

Pregancy Infomations

WuXiaochun

To my sweetly wife and brilliant unborn child.

Contents

1	General Conception	1
2	Terminology	1
3	Progression	2
3.1	Initiation	2
3.2	Prenatal period	2
3.2.1	Fertilization	3
3.2.2	Embryonic period	3
3.2.3	Changes by weeks of gestation	5
3.2.4	Gestational age vs. embryonic age	5
3.2.5	Week 3	5
3.2.6	Week 4	6
3.2.7	Week 5	6
3.2.8	Week 6	6
3.2.9	Week 7	7
3.2.10	Week 8	7
3.2.11	Week 9	7
3.2.12	Fetal period	8
3.2.13	Changes by weeks of gestation	8
3.2.14	Weeks 10-12	8
3.2.15	Weeks 13 to 16	8
3.2.16	Week 19	9
3.2.17	Week 23	9
3.2.18	Week 27	9
3.2.19	Week 31	10
3.2.20	Week 35	10
3.2.21	Weeks 36 to 39	10
3.3	Perinatal period	11
3.4	Postnatal	11
3.4.1	The postpartum period	11
3.4.2	Physical	11
3.4.3	Psychological	12
3.4.4	Cultures	12
3.5	Duration	12
4	Childbirth	14
4.1	The mechanics of vaginal birth	14
4.2	The stages of normal human birth	15

4.2.1	Latent phase	15
4.2.2	First stage: contractions	15
4.2.3	Second stage: birth	16
4.2.4	Third stage: placenta	16
4.2.5	After the birth	17
4.2.6	Pain	17
4.2.7	Descriptions	17
4.2.8	Non-medical pain control	18
4.2.9	Medical pain control	18
5	Diagnosis	19
6	Physiology	21
6.1	First trimester	21
6.2	Second trimester	22
6.3	Third trimester	22
6.4	Prenatal development and sonograph images	23
7	Physiological changes in pregnancy	24
7.1	Hormonal changes	24
7.2	Musculoskeletal changes	24
7.3	Physical changes	25
7.4	Cardiovascular changes	25
7.5	Respiratory changes	26
7.6	Metabolic changes	26
7.7	Renal changes	26
8	Management	26
8.1	Nutrition	26
8.2	Weight gain	27
8.3	Immunological tolerance	28
8.4	Drugs in pregnancy	29
8.5	Sexuality during pregnancy	29
8.6	Abortion	30

List of Figures

1	A pregnant woman near the end of her term	1
2	A sperm fertilizing an ovum	3
3	A newborn baby with umbilical cord ready to be clamped . .	16
4	Comparison of growth of the abdomen between 26 weeks and 40 weeks gestation	21
5	A pregnant woman at 26 weeks	22

1 General Conception

Pregnancy (latin graviditas) is the carrying of one or more offspring, known as a fetus or embryo, inside the uterus of a female. In a pregnancy, there can be multiple gestations, as in the case of twins or triplets. Human pregnancy is the most studied of all mammalian pregnancies. Obstetrics is the surgical field that studies and cares for high risk pregnancy. Midwifery is the non-surgical field that cares for pregnancy and pregnant women.

Childbirth usually occurs about 38 weeks after fertilization (conception), i.e., approximately 40 weeks from the last normal menstrual period (LNMP) in humans.

The World Health Organisation defines normal term for delivery as between 37 weeks and 42 weeks. The calculation of this date involves the assumption of a regular 28-day period.



Figure 1: A pregnant woman near the end of her term

2 Terminology

One scientific term for the state of pregnancy is gravid, and a pregnant female is sometimes referred to as a gravida. Neither word is used in common speech. Similarly, the term "parity" (abbreviated as "para") is used for the number of previous successful live births. Medically, a woman who has never been pregnant is referred to as a "nulligravida", and in subsequent pregnancies as "multigravida" or "multiparous". Hence during a second pregnancy a woman would be described as "gravida 2, para 1" and upon delivery as "gravida 2, para 2". Incomplete pregnancies of abortions, miscarriages or stillbirths account for parity values being less than the gravida number, whereas a multiple birth will increase the parity value. Women who have never carried a pregnancy achieving more than 20 weeks of gestation age are referred to as "nulliparous". The medical term for a woman who is pregnant for the first time is primipara.

The term embryo is used to describe the developing offspring during the first eight weeks following conception, and the term fetus is used from about two months of development until birth.

In many societies' medical or legal definitions, human pregnancy is somewhat arbitrarily divided into three trimester periods, as a means to simplify reference to the different stages of prenatal development. The first trimester carries the highest risk of miscarriage (natural death of embryo or fetus). During the second trimester, the development of the fetus can be

more easily monitored and diagnosed. The beginning of the third trimester often approximates the point of viability, or the ability of the fetus to survive, with or without medical help, outside of the uterus.

3 Progression

3.1 Initiation

Pregnancy occurs as the result of the female gamete or oocyte being penetrated by the male gamete spermatozoon in a process referred to, in medicine, as "fertilization", or more commonly known as "conception". After the point of "fertilization" it is referred to as an egg. The fusion of male and female gametes usually occurs through the act of sexual intercourse. However, the advent of artificial insemination and in vitro fertilisation have also made achieving pregnancy possible in cases where sexual intercourse does not result in fertilization (e.g. through choice or male/female infertility).

3.2 Prenatal period

Prenatal or **antenatal development** is the process in which an embryo or fetus (or foetus) gestates during pregnancy, from fertilization until birth. Often, the terms **fetal development**, **foetal development**, or **embryology** are used in a similar sense.

After fertilization the embryogenesis starts. In humans, when embryogenesis finishes, by the end of the 10th week of gestational age, the precursors of all the major organs of the body have been created. Therefore, the following period, the fetal period, is described both topically on one hand, i.e. by organ, and strictly chronologically on the other, by a list of major occurrences by weeks of gestational age.

3.2.1 Fertilization

When semen is deposited in the vagina, the spermatozoa travel through the cervix and body of the uterus and into the Fallopian tubes. Fertilization of the ovum (egg cell) usually takes place in the Fallopian tube. Man sperm must cooperate to penetrate the thick protective shell-like barrier that surrounds the ovum. The first sperm that penetrates fully into the egg donates its genetic material (DNA). The egg then polarizes, repelling any additional sperm. The resulting combination is called a zygote. The term "conception" refers variably to either fertilization or to formation of the conceptus after uterine implantation, and this terminology is controversial.

Prior to fertilization, each ovum contains a complete human genome, including a single X but no Y chromosome. Likewise, each spermatozoon contains a complete set of autosomes and a single sex chromosome, either X or Y. The resulting zygote is similar to the majority of somatic cells because it contains two copies of the genome in a diploid set of chromosomes. One set of chromosomes came from the nucleus of the ovum and the second set from the nucleus of the sperm. If the spermatozoon contributes a Y chromosome then the zygote will develop as a male. Unlike the X chromosome, the Y chromosome contains very little genetic information. However it does contain a gene, SRY, which will switch on androgen production at a later stage, leading to the development of a male body type. In contrast, the mitochondrial genetic information of the zygote comes entirely from the mother via the ovum.

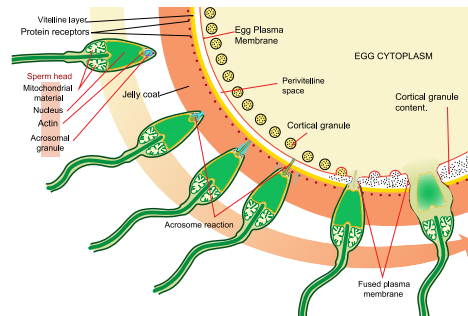


Figure 2: A sperm fertilizing an ovum

3.2.2 Embryonic period

The embryonic period in humans begins at fertilization (2nd week of gestation) and continues until the end of the 10th week of gestation (8th week of development).

The zygote spends the next few days traveling down the Fallopian tube. Meanwhile it divides several times to form a ball of cells called a morula. Further cellular division is accompanied by the formation of a small cavity between the cells. This stage is called a blastocyst. Up to this point there is no growth in the overall size of the embryo, so each division produces

successively smaller cells.

The blastocyst reaches the uterus at roughly the fifth day after fertilization. It is here that lysis of the zona pellucida, a glycoprotein shell, occurs. This is required so that the trophoctoderm cells, which give rise to extra-embryonic structures such as the placenta, of the blastocyst can come into contact with the luminal epithelial cells of the endometrium. (Contrast this with zona hatching, an event that occurs in vitro by a different mechanism, but with a similar result). It then adheres to the uterine lining and becomes embedded in the endometrial cell layer. This process is also called implantation. In most successful pregnancies, the conceptus implants 8 to 10 days after ovulation (Wilcox et al. 1999). The inner cell mass forms the embryo, while the outer cell layers form the membranes and placenta. Together, the embryo and its membranes are referred to as a conceptus, or the “products of conception”.

Rapid growth occurs and the embryo’s main external features begin to take form. This process is called differentiation, which produces the varied cell types (such as blood cells, kidney cells, and nerve cells). A spontaneous abortion, or miscarriage, in the first trimester of pregnancy is usually due to major genetic mistakes or abnormalities in the developing embryo. During this critical period (most of the first trimester), the developing embryo is also susceptible to toxic exposures, such as:

- Alcohol, certain drugs, and other toxins that cause birth defects, such as Fetal alcohol syndrome
- Infection (such as rubella or cytomegalovirus)
- Radiation from x-rays or radiation therapy
- Nutritional deficiencies such as lack of folate which contributes to spina bifida

Generally, if a structure pre-dates another structure in evolutionary terms, then it often appears earlier than the other in an embryo; this general observation is sometimes summarized by the phrase “ontogeny recapitulates phylogeny.” For example, the backbone is a common structure among all vertebrates such as fish, reptiles and mammals, and the backbone also appears as one of the earliest structures laid out in all vertebrate embryos. The cerebrum in humans, which is the most sophisticated part of the brain, develops last. The concept of recapitulation is not absolute, but it is recognized as being partly applicable to development of the human embryo.

Week	number	reached age
Gestational	x	x-1
Embryonic	x-2	x-3

3.2.3 Changes by weeks of gestation

3.2.4 Gestational age vs. embryonic age

Gestational age is the time that has passed since the onset of the last menstruation, which generally or as standard occurs 2 weeks before the actual fertilization. Embryonic age, in contrast measures the actual age of the embryo or fetus from the time of fertilization. Nevertheless, menstruation has historically been the only means of estimating embryonal/fetal age, and is still the presumed measure if not else specified.

Thus, the first week of embryonic age is already week three counting with gestational age. The other way around, week 1 and 2 of gestational age are merely theoretical extrapolations of embryonic age, since the embryo actually hasn't yet formed.

Furthermore, the number of the week is one more than the actual age of the embryo/fetus. For example, the embryo is 0 whole weeks old during the 1st week after fertilization.

The following table summarizes the various expression systems during week number x of gestation.

3.2.5 Week 3

Gestational age: 2 weeks old. 15-21 days from last menstruation.

Embryonic age: Week nr 1. 0 weeks old. 1-7 days from fertilization.

- Fertilization of the ovum to form a zygote. (day 1 of fert.)
- The zygote undergoes mitotic cellular divisions, but does not increase in size. This mitosis is also known as cleavage. A hollow cavity forms marking the blastocyst stage. (day 1.5-3 of fert.)
- The blastocyst contains only a thin rim of trophoblast cells and a clump of cells at one end known as the "embryonic pole" which include embryonic stem cells.
- The embryo hatches from its protein shell (zona pellucida) and performs implantation onto the endometrial lining of the mother's uterus. (day 5-6 of fert.)
- If separation into identical twins occurs, 1/3 of the time it will happen before day 5.

3.2.6 Week 4

Gestational age: 3 weeks old. 22-28 days from last menstruation.

Embryonic age: Week nr 2. 1 week old. 8-14 days from fertilization.

- trophoblast cells surrounding the embryonic cells proliferate and invade deeper into the uterine lining. They will eventually form the placenta and embryonic membranes. The blastocyst is fully implanted day 7-12 of fert.
- Formation of the yolk sac.
- The embryonic cells flatten into a disk, two cells thick.
- If separation into identical twins occurs, 2/3 of the time it will happen between days 5 and 9. If it happens after day 9, there is a significant risk of the twins being conjoined.
- Primitive streak develops. (day 13 of fert.)
- Primary stem villi appear. (day 13 of fert.)

3.2.7 Week 5

Gestational age: 4 weeks old. 29-35 days from last menstruation.

Embryonic age: Week nr 3. 2 weeks old. 15-21 days from fertilization.

- A notochord forms in the center of the embryonic disk. (day 16 of fert.)
- Gastrulation commences. (day 16 of fert.)
- A neural groove (future spinal cord) forms over the notochord with a brain bulge at one end. Neuromeres appear. (day 18 of fert.)
- Somites, the divisions of the future vertebra, form. (day 20 of fert.)
- Primitive heart tube is forming. Vasculature begins to develop in embryonic disc. (day 20 of fert.)

3.2.8 Week 6

Gestational age: 5 weeks old. 36-42 days from last menstruation.

Embryonic age: Week nr 4. 3 weeks old. 22-28 days from fertilization.

- The embryo measures 4 mm (1/8 inch) in length and begins to curve into a C shape.
- The heart bulges, further develops, and begins to beat in a regular rhythm. Septum primum appear.
- Branchial arches, grooves which will form structures of the face and neck, form.
- The neural tube closes.
- The ears begin to form as otic pits.
- Arm buds and a tail are visible.
- Pulmonary primordium, the first traits of the lung appear.
- Hepatic plate, the first traits of the liver appear.
- Buccopharyngeal membrane ruptures. This is the future mouth.

- Cystic diverticulum, which will become the gallbladder, and dorsal pancreatic bud, which will become the pancreas appear.
- Urorectal septum begins to form. Thus, the rectal and urinary passageways become separated.
- Anterior and posterior horns differentiate in the spinal cord
- Spleen appears.
- Ureteric buds appear.

3.2.9 Week 7

Gestational age: 6 weeks old. 43-49 days from last menstruation.

Embryonic age: Week nr 5. 4 weeks old. 29-35 days from fertilization.

- The embryo measures 8 mm (1/4 inch) in length.
- Lens pits and optic cups form the start of the developing eye.
- Nasal pits form.
- The brain divides into 5 vesicles, including the early telencephalon.
- Leg buds form and hands form as flat paddles on the arms.
- Rudimentary blood moves through primitive vessels connecting to the yolk sac and chorionic membranes.

3.2.10 Week 8

Gestational age: 7 weeks old. 50-56 days from last menstruation.

Embryonic age: Week nr 6. 5 weeks old. 36-42 days from fertilization.

- The embryo measures 13 mm (1/2 inch) in length.
- Lungs begin to form.
- The brain continues to develop.
- Arms and legs have lengthened with foot and hand areas distinguishable.
- The hands and feet have digits, but may still be webbed.
- The gonadal ridge begins to be perceptible.
- The lymphatic system begins to develop.

3.2.11 Week 9

Gestational age: 8 weeks old. 57-63 days from last menstruation.

Embryonic age: Week nr 7. 6 weeks old. 43-49 days from fertilization.

- The embryo measures 18 mm (3/4 inch) in length.
- Nipples and hair follicles begin to form.
- Location of the elbows and toes are visible.
- Spontaneous limb movements may be detected by ultrasound.
- All essential organs have at least begun formation.

3.2.12 Fetal period

The fetal period begins at the end of the 10th week of gestation (8th week of development). Since the precursors of all the major organs are created by this time, the fetal period is described both by organ and by a list of changes by weeks of gestational age.

Because the precursors of the organs are formed, fetus also is not as sensitive to damage from environmental exposures as the embryo. Instead, toxic exposures often cause physiological abnormalities or minor congenital malformation.

3.2.13 Changes by weeks of gestation

From the 8th week until birth (around 38 weeks), the developing organism is called a fetus. The fetus is not as sensitive to damage from environmental exposures as the embryo, and toxic exposures often cause physiological abnormalities or minor congenital malformation. All major structures are already formed in the fetus, but they continue to grow and develop.

3.2.14 Weeks 10-12

Gestational age: 9-11 weeks old.

Embryonic age: Weeks nr 8-10. 7-9 weeks old.

- Embryo measures 30 mm-8 cm (1.2-3.2 inches) in length.
- Intestines rotate.
- Facial features continue to develop.
- the eyelids are more developed.
- the external features of the ear begin to take their final shape.
- The head comprises nearly half of the fetus' size.
- The face is well formed
- The eyelids close and will not reopen until about the 28th week.
- Tooth buds, which will form the baby teeth, appear.
- The limbs are long and thin.
- The fetus can make a fist with its fingers.
- Genitals appear well differentiated.
- Red blood cells are produced in the liver.

3.2.15 Weeks 13 to 16

Gestational age: 12-15 weeks old.

Embryonic age: Weeks nr 11-14. 10-13 weeks old.

- The fetus reaches a length of about 15 cm (6 inches).
- A fine hair called lanugo develops on the head.
- Fetal skin is almost transparent.
- More muscle tissue and bones have developed, and the bones become harder.
- The fetus makes active movements.
- Sucking motions are made with the mouth.
- Meconium is made in the intestinal tract.
- The liver and pancreas produce fluid secretions.

3.2.16 Week 19

Gestational age: 18 weeks old.

Embryonic age: Week nr 17. 16 weeks old.

- The fetus reaches a length of 20 cm (8 inches).
- Lanugo covers the entire body.
- Eyebrows and eyelashes appear.
- Nails appear on fingers and toes.
- The fetus is more active with increased muscle development.
- "Quickening" usually occurs (the mother can feel the fetus moving).
- The fetal heartbeat can be heard with a stethoscope.

3.2.17 Week 23

Gestational age: 22 weeks old.

Embryonic age: Week nr 21. 20 weeks old.

- The fetus reaches a length of 28 cm (11.2 inches).
- The fetus weighs about 725 g (1 lb 10 oz).
- Eyebrows and eyelashes are well formed.
- All of the eye components are developed.
- The fetus has a hand and startle reflex.
- Footprints and fingerprints continue forming.
- Alveoli (air sacs) are forming in lungs.

3.2.18 Week 27

Gestational age: 26 weeks old.

Embryonic age: Week nr 25. 24 weeks old.

- The fetus reaches a length of 38 cm (15 inches).
- The fetus weighs about 1.2 kg (2 lb 11 oz).
- The brain develops rapidly.
- The nervous system develops enough to control some body functions.
- The eyelids open and close.

- The cochleae are now developed, though the myelin sheaths in neural portion of the auditory system will continue to develop until 18 months after birth.
- The respiratory system, while immature, has developed to the point where gas exchange is possible.

3.2.19 Week 31

Gestational age: 30 weeks old.

Embryonic age: Week nr 29. 28 weeks old.

- The fetus reaches a length of about 38-43 cm (15-17 inches).
- The fetus weighs about 2 kg (3 lb 0 oz).
- The amount of body fat rapidly increases.
- Rhythmic breathing movements occur, but lungs are not fully mature.
- Thalamic brain connections, which mediate sensory input, form.
- Bones are fully developed, but are still soft and pliable.
- The fetus begins storing iron, calcium, and phosphorus.

3.2.20 Week 35

Gestational age: 34 weeks old.

Embryonic age: Week nr 33. 32 weeks old.

- The fetus reaches a length of about 40-48 cm (16-19 inches).
- The fetus weighs about 2.5 to 3 kg (5 lb 12 oz to 6 lb 12 oz).
- Lanugo begins to disappear.
- Body fat increases.
- Fingernails reach the end of the fingertips.
- a baby born at 36 weeks has a high chance of survival, but may require medical interventions.

3.2.21 Weeks 36 to 39

Gestational age: 35-38 weeks old.

Embryonic age: Weeks nr 34-37. 33-36 weeks old.

- The fetus is considered full-term at the end of the 37th week of gestational age.
- It may be 48 to 53 cm (19 to 21 inches) in length.
- The lanugo is gone except on the upper arms and shoulders.
- Fingernails extend beyond fingertips.
- Small breast buds are present on both sexes.
- Head hair is now coarse and thickest.
- The development is continued postnatally with child development stages.

3.3 Perinatal period

Perinatal defines the period occurring "around the time of birth", specifically from 22 completed weeks (154 days) of gestation (the time when birth weight is normally 500 g) to seven completed days after birth.

Legal regulations in different countries include gestation age beginning from 16 - 22 weeks (5 months) before birth.

3.4 Postnatal

Postnatal (Latin for 'after birth', from post meaning "after" and natalis meaning "of birth") is the period beginning immediately after the birth of a child and extending for about six weeks. A more correct[citation needed] term would be postpartum period, as it refers to the mother (whereas postnatal refers to the infant). Less frequently used is puerperium.

Biologically, it is the time after birth, a time in which the mother's body, including hormone levels and uterus size, return to prepregnancy conditions. Lochia is post-partum vaginal discharge, containing blood, mucus, and placental tissue.

During the first stages of this period, the newborn also starts his/her adaptation to extrauterine life, the most significant[citation needed] physiological transition until death.

In scientific literature the term is commonly abbreviated to PX. So that 'day P5' should be read as 'the fifth day after birth'.

3.4.1 The postpartum period

A woman in the Western world who is delivering in a hospital may leave the hospital as soon as she is medically stable and chooses to leave, which can be as early as a few hours postpartum, though the average for spontaneous vaginal delivery (SVD) is 1–2 days, and the average caesarean section postnatal stay is 3–4 days. During this time the mother is monitored for bleeding, bowel and bladder function, and baby care. The infant's health is also monitored.

3.4.2 Physical

The mother is assessed for tears, and is sutured if necessary. Also, she may suffer from constipation or hemorrhoids, both of which would be managed. The bladder is also assessed for infection, retention and any problems in the muscles.

The major focus of postpartum care is ensuring that the woman is healthy and capable of taking care of her newborn, equipped with all the information she needs about breastfeeding, reproductive health and contraception, and the imminent life adjustment.

Some medical conditions may occur in the postpartum period, such as Sheehan syndrome and peripartum cardiomyopathy.

In some cases, this adjustment is not made easily, and women may suffer from postpartum depression, posttraumatic stress disorder or even puerperal psychosis.

3.4.3 Psychological

Early detection and adequate treatment is required. Postpartum depression may be the response to the hormonal changes and life adjustment the woman goes through immediately after childbirth, but can also be a sign of pre-existent depressive symptoms.

Over 1 in 100 women develop Posttraumatic stress disorder following childbirth, many more suffer from one or more of the symptoms. PTSD may occur after severe complications during delivery, but personality characteristics and previous psychiatric illness has also been associated with the development of posttraumatic stress symptoms.

Postpartum psychosis (also known as puerperal psychosis), is a more severe form of mental illness than postpartum depression, with an incidence of approximately 0.2%.

3.4.4 Cultures

In East Asia

In some East Asian cultures, such as Chinese and Vietnamese, there is a traditional custom of postpartum confinement known in English as doing the month or sitting the month (Mandarin zuò yuèzi). Confinement traditionally lasts 30 days, although regional variants may last 40, 60 or as many as 100 days. This tradition combines prescribed foods with a number of restrictions on activities considered to be harmful. It is widely believed in many East Asian societies that this custom helps heal injuries to the perineum, promote the contraction of the uterus, and promote lactation.

3.5 Duration

The expected date of delivery (EDD) is 40 weeks counting from the last menstrual period (LMP) and birth usually occurs between 37 and 42

weeks, The actual pregnancy duration is typically 38 weeks after conception. Though pregnancy begins at conception, it is more convenient to date from the first day of a woman's last menstrual period, or from the date of conception if known. Starting from one of these dates, the expected date of delivery can be calculated. 40 weeks is nine months and six days, which forms the basis of Naegele's rule for estimating date of delivery. More accurate and sophisticated algorithms take into account other variables, such as whether this is the first or subsequent child (i.e. pregnant woman is a primip or a multip, respectively), ethnicity, parental age, length of menstrual cycle and menstrual regularity.

Pregnancy is considered 'at term' when gestation attains 37 complete weeks but is less than 42 (between 259 and 294 days since LMP). Events before completion of 37 weeks (259 days) are considered pre-term; from week 42 (294 days) events are considered post-term. When a pregnancy exceeds 42 weeks (294 days), the risk of complications for woman and fetus increases significantly. As such, obstetricians usually prefer to induce labour, in an uncomplicated pregnancy, at some stage between 41 and 42 weeks.

Recent medical literature prefers the terminology pre-term and post-term to premature and post-mature. Pre-term and post-term are unambiguously defined as above, whereas premature and postmature have historical meaning and relate more to the infant's size and state of development rather than to the stage of pregnancy.

Fewer than 5% of births occur on the due date; 50% of births are within a week of the due date, and almost 90% within two weeks. It is much more useful, therefore, to consider a range of due dates, rather than one specific day, with some online due date calculators providing this information.

Accurate dating of pregnancy is important, because it is used in calculating the results of various prenatal tests (for example, in the triple test). A decision may be made to induce labour if a fetus is perceived to be overdue. Furthermore, if LMP and ultrasound dating predict different respective due dates, with the latter being later, this might signify slowed fetal growth and therefore require closer review.

The Age of Viability has been advancing relentlessly as medical revolution continues to unfold. Whereas it used to be 28 weeks, this has been brought back to as much as 23 weeks [22 weeks in a few countries]. Unfortunately, there has been a profound increase in morbidity and mortality associated with the increased survival to the extent it has led some to question the ethics and morality of resuscitating at the edge of viability.

4 Childbirth

Childbirth (also called labour, birth, partus or parturition) is the culmination of a human pregnancy or gestation period with birth of one or more newborn infants from a woman's uterus. The process of normal human childbirth is categorized in three stages of labour: the shortening and dilation of the cervix, descent and birth of the infant, and birth of the placenta. In some cases, childbirth is achieved through caesarean section, the removal of the neonate through a surgical incision in the abdomen, rather than through vaginal birth.

4.1 The mechanics of vaginal birth

Because humans are bipedal with an erect stance and have, in relation to the size of the pelvis, the biggest head and shoulders of any species, human fetuses are adapted to make birth possible.

The erect posture causes the weight of the abdominal contents to thrust on the pelvic floor, a complex structure which must not only support this weight but allow three channels to pass through it: the urethra, the vagina and the rectum. The relatively large head and shoulders require a specific sequence of manoeuvres to occur for the bony head and shoulders to pass through the bony ring of the pelvis. If these manoeuvres fail, the progress of labour is arrested. All changes in the soft tissues of the cervix and the birth canal are entirely dependent on the successful completion of these six maneuvers:

1. **Engagement** of the fetal head in the transverse position. The baby is looking across the pelvis at one or other of the mother's hips.
2. **Descent** and **flexion** of the fetal head
3. **Internal rotation**. The fetal head rotates 90 degrees to the occipito-anterior position so that the baby's face is towards the mother's rectum.
4. **Delivery by extension**. The fetal head passes out of the birth canal. Its head is tilted backwards so that its forehead leads the way through the vagina.
5. **Restitution**. The fetal head turns through 45 degrees to restore its normal relationship with the shoulders, which are still at an angle.
6. **External rotation**. The shoulders repeat the corkscrew movements of the head, which can be seen in the final movements of the fetal head.

4.2 The stages of normal human birth

4.2.1 Latent phase

The latent phase of labor may last many days and the contractions are an intensification of the Braxton Hicks contractions that may start around 26 weeks gestation. Cervical effacement occurs during the closing weeks of pregnancy and is usually complete or near complete, by the end of latent phase. Cervical effacement or Cervical dilation is the thinning and stretching of the cervix. The degree of cervical effacement may be felt during a vaginal examination. A 'long' cervix implies that not much has been taken into the lower segment, and vice versa for a 'short' cervix. Latent phase ends with the onset of active first stage; when the cervix is about 3 cm dilated.

4.2.2 First stage: contractions

The first stage of labor starts classically when the effaced (thinned) cervix is 3 cm dilated. There is variation in this point as some women may have active contractions prior to reaching this point, or they may reach this point without regular contractions. The onset of actual labor is defined when the cervix begins to progressively dilate. Rupture of the membranes, or a blood stained 'show' may or may not occur at or around this stage.

Uterine muscles form opposing spirals from the top of the upper segment of the uterus to its junction with the lower segment. During effacement, the cervix becomes incorporated into the lower segment of the uterus. During a contraction, these muscles contract causing shortening of the upper segment and drawing upwards of the lower segment, in a gradual expulsive motion. This draws the cervix up over the baby's head. Full dilatation is reached when the cervix is the size of the baby's head; at around 10 cm dilation for a term baby.

The duration of labour varies widely, but active phase averages some 8 hours for women giving birth to their first child ("primiparae") and 4 hours for women who have already given birth ("multiparae"). Active phase arrest in a primigravid woman is the failure of the cervix to dilate at a rate of 1.2cm/hr over a period of at least two hours. This is based solely upon Friedman's Curve, the gold standard for rates of cervical dilation and fetal descent during active labor, developed almost 50 years ago. The authors conclude that the Friedman curve likely represents an ideal, rather than an average, curve. Although this study has limitations (e.g., assessment of cervical dilation is somewhat subjective), practitioners who base their

diagnoses of protraction and arrest solely on the Friedman curve might need to reconsider their approach to labor assessment. Women who do not progress at this rate should not be considered 'abnormal,' only average. "Failure to Progress," is what can also be known simply as "Failure to wait," on the part of the practitioner, and should by no means be a red flag to perform a Cesarean - major abdominal surgery.

4.2.3 Second stage: birth

This stage begins when the cervix is fully dilated, and ends when the baby is finally birthed. At the beginning of the normal second stage, the head is fully engaged in the pelvis; the widest diameter of the head has successfully passed through the pelvic brim. Ideally it has successfully also passed below the interspinous diameter. This is the narrowest part of the pelvis. If these have been accomplished, all that will remain is for the fetal head to pass below the pubic arch and out through the introitus. This is assisted by the additional maternal efforts of "bearing down". The fetal head is seen to 'crown' as the labia part. At this point the woman may feel a burning or stinging sensation.

Birth of the fetal head signals the successful completion of the fourth mechanism of labour (delivery by extension), and is followed by the fifth and sixth mechanisms (restitution and external rotation).

4.2.4 Third stage: placenta

In this stage, the uterus expels the placenta (afterbirth). The placenta is usually birthed within 15-30 minutes of the baby being born. Maternal blood loss is limited by contraction of the uterus following birth of the placenta. Normal blood loss is less than 600 mL.

Breastfeeding during and after the third stage, the placenta is visible in the bowl to the right.

The third stage can be managed either expectantly or actively. Expectant management (also known as physiological management) allows the placenta to be expelled without medical assistance. Breastfeeding soon after birth and massaging of the top of the uterus (the fundus) causes uterine contractions that encourage birth of the placenta. Active management utilizes oxytocic agents and controlled cord traction. The oxytocic



Figure 3: A newborn baby with umbilical cord ready to be clamped

agents augment uterine muscular contraction and the cord traction assists with rapid birth of the placenta.

A Cochrane database study suggests that blood loss and the risk of post-partum bleeding will be reduced in women offered active management of the third stage of labour. However, the use of ergometrine for active management was associated with nausea or vomiting and hypertension, and controlled cord traction requires the immediate clamping of the umbilical cord.

4.2.5 After the birth

Many cultures feature initiation rites for newborns, such as naming ceremonies, baptism, and others.

Mothers are often allowed a period where they are relieved of their normal duties to recover from childbirth.

The length of this period varies. In other countries, taking time off from work to care for a newborn is called “maternity leave” or “parental leave” and can vary from a few days to several months.

4.2.6 Pain

Pain levels reported by labouring women vary widely. Pain levels seem to be influenced by fear and anxiety levels, experience with prior childbirth, cultural ideas of childbirth and pain, mobility during labour and the support given during labour. One study found that middle-eastern women, especially those with a low educational background, had more painful experiences during childbirth.

Pain is only one factor of many influencing women’s experience with the process of childbirth. A systematic review of 137 studies found that personal expectations, the amount of support from caregivers, quality of the caregiver-patient relationship, and involvement in decisionmaking are more important in women’s overall satisfaction with the experience of childbirth than are other factors such as age, socioeconomic status, ethnicity, preparation, physical environment, pain, immobility, or medical interventions.

4.2.7 Descriptions

Pain in contractions has been described as feeling like a very strong menstrual cramp. Midwives often encourage refraining from screaming but recommend moaning and grunting to relieve some pain. Crowning will

feel like intense stretching and burning. Even women who show little reaction to labor pains often show a reaction to crowning.

4.2.8 Non-medical pain control

Some women prefer to avoid analgesic medication during childbirth. They still can try to alleviate labor pain using psychological preparation, education, massage, hypnosis, or water therapy in a tub or shower. Some women like to have someone to support them during labor and birth, such as the father of the baby, the woman's mother, a sister, a close friend, a partner or a doula. Some women deliver in a squatting or crawling position in order to more effectively push during the second stage and so that gravity can aid the descent of the baby through the birth canal.

The human body also has a chemical response to pain, by releasing endorphins. Endorphins are present before, during, and immediately after childbirth. Some homebirth advocates believe that this hormone can induce feelings of pleasure and euphoria during childbirth, reducing the risk of maternal depression some weeks later.

Water birth is an option chosen by some women for pain relief during labor and childbirth, and some studies have shown waterbirth in an uncomplicated pregnancy to reduce the need for analgesia, without evidence of increased risk to mother or newborn. Hot water tubs are available in many hospitals and birthing centres.

Meditation and mind medicine techniques are also used for pain control during labour and delivery. These techniques are used in conjunction with progressive muscle relaxation and many other forms of relaxation for the mind and body to aid in pain control for women during childbirth. One such technique is the use of hypnosis in childbirth.

A new mode of analgesia is sterile water injection placed just underneath the skin in the most painful spots during labor. A control trial in Iran of 0.5mL injections was conducted with normal saline which revealed a statistical superiority with water over saline.

4.2.9 Medical pain control

Different measures for pain control have varying degrees of success and side effects to the woman and her baby. In some countries of Europe, doctors commonly prescribe inhaled nitrous oxide gas for pain control, especially as 50% nitrous oxide, 50% oxygen, known as Entonox; in the UK, midwives may use this gas without a doctor's prescription. Pethidine (with

or without promethazine) may be used early in labour, as well as other opioids, but if given too close to birth there is a risk of respiratory depression in the infant.

Popular medical pain control in hospitals include the regional anaesthetics epidural blocks, and spinal anaesthesia. Epidural analgesia is a generally safe and effective method of relieving pain in labour, but is associated with longer labour, more operative intervention (particularly instrument delivery), and increases in cost. One study found that the women receiving epidural analgesia had more fear before the administering of the epidural than those who did not receive it, but that they did not necessarily have more pain. Medicine administered via epidural can cross the placenta and enter the bloodstream of the fetus. Epidural analgesia has no statistically significant impact on the risk of caesarean section, and does not appear to have an immediate effect on neonatal status as determined by Apgar scores.

5 Diagnosis

The beginning of pregnancy may be detected in a number of different ways, either by a pregnant woman without medical testing, or by using medical tests with or without the assistance of a medical professional.

Most pregnant women experience a number of symptoms, which can signify pregnancy. The symptoms can include nausea and vomiting, excessive tiredness and fatigue, craving for certain foods not normally considered a favorite and frequent urination particularly during night.

A number of early medical signs are associated with pregnancy. These signs typically appear, if at all, within the first few weeks after conception. Although not all of these signs are universally present, nor are all of them diagnostic by themselves, taken together they make a presumptive diagnosis of pregnancy. These signs include the presence of human chorionic gonadotropin (hCG) in the blood and urine, missed menstrual period, implantation bleeding that occurs at implantation of the embryo in the uterus during the third or fourth week after last menstrual period, increased basal body temperature sustained for over two weeks after ovulation, Chadwick's sign (darkening of the cervix, vagina, and vulva), Goodell's sign (softening of the vaginal portion of the cervix), Hegar's sign (softening of the uterus isthmus), and pigmentation of linea alba - Linea nigra, (darkening of the skin in a midline of the abdomen, caused by hyperpigmentation resulting from hormonal changes, usually appearing around the middle of pregnancy).

Pregnancy detection can be accomplished using one or more of vari-

ous pregnancy tests which detect hormones generated by the newly-formed placenta. Clinical blood and urine tests can detect pregnancy soon after implantation, which is as early as 6-8 days after fertilization. Blood pregnancy tests are more accurate than urine tests. Home pregnancy tests are personal urine tests, which normally cannot detect a pregnancy until at least 12-15 days after fertilization. Both clinical and home tests can only detect the state of pregnancy, and cannot detect the age of the embryo.

In the post-implantation phase, the blastocyst secretes a hormone named human chorionic gonadotropin which in turn, stimulates the corpus luteum in the woman's ovary to continue producing progesterone. This acts to maintain the lining of the uterus so that the embryo will continue to be nourished. The glands in the lining of the uterus will swell in response to the blastocyst, and capillaries will be stimulated to grow in that region. This allows the blastocyst to receive vital nutrients from the woman.

Despite all the signs, some women may not realize they are pregnant until they are quite far along in their pregnancy, in some cases not even until they begin labour. This can be caused by many factors, including irregular periods (quite common in teenagers), certain medications (not related to conceiving children), and obese women who disregard their weight gain. Others may be in denial of their situation.

An early sonograph can determine the age of the pregnancy fairly accurately. In practice, doctors typically express the age of a pregnancy (i.e. an "age" for an embryo) in terms of "menstrual date" based on the first day of a woman's last menstrual period, as the woman reports it. Unless a woman's recent sexual activity has been limited, or she has been charting her cycles, or the conception is as the result of some types of fertility treatment (such as IUI or IVF) the exact date of fertilization is unknown. Absent symptoms such as morning sickness, often the only visible sign of a pregnancy is an interruption of her normal monthly menstruation cycle, (i.e. a "late period"). Hence, the "menstrual date" is simply a common educated estimate for the age of a fetus, which is an average of two weeks later than the first day of the woman's last menstrual period. The term "conception date" may sometimes be used when that date is more certain, though even medical professionals can be imprecise with their use of the two distinct terms. The due date can be calculated by using Naegele's rule. The expected date of delivery may also be calculated from sonogram measurement of the fetus. This method is slightly more accurate than methods based on LMP. The beginning of labour, which is variously called confinement or childbed, begins on the day predicted by LMP 3.6% of the time and on the day predicted by sonography 4.3% of the time.

Diagnostic criteria are: Women who have menstrual cycles and are sex-

ually active, a period delayed by a few days or weeks is suggestive of pregnancy; elevated B-hcG to around 100,000 mIU/mL by 10 weeks of gestation.

6 Physiology

Pregnancy is typically broken into three periods, or trimesters, each of about three months. While there are no hard and fast rules, these distinctions are useful in describing the changes that take place over time.

6.1 First trimester



Figure 4: Comparison of growth of the abdomen between 26 weeks and 40 weeks gestation

Traditionally, doctors have measured pregnancy from a number of convenient points, including the day of last menstruation, ovulation, fertilization, implantation and chemical detection. In medicine, pregnancy is often defined as beginning when the developing embryo becomes implanted into the endometrial lining of a woman's uterus. In some cases where complications may have arisen, the fertilized egg might implant itself in the fallopian tubes or the cervix, causing an ectopic pregnancy. Most pregnant women do not have any specific signs or symptoms of implantation, although it is not uncommon to experience minimal bleeding at implantation. Some women will also experience cramping during their first trimester. This is usually of no concern unless there is spotting or bleeding as well. After implantation the uterine endometrium is called the decidua. The placenta which is formed partly from the decidua and partly from outer layers of the embryo is responsible for transport of nutrients and oxygen to, and removal of waste products from the fetus. The umbilical cord is the connecting cord from the embryo or fetus to the placenta. The developing embryo undergoes tremendous growth and changes during the process of foetal development.

Morning sickness can occur in about seventy percent of all pregnant women and typically improves after the first trimester.

In the first 12 weeks of pregnancy the nipples and areolas darken due to a temporary increase in hormones.

Most miscarriages occur during this period.

6.2 Second trimester

Months 4 through 6 of the pregnancy are called the second trimester. Most women feel more energized in this period, and begin to put on weight as the symptoms of morning sickness subside and eventually fade away.

In the 20th week the uterus, the muscular organ that holds the developing fetus, can expand up to 20 times its normal size during pregnancy. Although the fetus begins moving and takes a recognizable human shape during the first trimester, it is not until the second trimester that movement of the fetus, often referred to as “quickening”, can be felt. This typically happens in the fourth month, more specifically in the 20 to 21 week, or by the 19th week if the woman has been pregnant before. However, it



is not uncommon for some women to not feel the fetus move until much later. The placenta is now fully functioning and the fetus is making insulin and urinating. The reproductive organs distinguish the fetus as male or female.

Figure 5: A pregnant woman at 26 weeks

6.3 Third trimester

Final weight gain takes place, which is the most weight gain throughout the pregnancy. The fetus will be growing the most rapidly during this stage, gaining up to 28g per day. The woman’s belly will transform in shape as the belly drops due to the fetus turning in a downward position ready for birth. During the second trimester, the woman’s belly would have been very upright, whereas in the third trimester it will drop down quite low, and the woman will be able to lift her belly up and down. The fetus begins to move regularly, and is felt by the woman. Fetal movement can become quite strong and be disruptive to the woman. The woman’s navel will sometimes become convex, “popping” out, due to her expanding abdomen. This period of her pregnancy can be uncomfortable, causing symptoms like weak bladder control and back-ache. Movement of the fetus becomes stronger and more frequent and via improved brain, eye, and muscle function the fetus is prepared for ex utero viability. The woman can feel the fetus “rolling” and it may cause pain or discomfort when it is near the woman’s ribs and spine.

It is during this time that a baby born prematurely may survive. The use of modern medical intensive care technology has greatly increased the

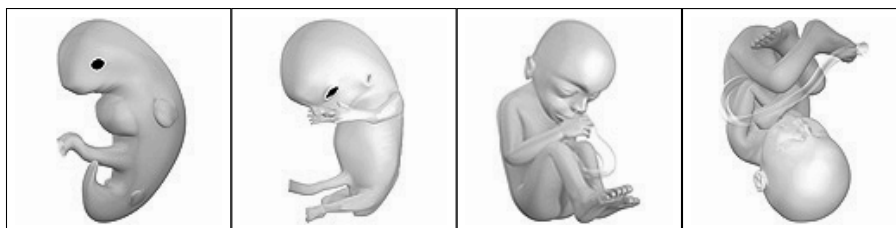
probability of premature babies surviving, and has pushed back the boundary of viability to much earlier dates than would be possible without assistance. In spite of these developments, premature birth remains a major threat to the fetus, and may result in ill-health in later life, even if the baby survives.

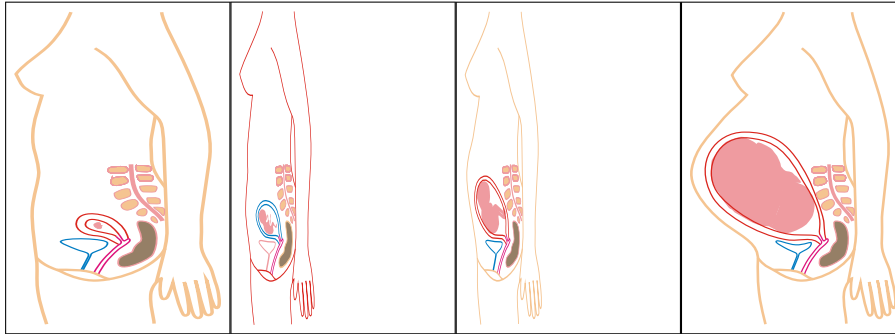
6.4 Prenatal development and sonograph images

Prenatal development is divided into two primary biological stages. The first is the embryonic stage, which lasts for about two months. At this point, the fetal stage begins. At the beginning of the fetal stage, the risk of miscarriage decreases sharply, all major structures including hands, feet, head, brain, and other organs are present, and they continue to grow and develop. When the fetal stage commences, a fetus is typically about 30 mm (1.2 inches) in length, and the heart can be seen beating via sonograph; the fetus bends the head, and also makes general movements and startles that involve the whole body. Some fingerprint formation occurs from the beginning of the fetal stage.

Electrical brain activity is first detected between the 5th and 6th week of gestation, though this is still considered primitive neural activity rather than the beginning of conscious thought, something that develops much later in fetation. Synapses begin forming at 17 weeks, and at about week 28 begin multiply at a rapid pace which continues until 3-4 months after birth. It isn't until week 23 that the fetus can survive, albeit with major medical support, outside of the womb. It is not until then that the fetus possesses a sustainable human brain.

One way to observe prenatal development is via ultrasound images. Modern 3D ultrasound images provide greater detail for prenatal diagnosis than the older 2D ultrasound technology. Whilst 3D is popular with parents desiring a prenatal photograph as a keepsake, both 2D and 3D are discouraged by the FDA for non-medical use, but there are no definitive studies linking ultrasound to any adverse medical effects. The following 3D ultrasound images were taken at different stages of pregnancy:





7 Physiological changes in pregnancy

The body must change its physiological and homeostatic mechanisms in pregnancy to ensure the fetus is provided for. Increases in blood sugar, breathing and cardiac output are all required.

7.1 Hormonal changes

Levels of progesterone and oestrogens rise continually throughout pregnancy, suppressing the hypothalamic axis and subsequently the menstrual cycle. The woman and the placenta also produce many hormones.

Prolactin levels increase due to maternal Pituitary gland enlargement by 50%. This mediates a change in the structure of the Mammary gland from ductal to lobular-alveolar. Parathyroid hormone is increased due to increases of calcium uptake in the gut and reabsorption by the kidney. Adrenal hormones such as cortisol and aldosterone also increase.

Placental lactogen is produced by the placenta and stimulates lipolysis and fatty acid metabolism by the woman, conserving blood glucose for use by the fetus. It also decreases maternal tissue sensitivity to insulin, resulting in gestational diabetes.

7.2 Musculoskeletal changes

The body's posture changes as the pregnancy progresses. The pelvis tilts and the back arches to help keep balance. Poor posture occurs naturally from the stretching of the woman's abdominal muscles as the fetus grows. These muscles are less able to contract and keep the lower back in proper alignment. The pregnant woman has a different pattern of gait. The step lengthens as the pregnancy progresses, due to weight gain and changes

in posture. On average, a woman's foot can grow by a half size or more during pregnancy. In addition, the increased body weight of pregnancy, fluid retention, and weight gain lowers the arches of the foot, further adding to the foot's length and width. The influences of increased hormones such as estrogen and relaxin initiate the remodeling of soft tissues, cartilage and ligaments. Certain skeletal joints such as the symphysis pubis and sacroiliac widen or have increased laxity.

7.3 Physical changes

One of the most noticeable alterations in pregnancy is the gain in weight. The enlarging uterus, the growing fetus, the placenta and liquor amnii, the acquisition of fat and water retention, all contribute to this increase in weight. The weight gain varies from person to person and can be anywhere from 5 pounds (2.3 kg) to over 100 pounds (45 kg). In America, the doctor-recommended weight gain range is 25 pounds (11 kg) to 35 pounds (16 kg), less if the woman is overweight, more (up to 40 pounds (18 kg)) if the woman is underweight.

Other physical changes during pregnancy include breasts increasing two cup sizes. Also areas of the body such as the forehead and cheeks (known as the 'mask of pregnancy') become darker due to the increase of melanin being produced.

The female body experiences many changes as the fetus grows through each trimester as shown and discussed in this pregnancy video. Two women at different stages in their pregnancy illustrate what has happened to their bodies.

7.4 Cardiovascular changes

Blood volume increases by 40% in the first two trimesters. This is due to an increase in plasma volume through increased aldosterone. Progesterone may also interact with the aldosterone receptor, thus leading to increased levels. Red blood cell numbers increase due to increased erythropoietin levels.

Cardiac function is also modified, with increase heart rate and increased stroke volume. A decrease in vagal tone and increase in sympathetic tone is the cause. Blood volume increases act to increase stroke volume of the heart via Starling's law. After pregnancy the change in stroke volume is not reversed. Cardiac output rises from 4 to 7 litres in the 2nd trimester

Blood pressure also fluctuates. In the first trimester it falls. Initially this

is due to decreased sensitivity to angiotensin and vasodilation provoked by increased blood volume. Later, however, it is caused by decreased resistance to the growing uteroplacental bed.

7.5 Respiratory changes

Decreased functional residual capacity is seen, typically falling from 1.7 to 1.35 litres, due to the compression of the diaphragm by the uterus. Tidal volume increases, from 0.45 to 0.65 litres, giving an increase in pulmonary ventilation. This is necessary to meet the increased oxygen requirement of the body, which reaches 50ml/min - 20ml of which goes to reproductive tissues.

Progesterone may act centrally on chemoreceptors to reset the set point to a lower partial pressure of carbon dioxide. This maintains an increased respiration rate even at a decreased level of carbon dioxide.

7.6 Metabolic changes

An increased requirement for nutrients is given by fetal growth and fat deposition. Changes are caused by steroid hormones, lactogen and cortisol.

Maternal insulin resistance can lead to gestational diabetes. Increase liver metabolism is also seen, with increased gluconeogenesis to increase maternal glucose levels.

7.7 Renal changes

Renal plasma flow increases, as does aldosterone and erythropoietin production as discussed. The tubular maximum for glucose is reduced, which may precipitate gestational diabetes.

8 Management

Prenatal medical care is of recognized value throughout the developed world. Periconceptional Folic acid supplementation is the only type of supplementation of proven efficacy.

8.1 Nutrition

A balanced, nutritious diet is an important aspect of a healthy pregnancy. Eating a healthy diet, balancing carbohydrates, fat, and proteins,

and eating a variety of fruits and vegetables, usually ensures good nutrition. Those whose diets are affected by health issues, religious requirements, or ethical beliefs may choose to consult a health professional for specific advice.

Adequate periconceptional folic acid (also called folate or Vitamin B9) intake has been proven to limit fetal neural tube defects, preventing spina bifida, a very serious birth defect. The neural tube develops during the first 28 days of pregnancy, explaining the necessity to guarantee adequate periconceptional folate intake. Folates (from folia, leaf) are abundant in spinach (fresh, frozen, or canned), and are also found in green vegetables, salads, citrus fruit and melon, chickpeas (i.e. in the form of hummus or falafel), and eggs. In the United States and Canada, most wheat products (flour, noodles) are fortified with folic acid.

DHA omega-3 is a major structural fatty acid in the brain and retina, and is naturally found in breast milk. It is important for a mother to consume adequate amounts of DHA during pregnancy and while nursing to support her well-being and the health of her infant. Developing infants cannot produce DHA efficiently, and must receive this vital nutrient from the mother through the placenta during pregnancy and in breast milk after birth.

Several micronutrients are important for the health of the developing fetus, especially in areas of the world where insufficient nutrition is prevalent. In developed areas, such as Western Europe and the United States, certain nutrients such as Vitamin D and calcium, required for bone development, may require supplementation.

Dangerous bacteria or parasites may contaminate foods, particularly listeria and toxoplasma, toxoplasmosis agent. Careful washing of fruits and raw vegetables may remove these pathogens, as may thoroughly cooking leftovers, meat, or processed meat. Soft cheeses may contain listeria; if milk is raw the risk may increase. Cat feces pose a particular risk of toxoplasmosis. Pregnant women are also more prone to catching salmonella infections from eggs and poultry, which should be thoroughly cooked. Practicing good hygiene in the kitchen can reduce these risks.

8.2 Weight gain

Caloric intake must be increased, to ensure proper development of the fetus. The amount of weight gained during pregnancy varies among women. The National Health Service recommends that overall weight gain during the 9 month period for women who start pregnancy with normal weight be

10 to 12 kilograms (22–26 lb). During pregnancy, insufficient weight gain can compromise the health of the fetus. Women with fears of weight gain or with eating disorders may choose to work with a health professional, to ensure that pregnancy does not trigger disordered eating. Likewise, excessive weight gain can pose risks to the woman and the fetus. Women who are prone to being overweight may choose to plan a healthy diet and exercise to help moderate the amount of weight gained.

8.3 Immunological tolerance

Research on the immunological basis for pre-eclampsia has indicated that continued exposure to a partner's semen has a strong protective effect against pre-eclampsia, largely due to the absorption of several immune modulating factors present in seminal fluid. Studies also showed that long periods of sexual cohabitation with the same partner fathering a woman's child significantly decreased her chances of suffering pre-eclampsia. Several other studies have since investigated the strongly decreased incidence of pre-eclampsia in women who had received blood transfusions from their partner, those with long, preceding histories of sex without barrier contraceptives, and in women who had been regularly performing oral sex, with one study concluding that "induction of allogeneic tolerance to the paternal HLA molecules of the fetus may be crucial. Data collected strongly suggests that exposure, and especially oral exposure to soluble HLA from semen can lead to transplantation tolerance."

Other studies have investigated the roles of semen in the female reproductive tracts of mice, showing that "insemination elicits inflammatory changes in female reproductive tissues," concluding that the changes "likely lead to immunological priming to paternal antigens or influence pregnancy outcomes." A similar series of studies confirmed the importance of immune modulation in female mice through the absorption of specific immune factors in semen, including TGF-Beta, lack of which is also being investigated as a cause of miscarriage in women and infertility in men.

According to the theory, pre-eclampsia is frequently caused by a failure of the woman's immune system to accept the fetus and placenta, which both contain "foreign" proteins from paternal genes. Regular exposure to the father's semen causes her immune system to develop tolerance to the paternal antigens, a process which is significantly supported by as many as 93 currently identified immune regulating factors in seminal fluid. Having already noted the importance of a woman's immunological tolerance to the fetus's paternal genes, several Dutch reproductive biologists decided

to take their research a step further. Consistent with the fact that human immune systems tolerate things better when they enter the body via the mouth, the Dutch researchers conducted a series of studies that confirmed a surprisingly strong correlation between a diminished incidence of pre-eclampsia and a woman's practice of oral sex, and noted that the protective effects were strongest if she swallowed her partner's semen. The researchers concluded that while any exposure to a partner's semen during sexual activity appears to decrease a woman's chances for the various immunological disorders that can occur during pregnancy, immunological tolerance could be most quickly established through oral introduction and gastrointestinal absorption of semen. Recognizing that some of the studies potentially included the presence of confounding factors, such as the possibility that women who regularly perform oral sex and swallow semen might also engage in more frequent vaginal intercourse, the researchers also noted that, either way, the data still overwhelmingly supports the main theory behind all their studies—that repeated exposure to semen establishes the maternal immunological tolerance necessary for a safe and successful pregnancy.

8.4 Drugs in pregnancy

Drugs used during pregnancy can have temporary or permanent effects on the fetus. Therefore many physicians would prefer not to prescribe for pregnant women, the major concern being over teratogenicity of the drugs. This results in inappropriate treatment of pregnant women. Use of drugs in pregnancy is not always wrong. For example, high fever is harmful for the fetus in the early months. Use of paracetamol is better than no treatment at all. Also, diabetes mellitus during pregnancy may need intensive therapy with insulin. Drugs have been classified into categories A,B,C,D and X based on the Food and Drug Administration(FDA) rating system to provide therapeutic guidance based on potential benefits and fetal risks. Drugs like multivitamins that have demonstrated no fetal risks after controlled studies in humans are classified as Category A. On the other hand drugs like thalidomide with proven fetal risks that outweigh all benefits are classified as Category X.

8.5 Sexuality during pregnancy

Most pregnant women can enjoy sexual intercourse throughout gravidity. Most research suggests that, during pregnancy, both sexual desire and

frequency of sexual relations decrease. In context of this overall decrease in desire, some studies indicate a second-trimester increase, preceding a decrease. However, these decreases are not universal: a significant number of women report greater sexual satisfaction throughout their pregnancies.

Sex during pregnancy is a low-risk behaviour except when the physician advises that sexual intercourse be avoided, because it may, in some pregnancies, lead to serious pregnancy complications or health issues such as a high-risk for premature labour or a ruptured uterus. Such a decision may be based upon a history of difficulties in a previous childbirth.

Some psychological research studies in the 1980s and '90s contend that it is useful for pregnant women to continue to have sexual activity, specifically noting that overall sexual satisfaction was correlated with feeling happy about being pregnant, feeling more attractive in late pregnancy than before pregnancy and experiencing orgasm. Sexual activity has also been suggested as a way to prepare for induced labour; some believe the natural prostaglandin content of seminal liquid can favour the maturation process of the cervix making it more flexible, allowing for easier and faster dilation and effacement of the cervix. However, the efficacy of using sexual intercourse as an induction agent "remains uncertain".

During pregnancy, the fetus is protected from penetrative thrusting by the amniotic fluid in the womb and by the woman's cervix.

After giving birth sexual intercourse can begin when the couple are both ready. However most couples wait until after six weeks and they should consult their GP if they have any concerns.

8.6 Abortion

An abortion is the removal or expulsion of an embryo or fetus from the uterus, resulting in or caused by its death. This can occur spontaneously or accidentally as with a miscarriage, or be artificially induced by medical, surgical or other means.