

The Growth of the Human Foetus as Seen in a Tertiary Care Government Hospital in Kolkata (Volume 2, Issue 1, January-March 2018)

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In Kolkata, a total of 1396 fetuses were studied during the period 1964–2007 in SSKM Hospital under the overall guidance of Professor KL Mukherjee. Besides studying the anthropometry, attempts were made to study the histological structure and some of the characteristic biochemical functions of individual organs of the fetuses. The following organs were specially studied: Liver, lungs, brain, intestine, kidneys, gonads, thymus, adrenal cortex and skeletal muscle. Since our limitations for the hysterotomy extended up to 20 weeks only, most of our studies were limited to that period of intra-uterine life. The gestation periods were calculated from the last menstrual period. Only a few fetuses of older periods were available for studies; all of them were stillborns.

In the present study, all the mothers were all normally nourished women and did not have any sign of undernutrition. It is presumed that all the fetuses were fully nourished for their periods of gestation. None of the mothers had anomalies of the placenta. The idea behind the study is to understand the growth of the individual foetus along with its development and maturation of all the organs. Growth implies both cell multiplication and accumulation of both intra- and extracellular material. It seldom involves just cell multiplication and matrix secretion, but simultaneously it causes cell differentiation, pattern formation, and changes in form. In the case of normal development, a great range of functions is simultaneously orchestrated to produce a harmonious pattern which is characteristic of normal development. The growth and maturation of an organ at the cellular level comprises four stages viz, (1) proliferation, (2) migration, (3) differentiation, and (4) death.

From fertilisation, the embryogenesis period continues up to the 10th week of gestation. The foetal 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 foetal 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, the foetus is also not as sensitive to damage from environmental exposure as the embryo. Instead, toxic exposures often cause physiological abnormalities or minor congenital malformation.

There is much variation in the growth of the foetus. When foetal size is less than expected, that condition is known as intra-uterine growth restriction (IUGR), also called foetal growth restriction (FGR). Factors affecting foetal growth can be maternal, placental, or foetal. Maternal factors include maternal weight, body mass index, nutritional state, emotional stress, toxin exposure (including tobacco, alcohol, heroin, and other drugs which can also harm the foetus in other ways), and uterine blood flow. Placental factors include size, microstructure (densities and architecture), umbilical blood flow, transporters and binding proteins, nutrient utilisation, and nutrient production. Foetal factors include the foetus genome, nutrient production, and hormone output.

Also, female fetuses tend to weigh less than males at full term. Foetal growth is often classified as follows: Small for gestational age (SGA), appropriate for gestational age (AGA), and large for gestational age (LGA). SGA can result in low birth weight, although premature birth can also result in low birth weight. Low birth weight increases risk for perinatal mortality (death shortly after birth), asphyxia, hypothermia, polycythaemia, hypocalcaemia, immune dysfunction, neurologic abnormalities, and other long-term health problems. SGA may be associated with growth delay, or it may instead be associated with absolute stunting of growth.

Research studies on the growth and development of the human foetus, an area of study, that has important implications for the development of a human being, and possible diseases that the adult human may face later in life due to problems suffered in utero, are few. This is understandable because while studies on animal models are easier to conduct with fewer ethical restrictions, research on human foetuses carries with it inherent difficulties and complications. However, with the development of new technologies, imaging and other ways, monitoring of growth has become easier and safer. Further, medical termination of pregnancy for different purposes and reasons are permitted in several countries, providing the opportunity for study and research after obtaining informed consent from all concerned.