

CONCEPTS OF PANCHAMAHABHUT AT ELEMENTAL LEVEL

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Article Received on 07/06/2017

Article Revised on 28/06/2017

Article Accepted on 19/07/2017

ABSTRACT

Since human body is a part of this universe, whatever is available in the universe, those are also present in the human body. Ayurveda is a life science. It has many own principles, among them Panchamahabhut principle is base for Ayurveda, and it is accepted worldwide. It is seen that there is a strong similarity between the Panchamahabhut and components of the earth. Like Panchamahabhut earth also contains five components. I.e. atmosphere, hydrosphere, lithosphere, mantle and core. Prithvi mahabhut contains properties of all previous mahabhuta, similarly lithosphere interacts with other components of earth. On close observation it is seen that predominance of properties and action of Akash and Vayu mahabhut are seen in atmosphere, Jala in hydrosphere, Agni in mantle and core, Prithvi in lithosphere and Vayu makes motion in all strata of the earth. It shows similarity of panchamahabhut and earth. Till date total no. Of elements discovered are 112. Out of them, only 26 elements are responsible for cent percent constitution, physical structure, as well as chemical and biological functions of the human body. These 26 elements present in the earth as well as in the human body are classified into Panchamahabhut.

KEYWORDS: *Panchamahabhut, Element.***INTRODUCTION**

Day from the creation of world man was amazed by the duality of the earth, the nature surrounding us, day, night, sun, moon, heat and coldness, disease and health and of course death and life taught him to correlate the relation of this duality.

Ayurveda is a life science, and not only limited to India because it is science of life and life is everywhere in the world. Being a science, Ayurveda has its own basic principles. Among the basic principles Panchamahabhuta is the first accepted principle to analyze this world. Panchamahabhuta principle is the basic tool that is helpful in the analysis of other principles like Sapta dhatu Concept (Seven tissue system), Tridosha theory (Vata, Pitta and Kapha), and Mala concept.

Need of the study

Now a days Ayurveda is not able to accept scientifically at global level due to lack of parametric measurement. There was no any previous study to analyze and measure the Ayurvedic science at parametric levels. In the present study it is tried to establish some facts based on internationally accepted basic parameters that can be useful in the measurement and explanation of Ayurveda at present scenario.

Objectives of the proposed work

The main objectives of this study were to compare the composition, properties and functions of Panchamahabhuta especially of Prithvi, with elements of earth.

Statement of research problem

A study was undertaken to compare the concept of Panchamahabhuta, with special reference to Earth .

Scheme of the study

- Literary materials were collected regarding Panchamahabhuta, and earth.
- Comparison was done between Panchamahabhuta and components of earth.
- Elements of earth present in human body are classified into Panchamahabhuta.
- Structure, Properties and Functions of Panchamahabhuta are compared with Structure, Properties and Functions of elements of earth.

Lacuna of the study

- In the present study only physical signs and symptoms are considered for comparison but mental signs and symptoms are omitted.

- Abnormal properties and functions of dosha, dhatu and mala are not compared with abnormal properties and functions of elements of earth.
- Treatment portion is not included in the present study.

In this study it is tried to compare the composition, properties, and functions of Panchamahabhuta especially of Prithvi with elements of earth and in next section between the elements of earth and human body. Ayurveda as well as Modern science are considered as two arms and whatever common features were available, those are compared.

The concept of Panchamahabhuta is the most ancient tool to analyze this Universe. On the basis of such analysis, Indian scientists claimed that, this Universe is made out of five causative factors. They are Akasha, Vayu, Agni, Jala and Prithvi, and termed as Panchamahabhuta. These have specific properties and actions.

According to Charaka whatever is present in this universe is also present in the human body. A comparison of the signs of Panchamahabhuta in this universe, as well as inside the Human body, is explained as, Akasha of the universe as cause of vacuums in the body, Vayu as cause of movement, Agni as cause of temperature, Jala as cause of fluidity and Prithvi as cause of solidity. Among Panchamahabhuta Prithvi is the latest one in genesis. At first Akasha mahabhuta originated, from Akasha, Vayu mahabhuta, then Agni and Jala mahabhuta originated. Prithvi mahabhuta is latest one having qualities of all previous mahabhuta.

The immediate perceptible form of Prithvi i.e. form of solidity is earth. According to Modern science earth is made up of five parts like Atmosphere, Hydrosphere, Lithosphere, Mantle and Core. On close observation it is seen that predominance of properties and actions of Akasha and Vayu mahabhuta are seen in Atmosphere, Jala in Hydrosphere, Agni in Mantle and Core, Prithvi in Lithosphere, and Vayu makes motion in all strata of earth. On the basis of qualities and functions, Panchamahabhuta are compared with components of the earth.

Human body is one form of existence in this universe which contains earthly matter. Therefore, naturally all the elements present in earth are also present in human body in varied concentration.

Now a day the total number of elements discovered in earth is 112. Among these elements 26 are present in human body. Carbon, Hydrogen, Nitrogen and Oxygen constitute 96% of the human body weight. Eight elements like Sodium, Potassium, Calcium, Magnesium, Phosphorus, Sulphur, Chlorine and Iron constitute 3.8% of body weight and rest 0.2% of body weight having 14

elements, in trace amount. These 26 elements constitute 100% of human body weight.

The Panchamahabhuta is equivalent to 112 elements present in the earth but human body contains only 26 elements. Therefore Panchamahabhuta are equivalent to 26 elements at human being level.

Twenty six elements are included into three blocks in the long form of periodic table i.e. S block, P block, and d block. Five elements among 26 namely i.e. Hydrogen, Sodium, Potassium, Calcium and Magnesium are present in S block. In P block elements all together 13 elements are included viz. Boron, Aluminium, Carbon, Silicon, Tin, Nitrogen, Phosphorous, Oxygen, Sulphur, Selenium, Fluorine, Chlorine and Iodine. In d block, eight elements like Vanadium, Chromium, Manganese, Iron, Cobalt, Copper, Zinc and Molybdenum are included. The comparisons were done on seven basic parameters that are scientific and internationally accepted. These basic parameters are Atomic mass, Atomic size, Atomic volume, Melting point, Boiling point, Ionization energy and Electron affinity.

Basically these parameters are based on certain qualities like mass, and size (both qualities in Ayurveda explained as Guru and Laghu guna), force of attraction that is product of mass and gravity (expressed as Guru guna especially found in Prithvi and Jala mahabhuta).

In the centre of all above mentioned parameters is the force of attraction. It depends upon the mass of molecules and distance between the molecules called Newton's law of motion. The force is directly proportional to mass and inversely proportional to distance between the molecules or atoms expressed as $F = \frac{m_1 m_2}{r^2}$. Where m_1 = mass of an object, m_2 = mass of another object and r = distance between the objects. Another responsible force is gravitational force of attraction by which earth attracts any objects and expressed as $F = \frac{G M m}{r^2}$, called Newton's gravitational force of attraction. Where G is earth's gravitational constant, m is mass of objects, and M is mass of earth that is fixed. Value of G is known today.

The force which determines the attraction between the earth and other objects depend upon the mass of that Object and distance between the earth and the object. The gravitational force is directly proportional to mass and inversely proportional to distance between the earth and objects. Therefore all the basic parametric value is nothing except computation of some parameters like mass and size etc.

Ancient Indian scientists were not able to measure the structure, properties and functions of their principles quantitatively but able to measure the qualitative values in the form of comparative qualities like Guru - Laghu, Sheeta - Ushna etc. With the advancement of technology and science modern scientist measure the same

qualitative values in the form of numerical values at different basic parameters.

LITERARY REVIEW

1.1. Genesis of Panchamahabhuta

The Panchamahabhuta is a Sanskrit word composed of three words i.e. Pancha, Maha and Bhuta. The bhuta is derived from the word “*bhu*” means that having their own existence. The bhuta is not generated by others, but it causes the generation of mahabhuta. It is inherent character of mahabhuta. Mahabhuta cannot be generated without the help of bhuta. It is so minute that cannot be perceived by sense organ also. It is very minute and transformed from one person to other by the help of mana (mind).

So it is clear that bhuta can be considered as causative factor, eternal, very minute and not perceived by any sense organs but transferable from one form to another. It can be considered as quantum (unit of energy).^[1] It is knowledgeable by inference.

There are so many different theories of philosophy described, regarding the genesis of bhuta. Ayurveda accepts mainly Samkhya view, Vedant view and Nyaya Vaisheshika view.

1.2 Qualities of Panchamahabhuta^[9]

According to all Indian philosophy each and every object of the universe is composed of Panchamahabhuta. Just before the creation of universe all of these bhuta are in state of inactivity, but due to initiation of three inherent characters of Prakriti (nature) i.e. satva, raja and tama activities of these bhuta are started and the process of creation started. Since Prakriti is endowed with these gunas. Though all of these bhuta are embraced by trigunas, still each of them has predominance and diminution of trigunas there by making these of different qualities and actions. The ultimate cause of creation is Avyakta. Avyakta has three gunas like satva, raja and tama. So all mahabhuta also have these qualities in different proportion as shown below.

Table 6: Showing predominant quality in Panchamahabhuta.

Mahabhuta	Predominant Quality
Akasha	Satva
Vayu	Raja
Agni	Satva + Raja
Jala	Satva + Tama
Prithvi	Tama

There are two forms of bhuta. These are subtle and gross. The subtle form of bhuta is the purest form of bhuta and contains particular special quality,^[10] as described below.

Table 7: Showing special quality in Panchamahabhuta.

Mahabhuta	Special quality
Akasha	Shabda
Vayu	Sparsha
Agni	Rupa
Jala	Rasa
Prithvi	Gandha

In addition to natural qualities bhuta possess the quality of their preceding bhuta, due to admixture of the bhas to one another called Bhutantara Pravesha^[11] in which Akasha mahabhuta contains only one natural quality of sound and further Vayu possess the quality of Akasha i.e. sound also in addition to its natural quality touch. In the similar way, Agni possesses the qualities of preceding bhuta, and finally Prithvi possess the quality of all of the four preceding bhuta's as shown below.

Table 8: Showing intermixing of guna in Panchamahabhuta.

Mahabhuta	Character
Akasha	Shabda
Vayu	Shabda+Sparsha
Agni	Shabda+Sparsha+Rupa
Jala	Shabda +Sparsha+Rupa+Rasa
Prithvi	Shabda+Sparsha+Rupa+Rasa+Gandha

By studying the qualities of various Panchabhautic substances, it can be inferred that the number of qualities increases from Akasha to Prithvi as mentioned below:

Akashiya	:	5 qualities
Vayaviya	:	6 qualities
Agneya	:	6 qualities
Jaliya	:	7 qualities
Parthiva	:	9 qualities

So such increase of qualities shows that bhuta gets intermixed with one another in successive order of their origin. Besides these qualities, Sushruta also described gurvadi qualities exhibited in Panchabhautic substance. These qualities are mentioned below.^[12]

The Special quality of earth is smell. Mahabhutas have their special qualities.^[13] These special qualities are given below.

Table 9: Showing Panchamahabhuta and their special quality.

Mahabhuta	Special Qualities
Akasha	Laghu
Vayu	Ruksha
Agni	Teekshna
Jala	Snigdha
Prithvi	Guru.

Mahabhutas have their own physical properties^[14] also. These physical properties are given below.

Table 10: Showing Panchamahabhuta and their physical quality.

Mahabhuta	Physical properties
Akasha	<i>Aprtighata</i> (free from friction)
Vayu	<i>Chalatva</i> (Motion)
Agni	<i>Ushnatva</i> (Heat and Temperature)
Jala	<i>Dravatva</i> (Liquidity)
Prithvi	<i>Kharatva</i> (Hardness)

Acharya Susruta mentioned some extra qualities in mahabhutas. These extra qualities are mentioned below.

- Akasha : Expansive and Porous.
- Agni : Rough.
- Jala : Moist, Heavy & Dense.
- Prithvi : Clearness.
- Vayu : Same as Charaka.

1.3 Functions of Panchamahabhuta^[15]

Akasha

- *Mardava* : Softness
- *Soushirya* : Porousness/sponginess
- *Laghava* : Lightness

Vayu

- *Roukshya* : Roughness
- *Glani* : Tiredness of sense organ
- *Vichara* : Movement
- *Vaishadya* : Ungreasiness
- *Laghuta* : Lightness
- *Vyuhana* : Holding in proper position

Agni

- *Daha* : Burning
- *Paka* : Digestion
- *Prabha* : Lusture
- *Prakasha* : Illumination
- *Varna* : Complexion
- *Tapan* : Warmth
- *Dharana* : Support

Jala

- *Upakleda* : Moisture
- *Snehabandha* : Viscidity
- *Vishyandana* : Liquefaction
- *Mardava* : Softness
- *Prahlada* : Refreshness
- *Sanghanana* : Cohesion

Prithvi

- *Upachaya* : Growth
- *Sanghata* : Compactness
- *Gourava* : Heaviness
- *Sthairya* : Steadiness
- *Bala* : Resistance
- *Dharana* : Retention

Charaka also described the contribution of each Panchamahabhuta^[24] in human being described below.

Parthiva Bhava

All the sthula, sthira, murtiman, guru, khara, and hard part of the body are made up of Prithvi mahabhuta. Nakh, asthi, danta, mamsa, twacha, pureesha, hair, shamasru, loma, kandra and all the smell and nasika are contribution of Prithvi bhava.

Jaliya Bhava

The quality such as drava, sara, manda, snigdha, mridu, picchila, are contribution of Jala mahabhuta. Rasa, Rakta, Vasa, Kapha, Pitta, mutra and Sweda are made up of predominantly Jaliya bhava.

Tejasa Bhava

The ushma present inside the body is contributed by Agni mahabhuta. The *pitta*, *ushma*, *prabha*, *rupa* and *netra* are contributed by Agni bhava mainly.

Vataja Bhava

Uchawasa, *nihswasha*, *unmesha*, *nimesa*, *akunchan*, *prasaran*, *Preenan*, *dharan* etc. are functions contributed by Vayu mahabhuta. Specially *sparsha* and *sparshan* indriya are contribution of Vataja bhava.

Akashiya Bhava

The pores of the body are contributions of Akasha mahabhuta. All the srotas, shabda and karma are contribution of Akashiya bhava.

All parts of the body are contributed by Panchamahabhuta. Two more components like *Budhi* and *Mana* are contribution of Atmaja bhava. So the human body is considered to be made up of six dhatu. Six dhatu means Panchamahabhuta and Atma.

Agni is considered as moola (root) of the body.²⁸ Acharya Charaka explained that after the cessation of the function of Agni, the individual dies. When Agni function properly, the individuals survive, remaining healthy and becomes diseased when the same is disturbed.

Comparison

Panchamahabhuta and Earth - Structural level

The immediate perceptible form of Prithvi i.e. form of solidity is earth. Since Prithvi contains all the properties and functions of preceding mahabhuta, Earth should possess all the properties and functions of all mahabhuta. According to Modern Science, Earth is made up of five parts like Atmosphere, Hydrosphere, Lithosphere, Mantle and Core. So the qualities of five parts of the earth and five parts of Prithvi (Akasha, Vayu, Agni, Jala and Prithvi) should be comparative. The layers present in Prithvi and earth can be compared as shown in table N0.39.

Table 39: Showing comparative layers in Prithvi and Earth.

Comparative components present in Prithvi and Earth		
S.N.	Layers in Prithvi	Layers in Earth
1.	Akasha	Atmosphere
2.	Vayu	Makes motion in all layers
3.	Agni	Mantle and core
4.	Jala	Hydrosphere
5.	Prithvi	Lithosphere

According to one view of Ayurveda Prithvi mahabhuta has the qualities of all previous mahabhuta and finally contains five components. Similarly in earth i.e. perceptible form of Prithvi also contains five components as shown in above table. All the layers present in earth and Prithvi basically have almost similar structures, properties and functions.

Panchamahabhuta and Earth - Property level

The genesis order of Panchamahabhuta is that, at first Akasha is originated, after that Vayu, Agni, Jala and Prithvi respectively. After Akasha mahabhuta, each succeeding mahabhuta contained the quality of preceding mahabhuta. So Prithvi, the latest one has the quality of all the four preceding mahabhuta.

Earth and Human body - Structural level

The Human body is one form of existence in this Universe, which contains the earthly matter. So, naturally all the elements present in earth will be present in varied quantity in human body. The total no. of elements present in earth is 112. Among these only 26 elements are present in human body. Twenty six elements present in earth are responsible for the structure of the human body.

Structural components of Earth and Human body at elemental level**Table 50: Showing Structural components of earth and human body at elemental level.**

S.N.	Elements	Symbol	Atomic weight.	Approximate % in Earth crust	Approximate % in Human body
1.	Oxygen	O	8	46.6	65
2.	Hydrogen	H	1	14	9.5
3.	Carbon	C	6	0.03	18.5
4.	Nitrogen	N	7	Trace	3.3
5.	Calcium	Ca	20	3.6	1.5
6.	Sodium	Na	11	2.8	0.2
7.	Potassium	K	19	2.6	0.04
8.	Magnesium	Mg	20	2.1	0.1
9.	Phosphorous	P	15	0.07	1
10.	Sulphur	S	16	0.03	0.3
11.	Chlorine	Cl	17	0.01	0.02
12.	Iron	Fe	26	5	0.005
13.	Silicon	Si	14	27.7	Trace
14.	Aluminum	Al	13	6.5	Trace
15.	Manganese	Mn	25	0.1	Trace
16.	Fluorine	F	9	0.07	Trace
17.	Tin	Sn	50	Trace	Trace
18.	Vanadium	V	23	0.01	Trace
19.	Chromium	Cr	24	0.01	Trace
20.	Copper	Cu	29	0.01	Trace
21.	Boron	B	5	Trace	Trace
22.	Cobalt	Co	27	Trace	Trace
23.	Zinc	Zn	30	Trace	Trace
24.	Selenium	Se	34	Trace	Trace
25.	Molybdenum	Mo	42	Trace	Trace
26.	Iodine	I	53	Trace	Trace

These 26 elements are members in the periodic table, and they belong to S - block, P - block and d - block. Block wise distribution of elements are mentioned below.

S - block elements**Table 51: Showing S- block elements and their concentration in human body.**

Group – I	Group – II
Hydrogen - 9.5%	-
Sodium - 0.2	Calcium - 1.5
Potassium - 0.04	Magnesium - 0.1

P - block elements**Table 52: Showing P block elements and their concentration in human body.**

Group - III	Group - IV	Group - V	Group - VI	Group - VII
Boron - Trace	Carbon -18.5%	Nitrogen -3.3%	Oxygen - 65%	Fluorine – Trace
Aluminum-Trace	Silicon – Trace	Phosphorous-1%	Sulfur - 0.3%	Chlorine - 0.2%
-	Tin – Trace	-	Selenium -Trace	Iodine - Trace

d - block elements**Table 53: Showing d block elements and their concentration in human body.**

V b	VI b	VII b	VIII	VIII	I b	II b
V-Trace	Cr - Trace	Mn- Trace	Fe - 0.005	Co - Trace	Cu - Trace	Zn - Trace
-	Mo- Trace	-	-	-	-	-

These elements are arranged in periodic table following some periodic law. These elements in periodic table are shown in figure No. 4.

Periodic Table of the Elements

Legend:

- hydrogen
- alkali metals
- alkali earth metals
- transition metals
- poor metals
- nonmetals
- noble gases
- rare earth metals

The periodic table shows elements from Hydrogen (1) to Oganesson (118), with the f-block elements (lanthanides and actinides) shown below the main table.

Periodic laws are based on some basic parameters. The basic parameters that are useful in the present study are mentioned below.

1. Atomic mass
2. Atomic size
3. Atomic volume
4. Melting point
5. Boiling point
6. Ionization energy
7. Electron affinity

The different values of above mentioned parameters (Atomic Size, Atomic Volume, Melting Point, Boiling Point, Ionization Energy and Electron Affinity) for 26 elements present in the human body are shown in table No.47.

Figure 4: Showing Long form Periodic Table of the Elements.**Table 54: Showing basic parametric values of elements present in human body.**

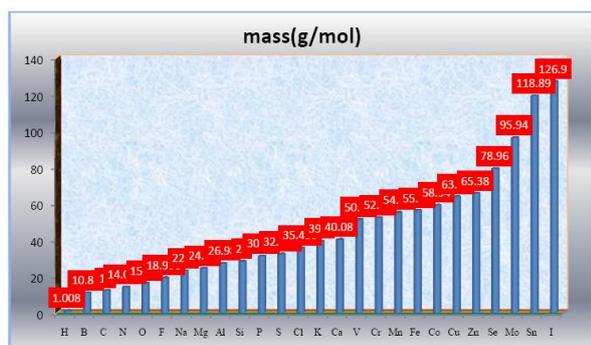
S.N.	Elements	Mass g/mol	Atomic radius A ⁰	Molar volume cm ³ /mol	M.P. °C	B.P. °C	I.P. KJ/mol	EA. KJ/mol
1	Hydrogen	1.008	0.74		14.01	-252.62	1312	72.8
2	Boron	10.81	0.82	4.62	2030	2550	800	83
3	Carbon	12.00	0.77	3.4	3727	4833	1086	122.3
4	Nitrogen	14.00	0.75	17.3	-210	-195.8	1402	00
5	Oxygen	15.99	0.73	14	-218.8	-183	1313.7	140.9
6	Fluorine	18.99	0.72	17.1	-218.6	188.16	1680.8	328.6
7	Sodium	22.9	1.54	23.68	97.8	883	495.2	52.8
8	Magnesium	24.31	1.36	19.97	650	1107	737	00
9	Aluminum	26.98	1.18	10	659	2450	577	50.2
10	Silicon	28	1.11	11.4	1410	2680	786	133.6
11	Phosphorous	30.97	1.06	17	44.1	280	1012	74.3
12	sulphur	32.064	1.09	15.5	114	444.6	999.4	200.7
13	Chlorine	35.45	0.99	18.7	-101	-34.6	1255.5	348.5
14	Potassium	39.1	1.96	45.36	64	756	418.7	48.4
15	Calcium	40.08	1.74	25.96	838	1440	590	2.37
16	Vanadium	50.95	1.22	8.35	1900	3450	650.2	50.6
17	Chromium	52.01	1.17	7.23	1875	2665	652.3	64.3
18	Manganese	54.94	1.17	7.3	1245	2150	716.3	00
19	Iron	55.98	1.16	7.1	1536	3000	762.3	15.7
20	Cobalt	58.94	1.16	6.7	1495	2900	758.1	63.7

21	Copper	63.54	1.17	7.1	1083	2595	744.7	118.4
22	Zinc	65.38	1.25	9.2	419.5	906	906.7	00
23	Selenium	78.96	1.16	16.5	217	685	940.9	195
24	Molybdenum	95.94	1.39	9.4	2610	5560	694.5	71.9
25	Tin	118.89	1.41	16.3	231.8	2270	708	107
26	Iodine	126	1.33	25.7	113.9	185.2	1008	295.5

The graphical representation of above mentioned seven parameters are mentioned below.

1. Atomic mass

The Atomic mass of elements in periodic table increases from top to bottom in group and left to right in period. The graphical representation of increasing order of mass of elements is shown below.



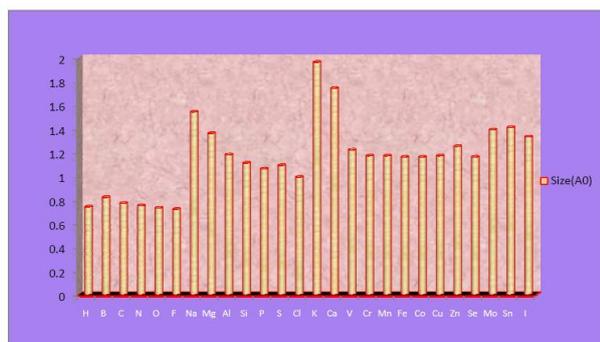
Graph 1: Showing ascending order of mass of elements present in human body.

The above chart shows the relation between Atomic mass and 26 elements present in human body. On Y axis Atomic mass and on X axis symbol of elements are taken.

Among 26 elements shown in above chart Iodine has maximum Atomic mass i.e. 126.9 g/mol and Hydrogen has minimum mass i.e. 1.008 g/mol.

2. Atomic size

The atomic size of elements generally increases from top to bottom in group and decreases from left to right in period. The graphical representations of size of elements are shown as.

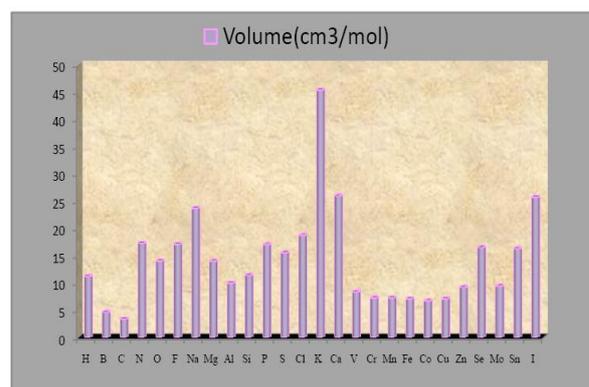


Graph 2: Showing size of elements present in human body.

The above chart shows the relation between Atomic size and 26 elements present in human body. On Y axis Atomic size and on X axis symbol of elements are taken. Among elements Potassium has maximum Atomic size i.e. 1.96 A⁰. Fluorine has minimum size i.e. 0.72 A⁰

3. Atomic volume

The atomic volume of elements increases from top to bottom in group and decreases from left to right in period. The graphical representation of volume of elements is shown as

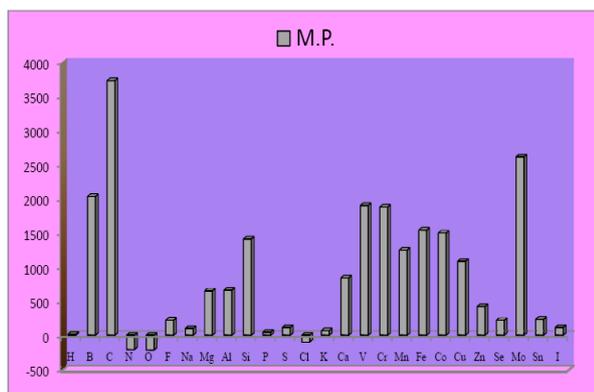


Graph 3: Showing Volume of elements present in human body.

The above chart shows the relation between volume and 26 elements present in human body. On Y axis volume and on X axis symbol of elements are taken. Among elements Potassium has maximum volume i.e. 45.36 cm³/mol. Carbon has minimum volume i.e. 3.4 cm³/mol.

4. Melting point

The melting point of a substance is the temperature at which the solid form of the substance changes to a liquid or from liquid to solid. It decreases from top to bottom in group and increases from left to right in period. Melting point is a measurement of force of attraction and depends upon size. The graphical representation of melting point of elements is shown in graph No.

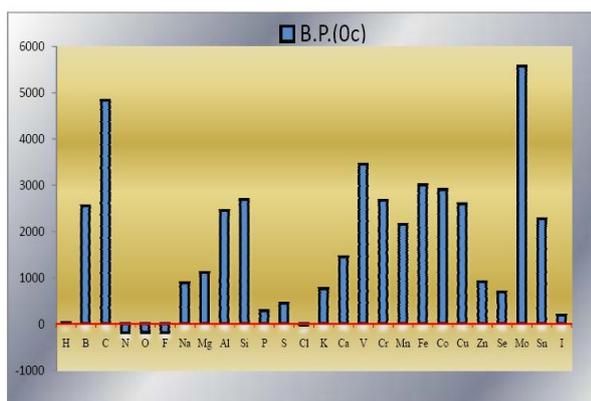


Graph 4: Showing Melting point of elements present in human body.

The above chart shows the relation between Melting points and 26 elements present in human body. On Y axis melting points and on X axis symbol of elements are taken. Among elements Carbon has maximum melting points i.e. 3727°C. Nitrogen has minimum melting points i.e. -218.8°C

5. Boiling point

Boiling point of a substance is the temperature at which the liquid form of the substance changes to a gas. The boiling point is sensitive to changes in pressure. It decreases from top to bottom in group and increases from left to right in period. It depends upon size, larger the size lowers the boiling point and smaller the size higher the boiling point.



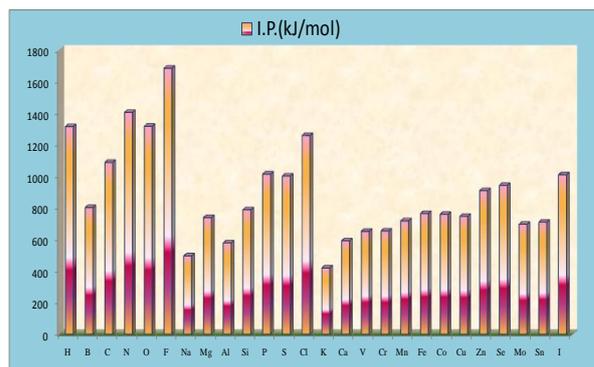
Graph 5: Showing Boiling point of elements present in human body.

The above chart shows the relation between Boiling points and 26 elements present in human body. On Y axis Boiling points and on X axis symbol of elements are taken. Among elements Molybdenum has maximum Boiling points i.e. 5560°C. Hydrogen has minimum Boiling points i.e. -252.62°C.

6. Ionization energy

Ionization energy of element generally decreases from top to bottom in group and increases from left to right in period. It can be explained as, moving down the group the atomic size increases, so

force of attraction decreases. In period atomic size decreases, so force of attraction increases and I.P. also increases. It is indirect measurement of force of attraction between the nucleus and electrons.

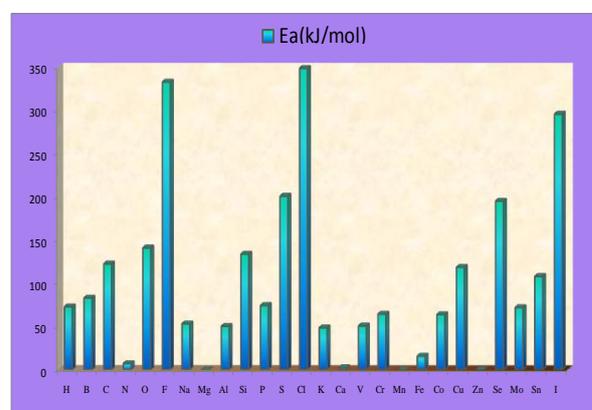


Graph 6: Showing Ionization energy of elements present in human body.

The above chart shows the relation between Ionization energy and 26 elements present in human body. On Y axis Ionization energy and on X axis symbol of elements are taken. Among elements Fluorine has maximum Ionization energy i.e. 1680 KJ/mol. Hydrogen has minimum Ionization energy i.e. 418.7 KJ/mol.

7. Electron affinity

Electron affinity of element generally decreases from top to bottom in group and increases from left to right in period. This can be explained as moving down the group, the atomic size increases, so effective nuclear attraction for the electron decreases. On moving across period atomic size decreases hence force of attraction exerted by the nucleus on the electron increases. Electron affinity does not depend upon size only but also depends upon electronic configuration. Thus, if an atom has fully filled or exactly half – filled orbitals, its electron affinity would be practically zero.



Graph 7: Showing Electron affinity of elements present in human body.

The above chart shows the relation between Electron affinity and 26 elements present in human body. On Y axis Electron affinity and on X axis symbol of elements are taken. Among elements Chlorine has maximum

Electron affinity i.e. 1680.8 KJ/mol. Minimum for Nitrogen, Magnesium, Manganese and Zinc i.e. zero.

DISCUSSION

According to Ayurveda all materials and non materials substances are made up of Panchamahabhuta. Ayurveda emphasizes that whatever is present in the universe or macrocosm, is also present in the individual body. Hence basic component of man and universe are same. Material and nonmaterial, two components are necessary for creation of universe. These are known as Panchamahabhuta. These are five in numbers i.e. Prithvi, Jala, Agni, Vayu and Akasha. These Panchamahabhuta by permutation and combination are able to produce innumerable creature of this universe including men.

Nonmaterial or Omni substances are three i.e. Satva, Raja, and Tama. These are also known as Trigunas. Satva means consciousness or knowledge, Rajas means motion or action and Tama means inertia, and resist others two.

The genesis order of Panchamahabhuta is that, at first Akasha is originated, after that Vayu, Agni, Jala and Prithvi respectively. After Akasha mahabhuta, each succeeding mahabhuta contained the quality of preceding mahabhuta. Hence Prithvi the latest one has the quality of all the four preceding mahabhutas.

According to modern science our earth is made up of five components i.e. atmosphere, hydrosphere, lithosphere mantle and core. Predominance of Akasha and Vayu are present in atmosphere, jala in hydrosphere, Agni in mantle and core and prithvi i.e., form of solidity in lithosphere. Vayu also contributes motion in all strata of earth. There is also interaction of lithosphere with other component of earth. When lithosphere interacts with air is called atmosphere, when interacts with water is called hydrosphere, and lithosphere even interacts with mantle and core. Likewise lithosphere (solid part of earth) is having the quality of other components of the Earth, Prithvi mahabhuta (heaviest among panchamahabhuta) is also having quality of other mahabhutas. Therefore structurally, Panchamahabhuta can be considered as having the similarity with components of earth.

Prithvi mahabhuta contains the qualities of all previous mahabhuta like Akasha, Vayu, Agni and Jala. Lithosphere of earth is having similar properties of Prithvi as mentioned in table No.43. Prithvi is hardest one among panchamahabhuta. Similarly lithosphere is hardest part in earth. Prithvi mahabhuta having qualities to incorporate with other mahabhutas, in the similar way lithosphere can interact with other layers of earth. All these forces work together to create our living world. Therefore Prithvi mahabhuta can be compared with lithosphere.

Earth and Human body - Structural level

The total number of elements present in earth is 112 and only 26 are present in human body. These 26 elements are members of periodic table in three blocks i.e. S-block, P-block, and d-block. The name of elements and their concentration are mentioned in table No.51, 52, and 53. The essential periodic properties of these elements are also mentioned in table No.54. These basic parameters are Mass, Volume, Size, Melting Point, Boiling Point, ionization energy and Electron Affinity.

SUMMARY

Literary aspects were collected regarding the ancient Indian view of Panchamahabhuta. Further an attempt was made to find out the different views regarding the genesis of Panchamahabhuta, qualities of Panchamahabhuta, functions of Panchamahabhuta, manifestation of Panchamahabhuta. Comparison were done between the Panchamahabhuta and elements of earth. Basic idea behind this comparison is that Prithvi mahabhuta contains the qualities of previous mahabhuta and whatever is present in Prithvi mahabhuta is also present in human body as explained by Charaka *Yavanto hi loke tavanto hi purushe*. On close observation it is clear that the most perceptible form of Prithvi i.e. form of solidity is earth. The earth contains 112 elements. Among these elements, only 26 elements are present in human body.

Some basic parameters are selected for the scientific and internationally acceptance of the study. These parameters are Atomic mass, Atomic volume, Atomic radius, Melting point, Boiling point, Ionization energy and Electron affinity. The basic comparative properties and functions of Panchamahabhuta and 26 elements are explained on above mentioned parameters.

There is strong relation between the concepts of Panchamahabhuta and earth. The Prithvi mahabhuta latest one in the genesis of mahabhuta has similarity with the components of earth. There are five components of earth. These are Atmosphere, Hydrosphere, Lithosphere, Mantle and Core. Components of earth like Atmosphere, Hydrosphere, Lithosphere, Mantle and Core are having similarity with Akasha, Vayu, Jala, Prithvi and Agni mahabhuta respectively.

The compositions, properties and functions of components of earth are like, Atmosphere having similarity with Akasha and Vayu mahabhuta, Hydrosphere having similarity with the properties and functions of Jala mahabhuta, Lithosphere having similarity with the properties and functions of Prithvi mahabhuta, Mantle and Core having similarity with the properties and functions of Agni mahabhuta.

The earth contains 112 elements. Out of these 26 elements are present in human body in various concentrations. The 26 elements are responsible for structures and functions of the human body. Among 26

elements, only four like Carbon, Hydrogen, Oxygen and Nitrogen constitute 96% of human body weight. Eight elements like Sodium, Potassium, Calcium, Magnesium, Phosphorus, Sulphur, Chlorine and Iron constitute 3.8% of body weight. While fourteen elements present in trace amount constitute rest 0.2% of human body weight. Therefore according to Modern science only these 26 elements provide structural, properties and functional aspects of the body.

CONCLUSION

- ❖ The concept of Panchamahabhuta is proved to be highly scientific.
- ❖ The Prithvi mahabhuta having qualities of preceding mahabhuta is closely related to components of earth
- ❖ Atmosphere is closely related to *Vayu* and *Akasha* mahabhuta
- ❖ Hydrosphere is closely related to *Jala* mahabhuta
- ❖ Mantle and Core are having similarity with *Agni* mahabhuta
- ❖ Lithosphere is similar to *Prithvi* mahabhuta
- ❖ *Vayu* mahabhuta are present in all strata of earth
- ❖ The Human body is made up of Panchamahabhuta
- ❖ Panchamahabhuta is equivalent to 26 elements present in the earth and the human body
- ❖ Potassium is dominated in *Akasha* mahabhuta
- ❖ Sodium, Calcium, Magnesium and Iodine are present in *Vayu* mahabhuta
- ❖ Nine elements like Vanadium, Chromium, Manganese, Iron, Cobalt, Copper, Zinc, Molybdenum and Hydrogen are present in *Agni* mahabhuta
- ❖ Oxygen, Nitrogen, Fluorine, Chlorine are mainly present in *Jala* mahabhuta
- ❖ Boron, Aluminium, Carbon, Silicon, Phosphorous, Sulphur, Selenium, and Tin are present in *Prithvi* mahabhuta.

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