perspectives.

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