5.1 Meaning of TTB :

Most of the people still think that the TTBs are grown in a test tube instead of growing in the womb of mother. When a TTB; named Gautam; was born in October 1992 at Jaipur Fertility and Medical Research Centre, Jaipur, and taken by his parents to their native place in Pilani (Rajasthan), lot of people came to see the baby and to find out whether the TTB is in any way different than the other children. In this connection Gautam's father said, "People came to our house only to find out if a test tube baby looked any different from other children. They believed that a test tube baby grows in a test tube instead of in his mother's womb and is not delivered like any ordinary baby".

However that is not the case; like NBB, the TTB also grows in the womb of the mother but the difference is only that the fertilization in case of TTB is artificially achieved in a test tube known as in vitro means outside the body whereas in case of NBB the fertilization is natural and takes place in vivo means inside the body.

Thus a TTB means a baby born out of fertilization of an egg with a sperm which is made to occur artificially inside a test tube or petri-dish and the subsequent transfer of the resultant embryo in the womb.

This technique of begetting TTB is known as In Vitro Fertilization and Embryo Transfer (IVF ET).
What is done by this technique is that the eggs of woman are taken out from her body and kept in a test tube or petri-dish, then the sperm of man are taken and poured in the same test tube or petri-dish. When both the eggs and sperm are mixed, the fertilization takes place in the same test tube / petri-dish and the moment it forms into an embryo, it is transferred into the uterus (womb) of the woman. When the conception is confirmed the woman is said to be pregnant and after due date she delivers a baby which is known as TTB. We can also understand this process with the help of diagram No. 1.

The term "test tube baby" was first used in the year 1978 in relation to human baby in the history of mankind. It was to denote that the baby in question is the outcome of medical test conducted in a test tube, in a laboratory outside the body of the woman, in order to observe the process of fertilization of an egg with sperm. The egg was taken out mixed with sperm in test tube where the fertilization took place and the resultant embryo was transferred in the womb to achieve pregnancy which could, otherwise, not be possible by means of coitus. Thus the baby was born in July 1978 in England as the result of pregnancy so achieved by the efforts of Dr Patrick Steptoe.

Since the fertilization was made to occur and successfully achieved in a test tube in a Laboratory after conducting requisite medical tests and the baby was born out of the pregnancy achieved from such fertilization by transferring the resultant embryo in the womb, so it has prominently been known as test tube baby since then.

However, in its broader sense TTB means a baby born out of the pregnancy achieved by any means other than the coitus.
Diagram No. 1.

Blocked Fallopian Tubes

Ovary

Uterus

Embryo Transfer

Embryo

Petri-dish

Egg

Meeting of Egg and Sperm
(Artificial fertilization)
Some expert opinions have defined 'TTB' in the following ways:

According to Dr K. S. Narayan Reddy, 'Test Tube Babies': the ovum is removed from the ovary of the woman and is fertilized outside the body \textit{(in vitro)}. At the stage of blastocyst, the embryo is returned to the uterus which gets implanted in the endometrium.\(^2\)

According to Dr C. K. Parikh, 'Test Tube Baby': the common abnormality leading to sterility in the female is the failure of the ovum to reach the uterus. In some of these cases, the technique of \textit{in vitro} Fertilization (test tube baby) may offer a chance of child bearing. The process consists of removing a matured ovum from the wife's abdomen, fertilising it with the husband's sperm in the Laboratory and implanting the resultant zygote in the uterine cavity. Legally, the process is comparable to A.1.II.\(^3\)

5.2 Modes and methods of begetting TTB:

Different modes and methods are being currently used to deal with the different problems being faced by the couples relating to different factors of their infertility owing to which they are unable to achieve pregnancy. Also there are some other difficulties and problems which are not related to infertility but have strong force to compel the couples to resort to beget child by achieving pregnancy through the modes and methods other than coitus. Modes and methods as per different problems of the couples can conveniently be grouped into following categories:

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(A) Artificial Insemination (A.I.) :-

This technique is used in those cases where inspite of both the male and female factors of reproductive system being perfectly in order, the fertilization of egg with sperm does not take place naturally inside the body \textit{(in vivo)}.

Cases where both the male and the female factors of their respective reproductive system are okay, that is to say, the male factor 'testes' are functioning normally enabling the male to be capable of producing sperm; and female factors 'ovaries' and 'fallopian tubes' are also functioning normally enabling female to be capable of ovulating eggs and facilitating their transfer through fallopian tubes to meet sperm. But still then the fertilization does not take place naturally owing to which the partners are unable to achieve pregnancy; may be because the male is altogether unable to perform coitus or unable to perform properly or ejaculation of the sperm in the vaginal tract is not proper or is not of requisite standard as essentially required for resulting into natural fertilization; or the sperm count is so low that the natural fertilization cannot take place; or may be because female mechanism destroys maximum sperm rendering the natural fertilization impossible or the loss of sperm is so rapid and gross in the vaginal tract due to cervical hostility caused by the cervical mucus or at some places inside the body that natural fertilization cannot be achieved or because of some unknown reasons the natural fertilization does not occur.

Under these situations the pregnancy is artificially achieved by resorting to the technique of Artificial Insemination (AI) also known as Therapeutic Insemination (TI) so as to accomplish artificial fertilization of egg with sperm \textit{in vitro} (outside the body) in a test tube and to transfer the resultant embryo
in the womb for its implantation. If it gets implanted the pregnancy is confirmed, embryo grows into healthy baby for safe delivery and TTB is in the lap of such couple. The sperm for artificial insemination may be either of the husband or of the donor. When the sperm are of husband it is known as Artificial Insemination Homologous or Artificial Insemination Husband (AIH) or Therapeutic Insemination Husband (TIH); and when the sperm are of donor, it is called Artificial Insemination Donor (AID) or Therapeutic Insemination Donor (TID). It is also called as Heterologous Insemination (III).

Therefore it is pertinent to know as to what is artificial insemination (AI) or Therapeutic Insemination (TI) and Artificial Fertilization (AF).

Some experts have defined these terms in the following manner:-

According to Warnock Report, "The term Artificial Insemination (AI) is used to refer to the placing of semen inside a woman's vagina or uterus by means other than sexual intercourse. The principle of this technique has been known for centuries in the veterinary context. The simplicity of artificial insemination contrasts sharply with the technical complexity of more recent developments such as in vitro fertilization. It begins with the collection of semen from the husband or a donor, through masturbation. The semen is either placed in the upper part of the vagina next to the cervix or injected into the uterus through a fine catheter. Insemination is undertaken near the predicted time of ovulation, the time in a woman's menstrual cycle when she has the highest chance of conceiving. The semen used may be fresh or it may have been previously frozen and thawed before use."
According to S. J. Behrman, Robert W. Kistner and Grant W. Patton, "Artificial Insemination is the instrumental introduction of semen into the female genital tract when normal sexual intercourse is not possible or has no likelihood of resulting in a pregnancy."\(^5\)

According to Stanley G. Clayton, T. L. T. Lewis and G. Pinker, "Artificial Insemination: the semen obtained by masturbation is injected with a sterile syringe and cannula on to the surface of the cervix at the time of ovulation".\(^6\)

In Bulgaria, 'Artificial insemination' means a therapeutic procedure whereby a woman is inseminated with genetic material from her husband or a third party unknown to the spouses.\(^7\)

In United States of America (New Hampshire), 'Artificial insemination' means the introduction of semen into a woman's vagina, cervical canal or uterus through extracorporeal or noncoital means.\(^8\)

In Norway, in this Law, 'artificial insemination' means the introduction of semen into woman's womb or cervix by means other than through sexual intercourse;\(^9\) and 'artificial fertilization' means artificial insemination and fertilization outside the human body.\(^10\) This definition stands repealed in view of the fact that the whole law containing this definition has been repealed by 'New Law'\(^11\) which enter into force on 1st September 1994 containing the following definition of artificial fertilization and artificial insemination:–

For the purpose of this law, 'artificial fertilization' means artificial insemination and extracorporeal fertilization.\(^12\)
For the purpose of this law, "artificial insemination" means introduction of sperm into a woman by methods other than sexual intercourse.\(^{13}\)

For the purpose of this law, "extracorporeal fertilization" means fertilization of eggs outside the mother's body.\(^{14}\)

In Sweden, For the purposes of this Law, "insemination" means the introduction of sperm into a woman by artificial means.\(^{15}\)

Now after analysing the above definitions, what we can understand by means of 'artificial Insemination' is that it is a technique by which fertilization is achieved by making union of egg with sperm and mixing them with each other through the means other than sexual intercourse. By this union or mixing up, the egg gets fertilized with sperm and this process is called as artificial fertilization. This fertilisation, by using various modes of artificial insemination, can be achieved at two places, as may be convenient and applicable in a situation of a particular problem. These two places are:

- Inside the body *in vivo*, and
- Outside the body *in vitro*.

If the artificial fertilization is done inside the body it is called '\(\text{in vivo}\) fertilization' and if it is done outside the body it is called '\(\text{in vitro}\) fertilization'. These terms can be discussed below:

For *in vivo* fertilisation, the techniques are:

"(a) Intravaginal insemination,
(b) Intracervical Insemination,

(c) Pericervical Technique, and

(d) Intrauterine Insemination.\textsuperscript{16}

(a) Intravaginal Insemination :-

By this technique the semen is injected in the vaginal tract by using any kind of syringe. "After intravaginal insemination the loss of sperm cells is extremely high; consequently one needs a complete ejaculate."\textsuperscript{17}

(b) Intracervical Insemination :-

As per this technique, the frozen sperm are injected into the cervix by using the special syringe meant for the purpose. "The French straws are adapted to use in the insemination 'pistol' and semen can be injected without loss; a disposable sterile sheath makes it all simple and hygienic to handle. American sperm banks also include such devices with straws of frozen sperm. Usually amounts of 0.25 to 0.5 ml are inseminated into the cervix."\textsuperscript{18}

(c) Pericervical Technique :-

For this purpose, several cervical caps have been devised, such as soft model (containing a small elastic membrane in the middle through which it is possible to inject the semen) or the vacuum cervical cap in which a flexible tube open into the cap. The semen sample is injected into the tube and can be pushed upward into the cap (even if the volume is very small). "Cervical cap insemination is quick and easy, and the woman may sit up at once and remove
the cap at home after 6 to 10 hours".19

(d) Intrauterine Insemination (I.U.I.) :-

By this technique, washed sperm are injected into the uterine cavity, also the pure motile sperm may now be injected into the uterine cavity. However it prevents the cervix from functioning as a reservoir so insemination would have to be repeated more frequently. As semen often is not sterile, and cannot be sterilized, the intrauterine insemination also escapes the protection of the cervix offers against injections. "Crampy contractions of the uterus after intrauterine injection occurred with small volumes of pure semen but rarely occur when washed sperm are used".20

*In Vitro* fertilisation and Embryo Transfer (IVF ET)

We have already discussed this mode of begetting TTB hereinabove. However, we may discuss some definitions of IVF as given by some experts.

According to Warnock Report, "The concept of IVF is simple. A ripe human egg is extracted from the ovary, shortly before it would have been released naturally. Next, the egg is mixed with the semen of the husband or partner, so that fertilization can occur. The fertilized egg, once it has started to divide, is then transferred back to the mother's uterus."21

In Switzerland (Geneva), "*in vitro* fertilization" means the union, in a culture medium, of a spermatozoon and an ovule withdrawn by means of instruments.22
In Israel, "in vitro fertilization" means, "fertilization of the ovum of a woman by semen outside the woman's body".23

In Australia (South Australia), "In vitro fertilization procedure" to mean any of the following : "(a) the removal of a human ovum for the purpose of fertilization within or outside the body; (b) the storage of any such ovum prior to fertilization; (c) the fertilization by artificial means of any such ovum within or outside the body; (d) the culture or storage of a fertilized ovum outside the body; (e) the transference of a fertilized or unfertilized ovum into the body."24

In South Africa, "In vitro insemination" means "the bringing together outside the human body of a male and female gamete and the placing of the zygote in the womb of a female person."25

"The idea of in vitro fertilization is simple but its realization is difficult. Basically what is involved is the retrieval of an oocyte from a mature ovarian follicle, fertilization with the partner's sperm, and replacement of the developing embryo into the uterus. Each of these steps presents problems. The oocyte matures within the follicle and must be retrieved shortly before ovulation would have taken place".26

(B) "Artificial Insemination Homologous" or "Artificial Insemination Husband (AIH) or Therapeutic Insemination (TI) :-

(a) Male Factors (Husband) : Defective :

This technique of AIH or TI is used in those cases, where the reproductive system of husband is in order and he is capable of producing sperm; but there
is some defect in his sperm owing to which the semen produced is not perfectly fit for fertilization or when husband is physically incapable or unable to achieve sexual intercourse or husband cannot ejaculate during intercourse or sperm counts are below the required standard, or where chances of pregnancy are likely to increase by concentrating the husband's semen or by inserting it directly into the uterus or where husband is about to go under surgical operation which may result in his sterility or may cause damage to his reproductive system. In all these situations Artificial Insemination Homologous or Artificial Insemination Husband (AIH) or Therapeutic Insemination (TI) is the best solution which has been defined by some experts in the following manner:

In the words of Warnock Report, the technique of Artificial Insemination by Husband (AIH) has been stated as: "This technique is used for some couples who cannot otherwise conceive, but where the man is not completely infertile. For example, it may be felt that the chances of pregnancy would be increased by concentrating the husband's semen or by inserting it directly into the uterus. When the husband is severely physically disabled and unable to achieve intercourse, AIH may offer the only possibility for him to father a child. It may further be used when the husband cannot ejaculate during intercourse. AIH may also be used to overcome a particular type of female infertility known as cervical hostility where the sperm are killed or rendered inactive by the cervical mucus. In such cases AIH may be successful if the semen is injected into the uterus. There are also situations where a man may have his semen frozen and stored for later use in artificial insemination, because he is to undergo surgery or treatment such as chemotherapy or radiotherapy that may result in sterility or damage to the testes."
According to S. J. Behrman, Robert W. Kistner, and Grant W. Patton, "Artificial Insemination by Husband (AIH) often called homologous insemination, consists in Artificial Insemination (AI) with the husband's (partner's) semen. There are, in fact, two types of AI, namely, AIH, in which the husband's sperm is placed directly against the cervix with minor alteration, and intrauterine insemination (IUI) in which sperm are centrifuged, washed, and allowed to incubate (capacitate) prior to injection into the uterine cavity."

According to Stanley G. Clayton, T. L. T. Lewis and G. Pinker, "Artificial insemination with the husband's semen (AIH) has been widely used in the management of infertility due to impotence or anatomical abnormality in the male, especially hypospadias which prevents the normal ejaculation of sperm into the upper vagina. The semen obtained by masturbation is injected with a sterile syringe and cannula onto the surface of the cervix at the time of ovulation."

(c) Artificial Insemination Donor (AID); or Heterologous Insemination (III): Male factors totally inoperative:

Where the male reproductive system is completely ineffective or sterilized and the husband is unable to produce sperm altogether and the possibility of achieving pregnancy with husband's sperm is altogether nil, the solution is Artificial Insemination Donor (AID) also known as Heterologous Insemination which has been defined by some experts as follows:

According to Warnock Report, "Artificial Insemination by donor (AID) may be used when investigations have shown the husband to be sterile or to have significantly reduced fertility, or it may be used for the avoidance of
hereditary diseases when these are carried by the male. In this procedure the woman is inseminated with semen from a donor.30

According to S. . Behrman, Robert W. Kistner and Grant W. Patton, "Artificial Insemination Donor (AID) : Historically, the use of AID, sometimes called 'homologous' insemination (i.e. with semen from the same species), preceded AID, referred to as 'heterologous' insemination (which really means from another species), in the treatment of infertility".31

(D) Zygote Intra Fallopian Transport (ZIFT) and Gamete Intra Fallopian Transfer (GIFT) :-

These two techniques are used to achieve pregnancy for TTB by artificial means. The pregnancy is achieved through ZIFT technique by transferring the Zygote inside the fallopian tube so as to form into an individual embryo and achieve conception; whereas in case of GIFT the gamete is transferred inside the fallopian tube for achieving conception.

In South Africa, "Zygote" is the product of the union of a male and a female gamete outside the human body.32

In The United States of America, "Gamete" means the ovum (egg) or the spermatozoa (sperm).33

According to Warrnock Report "Gamete is the collective term used to describe both sperm and eggs".34

Regarding GIFT technique, while discussing the other techniques, Leon
Speroff, Robert H. Glass and Nathan G. Kase have stated, "In addition to IVF, individuals with unexplained infertility have been offered a number of tactics to overcome hypothesized problems with gamete transport". For gamete intra fallopian transfer (GIFT), Asch and co-workers use minilaparotomy or laparoscopy to aspirate oocytes following hyperstimulation of the ovary. "After the oocytes are identified in the laboratory they are taken up into a transfer catheter which also contains 100,000 sperm separated by the swimup technique. The transfer catheters are guided into the distal 1.5 to 2 cm of a fallopian tube and the contents gently discharged. Usually 2 oocytes are placed in each tube. Extra eggs obtained by aspiration can be utilized for IVF. Success with GIFT is variable but many centers report pregnancy rates around 30%. Ectopic pregnancy occurs from 3 to 8 percent of the time. In a variation of GIFT, oocytes are obtained by vaginal aspiration, fertilized in vitro, and then 1 day later placed in the fallopian tubes by the GIFT technique.

"Other recent attempts to overcome problems of gamete transport include injections of washed sperm into the peritoneal cavity at the time of ovulation, and cannulation of the fallopian tube via the cervix, using ultrasound guidance, as a conduit for injecting sperm (or embryos) directly into the tube."

(E) Embryo Transfer :-

By this technique the embryo achieved outside the body is transferred into the womb of a female which gets implanted and grows into a healthy baby. This technique is useful in a situation where fertilization is not possible to achieve in vivo of the female due to various reasons especially blockage of the fallopian tubes. The embryo is achieved by in vitro fertilization out of the egg of the
same woman with the sperm of her husband or of a donor if husband is infertile and then it is transferred into the womb. Embryo can also be obtained by fertilization of the donated eggs and even \textit{in vivo} of the egg donor or any other female.

In Switzerland, "Embryo transfer" means the introduction of the developing embryo into the uterine cavity by the vaginal route.\textsuperscript{38}

\textbf{(F) Egg Donation :-}

Egg donation is one of those modes which helps the couple for begetting pregnancy in an artificial means. In a situation where the female reproductive system is totally ineffective and there is no possibility of ovulation of eggs or where ovulation of eggs is intact but fallopian tubes are blocked and ovaries are inaccessible, egg donation has proved to be an appropriate solution. The donated egg is fertilized with the sperm of the husband of the recipient woman or with the donor sperm if the husband is also infertile. The fertilization of the donated egg is done in a test tube or a petri-dish and the resultant embryo is then transferred inside the womb of the recipient woman; where, if it gets implanted, grows into a healthy baby. Also where a woman is undergoing infertility treatment but so many eggs are recovered from her, some of which she may donate to others.

According to Warnock Report, "A mature egg is recovered from a fertile woman donor, for example during sterilization, and is fertilised \textit{in vitro}, using the semen of the husband of the infertile woman. The resulting embryo is then transferred to the patient's uterus. If it implants she may then carry the pregnancy
to term. There are other situations where eggs might be donated. When a woman is herself undergoing infertility treatment and several eggs have been recovered from her, she may be prepared to donate one or more eggs to another woman whose infertility can be treated only by egg donation.\textsuperscript{39}

According to Leon Speroff, Robert H. Glass and Nathan G. Kase, "A fertilized human ovum can be removed by uterine lavage from a donor and placed transcervically in the uterus of an infertile recipient.\textsuperscript{40}

(G) Embryo Donation :-

This is also one of those artificial modes by which a couple can achieve pregnancy. In a situation where not only the fallopian tubes are ineffective and there is no ovulation of eggs in a female but also the husband is infertile, the embryo is obtained by \textit{'in vitro fertilization'} of the donor egg with the donor sperm and then transferred into the womb of the recipient female.

By this mode, the embryo can also be obtained by \textit{'in vivo fertilization'}. The donor egg in this case is not taken out of the body of the donor female but it is allowed to remain \textit{in vivo} of the donor female and is made to fertilize \textit{in vivo} of the donor female by insemination of the sperm of the husband of the recipient female or of the donor if the husband is also infertile. After 3 to 4 days of the fertilization when the embryo is about to be implanted \textit{in vivo} of the female, the uterus of the donor female is washed out and any embryo thus recovered is transferred into the womb of recipient female where, if it gets implanted, grows into healthy baby. This method of achieving the pregnancy from the transfer of embryo from the body of the donor female is known as IVF ET.
The technique of embryo donation has been expressed by the Warnock Report in the following words:

"Embryo donation may take two forms. One involves the donation of both egg and semen. The donated egg is fertilised \textit{in vitro} with donated semen and the resulting embryo transferred to a woman who is unable to produce an egg herself and whose husband is infertile. The second method, known as lavage, does not involve removing the egg by surgical intervention. Instead the egg is released naturally from the ovary at the normal time in the donor's menstrual cycle. At the predicted time of ovulation she is artificially inseminated with semen from the husband of the infertile woman (or from a donor if the husband is also infertile). Some three to four days later, before the start of implantation, the donor's uterus is "washed out" and any embryo retrieved is then transferred to the uterus of the infertile woman. If the embryo implants successfully the recipient carries the pregnancy to term. Embryo donation by lavage is, according to its advocates, much safer for the donor as it does not require general anaesthesia, and a simple and safer procedure is involved; moreover, for the embryo, there is the advantage of a shorter interval \textit{in vitro} during which time it might deteriorate. When semen from the husband is used, the child is genetically his though not his wife's.\textsuperscript{41}

(H) Surrogacy :-

The TTB can also be begotten by the technique of surrogacy. In a situation where the female is totally unable to bear pregnancy or whose uterus is removed by surgical operation on health ground or otherwise the uterus is defective though the female is capable of ovulating eggs, the \textit{in vitro} fertilization is obtained by
the union of an egg of the recipient woman with the sperm of her husband and in case the husband is also infertile, with the sperm of a donor and where the recipient woman is unable to ovulate any egg, the In Vitro fertilization is achieved by the union of the donor egg with the sperm of the husband of the recipient woman or the sperm of a donor if the husband is infertile and then the resultant embryo is transferred into the womb of the surrogate mother where, if it gets implanted, grows into a healthy baby. The surrogate mother could be that female herself who donated the egg or any other female who is arranged for bearing the pregnancy and delivering the baby to the recipient parents. There may also be situation where the recipient female does not wish to get pregnant and bear the pain of delivery even though married and capable of producing egg and having fallopian tube perfectly functioning or an unmarried or widow or divorcee who does not wish to marry or remarry, as the case may be, and does not wish to be pregnant herself may still get a TTB under the arrangement of surrogate mother by getting the In Vitro Fertilization out of the union of her own egg or the donor egg with the sperm of her husband or the donor and get the resultant embryo transferred in the womb of the surrogate mother and by getting the in vivo fertilization in her own body or in the body of the egg donor and get the embryo transferred in the womb of the surrogate mother arranged for the purpose. The fertilization can also be done in vivo of the surrogate mother by directly inseminating the sperm of the recipient father or the donor inside the body of the surrogate mother and by getting the embryo implanted there which, if gets implanted, grows into a healthy baby and the baby is delivered and handed over by the surrogate mother to the recipient parents.

As to what is Surrogacy? Warnock Report explains, "Surrogacy is the
practice whereby one woman carries a child for another with the intention that the child should be handed over after birth. The use of artificial insemination and the recent development of \textit{in vitro} fertilization have eliminated the necessity for sexual intercourse in order to establish a surrogate pregnancy. Surrogacy can take a number of forms. The commissioning mother may be the genetic mother, in that she provides the egg, or she may make no contribution to the establishment of the pregnancy. The genetic father may be the husband of the commissioning mother, or of the carrying mother; or he may be an anonymous donor. There are thus many possible combinations of persons who are relevant to the child's conception, birth and early environment. Of these various forms perhaps the most likely are surrogacy involving artificial insemination, where the carrying mother is the genetic mother inseminated with semen from the male partner of the commissioning couple, and surrogacy using \textit{in vitro} fertilization where both egg and semen come from the commissioning couple, and the resultant embryo is transferred to and implants in the carrying mother.

There are certain circumstances in which surrogacy would be an option for the alleviation of infertility. Examples are where a woman has a severe pelvic disease which cannot be remedied surgically, or has no uterus. The practice might also be used to help those women who have suffered repeated miscarriages. There are also perhaps circumstances where the genetic mother, although not infertile, could benefit from the pregnancy being carried by another woman. An example is where the genetic mother is fit to care for a child after it is born, but suffers from a condition making pregnancy medically undesirable.

If surrogacy takes place it generally involves some payment to the carrying mother. Payment may vary between reimbursement of expenses, and a substantial
fee. There may, however, be some instances where no money is involved, for example, where one sister carries the pregnancy for another.\(^{42}\)

In United Kingdom, "Surrogate mother means a woman who carries a child in pursuance of an arrangement :-

(a) made before she began to carry the child, and

(b) made with a view to any child carried in pursuance of it being handed over to, and the parental rights being exercised (so far as practicable) by, another person or other persons."\(^{43}\) and

An arrangement is a surrogacy arrangement if, were a woman to whom the arrangement relates to carry a child in pursuance of it, she would be a surrogate mother.\(^{44}\)

In United States of America, 'Surrogacy' or 'Surrogacy arrangement' means any arrangement by which a woman agrees to be impregnated using either the intended father's sperm, the intended mother's egg, or their pre-embryo with the intent that the intended parents are to become the parents of the resulting child after the child's birth.

"Surrogate" means a woman who agrees, pursuant to a surrogacy contract, to bear a child for intended parents.\(^{45}\)

(1) Frozen Sperm, Eggs and Embryos :-

The TTB can also be obtained by fertilization of frozen sperm, eggs or embryos. In a situation where the husband is to undergo some surgical operation
operation which would render him infertile for ever, he may get his sperm frozen for getting subsequent pregnancy through in vitro fertilization and transferring the embryo inside the womb of his wife or surrogate mother or through in vivo fertilization in the womb of his wife or the surrogate mother. The egg for fertilization may either be of his wife or of the donor female who could be any other lady including the surrogate mother.

Likewise in a situation where female spouse is undergoing surgical operation which is likely to render her reproductive system inoperative for ever, she can get her eggs frozen for the subsequent pregnancy either being herself or through surrogate mother.

While dealing with "the freezing and storage of human semen, eggs and embryos", the Warnock Report says, "The freezing, storage and thawing of human semen and embryos for subsequent use in artificial insemination or IVF are already practical realities, but a safe and reliable method of freezing and thawing human eggs has not yet been developed, although this is probably not far in the future. First, we see no objection in principle to the use of freezing in the treatment of infertility. There are however practical problems which may cause concern. There is anxiety that the process of freezing could induce damage in the gametes or embryos in a way which might lead to the birth of a child with an abnormality of structure or function. Nevertheless the experience of using frozen human semen for artificial insemination is reassuring, and so are animal studies in which semen has been used for AI after long-term frozen storage. We therefore recommended that the use of frozen semen in artificial insemination should continue."
This situation is not however paralleled in the case of eggs which have been fertilised after frozen storage. At present human eggs fertilised after freezing and thawing do not develop successfully. In addition, if this difficulty were overcome the problem of whether the resulting embryo would develop normally would still remain to be resolved. So far there is insufficient evidence on which to base a judgement that the freezing and thawing of human eggs will not result in abnormalities. We therefore recommend that the use of frozen eggs in therapeutic procedures should not be undertaken until research has shown that no unacceptable risk is involved. This will be a matter for review by the licensing body.

At the time of writing a small number of pregnancies has been achieved after frozen storage of human embryos, of which at least one has led to a live birth. Animal studies suggest that any damage caused by freezing is more likely to kill the embryo entirely than to impair its development and it is not thought likely that freezing of human embryos will cause abnormalities. Nevertheless, as a matter of good clinical practice, checks should be made after thawing to ensure so far as possible, that any frozen human embryo which is to be transferred to a woman is developing normally. We recommend that the clinical use of frozen embryos may continue to be developed under review by the licensing body.46

(J) Mixed sperm :-

By this technique also the artificial pregnancy can be achieved in a situation where the sperm of the husband (partner) are very weak to lead fertilization and conception. The deficiency is removed by mixing the donor sperm having higher degree of potential or sperm counts. But mainly it is done for the psychological coverage to remove the impact from the mind of the husband. Mixed sperm can
also be from two or more donors without mixing the sperm of husband.

However according to the American Fertility Society, "The practice of mixing the husband's semen with the donor's should be discouraged. The available data suggest that this practice may interfere with the fertilizing ability of the donor sperm. Also, it confuses the issue. Any psychologic uncertainty on the part of the couple should be dealt with before proceeding with insemination."47
NOTES AND REFERENCES (CHAPTER - 5, PART - I)

1. Sutapa Mukherjee, G. C. Shekhar, Ramakrishna Upadhyya and Anil Grover, "Mothers and Sons", The Telegraph Magazine, 11 April, 1993, p. 16


8. Ibid., 41(4), pp. 626-627, USA (NH) 90.1, 168-B 1, s-1.


10. Ibid., p. 782, s. 1.

12. Ibid., s. 2-1.

13. Ibid.

14. Ibid.


17. Ibid.

18. Ibid.

19. Ibid.

20. Ibid.


24. Ibid., 1988, 39(2), p. 386, Ausl. (SA) 88.8, s. 3.


26. STANLEY G. CLAYTON & Ors., n. 6, p. 273.

27. Warnock Report, n. 4, p. 17.

29. STANLEY G. CLAYTON & Ors., n. 6, p. 274.


32. IDHL, n. 25.

33. IDHL, n. 8, s. IV.

34. Warnock Report, n. 4, p. 15.


36. Ibid.

37. Ibid.

38. IDHL, n. 22, s. 1(2).

39. Warnock Report, n. 4, p. 35.

40. Leon Speroff & Ors., n. 35.


42. Ibid., pp. 42-43.

44. Ibid., s. 1(3).

45. IDHL, n. 8, Ss. XII and XIV.

46. Warnock Report, n. 4, p. 53-54.

47. S. J. BEHRMAN & Ors., n 5, p. 831.