Introduction

Technology itself has no moral value. It is the application of technology which may be subject to moral assessment. In the mid of twentieth century, the advents of different technologies, which fundamentally assist reproductive individuals or couples for procreation, are popularly known as 'assisted reproductive technologies' or ARTs. Now, the applications of these technologies have given rise to several controversial issues—moral, social, political, legal and even cultural. Surrogate motherhood is, no doubt, the most contentious technology among other assisted reproductive technologies. As a practice, it is not novel. Since Biblical era, we find various applications of this practice. Whatever is novel is its high-tech application. It is IVF-surrogacy which provides numerous novel opportunities to reproductive individuals or couples to procreate offspring genetically related to them. In fact, these novel opportunities, these unique applications of surrogacy also raise several crucial, controversial issues. Some issues are purely moral in nature; some others are related to socio-political or cultural issues. The debate reaches an extreme point mainly on issues like: whether commercial application of surrogacy is morally justifiable or not, whether surrogacy would be employed for convenience grounds or not. The controversies regarding this arrangement get enormous strength from both the opposing camps: proponents and opponents of this arrangement. Surrogacy, thus, becomes a topic of hot discussion. Fragmented motherhood, intrusion of third party in procreation, irrelevance of institutions like marriage—all these issues about collaborative reproduction are divergently assessed by these two opposing groups: proponents and opponents. Paradoxical court ruling offered by different courts regarding the nature and application of this arrangement, divergent surrogacy regulatory laws across globe, radically different experiences of women who have already acted as surrogates—gradually complicate the dispute to a large scale. The aim of this study is to assess these controversies and this arrangement from distinct
perspectives. How far these disputed issues are tenable? Which evaluation would be considered as more worthy, morally justifiable and socially appreciable? Proponent or opponent? To assess the entire controversy, our study would follow the plan of work mentioned below as guideline.

The first chapter of this study would discuss the traditional application of technology as instrument and how different applications of medical technologies raise serious moral debates and ultimately give rise to a novel branch of ethics, viz,—bioethics. Technological breakthroughs significantly affect another sphere of human life—reproduction. Different reproductive technologies like artificial insemination, in vitro fertilization, ova donation, and cryopreservation are used to assist in procreation. But, surrogate motherhood provides a unique assistance for procreation—gestation. We would conclude this chapter of discussion by referring to some unique features of surrogate motherhood.

Till ancient period of time, we find the traditional application of surrogacy by using a home-made device, called, Turkey buster. How does modern technology, like in-vitro-fertilization, facilitate to provide unique opportunities to intending couples, would be discussed in the second chapter of this study. Surrogacy is one of the popular forms of alternative motherhood. Distinctive features of surrogate motherhood, in comparison to other forms of alternative motherhood, significance of alternative names of this practice, various mythological references and finally the responses of three major religious institutions—Christianity, Hinduism and Islam—would be discussed in this chapter.

The third chapter would solely focus on the favourable grounds that would encourage couples to employ this technology in a large scale. Reproductive autonomy, genetic relatedness, various rights—both fundamental and constitutional, socially and legally approve.; surrogacy as a recognized practice.
The fourth chapter of this study would consider the entire moral disputes. We would discuss this controversy under seven distinct issues: baby-selling, prostitution, slavery, unlimited reproductive autonomy, exploitation, commodification and the impact of third party in kin reckoning. Our study would thoroughly scrutinize all these issues and include our personal observations.

Now, the question is: are these controversial issues morally justifiable? What are the roots of these moral debates? Which moral perspective or social doctrine do both the proponents or opponents adopt while assessing this arrangement? The chapter five of this study would analyze those issues in detail.

The sixth chapter would discuss the legal issues of surrogacy arrangement. One of the prime objectives of this study is to explore how the approach of legal moralism actually determines the legal recognition of this arrangement across globe.

And, the concluding section of this study would finally decide which approach towards this arrangement would be permissible, morally justifiable and socially appreciable? Which type of application of surrogacy would serve the social purpose of this arrangement and at the same time, be non-exploitative to all parties attached to this practice?

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Science and technology have intimate relationship. The relevance of science to mankind and also to human society significantly depends on technology. The word ‘technology’ comes from the Greek word tekhnologia, which means systematic treatment of an art or craft. Now, science and technology reinforce each other by complex interactions. While technology is dependent on science—for the knowledge of properties of materials and energy—for predicting the behaviour of natural forces, science is equally reliant on technology for its tools and instruments, for preparation of materials, for storage and distribution of information and for the stimulation of further research. As a result, the word ‘technology’ has been used with varied connotations. (i) Technology as object (physical devices of performance like tools and instruments); (ii) technology as knowledge (the know-how behind innovation); (iii) technology as a process (begins with a need, ends with a solution) and (iv) technology as a system (use and manufacture of objects involving people and other objects). Throughout human civilization, in different phases, these multiple connotations of technology have gradually developed.

1.1 Traditional form of technological instruments: Use of material object as instrument

Since prehistoric age, technology significantly has affected the abilities of human beings and also of animal species to control and adapt natural environments. Human beings virtually begin to use technology from the preliminary stage of human civilization by converting natural resources into simple tools or instruments. In Paleolithic age, stone-tools were used in the form of a chopper or scrapper for hunting or for house-hold use. Discovery of fire boosted the sources of food. Invention of wheel helped human beings to travel and control nature. Technology got prominence in 18th century, during industrial revolution. The advancements in computer technology, automobile technology, information technology, medical technology and so on—led to specialization.

1.2 Biology as technology—Use of living organisms as instruments

Now, at a first glance, it seems obvious that whatever we use as tool or instrument is physical or material object. Robert Carlson in his book, ‘Biology is Technology:
The Promise, Peril and New Business of Engineering life,' © 2010 Harvard University Press, claims: “Biology is the oldest technology.” (pp. 1) for him, throughout history of lives on earth, organisms have used each other in very sophisticated ways. He cites two examples in which biology has been used as technology. First, in early stages of evolution, both plants and animal organisms co-opted free-living organisms which could be easily transformed into sub-cellular component (which we presently call chloroplasts or mitochondria) of the host cell. This technology provides energy to its host cell. His second example is: plants, algae or cyanbacteria—all these use sunlight to convert carbondioxide (CO\textsubscript{2}) into oxygen (O\textsubscript{2}). In exchange, those organisms who consume O\textsubscript{2} convert it into CO\textsubscript{2} and produce enormous wastes which plants use as resources. Similarly, herbivore and carnivore—both use plants, algae etc. as sources or food. So, the interactions between organisms constitute natural, global economy that produces resources for all sorts of organisms, from molecular to microscopic. Human beings rely on these biological components for food, O\textsubscript{2} and other services.

1.3 Technology and moral value

Technology itself is incapable of possessing any moral quality. In his article, “Technology, Reproduction and Faith”, Wildes wrote: “Technology can change everything. Technology opens horizons and make possible what was once, at best, only imaginable. In so doing, technology can change human practices and change moral values. While neither good nor bad in itself, technology changes the way men and women see the world and act in it. In so doing, technology can influence what is identified as appropriate and inappropriate moral acts and values.” (Wildes, S.J, ‘Technology, Reproduction and Faith’, in “Infertility: A Crossroad of Faith, Medicine, and Technology,”© 1997 Kluwer Academic Publishers, pp. 1)

The question is: does technology improve or worsen human conditions? On this issue, thinkers have disagreed and intense philosophical debate took place. While doctrines like Transhumanism or technoprogressivism tried to show that technological progresses were always beneficial for human society and for human conditions, on the other hand, movements like Neo-Luddism, anarcho-primitivism, bioconservatism vehemently oppose the pervasiveness of the technology due to its harmful effects on nature and alienation of human beings from nature. These philosophical controversies gave rise to a new branch of ethics—ethics of
technology. Few works of Martin Heidegger and Hans Jonas, a German origin philosopher, are good examples of discussions of ‘ethics of technology.’

Now, our query is: how does technology affect nature as well as our society? Technology affects society and its surroundings in various ways. Technology, on the one hand, develops more advanced economy, but, at the same time, allows to create a novel class of society—a leisure class. Many applications of technologies produce unwanted by-products which are popularly known as pollutant. These toxic, harmful wastes not only deplete natural resources, it is also detrimental to earth and its environment. Parallel to these effects, some applications of technology greatly influence the traditional norms of moral values. For example, the rise of notions like efficiency in terms of human productivity, a term which originally applied only to machine, challenges the traditional norms of moral assessment. Thus, we have noticed that the moral issues of technology may be of two types:

1. Whether the application or invention of new technology is—always, never or contextually—right or wrong. Are all applications of technology beneficial for mankind? Most of us think that the innovations of computer viruses or nuclear weapons are morally not justifiable. But, the controversy is: are these applications morally wrong contextually or for ever?

2. Whether the extension or reduction of human attributes by applying technologies keep balance with the traditional norm of moral assessments. The ethics of technology quickly breaks down into the ethics of various human endeavors as they are altered by new technologies. Let us, take few instances of medical technologies and genetic engineering and their applications during Post World War II era to show how the traditional moral norms became subject to modification.

At a first glance, it seems beneficial to employ technologies like kidney dialysis or various organ transplantation, such as kidney, heart or lung transplantation. But, gradually, we have encountered some adverse consequences which are neither predictable beforehand nor avoidable any way.

1.4 Modification in paternalistic role of Physicians in decision-making

✓ In 1960, Dr. Belding Scribner at the University of Washington Medical School in Seattle designed a permanent, indwelling shunt that allowed patients with
chronic, end-stage kidney failure to be connected to the dialysis machine without any surgery. These machines could keep people alive for long. However, these machines were very few in number. As the need of machine far exceeded the supply, it forced the physicians to decide who would be treated and who would not. The Seattle physicians took an unprecedented decision by asking the county medical society to appoint a **lay committee** to determine who would get dialysis. (Beginnings count: The technological imperative in American health care, By David J. Rothman, Published by Oxford University Press US, 1997, pp. 88-90)

The lay committee consisted of—lawyers, ministers, housewives, government officials, labor leaders and surgeon - were a “life or death committee with no moral or ethical guidelines save their own individual consciences.” The Seattle Artificial Kidney Center selection committee made its decisions about who would be treated based on “social worth criteria,” giving preference to heads of households and those who contributed to the community as church members or scout leaders.


This earliest and one of the most successful life-saving inventions, for the first time, shows that **physicians had turned life and death matter over to a lay committee**. By so doing, they had acknowledged the need for all segments of society to share the burden of choosing who would live and who would die. The paternalistic role of physicians on decision-making since the era of Hippocrates era had gradually diminished.

**1.5 Organ transplantation – Death redefined**

✓ At the end of 1954, the first successful kidney transplant was arranged by a Boston transplant team between two identical twins to avoid the risk of graft rejection. At that time, transplantation between unrelated individuals seemed impossible due to immunological barriers. (Transplantation Surgery, Edited By Nadey Hakim and Gabriel Danovitch, © 2001 Springer-Verlag London
In 1967, Dr. Christian Barnard in South Africa had arranged the first heart transplant. Though the patient lived only 18 days, but the event sparked media frenzy. The first human lung transplantation was conducted by Dr. James Hardy at Mississippi. The recipient was a 58 years old man who had been sentenced to death for committing a murder. Although the graft functioned initially, the recipient died within a very short period.

Organ transplantation offers number of ethical issues: the scarcity of organs and the potential conflict of interest between donor and recipient. But the most difficult ethical problem caused by organ transplantation is: the need to redefine death. Before the invention of artificial respiratory technique, death was pronounced to a patient when his/her heart and respiration were totally stopped (Cardio-Respiratory Criterion of death). But, with the application of artificial respirators, the heart and lung of an unconscious patient may function almost indefinitely, though his/her cerebral functions may stop beforehand.

Now, organ transplantation would be made possible only when the donor-patients would continue their ventilation and there remains profuse blood and oxygen in their organs. The moral disputes arise: at what point of time organs could be removed from a donor-patient? If we accept the stoppage of heart as the criterion death, transplantation of organ becomes impossible. But, if we grant the brain death of the donor as the end of his life, then the donor is still alive according to the former cardio-respiratory criterion. Whose interest would be crucial to a physician—donor or recipient?

1.6 Novel form of decision-making: withdrawal of technology, new shapes of Infanticide and Euthanasia

In 1970’s, medicine became increasingly successful in treating critically ill newborn babies. But, in various western countries, parents of those ill babies decided not to treat those babies and allowed them to die. In our study, I like to refer to few such instances. In 1971, a child was born with Down’s syndrome with blockage in her intestine. Or, in 1982, Baby Doe born in Bloomington, Indiana, with Down’s syndrome and with defective esophagus. Both these babies could be successfully operated by surgery. But, parents of those babies did not wish to rear children with Down’s syndrome. In both cases, they refused to give consent for surgery. Concerned hospitals and physicians were
On April, 1975, Karen Ann Quinlan, a 21 year-old young girl, was admitted to St. Claires Hospital with severe brain damages. She never regained consciousness and was in a persistent vegetative state for long time. During that period, her weight dropped very quickly. Being upset at her condition, Karen’s parents appealed to remove the artificial respirator and nasogastric tubes immediately to die her. The consulting physician, Dr. Robert Mores, had refused parents’ plea, because, in catholic teaching, euthanasia is equivalent to killing and St. Claires was a catholic hospital. Quinlan’s parents, then, appealed to Superior Court of New Jersey in Morristown. But, court ruled out their petition on the grounds that ‘right to die’ is not a constitutional right. Finally, New Jersey State Supreme Court ruled in favour of passive euthanasia. On June 13, 1986, Karen died in a private nursing home. (Euthanasia: A Reference Handbook, by Jennifer Fecio McDougall and Martha Gorman © 2008 by ABC-CLIO, Inc., pp. 141-42)

On January 11, 1983, Nancy Cruzan, a young girl, became unconscious due to a car accident in Missouri. Paramedics resuscitated her, but lapsed into a persistent vegetative state. Unlike Karen Quinlan, Nancy could breathe spontaneously. Her nutrition and hydration were continued by a gastrostomy tube. Five years later, Nancy’s parents requested to remove the tube and to allow her to die. Hospital was reluctant to do so. On the plea of Nancy’s parents, Jasper County Circuit Court had ruled that state has a compelling interest in preserving life, regardless of quality of life, unless clear and convincing evidence of patient’s wish concerning the end of life-sustaining treatment was available. (Cruzan v. Missouri: The right to die, by Lila Perl, Published By Marshall Cavendish Benchmark, © 2008 by Lila Perl, pp. 45-82)

Now, all these incidents perpetuate a moral dilemma: any advancement related to medical science fundamentally rests on two contradictory effects—dysgenic and eugenic effects of technology. While dysgenic effect preserves the lives of those genetic disorders, we also experienced a countervailing eugenic trend to reduce the birth incidence of genetic disorders by prenatal diagnosis and
pregnancy termination. **Which effect is to be considered as morally justified—dysgenic or eugenic?** Is passive euthanasia permissible?

1.7 Creation and use of transgenic animals as models of human diseases—New era of Biotechnology and ethics

✓ In 1982, two geneticists, Phil Leder and Timothy Stewart of Harvard University, inserted ‘oncogenes’ (cancer causing genes), into a mouse. The resulting “oncomouse” and its offspring were then offered as a living model, in which researchers could study the onset of cancer and test the efficacy of treatments. This mouse was used as a valuable model of human breast cancer. In April 1988, oncomouse made history as a first transgenic animal that got a patent. In U.S, Leder-Stewart and Harvard University won this patent on oncomouse as a research tool (Animal Patenting: European law and the ethical implications, by Peter Stevenson, in the book: Animal Biotechnology and Ethics, Edited by Allan Holland and Andrew Johnson © 1998 Chapman and Hall, pp. 296-300).

Such oncomouse developed tumours in various parts of the body including mammary tissues, blood, lungs, necks, and groin. In some cases, oncomice suffered from limb deformities as a side effect of genetic manipulation. Half of the female oncomice were prone to develop breast cancer at the age of 10 months.

✓ The cystic fibrosis (CF) mice were created by using embryonic stem cells. The mutant mice could not be distinguished from their littermates visually but their cells displayed electrophysiological properties characteristic of CF. These mice were successfully used to validate gene therapy approaches to disease treatment.

The creations of these animals pose the question of whether an ethical distinction should be drawn between **inducing** cancer or painful human diseases in laboratory animals and genetically **engineering** animals to develop cancer or other diseases. Now, from practical point of view, there seem some differences between an animal who are genetically created and those who have been induced human diseases. Some thinkers argued that it is ethically objectionable to alter an animal’s genetic structure with the clear purpose of causing it to be defective which subsequently shall lead to a painful and lethal condition.
In some cases of animal research, researchers employ euthanasia at a certain stage of development of tumours or other diseases to reduce the suffering of laboratory animals. However, it has been suggested that research into a number of devastating human genetic diseases (e.g. Lesch-Nyhan disease and HPRT deficiency), where animals are likely to be increasingly used as models, will need to keep those animals alive for as long as possible in order to study the total manifestation of the disease.

The fundamental issue in this context is: what is the proper extent of 'moral community?' To be the member of such a community would mean that one is considered as worthy of moral respect and entitled to have one's interests taken into account. Do only human beings belong to this community?

Now, the sentiency or capacity to experience pain and pleasure of animal very often has been treated as an overriding qualification for membership of the moral community. Such a refusal, involving preferential consideration for human beings over animals, has been labeled as 'speciesism.' It implies that belonging to a particular species (e.g. Homo sapiens) is ethically significant in determining one's membership of the moral community and the non-membership of other species. *Is it morally justified to show the moral superiority of a powerful species over less superior species?*

In course of our discussion, I have taken three types of technological application—transplantation of organs, withdrawal of technologies and formations of transgenic animal as model. We have seen that the ethical code that had traditionally supported the medical profession had to confront new questions, raised as a result of the extraordinary progress being made in the biomedical sciences: what is the definition of death? What are the limits for the use of resuscitation and for sustaining life? What are the consequences of organ transplants? What are the implications for interventions on newborn life and on the human genome? As a response to these questions, philosophers and theologians, jurists and sociologists, together with doctors and scientists, began to rethink and revise the old standards. Thus, the ethics of technology gave rise to a new approach—Bioethics.

**1.8 Technology, human sexuality and reproduction**

Now, technological inventions, ethical debates regarding applications of technologies, effects of those technologies on life and nature, radical changes or
modifications in age-old cultural believes—all these matters significantly take place in another crucial area of human life—human sexuality and reproduction. Technological assistances not only drastically change the very nature, mode and choices of both sexual and reproductive lives of mankind, but also various applications of these technologies in the field of life enforce us either to change or to rethink the traditional cultural beliefs of society. Before we discuss how technology affects this most private, covert region of human life, we would like to refer some of the significant progress and achievements in this field of life.

➢ Rise and progress of modern Reproductive Science

According to Adele Clarke (Article: Controversy and the Development of Reproductive Sciences, by Adele E. Clarke, Published in: Social Problems, Vol. 37, No. 1. (Feb., 1990), pp. 18-37), Reproductive science has emerged as a separate discipline comparatively late among other biological sciences, perhaps because of its association with human sexuality. However, once established it grew rapidly. He claimed that by 1960’s, scientific inspection in sex and modern sex education, i.e., theoretical progression in reproductive sciences took place. At this stage, I would like to refer few major developments in biological sciences that facilitated the rise of reproductive sciences methodically.

1. Since Darwin, life-scientists’ focus primarily centred on evolution, heredity and development. At the beginning of twentieth century, Gregor Mendel’s rediscovery on the inheritance of characteristics in pea plants had provoked investigators to separate the problem as a distinct sub-problem. From then onwards, Genetics, Developmental Embryology, Reproductive science—came forward as separate disciplines.

2. The second noteworthy advancement was the emergence of Endocrinology during the late nineties and early twentieth centuries. This development enabled us to understand that human bodily processes are not only regulated by nervous system but also by a chemical messenger called ‘hormones’. Endocrinology became the core activity of reproductive scientists during 1940s. Major hormones were discovered, implicated in reproductive phenomena, and placing Endocrinology at the centre of reproductive sciences reflected a series of choices and commitments made by scientists from different countries.
3. Thirdly, in 1953, the discovery of the molecular structure of DNA by Francis Crick and James Watson, enabled scientists to gain a much greater understanding of living organisms at the genetic level. It began to manipulate and control biological processes by adjusting the genetic code. This significant discovery ultimately made it possible to allow genetic counseling, prenatal diagnostics, and manipulation of congenital characteristics.

4. And finally, Sexology evolved as a body of specialist knowledge, was assembled and disseminated by experts namely, Havelock Ellis, Alfred Kinsey, William Masters and Virginia Johnson. Alfred Kinsey reported that a significant number of the population was homosexual. But the extent of homosexual behaviour was debated. Homosexuality was either shrouded in silence or mentioned briefly as a perversion, an illness, a threat to society or simply an embarrassment.

Physiological mechanisms of fertilization, investigation of the hormones regulating female cycle, complex processes involved within embryo genesis had rendered these processes not only easier to comprehend, but also easier to control. Thus from the early twentieth century, systematic theoretical knowledge formation in reproductive field gave a solid foundation for further advancements in the field of reproductive science.

- **Victorian nature of Human sexuality**

Until the latter half of the twentieth century, it has been found that a specific conservative approach of human sexuality fundamentally dominates the cultural beliefs of Euro-American societies. This conservative approach is popularly known as **Essentialist or Positivist approach of sexuality**. This is basically a socio-scientific approach. This approach principally views based on following assumptions:

1. Human sexuality is **natural**.
2. Whatever is natural is **heterosexual**, monogamous and reproductive.
3. Sexuality subsists within institutions like **marriage** or at least in long-term relationship.

According to this perspective, each individual has a stable, fixed sex relationship and is also granted social classification of certain kinds of behavior. Within this category, certain forms of action are natural and normal while others are unnatural
and deviant. Reproduction or procreation is naturally associated with the concept of human sexuality. But, different applications of assisted reproductive technologies not only change the very nature of reproduction, they also transform the traditional Victorian interpretation of sexuality and its interdependence with procreation. Let us discuss, at first, different applications of technology in reproductive field and how these applications modify the traditional understanding of sexuality, procreation and marriage.

1.9 Human sexuality and reproduction: Assistance of Technology

In the mid of twentieth century, we have seen several innovations and applications of technologies related either to human sexuality or to human procreation. We, broadly, classify these inventions into four distinct categories.

1. Technology related to avoid reproduction - Contraception and Abortion
2. Technology for controlling the quality of off-spring
3. Uses of reproductive materials for non-reproductive purposes
4. Assisted Reproductive technology (ART) for relieving infertility.

Very prominently, except the first category, other three categories of technological developments, are, some ways, related to acts of procreation. Thus, various reproductive technologies offer two types of opportunities to couples: to procreate or to avoid procreation.

1. Technology related to avoidance of reproduction - Contraception and Abortion

In 1973, US Supreme Court, for the first time, recognized the right to abortion as constitutional right of couple. Before that declaration, in 9th May, 1960, FDA (Food a Drug Administration) of US government approved the use of birth-control pill or oral contraceptive (Birth Control Pills, by Jon Zonderman and Laurel Shander, Published By InfoBase, NY, 2006, pp. 12). Later on, innovations of long-lasting contraceptives like Norplant system, a technology which consists of six capsules, containing synthetic progestin, has been inserted under the skin of the upper arm (Management of common problems in obstetrics and Gynecology, by Daniel Mishell, Goodwin and Brenner, Published By Blackwell Publisher, 2007, pp. 12) or contragestive agents like RU486, which prevent implantation of embryos in the uterine wall for certain periods of time (RU486: The abortion pill,
by Caroline De Costa, Boolarong Press, pp 6-8). Now, the control over one’s sexual or reproductive life gradually became a social issue: whether a person has the right to control reproductive life or to abort a fetus when he/she finds it convenient to do so. These technologies not only separate sexuality from procreation, but also raise some crucial issues deeply related to our moral understandings: what is the status of early embryo? At what point of time, abortion is morally justifiable? The debates between pro-life and pro-choice are still going on.

2. Technology for controlling the quality of off-spring

Any technology under this category is applied to identify whether the produced embryo has any genetic disorder or not. The use of PGD had begun around 1990. Before that era, we found various tests of pre-natal diagnosis like amniocentesis, chorionic villus sampling (CVS) etc. The fetal cells collected by amniocentesis or CVS were placed for screening whether the embryo is free of dread defects like cystic fibrosis or Tay-Sachs or Down’s syndrome. Now, one of the great limitations of these pre-natal diagnosis techniques is amniocentesis which can be applied after 15th week of development of embryo, whereas by CVS, couple might wait earliest at eighth week of development. Instead of waiting for long period during fetal development, in late 70’s, there were gradual inventions of different technologies under PGD (Pre-implantation Genetic Disorder). Blastomere testing (six to eight embryonic cells) has been used for many common autosound recessive disorders, such as, Tay-Sachs and the most X-linked disorders like muscular dystrophy, Lesch-Nyhan syndrome, hemophilia etc. A technology, popularly known as polar body biopsy, has been applied to test genetic disorders even before fertilization takes place (Public Health Genome: The Essentials, by Claudia Mikhail, Published By Jossey-Bass, 2008, pp. 111-114). Unlike per-natal diagnosis tests like amniocentesis, PGD offers a positive form of selection, through which only ‘healthy’ embryos are selected for implantation.

Now, the ethical challenge over PGD is closely related to its potentials for screening of non-medical traits. Through PGD, it becomes possible to get enough information whether couples possess any risk-factors of deadly diseases or not,
also to recognize various non-medical physical traits. The query is: where to draw a dividing line between acceptable and unacceptable application of PGD. The issue becomes controversial amongst the moralists and physicians. The most problematic issue is the use of PGD for non-medical sex selection. Moreover, PGD provides great opportunities to couples not only to identify, but also to choose their children's genetic make-up according to their will. In short, technologies under this category encourage the notion of 'designer' baby.

3. Uses of reproductive materials for non-reproductive purposes

Modern reproductive sciences use embryo or fetus as the source of tissue beneficial for transplantation or for research. The most notable researches using fetal tissue cells to treat Parkinson's, Alzheimer's diseases or diabetes are still going on. (Few relevant references on this issue: (i) Parkinson's Disease: Diagnosis and Clinical Management, Edited By Stewart Factor, Published By Demos Medical Publishing, 2008, pp. 695, (ii) Alzheimer's Disease: A Physician's guide to Practical Management, Edited By Ralph Richter and Brigitte Richter, Published By Humana Press, New Jersey, 2007, pp. 289, (iii) Prospects For Induced Pluripotent Stem Cell therapy for Diabetes, in book, 'Stem Cells and Regenerative Medicine: From molecular embryology to Tissue Engineering,' Edited By Krishnarao Appasani, © Springer and Business Media, pp. 387-96)

4. Assisted Reproductive technology (ART) to resolve the problem of childlessness of substitute-fertile and infertile couples

In the recent years, one of the pathbreaking achievements in reproductive science is the rapid advancement of assisted reproductive technologies. Though the application of these technologies promises undreamed benefits to mankind, they raise many questions of law and ethics stimulating public interest and concern. ART has been considered as a feasible alternative for the treatment of infertility. Assisted reproductive technologies include any fertilization involving manipulation of gametes/embryos outside the human body and transfer of gametes/embryos into the body. In fact, assisted reproductive technology (ART) is a general term, which refers to compilation of various methods used to achieve pregnancy artificially or by partially artificial means. ART is either used in fertile
couples for genetic reasons or to protect couples from certain communicable
diseases, like AIDS, to reduce the risk of infection when a pregnancy is desired.
Thus, there is no strict definition of the term—'assisted reproductive
technologies.' Use of the ART is primarily confined to the field of reproductive
donocrinology and infertility.

These new technologies encompass different kinds of procedures – Artificial
Insemination (AI), In-Vitro-Fertilization (IVF), Embryo Transfer (ET), Embryo
Freezing or cryopreservation, Surrogate Motherhood etc.

**Artificial Insemination** involves manipulation of fertilization by injecting sperm
artificially with the help of a needle into the uterus of the wife directly without
sexual intercourse. When a man cannot produce sperms or his sperm count is low,
the wife is artificially inseminated with the sperm of an anonymous donor or the
husband. Where the husband's sperm count is low or because of a disease cannot
ejaculate, the artificial insemination is done with the sperm of the husband (AIH).
But where the husband is not able to produce sperms, the sperm can be taken
from an anonymous donor (AID).

AID introduces a third party into the reproductive matrix. Someone who donates
sperm to be used for AID, is now contributing genetic material without the intent
to parent the child that will be produced through the use of his genes. Most of the
religions also don't accept the impregnation of one's wife by the sperm of a third
person as it doesn't make the child one's own and is looked down upon as
illegitimate even in man made laws. The donation is, however, always made
anonymously so that the father could not be traced by the child, nor the father can
make contact with the child, thereby preventing disruption in a family.

**In-vitro fertilization** (IVF) simply means fertilization 'in glass' or petri dish. It
involves fertilization that is artificially performed outside the woman's body in a
'test-tube.' The procedure involves extraction of a number of eggs from the
woman. To do this she is given a drug that enables her to 'super ovulate,' or to
produce more eggs in one cycle than she normally does. Some of the ethical issues
involved in this technology are: bypassing the natural method of conception,
creating life in laboratory, fertilizing more embryos than will be needed,
discarding excess embryos, unnatural environment for embryos, expensive technology not affordable for common man, creating embryos, freezing them and keeping them in limbo, destroying embryos in research, potential to select embryos, selective termination of embryos etc. GIFT (gamete intrafallopian transfer) and ZIFT (zygote intrafallopian transfer) are derivatives of IVF.

Cryopreservation is a technique which stores excess embryos in freezers. IVF is an expensive procedure. In course of IVF, physicians always fertilize more embryos than required. These excess embryos could be reimplanted without additional cost and time. These embryos are frozen, discarded, donated and used for further experiments.

Since freezing is an expensive procedure, sometimes, some embryos are killed. According to some religious beliefs, it is opposed to law and ethics. According to Christianity, life begins at the very moment of conception. So, to kill an embryo means killing a human life, which is contrary to both law and ethics. Since embryos are human lives, we should develop and nurture them till birth. If they are used for experiment, it could be fatal for them. Using them for expert indentation is also not permissible as science cannot experiment with someone with basic human rights without prior permission.

Surrogate motherhood is the most complicated technology among other assisted reproductive technologies. In this technology, a woman, who agrees to act as a surrogate mother, plays the role of a gestational carrier and becomes pregnant and delivers a child for the commissioning couple. In some cases of surrogacy, the surrogate contributes her ova in reproducing the child through in vitro fertilization; in some other cases, she would carry the embryo created and transferred by commissioning couple.

1.10 Surrogate motherhood and other reproductive technologies: A comparison

Now, reproductive technologies under these four categories have critically challenged some issues which are deeply rooted in legal, moral and traditional cultural beliefs. We have already mentioned some of these issues while discussing various types of reproductive technologies.
Very prominently, both abortion-contraceptive technology and assisted reproductive technologies separate sexuality and procreation, but in different manner. The focal point of interest of employing both these technologies is different. While abortion-contraception technology provides enormous opportunities to couples to perform sex without procreation, assisted reproductive technologies allow both sub-fertile and infertile couples to be the parents of offspring asexually. Thus, assisted reproductive technologies promote procreation without sex, whereas, abortion-contraception upholds sex without procreation. Now, any attempt to separate sexuality and procreation—crucially challenges the traditional belief about unification of sex and procreation.

Moreover, ARTs allow—the intrusion of a third party and also permit the genetic contribution of them in reproducing children for married couples. Thus, assisted reproductive technologies not only separate procreation from sexuality, they also separate marriage from procreation. Procreation not only becomes asexual in nature, it soon become collaborative in practice. The traditional cultural belief of unification of—marriage, sex and procreation—become redundant. Intrusion of third party among married couple makes institutions like marriage insignificant and trivial.

The question is: what are the unique features of surrogate motherhood? Is this technology, like other assisted reproductive technologies, separate reproduction both from sexuality and marriage? No doubt, like other assisted reproductive technologies, surrogate motherhood also separates (i) reproduction from sex and (ii) reproduction from marriage. But, unlike other assisted reproductive technologies, surrogate motherhood (iii) fragments motherhood into several distinguishable parts—genetic, gestational and social; (iv) the act of child-bearing and act of child-rearing become two independent acts of motherhood; (v) in case of gestational surrogacy, where the surrogate mother only gestates the embryo that has been provided by the commissioning couple, the resulting child has two separate biological mothers—genetic and gestational mother; (vi) unique contribution of surrogate’s gestation for a long period of time. Unlike in-vitro-fertilization, surrogate motherhood provides human gestation, not artificial petri dish, for full course of pregnancy; (vii) like other assisted reproductive
technologies, surrogacy also promotes a novel concept, collaborative reproduction. It incorporates the biological contributions of outsiders in such an extreme manner, procreation not only reduces to collaborative act of many individuals, in an extraordinary case of application, five unrelated individuals (sperm donor, ova donor, gestational surrogate, social father and social mother) could offer their parental claims to a child born through surrogate pregnancy; (viii) not only heterosexual couple—same-sex couples, even any reproductive individual may reproduce children, genetically related with them, with the assistance of this technology.

Our final query is: whether these are morally, socially or legally justifiable? Surrogacy is the most contentious as well as popular technology among assisted reproductive technologies. Its vast application, in some countries like India, instigate to form a booming business worth approximately around half a billion dollars per year ($449 million), as reported in The Gurdian. (http://www.gurdian.co.uk/frontpage/story/0,1734989,00.html) Site visited on 2/6/2010.

Throughout our study, we would sincerely try to find out: why applications of surrogate motherhood become so much popular technology in spite of so many controversies? Are all these controversies proper? How is it possible to keep balances between controversies and popularity of a practice? In our study, in assessing surrogate motherhood, we would try to develop a legal moralistic approach. This approach would recommend a legal ban on any practice, if it is proved to be morally unjustifiable, wrong. Therefore, in assessing surrogate motherhood, we would pursue the following courses of actions as the guiding-principles of our study.

1. Is surrogacy related to risk factors?
2. If yes, what are those risk factors?
3. Are these factors morally justifiable?
4. If not, should surrogacy contract be totally prohibited or banned?

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