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Hepatic role in formation of humors and implication of humors on human body

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Abstract

Liver has been considered as one of the principal vital organs responsible for all metabolic functions in the body. It is the *uzw-e-rais* for *quwa-e-tabi'yah*. Liver play a very important role in formation of humors (*akhlat*). Humors are moist and fluid parts of the body which are produced after metabolism and transformation of food. Power of transformation and metabolism occurs in every parts of the body organs continuously to replaces the wear and tear (*badal ma yatahallul*) of the body which leads to production of humors and enhances the normal growth. Humors serve as nutritive function, growth and repair, production of energy and preservation of individuals. This review paper aims that importance of liver in formation of humors.

Keywords: Liver, humors, *quwa-e-tabi'yah*

Introduction

Liver is the chief organ of *Al-Quwa-al-Tabi'yah*. *Al-Quwa-al-Tabi'yah* are those powers which are responsible for ingestion, digestion, absorption, transformation, assimilation of food, excretion of waste materials and prevention of races^[1]. *Ibne Sina* classified *Quwat-e-Tabiyah* into *Quwat-e- Shakhshiyah* and *Quwat-e- Tanasuliyah*. The seat of *quwat-e-tabi'yah* is Liver^[2]. Major Functions of *Quwat-e-Tabiya* are *Quwwat-e- Taghziya* and *Quwwate Tanmiya*^[3]. Most part of blood is produced in the liver. According to Oxford English Dictionary, the word "Blood" originated before 12th century and it's derived from old English word *blōd*, which means blood. The concept of Humor (*akhlat*) has basic and central place in unani system of medicine. In Unani system of medicine, literal meaning of *Akhlat* (Humors) is "Admixture" which refers to body fluids^[4]. Hippocrates (460 B.C.) firstly postulated the humoral theory and defined as: "the body contains four major humors, i.e. *dam*, *balgham*, *safra* and *sauda*: a right proportion according to quality and quantity constitutes health and irregular distribution of these constitutes diseases."^[5, 13, 15]

Hepatic role in formation of Humors

A body-fluid or "humor" is that fluid moist body into which our aliment is transformed. Healthy, or "good " humor (whether present in the aliment in a pure state or admixed) is such as has the capacity for becoming transformed into actual body-substance, either by itself or in combination with something else. All the fluids of body are called as humor (*akhlat*)^[6]. *Ibn Sina* says: "Food is partially digested on account of mastication with the help of saliva. When food reaches the stomach and intestine, the primary digestion (*hazm mi'adi*) of certain food materials (especially proteins) takes place with the help of HCl. The food materials then transformed into liquid substance like barley water (*hassu*). When these liquid substances passes into the duodenum through the pylorus, further digestion of various materials (like proteins, fats and carbohydrates) with the help of bile and pancreatic juices. Finally the primary digestion (*hazm mi'adi*) is completed in small intestine with the help of intestinal juices and liquid material gets finer, thinner and transformed amino acid, fatty acid, glycerol and glucose in the form of chyle (*kaylus*; is a milky bodily fluid consisting of lymph and emulsified fats, or free fatty acids and is formed in the small intestine during digestion of fatty foods, and taken up by lymph vessels specifically known as lacteals). A lacteal is a lymphatic capillary that absorbs dietary fats in the villi of the small intestine.

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This chyle able to absorb from mesenteric vein then passes into portal vein (bab-al-kabid) and spread into branches of portal vein and finally goes to the liver. These chyle spread into the finer vessels (liver sinusoids), hence the entire vessels come in contact with the chyle." These thinner substance transformed into Humors, which goes to all organs. In many passages of the Canon it would seem that when "matter" is spoken of, in connection with disease, humor is often meant, and particularly a morbid humor. But it is also clear that behind the humour there is what Paracelsus would call an "essence," or "radical humour," which itself governs the nature of the humor and whether or not it is going to become morbid. On such a view health depends on the maintenance of the essential humour in a state of purity^[7].

Ibn Sina adopted the Galenic view and restricted the term akhlat to the fluids of blood vessels and says that, "from stomach the chyle is reaches to the liver where it is cooked and some substances are formed. One of these substances is foam like (raghwah) which is called as yellow bile (safra), the other one is black bile (sauda). The incompletely digested matter is called phlegm (balgham) and completely digested matter is called blood (dam).

Maseehi says that: "Food transformed in the body in three stages-

- a) First transformation occurs in stomach in which food is change into a thinner substance like barley water which goes to portal vein through mesenteric vessels and finally reaches to liver.
- b) Second transformation occurs in liver, in which extract of food materials which comes to liver further transforms and change into blood (humors).
- c) Finally blood goes to organs and transforms into essential components of organ and the waste materials which are not accepted by organs excreted through sweat and other morbid matters^[8].

In tibb it is considered that most part of the blood is produced in the liver such as plasma proteins and in the foetal life R.B.Cs. are also produced in the liver.

In Kitab-al-miat, Abu Sahl Maseehi says that; "Fluids which found in the vessels are called Humors." He says that; "Normal blood is that blood in which all the humors are in normal proportion in their quality and quantity." Maseehi also says that all the body fluids are included in humors^[8]. In the early weeks of embryonic life, primitive and nucleated red blood cells are produced in the yolk sac. During the middle trimester of gestation, the liver is the main organ for production of red blood cells, but reasonable numbers are also produced in the spleen and lymph nodes. During the last month or so of gestation and after birth, red blood cells are produced exclusively in the bone marrow.

Implication of humors on the body

Hemoglobin is main component of erythrocyte which serves as a vehicle for transportation of oxygen and carbon dioxide. It is composed of haem and globin. The haem part contains Iron and porphyrin (red pigment). 65% Iron in the body is bound with haemoglobin molecules and 30% of iron in the body is stored as ferritin or haemosiderin in the spleen, bone marrow and the liver. The hepatic cells contain large amounts of a protein called apoferritin, which is capable of combining reversibly with iron. Therefore, when iron is available in the body fluids in extra quantities, it combines with apoferritin to form ferritin and is stored in this form in the hepatic cells until needed elsewhere. Synthesis of hemoglobin begins in the

proerythroblasts and continues even into the reticulocyte stage of the red blood cells. First, succinyl-CoA, formed in the Krebs cycle, binds with glycine to form a pyrrole molecule. In turn, four pyrroles combine to form protoporphyrin IX, which then combines with iron to form the heme molecule. Finally, each heme molecule combines with a long polypeptide chain, a globin synthesized by ribosomes, forming a subunit of hemoglobin called a hemoglobin chain. The most common form of hemoglobin in the adult human being is hemoglobin A, with a combination of two alpha chains and two beta chains and a molecular weight of 64,458^[9].

The most important pathway for the metabolism and excretion of cholesterol in mammals is the formation of bile acids. The two major primary bile acids, cholic and chenodeoxycholic acids are formed in the liver and secreted in bile to the intestine.

Bile is secreted in two stages by the liver: (1) the initial portion is secreted by the principal functional cells of the liver, the hepatocytes; this initial secretion contains large amounts of bile acids, cholesterol, and other organic constituents. It is secreted into minute bile canaliculi that originate between the hepatic cells. (2) Next, the bile flows in the canaliculi toward the interlobular septa, where the canaliculi empty into terminal bile ducts and then into progressively larger ducts, finally reaching the hepatic duct and common bile duct. From these the bile either empties directly into the duodenum or is diverted for minutes up to several hours through the cystic duct into the gallbladder^[9].

Some bile are produced at the time of any emergency in the body and emotional states such as joy, grief, anger, heat and cold which are manifested by tachycardia, hypertension, increased respiration, increased metabolism and excessive heat production etc. All these sign and symptoms are produced by several chemical compounds viz. catecholamine (epinephrine, nor epinephrine and dopamine), acetylcholine and neurotransmitters. Epinephrine and nor epinephrine are secreted by medulla of supra renal gland and acetylcholine are produced at nerve endings, synapses and nerve ganglia. Both epinephrine and nor-epinephrine are produced by phlegm (balgham) i.e. tyrosine and phenylalanine (amino acid). Phenylalanine first converted into tyrosine in the liver. This tyrosine stored in the medulla of supra renal gland and gets converted into dopamine. This dopamine converted into nor-adrenaline (nor-epinephrine)^[5]. Melanin (the black pigment of skin and hair) is also derived from tyrosine^[11]. This melanin pigment is considered in unani classical books as khilt-e-sauda. As mentioned above, liver play a key role in conversion of phenyl alanine (phlegm) to tyrosine. The melanin in the skin is produced by melanocytes, which are found in the basal layer of the epidermis. Although, in general, human beings possess a similar concentration of melanocytes in their skin, the melanocytes in some individuals and ethnic groups produce variable amounts of melanin. Some humans have very little or no melanin synthesis in their bodies, a condition known as albinism^[10].

Conclusion

Liver is the uzv-e-rai (vital organ) for quwa-e-tabi'yah. It plays a very important role in formation of humors (akhlat). Most part of blood is produced in the liver. Chyle is a fluid consisting of a mixture of lymphatic fluid (lymph) and chylomicrons that has a milky appearance. Chylomicrons are small fat globules composed of protein and lipid (fat) which are combined in the lining of the intestine. Chylomicrons are found in the blood and in lymphatic fluid where they serve to

transport fat from its port of entry in the intestine to the liver and to adipose (fat) tissue^[12]. Second transformation occurs in liver, in which extract of food materials which comes to liver further transforms and change into blood (humors). Hippocrates states that this blood contains red (dam) colour constituents along with white (balgham), yellow (safra) and black (sauda) constituents and termed as Akhlat-e-arb'a^[14]. The normal proportion of these humors maintains health and any disturbance in the ratio of akhlat-e-arb'a leads to disease.

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