AIM OF THE STUDY

In recent years, improvement in diagnostic techniques has led to better recognition of “disorders of cortical development” These disorders constitute a significant cause of epilepsy, mental retardation, developmental delay and neurological deficits in childhood, and may also contribute to the pathogenesis of psychological and neurogenerative diseases in adults. Hitherto few systematic studies of the human fetal cortex have been performed, and little knowledge known about the ontogenetic processes of the neocortex in man. The aim of the study is to establish and understand the developmental events of human neocortex like cell proliferation, differentiation, migration and maturation from 10 weeks onwards by using the histological techniques, biochemical parameters and monoclonal antibodies for glial cells.

Early developmental events seen to be dictated by an innate programme, whereas late events may be more susceptible to extrinsic influences It is hoped that knowledge of the normal developmental process can lead to better understanding of the causes and mechanisms of disorders of cortical development and for better treatments.

The isolation, culturing and expansion of human neural progenitor cells has important potential clinical applications in cellular transplantation strategies as well as in developmental studies involving central nervous system. There are lot of controversies, to culture neurons and astrocytes from proliferative progenitor cells in (I or II trimester fetal CNS tissue ) selecting the exact period for cultures.
Neural transplantation holds promise for the treatment of traumatic brain and spinal cord injury by replacing lost cellular elements as well as repairing neural damage. Fetal human stem cells derived from central nervous system are potential transplantable sources for all cell types found in the mature human nervous system including neurons, astrocytes and oligodendroglia. Although nearly all areas of fetal human neuraxis contain undifferentiated neural precursor cells, the phenotypic fate of the daughter cells might vary from one region to another during a specific developmental period.

Stem cells are exciting candidates for therapeutic strategies in neurodegenerative diseases, due to their multipotency and migratory capabilities. Stem cell like embryonic normal Human Neural Progenitors (HNPs) are capable of proliferating in response to mitogenic growth factors and differentiate into diverse central nervous system cell types invitro. Central nervous system progenitor cells maintained in a proliferative state in culture can migrate and differentiate into both neurons and astrocytes following intracerebral grafting. As such these cells may have potential for development as an alternative source of tissue for neural transplantation in degenerative diseases.

If any abnormality is found out by MRI study in any particular area of human fetal brain, at early stages, it is possible to rectify the problem by transplanting stem cells into the affected area. To carryout this stem cell research, the knowledge of exact time of cell differentiation and cell lineage migration is very important.

Hence the present study was attempted to investigate the developmental changes of brain that occur from 10 weeks onwards in relation to histological studies like thickness of
different layers, density of neurons, formation of processes, laminar pattern, and estimation of biochemical parameters and the exact time of neuron and glia differentiation by using monoclonal antibodies.

Brain maturation in some species counted in days, in others in weeks and in some others in months. Thus for example in rats gestation lasts for 21 days, brain maturation 98 days. In humans brain maturation starts during gestation and is not completed until 2 years of extrauterine life. Therefore the experimental data from animals are risky and can sometimes be deceptive to apply to man what occurs in the rat or rabbit.

The data obtained from the samples of human materials are therefore necessary. Literature study revealed that numerous works were done on animals not in humans. It is important to establish the timing of the phases of brain developments in relation to weeks of gestation and postnatal period in order to determine the period of vulnerability.

All the functional areas are not developing and growing at the same stage. Knowledge of normal development of various brain regions is required to access the vulnerable stage for each region, when it is susceptible for toxic effects like alcohol and some drugs as well as some environmental factors. All these can be best explained and proved using the human fetus as model which does not involve killing or torturing the animal groups.