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ISSN 0976-9595 Review Article

CONTRIBUTION OF GREEK-O-ARAB PHYSICIANS IN *TASHREEH-E DIMAGH* (ANATOMY OF BRAIN) - A REVIEW

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ABSTRACT

Brain (*Dimagh*) is the organ of consciousness, creativity, intelligence, memory, language and emotion. These functions make it utmost important organ of human body. That's why Greek-o-Arab physicians described it as *Aaza'aRa'eesa* (vital organ) of the human body. Greek-o-Arab physicians like Hippocrates, Herophilus, Galen, *ZakariyaRhazi*, *Ali Ibn Abbas Majusi*, *Ibn-e Sina* etc. made great contribution in brain anatomy. They discovered various brain structures and described profoundly. They also described functions along with structure of different parts of the brain in detail.

Objective of the current study was to compile progression of *Tashreeh-e- dimagh* (Anatomy of brain) in Greek-o-Arab period along with acknowledgment of contribution of Greek-o-Arab Physicians in brain anatomy. To compile contribution of Greek-o-Arab Physicians in brain anatomy we search & collect the material from Unani Classical reference books such as Kamil-us-Sanaa, 'Alqanoonfiltibb', KitabulMansoori, Modern books, Journal, Research Paper, & online resources etc. This paper enlighten the praiseworthy work done by unani physicians, who compiled their observations and research work about *Tashreeh-e Dimaghi* (brain anatomy) which is present in our ancient unani literature. The ancient unani literature became the base for today's advance Neuroanatomy. This paper will provide enough matter that will help and open door for further researches in *Tashreeh-e Dimaghi*.

Keywords: Tashreeh-e-dimagh (Anatomy of brain), TashreehulBadan, Herophilus, Jalinoos (Galen), Ibne-e Sina, Ali Ibne Abbas Majūsi, Unani system of Medicine.

1. INTRODUCTION

Brain (*Dimagh*) is the seat of consciousness, creativity, intelligence, memory, language and emotion. It controls most of the activities of the body like processing, integrating, and coordinating the information which receives from the sense organs, and making decisions as to the instructions sent to the rest of the body [1]. These functions make it utmost important organ of human body. Greek-o-Arab scholars described it as one of the vital organs (*Aaza'aRa'eesa*) of the human body [2].

Unani physicians made great contribution in the field of anatomy especially brain anatomy. They discovered various brain structures and described deeply. They were the first to recognise the brain as an organ of consciousness and intelligence. Alcameon recognized brain as site of sensation and cognition [3]. Hippocrates described Brain (*Dimagh*) as superior organ of the body which controls all the activities. Herophilus; who is known as the father of anatomy, made outstanding anatomical discoveries in human cadavers. He distinguished the brain from the cerebellum and recognized the internal surface of the skull and the cranial sutures, brainstem and spinal cord (Nukha) and discovered meninges and torcularHerophili [3, 4]. Later on, the great Roman physician Galen explains the method of dissections of brain and discovered corpus callosum. Galen also described the brain's ventricles and meninges in details. Likewise he discovered various other structures of the brain [5]. During Arabic era which is also known as golden period of unani medicine, Arab physicians like ZakariyaRhazi, Ali Ibn Abbas Majusi, Abu SahalMasihi, Ibn-e Sina etc. made significant contribution in the field of anatomy. They described the parts of brain, ventricular system and meninges of brain. They described the function along with structures of different parts of brain in details.



Fig. 1: Lobes and parts of the Brain (Dimagh) [6]

2. DISCOVERIES AND CONTRIBUTIONS OF GREEK & ROMAN PHYSICIANS IN BRAIN ANATOMY

In 500 BC Alcmaeon was the first writer to champion the brain (*Dimagh*) as the site of sensation and cognition [3]. The brain (*Dimagh*) is hegemonic in the body. He said that all the senses are connected with the brain and it is the governing body of intelligence [7].

Hippocrates (*Buqrat*) (460-377 B.C.) considered the brain (*Dimagh*) as a gland secreting mucous that cooled the Body. Brain (*Dimagh*) is finally recognised by him as the organ of consciousness and cause of our unique human behaviour [7]. He said that the brain (*Dimagh*) is covered with thick and soft membranes and spinal cord Emerge from it [8].

Aristotle (*Arastu*, 384 B.C.) the founder of comparative anatomy, with regard to the vertebrate brain noted that it is covered by two membranes that are abundantly innervated with fine blood vessels. It is likely that Aristotle is referring to the meninges, the duramater and piamater. Aristotle also describes the brain as 'paired' providing a clear reference to the two cerebral hemispheres. He also recognise a separate structure that he calls the parencephalis located 'at the back' that is markedly different in appearance and texture i.e. the cerebellum. Aristotle also observed a small hollow part in centre of the brain i.e. ventricle filled with cerebrospinal fluid. Aristotle believed that the heart, not the brain, was the seat of intelligence [7, 9, 10].

Herophilus (300 B.C) the father of anatomy believed to be one of the first to differentiate nerves from blood vessels and tendons and to realize that nerves convey neural impulses. He made outstanding anatomical discoveries in human cadavers: for example, he distinguished the brain from the cerebellum, and described the brain as the seat of intelligence, contrary to the beliefs of his contemporaries. Herophilus described the brainstem and spinal cord (Nukha) as one structure he referred to as "spinal marrow". He identified and described several brain structures, some of which still have his name, such as the concavity on the internal surface of the occipital bone, in which lodges the posterior confluent of the cranial venous sinuses, known as the Herophilus press (torcularHerophili). The meninges of the brain were also discovered by Herophilus and named as "chorioid" because of their resemblance with chorionic membrane of the fetus [4]. His greatest achievement was to describe the ventricular system which is a series of interconnected cavities inside the brain. Although parts of the ventricular system had been noticed by others, Herophilus provided the first complete description of it. He described the connection of two anterior ventricles of the brain (one in eachcerebral hemisphere) with the bottom-most (posterior) ventricle close to the spinal cord by a small passage that he called the aqueduct. In addition, he identified a long groove in this lower ventricle that he likened to a reed pen (kalamos). Herophilus also noticed that the inside

surface of the ventricles were uneven and contained small bumpy protrusions, which he called the choroid plexus (*meaning delicate knots*). Today we know these structures produce cerebrospinal fluid. Herophilus also outlined the external features of the brain (*Dimagh*) and described the delicate covering of the brain, the arachnoid mater (*Ghisha-e-Ankabutia*) [7, 10, 11].

Erasistratus (310 B.C.) improvised upon the observations of Herophilus by providing a more thorough account of the ventricular system by describing four main cavities. In fact, Herophilus had only mentioned three ventricles, and was seemingly unaware of the central one (the third) located in the midbrain. Erasistratus also emphasize the convoluted shape of the cerebral hemispheres and described its resemblance to the coils of the small intestine. Erasistratus also recognised different nerves for the sensation and movement, although under influence of Aristotle's theory, he thought that these nerves originate from the brain's outer membranes rather than brain. Erasistratus also appears to have been the first to realise the marrow of the brain and spinal cord were continuous with each other [7].

Galen (Jalinoos129-200 AD) described the meninges as protecting cover the brain (Dimagh) including their fibrous outermost layer dura mater (Umm-e-Ghalij), and the inner more delicate layer pia mater (*Umm-e-Raqiq*). During dissection of the brain (Dimagh), the first structures he revealed were the corpus callosum. This is the most striking of the brain's internal structures and today we know it is a pathway connecting the two cerebral hemispheres. Galen (Jalinoos) also provided a detailed account of the brain's ventricles. He demonstrated that ventricular system is composed of two anterior ventricles connected through intraventricular foramina to the middle ventricle (Batan). This ventricle is in turn connected by an aqueduct to the posterior ventricle feeding into the spinal cord (Nukha). He recognised the choroid plexus within the ventricles, which he recognised as a collection of veins and arteries woven together. Delving deeper into the brain (Dimagh), Galen comes across a singular pine-cone shaped body or conarium that rests close to the aqueduct connecting the third and fourth ventricles. Another conspicuous structure is a white coloured long arch whose two arms are found below the lateral ventricles, which Galen (Jalinoos) refers to as the fornix. He also likens this to a vaulted roof because in structural terms it seems to be holding up the rest of the brain (Dimagh) above it, including the cerebral hemispheres. Turning the brain over, and looking at it from below, Galen describes a funnel-shaped stalk called the infundibulum, which is connected with the pituitary gland. Another part of the brain (Dimagh) described by Galen was its 'buttocks'. These are most likely are rounded protrudences located in the upper brainstem, which today are known as the superior and inferior colliculi. Galen (Jalinoos) also refers to a narrow worm-like structure located between the two halves of the cerebellum which he calls the vermiform process. This was shortened to vermis in the work of later writers who would recognise it as a channel regulating the flow of pneuma into the fourth ventricle [8]. As per Galen (Jalinoos) the brain (Dimagh) is the hegemonikon because the organ alone is responsible for sensation and voluntary motion. Galen also maintains that the site of the hegemonikon i.e. brainis not only the source or origin of the nerves but the nerves are composed of the same substanceas of brain [12-15].

3. CONTRIBUTION IN BRAIN ANATOMY (TASHREEH-E-DIMAGH) BY ARAB PHYSICIAN

As per *Ali IbnRabban Al-Tabari* (838-870 AD), the brain (*dimagh*) is covered by two membranes, inner thin one which is very delicate covered the soft tissue of brain and is enriched with blood capillaries for nutrition of brain while the thick one close to the skull bones and provides protection to the brain (*dimagh*). Brain is the center of sensation and voluntary movement. He divided the brain in three parts, anterior lobe (*Muqaddamdimag*), middle lobe (*AusatDimagh*) and posterior lobe (*Moakhhardimagh*). According to him the anterior lobe of the brain (*Muqaddamdimagh*) is the center for imagination, the middle brain (*AusatDimagh*) is for thinking and the posterior lobe (*Moakhhardimagh*) is for memory [16, 17].

According to *Mohammad bin ZakariyaRazi* (850-923 A.D.), brain (*dimagh*) is a soft organ containing some cavities called ventricles (*butun-e dimagh*). He quoted Galen that there are four cavities in the brain which are interconnected and overlaps each other. Two cavities are present in forebrain (*Muqaddamdimagh*), third one is in the middle brain (*Ausatdimagh*) and fourth cavity is in the posterior brain (*Moakhhardimagh*). Some special structures are presented adjacent to these cavities which help in opening and closure. Both the anterior ventricles (*BatanMuqaddam*) have two protuberances like nipple of the breast that reach to the ethamoid bone, there is power of smell in them, there are many small irregular

holes in this ethamoid bone. Its location is under the skull to the extreme edge of the nose [15]. According to him two Membranes (Meninges) in the brain, one membrane is hard which is called Dura mater (Umm-e-Galeej), the second is soft which is called Pia mater (Umm-e-Raqiq), Pia mater is attached to the brain, which at some point is completely connected to the brain. Dura mater (Umm-e-Galeej) is connected to the skull which at some point is attached to the brain and some hidden area in the brain. Dura mater (Umm-e-Galeej) has many holes in two places, one near the opening of the ethamoid bone and the other near the lower jaw bone, this bone is also perforated. Through ethamoid bone, the wastes of both the anterior ventricle of the brain flow towards the nose and the wastes of the middle ventricle of the brain flow near the lower jaw, thus protecting the Posterior ventricle from many bad diseases. Below the brain is Dura mater (*Umm-e-Galeej*), which has become like a web by connecting with the arteries going up to the head, and two more veins (Vertebro-occipital vein) come out of it, these two vein enter the Dura mater and are connected to the brain [18].

Ibne Abbas Majūsi (930-994 A.D.): The origin of brain (dimagh) is designed in such manner that it gets changed (Processed) and perception of sensed objects such as its weight, quality, quantity, texture is easily sensed. According to him brain(dimagh) is surrounded by the two membranes, which are called Meninges (umm -edimagh). The outer membrane is thick which is called dura mater (umm-e- Jafia) and second inner membrane is thin which is called pia mater (umm-e- Raqiqia). Dura mater (umm-e-Jafia) is also called umm-e-Ghaleej. Ibne Abbas Majūsi divided the brain (dimagh) in two parts, one part is in front of it called the fore brain (Muqaddamdimagh) and the other is behind it is called the hind brain (Moakkhardimagh). He described a thick (Galeej) membrane which is present between these two parts which further split into two layers. This membrane completely separates the both parts from each other. The channel of communication is only the duct which lies beneath the meeting point of frontal and parietal bone i.e. bregma. He said that the fore brain (Muqaddamdimagh) is bigger and softer than hind brain (Moakkhardimagh). It gives origin to spinal cord (Nukha) and sensory nerves (A'sab-e hissiyah). While the hardness of posterior part of brain (Moakkhardimagh) gives stability to the brain. He mentioned four cavity or deep structure in the brain (dimagh) called the ventricle of brain (*Batun-e dimagh*). Two of them are present in the forebrain (*Muqaddamdimagh*), one in the hind brain while the fourth one in the middle brain. According to Majoosi, vital pneuma transformed into psychic pneuma in the first two ventricles. These ventricles also contain two bulging processes which help in sense of smell. Nerves originates in pair which makes an advantages, if one nerve (*A'sab*) is damaged then other nerve (*A'sab*) compensate its function. There is a pine cone shaped (habb-e-shanoverya) structure found at the junction of third and fourth ventricle, in modern anatomy it is termed as pineal gland [19].

Likewise Ibne Abbas Majūsi, Abu SahlMashihi (1010 A.D.) also divided the brain into two parts and described the two membranes which covers the brain, *umm-e- Jafia and umm-e- Raqeeqa*. He also described that the matter of nerves and same as of brain but the difference is only that the brain is softer that nerves. He described the three ventricles of brain in which two are in anterior lobe while the third one in the posterior lobe. He also described the pineal gland as pine cone shaped gland situated in the cavity between anterior and posterior ventricles [20].

Ibne Sina (Avicenna980-1037 A.D.) says that Brain is the source of motion and sensation, and discovered the cerebellar vermis which he named vermis and the caudate nucleus, which he named tailed nucleus or nucleus caudatus. These terms are still used in modern neuroanatomy and neurophysiology. Moreover, he was the first person to relate intellectual dysfunctions to deficits in the brain's middle ventricle and frontal lobe, which mediates common sense and reasoning. Avicenna Ibn-e Sina (Avicenna) broadly divides the brain into two parts, anterior and posterior. According to him anterior part of the brain is soft because of the sense organs, especially hearing and smell arise from it while the Posterior part of the brain is hard because of the majority of motor nerves and spinal cord arises from it. He describes the ventricles, which are, "three longitudinally cavities." He states that the anterior ventricles, "serve to aspirate the air, to dispose of the excesses, and to distribute the great majority of the sensory Pneuma, and to operate the creation of ideas arising from internal perception." Alternatively, the posterior ventricle is involved with the spinal cord and "the great majority of the motor pneuma, and the operation of memory faculties." He called the middle ventricle is a passage between the anterior and posterior ventricles, and as a corridor between them [7, 21-23].

Ibn-e-Rushd (*Averroes* 1126-1198 A.D.) in his famous book Kitabul Kulliyat, described that the brain is covered by two membranes outer one is thick and attached to the skull while the inner one is thin and attached to the brain termed as *UmmeRaas* (Mother of brain). He also divided the brain in anterior and posterior parts and described the three ventricles of the brain [24].

IbnHubalBagdadi (1121-1213 A.D) described that the head is house and chamber of the brain and is placed higher in the body to easy visualization of eyes. This chamber is formed by bony case of frontal bone (Izamul-Jabahia), occipital bone (Izam-ul-Qamhuda) Parietal bone (Izam-ul-Qahaf) and sphenoid bone. The brain is divided into two parts, anterior and posterior and it contains three ventricles. Ventricle in the anterior lobe is biggest and is for the perception of sense. All three ventricles are interconnected with each other for the passage of psychic pneuma. Both parts of brain are different in texture, and are separated by some membranes and vessels. Beneath separating membrane there is a sinus known as muasserah in which blood drained from the vessels and after metabolism this accumulated blood is transformed into matter of brain. This sinus gives origin to two vessels and after ramification these vessels gives blood supply to the frontal ventricles and related structure. And again these capillaries joined together and formed two big vessels which give blood supply to other two ventricles. This process of repeated ramification makes a network of small vessels supported by a thin membrane which cover the brain and is known as Umme- Raqeeq. Pia mater (Umm-e-raqeeq) act as ligaments for the arteries and veins, It's like a placental membrane and for this reason, it remains attached to the brain and enters the brain at many places, Except for the posterior ventricle, because it is free from this membrane due to its hardness. Anterior ventricle (batun-e-muqaddam) is the large ventricle; it is divided into two parts along its length. It is the place of sensation and it is softest because sensory nerves come out it and in the front part of this ventricle there are two appendages or process like Nipple, are present which contain the power of olfaction. These appendages or process is harder than the anterior ventricle and softer than the nerves. The middle ventricle is smallest, it is designed like a base, and is placed between anterior and posterior ventricle. Its roof is round like a lemon (taranj), which is kept in length like a worm, Baghdadi named it utrujmajrad. It shrinks and expands in a state of contraction and expansion. This ventricle composed of two process of brain called unbateen. Middle ventricle is in connection with these processes. When middle ventricle stretched the thickness of unbateen decreases and when it constricted, unbateen become thick. The posterior ventricle is larger than the middle ventricle and smaller than the anterior ventricle and harder than the both the ventricle, because most of the motor nerve of the brain are emerged from here. The posterior ventricle gradually becomes thin and narrow and it continues with the spinal cord. There are two vessels to eliminate waste product from the brain situated in the anterior ventricle and middle ventricle. Both these vessels drained in to a deep sinus where the first vessel entered the Pia mater (hijab-e- raqiq) and the second vessel entered the Dura mater (hijab-e- sulb). When the vessel entered the duramater it meets with a gland which is present between the duramater and palate. This gland has a duct which opens into the palate through ethamoid bone [25].

According to IbnQuf (1233-1286A.D.) brain is a white coloured organ having moist temperament. It is divided into two parts through mid-sagittal section, into three parts in transverse section called ventricles. First ventricle is softer than middle ventricle while the middle ventricle is softer than posterior ventricle. The brain gradually narrowed down to the spinal cord. From each half of the anterior ventricle, there are two nipples like processarises to store the memory. In between of the anterior brain and posterior brain is a pathway which is called the vermis (dooda). The mater of the vermis is similar to the mater of the meninges. The anterior ventricle is wider than the posterior ventricle. The passage between these two ventricles is filled with glandular muscle known as alyata'an. This gives the passage to the transformed pneuma from anterior to posterior ventricle. During this process of movement of pneuma the passage constricted and alyata'an separated from it. Between anterior ventricle and posterior ventricle, there is a place where blood oozed out, called berka or tank. Blood is transformed in the berka and move to dooda. During movement of blood this passage is closed and vermis become wide due to which it covered with nipple like process of anterior ventricle. The matter of brain contains round and red colour components which are called gyri (tajrida). But these gyri do not found in the process (alyatain). The brain is surrounded by two membranes which are called Ummul-e-dimagh, a membrane with a thin consistency is connected to the brain it is called pia mater (Umm-eRaqiq or ghisa-e- mashima). In this membrane, there is a network of veins and arteries that are located in the end of middle ventricle of the brain. The second membrane is thickest and viscosity of this membrane is hardest, and attached to the skull which is called Dura mater (Umm-e*jafia*). Some appendages come out in this membrane, which reach on the upper side of the cranium and go out of the skull in the way of sinus (shaion). Among them, another membrane called sumac is formed above the scalp and under the skin. Pia mater and Dura mater start from the edges of the skull which is called Styloid (*abarya*). There are some wastes in the brain which are produced due to reaching on the vapours of the body and some are produced as a result of this waste food which must be disposed of. So thin or liquid waste is decomposed by the simple decomposition and emerges out by the sinus. And thick waste is emerging out by the some ways which are present in the inner portion of the brain. The waste material is born in the anterior ventricle and goes to the both nostril of the nose, first goes in to the saqba-e-mollob (a hole is an opening or hollow space) of the Dura mater, and then come to the nostrils with the help of the exhaust air passing through the foramen of the ethamoid. The middle ventricle and posterior ventricle wastes are discharged from the superior palate through two vessels that run diagonally towards the mouth. These two vessels join each other and connect to the round, deep and shelly vessel. The upper part of this vessel is called *abzan* and the lower

part is called infundibulum (kamaa). The matter of this vessel is meninges type, when this vessels passes through its way, there is a gland under it similar to like a flattened disc and filled the empty space between the reticular layer (tabqasaqbia). Then it passes through ethamoid bone to the superior part of the palate. The brain is placed higher than all the other organs so that the eye can be getting away from harmful things and closing to beneficial things. The brain is whitish colour because this is suitable for being the centre and source of all actions. The reason for its consistency is moist because the easy reflection of the images. Due to frequent movement, it could not dry and soft nerves come out of it. The brain divided into two halves in length, and divided the ventricle two parts and formed the pair. Brain is the centre of different powers because it is divided in width. So requirement of different ventricle have a special power can perform the functions of the brain. The anterior ventricle is soft and posterior ventricle is hard because sensory nerve arises from anterior ventricle and motor nerve arises from posterior ventricle. Vermis (dooda) - acts as a passageway for the penetrating material from the anterior ventricle to the posterior ventricle. For the completion of joint, they are placed in width because if these joints were longitudinal or hexagonal, they would not be perfect. In the anterior ventricle, its edges are made wide, because there is a lot of thick blood in this place, so it should be wide because blood flows do not stopped [26].



Journal of Advanced Scientific Research, 2023; 14 (06): July-2023

Name (Arabic)	Name (Latin)	Life span	Contribution		
Alcmaeon	, , , , , , , , , , , , , , , , , , ,	500 B.C.	First scholar to recognize the brain (<i>Dimagh</i>) as the site of sensation and cognition		
Buqrat	Hippocrates	460-377 B.C.	First to Considered the Brain (<i>Dimagh</i>) as an organ. Recognize membranes covering the brain i.e. Meninges		
Arastu	Aristotle	384 B.C.	Founder of comparative anatomy Described meninges and named it as Dura Mater (<i>Umm-e-Ghaleej</i>) and Pia Mater (<i>Umm-e-Raqeeq</i>). Recognise cerebral hemespheres and cerebellum.		
Herophilus	Herophilus	300 B.C.	Differentiate nerves from blood vessels and tendons. Describes cerebellum. Described brain stem and spinal cord as one structure. Discovered TorcularHerophilli Discovered the ventricular system. Named meninges as choroid. Named delicate covering of the brain as Arachnoid mater.		
Erasistratus		310 B.C	Elaborated description of ventricular system recognized by Herophilus and discovered the fourth ventricle. Recognise sulcus &gyri of cerebrum. Differentiate the motor and sensory nerves. First to recognise that cavity of spinal cord is continuous with brain.		
Jalinoos	Galen	129-200 A.D.	Discovered corpus callosum. Discovered the choroid plexus. Discovered the pineal gland Discovered and described infundibulum Discovered vermiform process		
Ali IbnRabban Al- Tabari		838-870 A.D.	Described the division of brain and their functions.		
Mohammad bin ZakariyaRazi	Rhazes	850-923 A.D.	Described the parts of brain and meninges in detail. He described the recurrent laryngeal nerve and thought it originated near the trachea.		
Ali Ibne Abbas Majūsi	Hally Abbas	930-994 A.D.	Described the parts of brain, meninges and ventricles in detail. Described the transformation and flow of psychic pneuma. Described the functions of different parts of brain in detail. Recognize the pineal gland and give the term <i>habb-e</i> <i>shanovariayah</i> .		
Abu SahlMashihi		1010 A.D.	Described the parts of brain, meninges, ventricles and pineal gland.		
AbulHasal Ali IbneSina	Avicenna	980-1037 A.D.	Described the meninges, division of brain, ventricles of brain, and related structures in detail like cerebellar vermis and caudate nucleus. Described the detail function of different parts of the brain		
Abu Alwaleed Mohammad Ibn-e- Rushd	Averroes	1126-1198 A.D.	Described division and covering of brain Given the term "UmmulRaas" for inner thin membrane of brain		
IbnHubalBagdadi		1121-1213 A.D	Described the meninges, division of brain, ventricles of brain, blood supply of brain, sinus of brain and related structures in detail.		
IbnQuf		1233-1286 A.D	Described the meninges, division of brain, ventricles of brain, and related structures in detail.		

Table 1: Contributions	of Greek-o Ara	b Scholars in the	Field of	Tashreeh-e 1	Dimagh

AllamaNafees (1210-1288 AD) also says that, "The Major composition of brain is Nerve fibres, grey matter and white matter. Mizāj of Brain is Bārid-Raţab in comparison of other organs because in brain there should be dominance of *Rukn-e-Ma* (watery elements)

and Rukn-e Ard (earthy elements). The moisture of organs is due to Rukn-e-Haw \bar{a} (airy elements) and Rukn-e-Ma present in them. Magz (medulla) of brain is more b \bar{a} rid than magz of spinal card because, brain contain oily substances. The illustration of that, when

magz of brain cook, then all the fluid comes out and the matter become more viscous and left only earthy material. There is more blood supply of brain than other organ but, there are no kinetic movements of brain, only conduction is present. Absence of movement in the brain, is the indicator of bāridMizāj of brain. The reason of RaţabMizāj is that, the water content of brain is little more than that of spinal cord. In brain, grey matter represents a concentration of nerve cell bodies contains more water than the white matter where the nerve fibers are mainly found [27, 28].

In this paper we search & collect the Material from Unani Classical refrence books such as Kamil-us-Sanaa, 'alqanoon fit tib', kitabulMansoori,& Modern books, Journal, Reasearch Paper etc.

4. DISCUSSION

In 500 BC Alcmaeon was the first to recognise the brain (Dimagh) as the site of sensation and cognition. According to him brain is the governing body of intelligence and senses. While Hippocrates (Bugrat) (460-377 B.C.) the father of medicine, considered the brain as a gland secreting mucous that cooled the Body. He also recognised the brain as the organ of consciousness and he added that brain is responsible for unique human behaviour. Later on Aristotle (Arastu) (384 B.C.) the founder of comparative anatomy, described the covering of brain i.e. meninges in detail and named it as duramater and piamater. He described the brain as paired organ perhaps he recognized the two cerebral hemispheres of brain. He also recognized the cerebellum and ventricles of brain. Herophilus (300 B.C.), the father of anatomy, made outstanding contribution in the field of human anatomy. He recognized different parts of brain. He had given the term spinal marrow for brain stem and spinal cord. He discovered a structure in the brain which named after him as torcularherophili. He termed the meninges as choroid due to its resemblance with the foetal membrane. He discovered the delicate covering of brain i.e. arachnoid mater (Ghisha-e Ankabutia). Herophilus discovered the ventricular system of brain and described it elaborately. He described the bumpy protrusion found inside the ventricles which produces CSF. (310 B.C.) improvised upon Erasistratus the observations of Herophilus by providing a more through account of the ventricular system by describing four main cavities. In fact, Herophilus had only mentioned three ventricles, and was seemingly unaware of the central one (the third) located in the midbrain. He also

described the sulcus and guyri of cerebrum. He was the first to find out the continuation of cavities of brain and spinal cord. In 1st century A.D., the great Roman physician Galen had been described the human anatomy in detail. He discovered the corpus callosum, pineal gland, infundibulum, vermiform process and superior & inferior colliculi.

As Per Ali IbnRabban Al-Tabari (838-870 AD) the brain (dimagh) is covered by two membranes, inner thin one which is very delicate covered the soft tissue of brain and is enriched with blood capillaries for nutrition of brain while the thick one close to the skull bones and provides protection to the brain (dimagh). According to Mohammad bin ZakariyaRazi (850-923 A.D.), brain (dimagh) is a soft organ containing some cavities called ventricles (butun-e dimagh). He quoted Galen that there are four cavities in the brain which are interconnected and overlaps each other. Two cavities are present in forebrain (Muqaddamdimagh), third one is in the middle brain (Ausatdimagh) and fourth cavity is in the posterior brain (Moakhhardimagh). According to Ibne Abbas Majūsi (930-994 A.D.) The origin of brain (dimagh) is designed in such manner that it gets changed (Processed) and perception of sensed objects such as its weight, quality, quantity, texture is easily sensed. The brain (dimagh) is surrounded by the two Membrane, which is called Meninges (umm -e- dimagh). The outer membrane is thick which is called dura mater (umm-e- Jafia) and second inner membrane is thin which is called pia mater (umm-e- Raqiqia). Dura mater (umm-e-Jafia) is also called umm-e-Ghaleej.¹⁶ He divided the brain (*dimagh*) in to two parts, one part is in front of it called the fore brain (Muqaddamdimagh) and the other is behind it is called the hind brain (Moakkhardimagh). He described a thick (Galeej) membrane which is present between these two parts which further split into two layers. This membrane completely separates the both parts from each other. The channel of communication is only the duct which lies beneath the meeting point of frontal and parietal bone i.e. bregma. He said that the fore brain (Muqaddamdimagh) is bigger and softer than hind brain (Moakkhardimagh) [16]. It gives origin to spinal cord (Nukha) and sensory nerves (A'sab-e hissiyah). While the hardness of Posterior part of brain (Moakkhardimagh) gives stability to the brain. He mentioned four cavity or deep structure in the brain (dimagh) called the ventricle of brain (Batun-e dimagh). Two of them are present in the forebrain (Muqaddamdimagh), one in the hind brain while the fourth one in the middle brain. According to Majoosi vital pneuma transformed into psychic pneuma

in the first two ventricle. These ventricles also contain two bulging processes which help in sense of smell. Likewise Ibne Abbas Majūsi, Abu SahlMashihi (1010 A.D.) also divided the brain into two parts and described the two membranes which covers the brain, umm-e- Jafia and umm-e- Rageega. He also described that the matter of nerves and same as of brain but the difference is only that the brain is softer that nerves. IbneSina (Avicenna) discovered the cerebellar vermis which he named vermis and the caudate nucleus, which he named tailed nucleus or nucleus caudatus. These terms are still used in modern neuroanatomy and neurophysiology. Avicenna (Ibn-e Sina) broadly divides the brain into two parts, anterior and posterior. According to him anterior part of the brain is soft because of the sense organs, especially hearing and smell arise from it while the Posterior part of the brain is hard because of the majority of motor nerves and spinal cord arises from it. Ibn-e-Rushd (Averroes 1126-1198 A.D.) in his famous book KitabulKulliyat, described that the brain is covered by two membranes outer one is thick and attached to the skull while the inner one is thin and attached to the brain termed as UmmeRaas (Mother of brain). IbnHubalBagdadi (1121-1213 A.D) described that the head is house and chamber of the brain and is placed higher in the body to easy visualization of eyes. This chamber is formed by bony case of frontal bone (Izam-ul-Jabahia), occipital bone (Izam-ul-Qamhuda) Parietal bone (Izam-ul-Qahaf) and sphenoid bone. The brain is divided into two parts, anterior and posterior and it contains three ventricles. Ventricle in the anterior lobe is biggest and is for the perception of sense. All three ventricles are interconnected with each other for the passage of psychic pneuma. Both parts of brain are different in texture, and are separated by some membranes and vessels. Beneath separating membrane there is a sinus known as muasserah in which blood drained from the vessels and after metabolism this accumulated blood is transformed into matter of brain. This sinus gives origin to two vessels and after ramification these vessels gives blood supply to the frontal ventricles and related structure. According to IbnQuf (1233-1286A.D.) - Brain is a white coloured organ having moist temperament. It is divided into two parts through mid-sagittal section, into three parts in transverse section called ventricles. First ventricle is softer than middle ventricle while the middle ventricle is softer than posterior ventricle. The brain gradually narrowed down to the spinal cord. From each half of the anterior ventricle, there are two nipples like

processarises to store the memory. In between of the anterior brain and posterior brain is a pathway which is called the vermis (*dooda*). Allama Nafees also says that, "The Major composition of brain is Nerve fibres, grey matter and white matter.

5. CONCLUSION

This paper enlighten the praiseworthy work done by unani physicians, who compiled their observations and research work about *Tashreeh-e Dimaghi* (brain anatomy) which is present in our ancient unani literature. The ancient unani literature became the base for today's advance Neuroanatomy. In today's world where everything is evidence based, unani physicians had already been mentioned about Tashreeh-e Dimaghion the basis of observations and evidences. According to this, unani physicians have achieved a big milestone in the field of Tashreeh-e Dimaghi. For example buqrat told us about the membrane of brain, and Aristotle described two membrane i.e. duramater (ummegalij) and pia mater (ummeraqiq). Herophilus discovered torcularherophilli and ventricular system and Galen (jalinoos) discovered corpus callosum, Pineal gland, choroid plexus, vermiform process, and Infundibulam. In Arab Period, Razi discovered recurrent laryngeal nerve and Ali Ibne Abbas Majoosi told pineal gland to be similar with Habb-e-Shanoverya (pine cone shaped). We hope that through this paper researchers will get enough information that will help and open door for further researches in Tashreeh-e Dimaghi and thus unani scholars will be benefited.

Conflict of interest

No any conflict of interest.

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