

Embryonic Advancement: An Overview from a Surgical Perspective

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Abstract

The fertile ground of a mother's body serves as the nurturing environment where the seed of life can thrive, ensuring that it receives the necessary nutrients to burgeon into a robust and resilient offspring. A well-nourished mother possesses the capacity to furnish her developing fetus with all essential requirements, simultaneously building up reserves to support ample breastfeeding postpartum. This dual focus on maternal nutrition not only aims for optimal fetal development but also strives for the creation of a strong foundation, devoid of anomalies, facilitating an uncomplicated full-term delivery while prioritizing the safeguarding of the mother's well-being. Ensuring the mother's diet is rich in vital nutrients is akin to tending to the soil before planting seeds, laying the groundwork for healthy growth and flourishing potential. Just as a gardener carefully tends to the soil's composition to support the growth of vibrant plants, a mother's nutritional intake profoundly impacts the trajectory of her baby's development. By providing an abundance of essential vitamins, minerals, and macronutrients, the mother cultivates an environment conducive to optimal fetal growth and development, fostering the emergence of a strong, resilient individual. Moreover, this focus on maternal nutrition extends beyond the gestational period, as the reserves accumulated during pregnancy serve as a vital resource for breastfeeding, promoting the ongoing health and well-being of both mother and child. Thus, the pursuit of excellence in fetal development through proper maternal nutrition encompasses not only the immediate outcomes of a healthy pregnancy but also lays the groundwork for long-term well-being and resilience.

Keywords: Foetus, anomalies, delivery, nourishment and nutrition

INTRODUCTION

The female is the creator of new life in next generation. God created the female in such a way so that she not only carry the new life in her womb but also nurish with her blood till it comes in the outer world

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Prenatal development encompasses the growth and maturation of both the embryo and fetus throughout the gestation period of viviparous animals. This developmental process commences with fertilization, marking the onset of the germinal stage in embryonic development, and progresses through fetal development until delivery. In the context of human pregnancy, prenatal development is alternatively referred to as antenatal development. The progression of the human embryo begins post-fertilization and extends into fetal development stages until birth. Analysis of this concept from modern perspective is essential, rendering easy penetration of the subject and make more acceptable to the scientific world.

CONCEPTUAL STUDY

Foetal Development: Stages of Growth

Pregnancy is initiated with the onset of your last menstrual period, marking what is termed as the 'menstrual age,' which typically precedes conception by approximately two weeks. Let's delve into the progression of fetal development month by month [1].

Understanding conception is pivotal. Each month, a batch of eggs known as oocytes is recruited from the ovary for potential release. These eggs mature within fluid-filled sacs called follicles, with typically one follicle becoming dominant and halting the growth of others. Upon maturation, the dominant follicle releases the egg during ovulation, occurring about two weeks before the next expected menstrual period. After ovulation, the ruptured follicle transforms into the corpus luteum, which secretes progesterone and estrogen, aiding in the preparation of the uterine lining (endometrium) for potential embryo implantation [2].

On average, fertilization happens roughly two weeks after the last menstrual period. At fertilization, the genetic composition of the embryo, including its sex, is established. If a Y sperm fertilizes the egg, the baby will be a boy; if an X sperm fertilizes the egg, the baby will be a girl. Human chorionic gonadotropin (hCG) is a hormone detectable in the blood from the time of conception, produced by placental cells and detected in pregnancy tests typically three to four weeks after the first day of the last menstrual period [3].

Within 24 hours of fertilization, the egg begins rapid cell division and travels through the fallopian tube as a blastocyst for approximately three days before reaching the uterus for implantation into the endometrium. Before implantation, the blastocyst sheds its protective covering. Upon contact with the endometrium, hormonal interactions facilitate attachment. Some women may notice slight spotting during implantation. As the blastocyst implants, the endometrium thickens, and the cervix is sealed with mucus [4].

By three weeks post-conception, the blastocyst evolves into an embryo, with the formation of the baby's initial nerve cells [5]. The term "embryo" encompasses the developmental stage from conception to the eighth week of pregnancy. After the eighth week and until the moment of birth, your developing baby is called a foetus [6]. These Events of Fertilization are tabulated in Table 1, given as.

The development stages of pregnancy are called trimesters or three-month periods, because of the distinct changes that occur in each stage.

Table 1. Events of fertilization.

Important events following fertilization	
'0' Hour	Fertilization
30 hours	2 cell stage (Blastomeres)
40–50 hours	4 cell stage
72 hours	12 cell stage
96 hours	16 cell stage. Morula enters the uterine cavity
5 th to 6 th day	Blastocyst
9 th day	Interstitial implantation occurs
9 th day	Lacunar period. Endometrial vessels-tapped
10–11 ^m day	Implantation completed
13 ^m day	Primary Villi
16 ^m day	Secondary Villi
21 st day	Tertiary Villi
21 st –22 nd day	Fetal heart- feto-placental circulation

STAGES OF GROWTH: MONTH BY MONTH

First Month

As the fertilized egg grows, a water-tight sac forms around it, gradually filling with fluid. This is called the amniotic sac, and it helps cushion the growing embryo. The placenta also develops. The placenta is a round, flat organ that transfers nutrients from the mother to the baby, and transfers wastes from the baby.

A primitive face will take form with large dark circles for eyes. The mouth, lower jaw and throat are developing. Blood cells are taking shape, and circulation will begin. The tiny "heart" tube will beat 65 times a minute by the end of the fourth week. By the end of the first month, your baby is about $\frac{1}{4}$ -inch-long — smaller than a grain of rice.

Second Month

In this month baby's facial features continue to develop. Each ear begins as a little fold of skin at the side of the head. Tiny buds that eventually grow into arms and legs are forming. Fingers, toes and eyes are also forming.

The neural tube (brain, spinal cord and other neural tissue of the central nervous system) is well formed. The digestive tract and sensory organs begin to develop. Bone starts to replace cartilage.

The head is large in proportion to the rest of the baby's body. By the end of the second month, your baby is about 1-inch-long and weighs about $\frac{1}{30}$ of an ounce. At about 6 weeks, your baby's heart beat can usually be detected. After the 8th week, your baby is called a foetus instead of an embryo.

Third Month

In this month baby arms, hands, fingers, feet, and toes are fully formed. Baby can open and close its fists and mouth. Fingernails and toenails are beginning to develop and the external ears are formed. The beginnings of teeth are forming. Baby's reproductive organs also develop, but the baby's gender is difficult to distinguish on ultrasound.

By the end of the third month, baby is fully formed. All the organs and extremities are present and will continue to mature in order to become functional. The circulatory and urinary systems are working and the liver produces bile.

At the end of the third month, baby is about 4 inches long and weighs about 1 ounce. Since baby's most critical development has taken place, hence more chance of miscarriage drops considerably after three months.

Fourth Month

In this month we can hear the heartbeat of baby with Doppler. The fingers and toes are well-defined. Eyelids, eyebrows, eyelashes, nails, and hair are formed. Teeth and bones become denser.

The nervous system is starting to function. The reproductive organs and genitalia are now fully developed, and heart-beat of the foetus can be audible with the Doppler. By the end of the fourth month, baby is about 6 inches long and weighs about 4 ounces.

Fifth Month

In this month pregnant lady begin to feel baby move, since he or she is developing muscles and exercising them. This first movement is called quickening.

Hair begins to grow on baby's head. Baby's shoulders, back, and temples are covered by a soft fine hair called lanugo. This hair protects baby and is usually shed at the end of the baby's first week of life.

The baby's skin is covered with a whitish coating called vernix caseosa. This "cheesy" substance is thought to protect baby's skin from the long exposure to the amniotic fluid. This coating is shed just before birth. By the end of the fifth month, your baby is about 10 inches long and weighs from 1/2 to 1 pound [7].

Sixth Month

In this month baby's skin is reddish in colour, wrinkled, and veins are visible through the baby's translucent skin. Baby's finger and toe prints are visible. The eyelids begin to part and the eyes open.

Baby responds to sounds by moving or increasing the pulse. Pregnant lady may notice jerking motions if baby hiccups. If born prematurely, baby may survive after the 23rd week with intensive care. By the end of the sixth month, your baby is about 12 inches long and weighs about 2 pounds.

Seventh Month

Baby will continue to mature and develop reserves of body fat. Baby's hearing is fully developed. He or she changes position frequently and responds to stimuli, including sound, pain, and light. The amniotic fluid begins to diminish.

At the end of the seventh month, baby is about 14 inches long and weighs from 2 to 4 pounds. If born prematurely, baby would be likely to survive after the seventh month.

Eighth Month

By this month baby will continue to mature and develop reserves of body fat. You may notice that your baby is kicking more. Baby's brain is developing rapidly at this time, and your baby can see and hear. Most internal systems are well developed, but the lungs may still be immature. Your baby is about 18 inches long and weighs as much as 5 pounds [8].

Ninth Month

Your baby continues to grow and mature: the lungs are nearly fully developed. Your baby's reflexes are coordinated so he or she can blink, close the eyes, turn the head, grasp firmly, and respond to sounds, light, and touch. Baby is definitely ready to enter the world!.

You may notice that your baby moves less due to tight space. Your baby's position changes to prepare itself for labour and delivery. The baby drops down in your pelvis. Usually, the baby's head is down toward the birth canal. Your baby is about 18 to 20 inches long and weighs about 7 pounds.

These events of Embryonic and Foetal development are tabulated in Table 2, given as

Table 2. Events of Embryonic and Foetal development.

Principal events of embryonic and foetal development	
Post conception day 14–21	Ectoderm thickens to form neural plate and Neural folds
Post conception 21–28 days	Heart becomes predominant and neural folds fused to form Neural tube.
Post conception weeks 4–6	Formation of face, limbs buds appear and optic (4–15 mm embryo) vessels appear.
Post conception weeks 6–8	All major structure form, recognizably human (15–30 mm embryo)
Post conception weeks 8–12	External genitalia develops (30–60 mm embryo)
Weeks-20	Skin is covered with lanugo Vernix caseosa is present
Weeks-28	Testes descend to the internal inguinal ring. Baby is viable
Weeks-36	One testicle descends in to scrotum Lanugo tends to disappear.
Weeks-40	Both the testicles descends in to the scrotum Nails project beyond the finger tips Posterior fontanelle is closed

DISCUSSION

Various factors, including genetics, nutrition, environmental conditions, uteroplacental health, and fetal characteristics, play crucial roles in shaping the growth and development of the fetus [9]. The initial twelve weeks of gestation represent a critical phase wherein the foundation of the fetus's major organs and bodily systems is laid. Any detrimental influence during this delicate period, such as exposure to drugs, infectious agents, radiation, specific medications, tobacco, or harmful substances, can significantly impair the proper formation of these vital structures, leading to potential complications. It is imperative to prioritize and ensure the unhindered physiological and anatomical progression of the fetus during pregnancy. This not only fosters the well-being of the developing baby but also safeguards the maternal health, reducing the likelihood of postnatal complications for both mother and child. Therefore, comprehensive attention to promoting optimal fetal growth and development is indispensable for maintaining the overall health and mitigating potential risks throughout the prenatal period [10].

CONCLUSION

Understanding the appropriate growth and development of the fetus is crucial for ensuring the well-being of both the mother and the baby, thereby mitigating the risk of postnatal complications. Knowledge regarding the progressive stages of fetal development empowers expectant mothers to make informed decisions and take necessary precautions throughout their pregnancy journey. Comprehending the intricate process of fetal growth allows healthcare providers to monitor the pregnancy closely, identifying any deviations from the norm early on and intervening promptly if required.

Taking this proactive approach can greatly decrease the chances of complications occurring during delivery and the period following childbirth. Moreover, being well-informed about fetal development enables mothers to adopt healthier lifestyle choices and adhere to prenatal care guidelines, such as proper nutrition, regular exercise, and adequate rest.

Implementing these methods not only supports optimal fetal development but also enhances the mother's general health and wellness, leading to a more seamless pregnancy journey. Additionally, understanding fetal development fosters a deeper connection between the mother and her unborn child, fostering a sense of responsibility and nurturing even before birth. This emotional bond can positively impact the mother's mental health and reduce stress levels, which in turn may further enhance pregnancy outcomes.

Furthermore, knowledge about fetal growth equips expectant parents with the tools to recognize any warning signs or symptoms that may indicate potential complications, prompting them to seek timely medical assistance when needed. Early detection and intervention can significantly improve prognosis and minimize the risk of adverse outcomes for both mother and baby. In conclusion, a comprehensive understanding of fetal growth and development is indispensable for safeguarding the health and well-being of expectant mothers and their babies. By staying informed and proactive throughout the pregnancy journey, individuals can mitigate the risk of postnatal complications and promote positive outcomes for both themselves and their newborns.

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