Limbic System

- This term (Limbic system) is used to include all the components of limbic lobe and the subcortical nuclei e.g.
  - Amygdaloid nuclear complex.
  - Septal thalamus
  - Anterior nuclei of thalamus.
  - Mammillary bodies
  - Hippocampal formation.
  - Subcallosal
  - Cingulate
  - Parahippocampal gyri
  - Limbic system is a complex set of three C-shaped structures containing both gray and white matter.
  - It lies deep in the border zone between cerebral cortex and the hypothalamus.
  - It is one of the primitive parts of brain.

- **Outer arc** of limbic system (Limbic gyrus) includes
  - Subcallosal area,
  - Cingulate gyrus and isthmus of cingulate gyrus
  - Parahippocampal gyrus including the uncus and subiculum.

- **Middle arc** (Broca’s intra limbic gyrus)
  - Consists of para terminal gyrus
  - Indusium griseum and Hippocampus.

- **Inner arc** has mamillary bodies
  - Fornix
  - Alveus
  - Fimbria
- Apart from these, limbic lobe is also influenced by thalamus and hypothalamus where as olfactory nerves, bulb, tract, stria and trigone are also its constituent parts.

**AMYGDALA**
- Almond shaped mass of nuclie located deep within temporal lobes medial to hypothalamus and adjacent to hippocampus, anterior and superior to inferior horn of lateral ventricle,
- Related with arousal, emotion, and hormonal secretions.

**HIPPOCAMPAL FORMATION**
- Consists of
  - Hippocampus
  - Dentate gyrus
  - Parahippocampal gyrus
- **Medial and lateral longitudinal striae:**
  - Longitudinal strands of white fibers representing the white matter of indusium Griseum.

**HIPPOCAMPUS**
- Hippocampus is an in folded C-shaped gray matter of the cortex located is the entire length of floor of the inferior horn of lateral ventricle.
- Named, because it resembles a sea horse.
**DENTATE GYRUS:**
- It is a crenated strip of gray matter which lies between the fimbria of hippocampus and the parahippocampal gyrus.
- Posteriorly gyrus accompanies fimbria to splenium and becomes continuous with indusium griseum.
- **Indusium Griseum** is a thin layer of gray matter covering the upper surface of of corpus callosum.
- **Medial and lateral longitudinal striae:**
  - Longitudinal strands of white fibers representing the white matter of indusium Griseum.

**FUNCTIONS OF LIMBIC SYSTEM**
- Its central role is in memory, learning, emotions, neuroendocrine function and autonomic activities.
- The limbic system is involved in epilepsy, congenital diseases, dimentia, and various psychiatric disorders.

**FUNCTIONAL ROLE OF LIMBIC SYSTEM**
- It is responsible for emotional reactions having a broad biological importance.
- **Bilateral removal** of the temporal lobes (which include the hippocampus and amygdaloid body) in monkeys is followed by an attitude of indifference and total loss of emotional responses even of a basic nature such as fear or fright reaction, or a rage or defence reaction. Some animals exhibit hypersexual or even per-verted sexual behaviour.

- It controls visceral functions associated with emotions. These are mediated mainly through the hypothalamus.
3. **Olfactory** impulses reaching the hippocampus (from the primary olfactory area or via medial olfactory stria and septal area) are considered to be concerned with emotional and visceral responses. It is a common experience that a pleasant smell of food produces salivation and an unpleasant odour causes nausea.

- It is suggested that a normally functioning hippocampus, fornix, mamillary body, thalamus, limbic cortex connection is necessary for a recent memory trace. Bilateral removal of hippocampal structures in experimental animals is followed by impairment and disturbance of recent memory.

**SCHIZOPHRENIA**
- It is a serious mental illness characterized by a disintegration of the process of thinking and of emotional responsiveness.
- Increased dopamine activity in the mesolimbic pathway of the brain is commonly found in people with schizophrenia.

**Clinically**
- Limbic encephalitis (secondary)
- Degenerative changes (Alzheimer’s disease)
  - Anxiety disorders
  - Schizophrenia

There are several types of schizophrenia, and no one characteristic is common to all. Psychotic symptoms include:
- delusions
- hallucinations
- incoherence
- catatonic or hyperactive behavior
- flat affect