MINI REVIEW

PRE-IMPLANTATION AND PRE-GENETIC DIAGNOSIS - AN ADVANCED TOOL FOR THE FORTHCOMING GENERATION

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ABSTRACT
Genetic disorders are a major cause of miscarriage and fetal death. Pre-implantation genetic diagnosis (PGD) is a very useful technique which can be used to diagnose genetic defects before pregnancy. It can be done by creating embryos using IVF technique and then removing single cells which are genetically analyzed by fluorescence in situ hybridization (FISH) or by polymerase chain reaction (PCR). PGD has also been employed when it comes to save a child by providing human leukocyte antigen (HLA) matched stem cell. This technique is also been considered an important tool to have a baby with the gender choice of parents. Some couples often demand for PGD to select the embryos having same mutations so that they could be better adjusted in their community because of the particular characteristics of their previous kids while some would like to have some special traits of their unborn child. These features could possibly be done by applying PGD technique. Pre-natal genetic diagnosis aims to identify any fetal abnormality during pregnancy and then leaving the decision to the mother whether to bring the child in this world.

Keywords: Pre-implantation genetic diagnosis, ethical issues, genetic screening, pre-natal genetic diagnosis.

1. INTRODUCTION
1.1. Pre-Implantation Genetic Diagnosis
The pre-implantation genetic diagnosis (PGD) has always been discussed in association with genetic and reproductive technologies. The advancement in genetic sciences and discovery of novel genetic tests has led the parents to decide what and how should their offsprings be like. These tests have enabled the participants to determine the information about widespread risks, inherited disorders as well as designing of the precise characteristics of their future kid.

In an assessment of efficiency and effectiveness, the PGD is evaluated as the least standardized test in comparison with other forms of genetic testing and thus, its practice could not assure the promising results. According to Kuhse and Singer, the reliability of the test is inappropriate as it may present with false positives or negatives, or simply fail to provide any useful results that would encourage the physician to take any action against the response. The technique involves the initial genetic screening of human embryos prior to in-vitro fertilization. The embryos which are found to have a malfunction gene are either discarded or frozen until required while the healthy embryos are implanted in the uterus.

The screening usually takes into account the low prognostic infertile patients for the determination of chromosomal abnormality, for a single gene mutation, or X-linked disorders in the at-risk couples. However, currently the extended use of PGD for non-medical traits such as sex selection of embryos solely for social or cultural reasons, enhancing the phenotypic characteristics of the child is now rapidly spreading similar to virus transmission from person to person. Many ethical dilemmas emerge in consideration with PGD, such as:

- When this technique should be offered?
- Could the diagnosis be reliable enough to make unethical and biased decisions?
- Do the parents are autonomous to amend the features of their offsprings?

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The utilization of PGD for therapeutic purposes is morally acceptable but is highly controversial and ethically not appropriate to discard the embryo for non-life threatening disorders or that result into eugenic outcomes.

1.1.1. PGD for HLA match

The concept of “designer babies” or more precisely “savior babies” would be partly successful when taking PGD into account. This technique provides a genetic match for the sick sibling who desperately requires a HLA matched stem cell transplant especially when the sick child is suffering from incurable life hereditary disorders such as thalassemia, Fanconi syndrome, leukemia, etc. There has been a great amount of public awareness in this procedure and people are looking forward to provide a new healthy life to their sick descendent. The principle of autonomy will be overruled since the child would be incompetent to take decisions and is dependent in the hands of parents. Similarly, the principle of justice is breached in saving a sick child because of high discrimination in between the two. If we consider the principle of beneficence and non-malfeasance in regard of a sick child, then this act is a promising step in providing him a new life and eases his infinite sufferings.

The larger ethical debate on savior siblings is the instrumentalization of the child that is planned to bring in this world just for a reason. In addition, the savior sibling would be posed to uncountable physical and psychological harms when identifying him as the “organ factory”. But if the created child does not result into a HLA matched for his sick sibling, there are endless arguments in the respective issue. Would be the savior child be treated as he should? and would he be loved as he should after revealing the fact that he could no more help his sick brother/sister?

1.1.2. PGD for sex selection

A big controversy exists in the use of PGD for the gender selection in terms of satisfying the personal and family issues. The plea for PGD particularly in case of gender selection arises from the couple who are going to have their first child. The couple reflects the desire of having a male child due to cultural and societal pressure. The principle of justice would be overruled in this case. In addition, there are other people who wish to have gender variety in their family, request to undergo PGD. The couple would be choosing a specific gender for their second child or subsequent ones to minimize the risk of sexism. But does this action could morally and ethically be justified? It triggers several ethical issues to be debated. In long term, the sex selection methodology would result into massive disproportion in the sex ratio of the population, as turned out in China and India. However, sex-selection could only be justified in case of preventing the serious incurable sex related hereditary disorders.

1.1.3. PGD for eugenic purpose

The family possessing deafness or dwarfism, often demand for PGD to select the embryos having same mutations so that they could be better adjusted in their community. Undoubtedly parents have the autonomy over their future children but this type of example proceeds to argue that autonomy has limited values. Soini et al. in a review stated that it is completely unethical because it would intentionally target the life of the future person with countless threats and irreversible disadvantages. Disobeying the principle of beneficence and non-maleficence completely as hearing is entirely beneficial for the forthcoming child. In addition, Kuhse and Singer argue that although the parents are autonomous to take decisions for their future child but deliberately willing to bring a deaf or short stature child in the world where they could have had an absolutely healthy child instead is purely unacceptable.

Moreover, the couples wish to have PGD for particular traits of their unborn child. It includes of having high intellectual skills, attractive eye color or unique personality. Hence, several bioethicists raise a question pointing towards the ethical and moral values of a human being. Should the parents be allowed to choose the characteristics of their child regardless of any inherited disorder? The child is a beautiful “gift” of God and that any sort of
selection or manipulation turns the child into “manufacture” which impedes the dignity and flourishing of a mankind.

1.2. Pre-Natal Genetic Diagnosis

In recent times, the pre-natal genetic diagnosis ought to be the best possibility for pregnant women in order to have the information about the origin and development of their fetus. The leading cause of infant deaths in United States is congenital malformations, deformations and chromosomal abnormalities accounting for 20.5% of all infant deaths. However, the survival rates are accelerated in recent years due to the enhanced usage of prenatal genetic diagnosis and elective abortions of fetuses with abnormalities. Since then the medical profession is meeting with infinite ethical and moral dilemmas. These issues are more complicated as they involve the potential interests of the fetus and autonomy of the woman in whose womb the fetus is carried. As abortion is the only elucidation in case of detecting any genetic abnormality, several authors argue it to be an unethical approach. Aborting the fetus with genetic problems look morally the same as killing “imperfect” people without their consent. On the other hand, the argument lies in favor of aborting an unborn child as it does not possess the basic element to live a minimally satisfying healthy life. Because health is instrumentally valuable and bringing the child into the world with Huntington’s disease or other genetic disorders would be immensely unjustifiable because we do not expect them to be so miserable that they wish they were dead.

Another important question arises that what would be the point if any diagnostic failure may result in the abortion of an unaffected child or avoidable birth of the physically handicapped baby. Thus, this ethical dilemma is of utmost importance because the failure to prevent the birth of a disabled child, led the mother and the child to be discriminated by the insurance companies as well as the employers. In addition, offering the prenatal test demonstrates that the woman has conceived but the post-conception testing might bring about harmful effects and stress onto the prospective mother. Some invasive testing such as amniocentesis may put the pregnancy at risk. The conductance of the genetic test must be fruitful and in favor of the mother and the child where benefits outweigh the risks. Therefore, obstetricians must counsel the pregnant women in a non-directive manner that would help her to take decisions voluntarily and must give a black and white informed consent for the test procedure. During counseling the health care professionals must also consider the women’s autonomy and her right to choose respecting the principle of autonomy. Thus, it is the responsibility of the physician to provide a beneficial advice protecting the rights of the women and their future child. The principle of beneficence has to be balanced in clinical judgment by the principle of respect for autonomy.

Apart from pregnancy termination, if fetus is diagnosed with a genetic disorder, fetal gene therapy and intervention can be taken into account. This sort of novel treatment is still under trials and is taking place in well-established fetal care centers. Thus, this clearly exhibits that such therapy could only be possible in well-resourced countries while in remote areas of the world, it anticipates ages to take place. This overrules the principle of justice as treatment options should be equally available to every individual all around the globe. Furthermore, any fetal interventions could only be take place with the informed consent of prospective mother. However, in some instances the pregnant woman may find significant risks for her unborn baby while some women may assume a resistance towards the intervention because of societal and family pressure and even pressure from within themselves.

2. CONCLUSION

PGD is a highly modern and advanced form of genetic screening. It helps to select the embryo of choice based on the gender, modifying the physical as well as characteristic features of the embryo by gene mutations and/or to design a baby called as “Savior baby” to provide HLA match stem cells to save a child suffering from incurable life threatening disease. Pre-natal genetic diagnosis is involved in
the identification of any fetal related disorders during pregnancy, but at the same time it is also surrounded by several ethical and moral issues.

REFERENCES