

## ASSESSMENT OF PHOSPHORUS IN ASTHISARA AND ANYASARA INDIVIDUAL – A SURVEY STUDY

Manjusha Sonpipare<sup>1</sup>, Madhuri Jaiswal Koche<sup>2</sup>

<sup>1</sup>BAMS, MD., Professor; <sup>2</sup>BAMS, MD, Associate Professor,  
Rajiv Lochan Ayurved Medical College, Chandkhuri, Durg, Chhattisgarh, India

Email: [manjushasonpipare@yahoo.com](mailto:manjushasonpipare@yahoo.com)

### ABSTRACT

*Dhatus* are structural element of the body. They sustain the body by giving structural strength. This stability mainly provides by the *Asthidhatu*. This function of *Asthidhatu* is excellent in *Asthisara* individual. Thus *Dhatusaratah* is defined as an excellent function of the *Dhatus*. This excellent function is shown by some special features in the *Asthisara* individuals. According to modern science toughness of bones is maintained by combined formula of Calcium and Phosphorus. Phosphorus is essential for ossification and resorption of bones. It plays an important role in maintaining sufficient metastability of ECF to sustain adequate mineralization of bone. According to this function of Phosphorus, it can be established as *Asthiposhakansh*. In *Asthisara* individuals this function of Phosphorus must be excellent. Deficiency of Phosphorus is the cause of Osteomalacia in adults and Rickets in children. Strong and Robust bones are the main features of *Asthisara*. In *Asthisara* values of Phosphorus must be excellent. To assess this function of Phosphorus one survey is conducted to compare the values of Phosphorus in *Asthisara* and *Anysara* individuals.

**Keywords:** *Dhatusaratah*, Composition of Bones, Phosphorus and its functions.

### INTRODUCTION

Ayurved physiology is based on study of *Doshas*, *Dhatus* and *Malas*. *Doshas* are functional element of the body. *Dhatus* maintain structure of the body and helps to sustain the body. *Mala* excreted impure, toxic substances of the body formed by the me-

tabolism and makes body pure. Thus *Dosha*, *Dhatu*, *Mala* are the roots of the body<sup>9</sup>. Normally they maintain the body functions and keeps body healthy. In their abnormal form body functions get disturbed and person become unhealthy<sup>10,11</sup>. So, it is neces-

sary to keep them in normal form. To keep *Dosha, Dhatu, Mala* in normal form *Ayurveda* describes *Dincharya* and *Ritucharya*<sup>12</sup>. To examine their normal functions *Ayurved* also describes some *parikshas*<sup>13</sup> like *Prakritipariksaan, Saratahpariksaan*. Now a day, to understand Ayurvedic physiology the knowledge for bio-chemistry and bio-physics is necessary as per modern medical science.

#### ***Dhatusaratah:***

*Dhatus* are those elements of the body which gives structural stability to the body<sup>1,2</sup>. They are seven in numbers, *Rasa, Rakta, Mansa, Meda, Asthi, Majja* and *Shukra*<sup>14,15</sup>. The excellence of their functions is known as *Dhatusarah*<sup>7</sup>. So, *Dhatusarah* offers certain kind of specific physical and mental strength to the persons. By the appearance of the person, some may get confused that person having a large sized body is strong and person having small sized body is weak. But, some people having a small sized body are seen to be strong. They are like ants that have a small body but can carry too heavy load<sup>16</sup>. Thus, one should examine the individual with references in *Ayurveda* of the excellent *Dhatus*. Examination of *Sara* indicates the actual *Bala* of the person. *Asthidhatu* forms skeleton of the body and gives support. The Excellency of the function of *AsthiDhatu* is known as its *Sarata* and the person know as *Asthisara* and characterized by robust heels, ankles, knees, forearms, collar bones, chin, head, joints, bones, nails and teeth. Such persons are very enthusiastic, active and endowed with strong and firm bodies as well as longevity<sup>17,18</sup>.

#### **Formation of *AsthiDhatu:***

*Asthidhatu* is formed by *Medodhatu* with the influence of *Prithvi, Agni* and *VayuMahabhuta*. *Prithvi, Agni* and *Vayu* give hardness and roughness to *Medodhatu* which is after getting hard known as *Asthidhatu*<sup>19-21</sup>.

According to modern aspects formation of bones starts in the fetal stage and completed upto the age of 25 yrs.

#### **Modern aspects of bone:**

Bone is specialized tough connective tissue forms the skeleton of the body. Bones gives support to the body and protects the vital organs and soft tissues. Also helps in homeostasis of calcium and phosphate metabolism.

#### **Composition of bones:**

Bones composed of a collagenous framework impregnated with bone salts -consists of one third organic bone matrix and two third minerals (inorganic).

Water – 25% and solids – 75%. Solids having 30% organic and 45% inorganic components. Bone salts constitute the inorganic component of bone which is combined form of calcium and phosphate in the form of hydroxyapatite crystals  $[Ca_{10}(PO_4)_6(OH)_2]$ . This compound also contents in small quantity of other salts such as sodium, potassium, magnesium and carbonate. The bone salts strengthen the bone matrix.

#### **Phosphorus, one of the main components of bones:**

##### **Sources:**

- Inorganic sources: As salts in milk, muscles and vegetables.
- Organic sources: Nucleo protein – in all cell nuclei

Phosphoprotein – Milk, egg, etc.  
Phospholipids – Brain, liver, yolk of eggs, etc.  
Phosphagen and ATP – in all muscles.

### **Distribution of Phosphorus<sup>22</sup>:**

An adult body contains about 1Kg phosphate which is distributed as:

Bones and teeth – 80% in combination with calcium.

Muscles and blood – 10% in association with protein, carbohydrates and lipids.

Chemical compound – 10% widely distributed in body.

### **Blood Phosphorus:**

1. **Inorganic phosphate** – distributed equally between plasma corpuscles.

Normal values: 2.5 to 4.5mg/100ml (Avg 3mg/100ml).

2. **Organic phosphate**—larger quantities in the form of phospholipids and also as ester phosphorus (Glycerophosphatase) are found in the red cells. Blood contains phosphates enzyme which hydrolyse ester phosphates into inorganic phosphate chiefly in the red cells.

Calcium / Inorganic phosphorus ratio in blood is on the average 2:1. Anything that raises calcium lowers phosphate and vice versa. Their products remain constant.

### **Absorption of Phosphorus:**

Phosphorus is absorbed from the upper part of small intestines (especially in the jejunum) chiefly in the form of inorganic phosphate. Organic phosphates are believed to be converted into inorganic forms before absorption.

### **Metabolism of Phosphorus:**

Almost all the inorganic phosphate is diffusible, only 12% being protein bound. All the diffusible phosphate not gets ionized. Some

of them bound to calcium and magnesium. That's why true plasma concentration of inorganic phosphate ions is uncertain. At a normal blood pH, 85% of the ionized inorganic phosphate is present as  $\text{HPO}_4^{2-}$  and 15% as  $\text{H}_2\text{PO}_4^-$

As phosphorus is present in all animal and plant cells, dietary deficiency never recurs in man. Phosphorus depletion may occur as a result of renal tubular disorders and very rarely in patients who consume excessive quantities of aluminium hydroxides, as an antacid which binds phosphate in the gut.

### **Excretion of Phosphorus<sup>26</sup>:**

1. Faecal excretion includes 300mg of phosphate which is not absorbed.

2. Urinary excretion: About 7000 mg phosphorus is filtered by kidney per day. 90% of the filtered phosphate is reabsorbed. Thus, in healthy adult about 700mg is excreted in urine.

### **Functions of Phosphorus:**

1. Essential constituent of all cells, for instance, nucleoproteins in the nuclei and phospholipids in the element content of the cells. In these forms they play an essential role in the functions of the cells.
2. Essential for the formation of bones and teeth.
3. Phosphoric acid compounds, such as ATP, phosphagen, hexose phosphate, etc, take an essential role in the chemical changes in muscular contraction.
4. Phosphorylation of lipids, glucose.
5. Take parts in blood clotting- Kephalin (Cephalin) is a phospholipid, which initiates blood clotting.
6. Regulate hydrogen ion concentration of cells, blood and urine. In the blood, an acidic and alkaline phosphate acts as

buffers. In the urine the relative proportion of these salts are responsible for the reaction of the urine. Inside the cells there is also phosphates buffer system which regulates intercellular reaction.

7. Helps in the enzymatic function of Vitamin B complex. Thiamine, riboflavin, nicotinic acid, etc act as coenzymes in combination with phosphoric acid.
8. Other metabolic functions: Phosphate ions play a critical role in maintaining an adequate ion solubility product and thereby maintaining sufficient metastability of external cellular fluid to sustain adequate mineralization of bone. An adequate level of blood phosphate may be essential to provide inorganic phosphate for enzymatic coupling of phosphate to element in the organic matrix of bone, as an essential step in the initiation of ossification. Phosphate ion may also play a role in bone resorption.

#### **Effects of deficiency:**

Deficiency of phosphorus causes Rickets in children and Osteomalacia in adults. Phosphate deficiency is one of the most common forms of osteomalacia. Hypophosphatasia is a recessive disorder with deficiency of alkaline phosphate in tissues and serum, which interfere with calcification of osteoid tissue. In renal tubular dysfunction, low serum phosphate is due to reduced renal tubular reabsorption of phosphate.

#### **Hypophosphatemia may be due to:**

- Decreased intake – In starvation, malabsorption, vomiting.
- Increased cell uptake – High dietary carbohydrate and in liver disease.
- Increased excretion – In the treatment of diuretics, hypomagnesaemia.

#### **Hyperphosphatemia may be due to:**

- Haemolysis, prolonged contact of plasma with RBCs, about 7-8hrs.
- Increased intake – Increased VitD in diet
- Increased release from cells – In DM, acidaemia, starvation.
- Increased release from bones – In malignancy, Renal failure.
- Decreased excretion – In renal failure, hypoparathyroidism, increased GH.

#### **Material and method:**

Phosphorus is the main component of the bones. It is essential for bone formation. Adequate volume of blood phosphate is essential to provide inorganic phosphate for enzymatic coupling of phosphate to element in the organic matrix of bone, as an essential step in the initiation of ossification. Phosphate ion may also play role in bone resorption. In this survey tried to evaluate the volume of Phosphorus in *Asthisara* individuals comparing with the *Anyasara* individuals. By this survey it may be established that Inorganic phosphate, act as an *Asthiposhakansh*, which is significant in *Asthisara* individual.

**Name of method:** Method of Kuttner and Lichtenstein [Kuttner and Lichtenstein, 1930, Shinowara, Jones and Reinhart, 1942]

#### **Inclusion criteria:**

- Healthy persons having age group of 27 to 37 selected randomly from different places.
- Persons having weight between 55Kg to 80Kg.

#### **Exclusion criteria:**

- Persons having critical disease as well as diseases not related to bones and joints.

**Steps of survey:**

- **1<sup>st</sup> step** – Selection of 50 healthy individuals having age group between 27 to 37 and having weight between 55 to 80 Kg.
- **2<sup>nd</sup> step** – Determination of *Sara* of the selected individuals with the help *Sara pariksanaproforma* which is according to references in *Ayurvedic* texts.
- **3<sup>rd</sup> step** – Formation of two groups from the selected individuals.30 individuals are selected as *Asthisara* and 20 persons selected as *Anyasara*.
- **4<sup>th</sup> step** – Determination of Serum Inorganic Phosphate in both the groups by the mentioned method.

- **5<sup>th</sup> step** – Assessment of phosphate level in both groups by the statistical data.

**Observations:**

50 Healthy persons having age between 27 and 37 of different regions were selected for this survey. Average weight of these individuals was in the range of 55Kg to 80Kg. By *Sara Pariksan* proforma *Dhatusaratah* is detected and two groups are made as *Asthisara* and *Anyasara*. Level of Serum Inorganic Phosphate is measured by the above mentioned method and the result found is as follow:

**Table 1:** Volumes of Inorganic Phosphate in *Asthisara* and *Anyasara* individuals:

Statistical Parameters	<i>Asthisara</i>	<i>Anyasara</i>
n	30	20
$\bar{x}$	4.575	3.2045
SD	0.6402	0.8577

**Table 2:** Statistical analysis of Serum Inorganic Phosphate level in *Asthisara* and *Anyasara* individuals:

Asthisara (n <sub>1</sub> )	Anyasara (n <sub>2</sub> )	Statistical comparison
n <sub>1</sub>	+ n <sub>2</sub>	30 + 20
$\bar{x}_1$	- $\bar{x}_2$	1.3705
CSD		0.7340
SE		0.2119
t		6.4677
P		<0.001

**DISCUSSION**

Development of bone begins from mesoderm in the embryonic stage (from sixth week) and a good number of bones of the body continue to grow until a person reaches about 25<sup>th</sup> year<sup>27</sup>. After the age of 45 persons may get age related difficulties. Age be-

tween 30 to 35 having mental and physical stability. For this research work 50 healthy persons between the age of 27 to 37 having weight 55 to 80Kg been selected for the *Sara Pariksan*. Bones are mainly composed of proteins and minerals. Minerals are calcium, phosphorus.

Calcium is found in compound form with phosphorus in bones. This compound gives bones toughness.

In *Asthisara* persons function of *Asthidhatu* is excellent than *Anyasara*. Bones and joints are long and robust in *Asthisara* persons. Surely the *Asthiposhakansh* in *Asthisara* persons is excellent or in good volume.

For the assessment of Phosphorus in *Asthisara* persons as *Asthiposhakansh* one survey is done. For this survey two groups are selected as *Asthisara* and *Anyasara* by *Sara Pariksana*. Volume of Serum inorganic phosphate is measured by Kuttner and Lichtenstein method in these groups.

By analyzing statistical data of volume of serum inorganic phosphate in *Asthisara* and *Anyasara* one result is found that serum inorganic phosphate is determinant in *Asthisara* individuals than *Anyasara* individuals. So, we can say that phosphorus may act as *Asthiposhakansh* and is excellent in *Asthisara* individuals.

## CONCLUSION

1. By the above data analysis, it shows *Asthisara* and *Anyasara* are different groups.
2. Serum inorganic phosphate is found significantly higher in *Asthisara* persons as compared to *Anyasara* persons.
3. Serum inorganic phosphate may be established as *Asthiposhakansh*.

## REFERENCES

1. Shastri A, Susruta Samhita, Reprint, Varanasi, Chaukhamba Sanskrit Sansthan, 2007, Sutrasthan 14/20, page no 52.
2. Mishr B, Bhavprakash, Reprint, Varanasi, Chaukhamba Sanskrit Bhavan, 2012, Purvakhand 3/133, Page no 43.

3. Tripathi B, AstangHriday, Reprint, Delhi, Chaukhamba Sanskrit Pratisthan, 2003, Sutrasthan 11/4, Page no
4. Shastri A, Susruta Samhita Reprint, Varanasi, Chaukhamba Sanskrit Bhavan, 2012, Sutrasthan 4/5, Page no 15.
5. Srivastav S, Sharangdharsamhita, Reprint, Varanasi, ChaukhambaOrientalia, 2009, Purvakhand5/38, Page no 42.
6. Shastri A, Susruta Samhita, Reprint, Varanasi, Chaukhamba Sanskrit Sansthan, 2007, Sutrasthan 15/3, Page no 56.
7. Kushvaha H, Charak Samhita, 1<sup>st</sup> edition, Varanasi, ChaukhambaOrientalia, 2005, Vimansthan 8/102, Page no 691.
8. Kushvaha H, 1<sup>st</sup> edition, Varanasi, ChaukhambaOrientalia, 2005, Vimansthan 8/107, Page no 691.
9. Shastri A, Susruta Samhita, Reprint, Varanasi, Chaukhamba Sanskrit Sansthan, 2007, Sutrasthan 15/3, Page no 15.
10. Shastri A, Susruta Samhita, Reprint, Varanasi, Chaukhamba Sanskrit Sansthan, 2007, Sutrasthan 15/48, Page no 64.
11. Hemraj S, Kashyap Samhita, 10<sup>th</sup> edition, Varanasi, Chaukhamba Sanskrit Sansthan, 2005, Khilsthan 2/63-64, Page no 239.
12. Rama Rao B, AstangHriday, Revised edition, Varanasi, ChaukhambaVishvabharati, sutasthan chapter 2 and 3, 2017.
13. Kushvaha H, Charak Samhita, 1<sup>st</sup> edition, Varanasi, Chaukhamba Orientalia, 2005, Sutrasthan 11/17, Page no 161.
14. Tripathi B, AstangHriday, Reprint, Delhi, Chaukhamba Sanskrit Pratisthan, 2003, Sutrasthan 1/13, Page no
15. Shastri A, SusrutaSamhita, Reprint, Varanasi, Chaukhamba Sanskrit Sansthan, 2007, Sutrasthan 15/48, Page no 692.
16. Kushvaha H, Charak Samhita, 1<sup>st</sup> edition, Varanasi, ChaukhambaOrientalia, 2005, Vimansthan 8/115, Page no 692.
17. Kushvaha H, Charak Samhita, 1<sup>st</sup> edition, Varanasi, ChaukhambaOrientalia, 2005, Vimansthan 8/107, Page no 691.
18. Shastri A, SusrutaSamhita, Reprint, Varanasi, Chaukhamba Sanskrit Sansthan, 2007, Sutrasthan 35/16, Page no 132.

19. Tripathi B, AstangHriday, Reprint, Delhi, Chaukhamba Sanskrit Pratisthan, 2003, Sharirsthan 3/62, Page no 377.
  20. Kushvaha H, Charak Samhita, 1<sup>st</sup> edition, Varanasi, ChaukhambaOrientalia, 2005, Chikitsasthan 15/30, Page no 386.
  21. Shastri A, SusrutaSamhita, Reprint, Varanasi, Chaukhamba Sanskrit Sansthan, 2007, Sutrasthan 14/10, Page no 49.
  22. Khurana I, T.B. of Medical Physiology, Reprint edition, Elsevier, Noida, 2009, Page no 728.
  23. Jain A K, T.B. of Physiology II, Avichal Publishing Company, Sirmour, Reprint edition, 2013, Page 727.
  24. Guyton and Hall, T.B. of Medical Physiology, Indian Reprint, 2003, Elsevier, New Delhi, Page no 901.
  25. Varley H, Practical Clinical of Biochemistry, 4<sup>th</sup> edition, Heinemann Medical, 1967.
  26. Khurana I, T.B. of Medical Physiology, Reprint edition, Elsevier, Noida, 2009, Page no.730.
  27. Chaterjee C C, Human Physiology 1, 11<sup>th</sup> edition-Reprint, 1987, Medical Allied Agency, Calcutta, Page no.44.
- 

**Source of Support: Nil**

**Conflict Of Interest: None Declared**

How to cite this URL: Manjusha Sonpipare & Madhuri Jaiswal Koche: Assessment Of Phosphorus In Asthisara And Anyasara Individual – A Survey Study. International Ayurvedic Medical Journal {online} 2018 {cited February, 2018} Available from: [http://www.iamj.in/posts/images/upload/267\\_273.pdf](http://www.iamj.in/posts/images/upload/267_273.pdf)