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COVER PAGE PHOTOGRAPHY: DR. HARI VENKATESH K R,
PLANT ID – FRUITS OF DANTI – BALIOSPERMUM SOLANIFOLIUM (BURM.) SURESH* 
OF THE FAMILY EUPHORBIACEAE
PLACE – KOPPA, CHIKKAMAGALUR DISTRICT,
KARNATAKA, INDIA
*BOTANICAL NAME VALIDATED FROM www.theplantlist.org AS ON 10/04/2015
A STUDY OF VARIOUS MARKET SAMPLES OF SPIKENARD (NARDOSTACHYS JATAMANSI DC.) WITH SPECIAL REFERENCE TO ITS PHARMACOGNOSTIC & PHYTOCHEMICAL ASPECTS.

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ABSTRACT

Spikenard has been mentioned in Ayurveda since the period of Atharva Veda. It is the rhizome of Nardostachys jatamansi DC. belongs to Family Valerianaceae. Its demand in market increases with about 8.7 % of average growth rate. Spikenard being endangered and included in negative listed drug; the export of its rhizome or other derivatives and extracts obtained from the wild is banned. Again commercial cultivation of Spikenard has not been observed yet. So the farmers and other collectors directly sold it after collecting from forest to the local traders. Mere absence of commercial cultivation, continuous extraction from natural resources by untrained / unskilled persons, high therapeutic demands are being directly or indirectly damaging the plant’s habitat and harvested even before its maturity time. Further these factors responsible to increase market cost, induce the practice of substitution and adulteration with other species. Such types of raw materials are less aromatic or some time devoid of volatile oil and essential chemical constituents and when used as medicine it does not show the desired effects. Therefore a study had been conducted on different market samples of Spikenard; where it was analyzed on basis of Pharmacognostic & Phytochemical parameters in search of a genuine drug.

KEY WORDS: Spikenard, Indian-nard, Market Sample, Pharmacognostical study & Phytochemical study.

Cite this article:

INTRODUCTION:

In Atharva Veda and other Ayurvedic texts described Spikenard to be an useful drug in mental problems, insomnia and restoring consciousness. Botanical identity of this species is Nardostachys Jatamansi DC & Family Valerianaceae. Its useful part is rhizome. It contains nardol, nardostachanol, nardostachone, actinidine, carotene, calarene, jatamol A & B, jatamanic acid, jatamansone, jatmansinol, jatamansin, valaerana, valeranone, viroline and caumarins etc. It also contains oil, resin, camphor and gum. Rhizome is bitter, astringent, cooling, acrid aromatic, antiseptics, carminatives, tranquilizer, sedative, antihypertensive, anti-convulsant, intellect promoting and analgesic. (Billore K.V. 2005; Chopra R.N, 1958; Dey Depali et al., 1990; Kokate C.K., 2007; Rastogi R.P., 1970–1979).

In India it is distributed in Alpine Himalayas from Kumaon to Punjab, Himachal Pradesh, Uttar Pradesh, Sikkim and Arunachal Pradesh. It is usually found in rocky slopes of Tangankhain, Mangiban and in Kullu districts of Himachal Pradesh. It is also available in Bhutan, Nepal, Myanmar and South West China. (Billore K.V, 2005; Dey Depali et al., 1990; Kokate C.K., 2007)

It is a perennial aromatic herb; harvested after maturation during September and October to achieve higher quantity of active principles. The harvesting period for this species is 3–4 Years. The harvested roots are washed, shade dried and stored in dry and cool place (Billore K.V, 2005; Dey Depali et al., 1990). Rhizomes of Spikenard and its extracts are banned to export. But it is only allowed to export in its prepared formulations (Billore K.V., 2005). Yet now significant commercial cultivation of Spikenard has not been observed (Dey Depali et al., 1990). Insignificant commercial cultivation along with the declined natural resources, increased therapeutic applications create an imbalance in between the demand and supply of Spikenard. This prepared a platform for intentional practice of substitution and adulteration. Therefore this study was undertaken.

Characteristic of Spikenard:-

Dried samples of Spikenard are the rootstocks consisting of underground rhizomes & above the ground fibrous parts. These fibrous parts are the network of venation of old & dried leaf bases. Fibers are dark brown in color & form several layers of loose interconnected network system surrounding the innermost leaf bases. Rhizomes are brown, uneven with a scaly outer bark & slightly woody inside measuring 8–12 mm in diameter & the samples are strongly aromatic, acrid and bitter in taste (Dey Depali et al., 1990; Kokate C.K., 2007).

Substitution & Adulteration:-

Spikenard is substituted by roots of following drugs; like:- Valeriana officinalis C.B.Clarke, Cymbopogon schoenanthus Spreng & Nymphoides macrosernum Linn etc. in Indian drug market; (Billore K.V. 2005, Dey Depali et al., 1990).


MATERIALS & METHODS:-

As per the sampling procedure of crude drug i.e. QUARTERING PROCEDURE for raw drug collection (Khandelwal K.R., 2012) four different market samples of Spikenard were purchased from the markets of Vadodara, Delhi, Belgaum & Kolkata. These four samples were named as Sample –A, Sample –B, Sample –C & Sample –D respectively. All the samples were evaluated in Department of Pharmacognosy, Goa College of Pharmacy, Panaji, Goa, India with five detailed evaluation methods i.e,

1. Morphological or Organoleptic evaluation.
2. Common identification test.
3. Chemical Evaluation (Preliminary Phytochemical study for organic constituent’s
a. Qualitative Chemical Examination b. Quantitative Chemical Examination.

RESULTS & DISCUSSION:

Raw material samples of Spikenard purchased from four different markets were having variations in their physical appearances and market price. The sample purchased from Delhi (Sample – B) satisfied all the physical constant values / standards of Ayurvedic Pharmacopoeia of India. The details of the observations have been presented below.

1. Organoleptic characteristics (Table 1):

The organoleptic characters of Spikenard were analyzed on basis of criteria i.e. Physical appearances, Color, Smell & Taste etc (Dey Depali et al., 1990).

Table 1: Organoleptic Examination:-

<table>
<thead>
<tr>
<th>Character</th>
<th>Sample-A</th>
<th>Sample-B</th>
<th>Sample-C</th>
<th>Sample-D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical appearances</td>
<td>Rhizomes are cylindrical, fibers present on the leaf bases.</td>
<td>Rhizomes are elongated and cylindrical covered with reddish brown fibers forming a network on rhizomes.</td>
<td>Rhizomes are elongated crowned with reddish brown tufted fibers.</td>
<td>Rhizomes are cylindrical, grayish brown fibers present in it.</td>
</tr>
</tbody>
</table>

Table 2: Result of common identification test of all samples.

<table>
<thead>
<tr>
<th>Test</th>
<th>Sample-A</th>
<th>Sample-B</th>
<th>Sample-C</th>
<th>Sample-D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powder mixed with water and shaken thoroughly, settled at the bottom of the flask.</td>
<td>Slightly tinted solution</td>
<td>Slightly tinted solution.</td>
<td>Tinted solution</td>
<td>Deeply tinted solution</td>
</tr>
<tr>
<td>On addition of 5% KOH solution on powder, it settles at the bottom and gives brown color.</td>
<td>Light brown solution</td>
<td>Brown solution</td>
<td>Light brown solution</td>
<td>Dark brown solution</td>
</tr>
<tr>
<td>Powder mixed with 5% H₂SO₄ solution, most of the powder settled at the bottom, small quantity floats on the surface.</td>
<td>Deep Straw colored solution</td>
<td>Light Straw colored solution</td>
<td>Deep Straw colored solution</td>
<td>Light Straw colored solution</td>
</tr>
<tr>
<td>80 % of alcoholic extract of drug shows fluorescence under ultraviolet light gives color.</td>
<td>Grayish white</td>
<td>Bluish white</td>
<td>Light white</td>
<td>Bluish white</td>
</tr>
</tbody>
</table>
Macroscopic or Organoleptic observations:-

Physical appearances:

Rhizomes were elongated covered with reddish brown fibers forming a network on rhizomes observed in Sample B & C. Rhizomes were cylindrical and grayish brown fibers were present in Sample D where as cylindrical fibers present on rhizome at the remaining of leaf bases of Sample A.

Color:

Sample A & D were having light grey color rhizomes where as Sample B & C were dark gray color.

Smell:

Sample A & D were aromatic in smell while Sample C was comparatively less aromatic. The Sample B was strongly aromatic and highly agreeable.

Taste:

Sample A & C were bitter, acrid where as Sample B & D were slightly bitter and acrid.

2. Common identification tests:-

Drug samples were dried to remove the excess moisture and grounded to powder. Powder was dark brown fibrous and with sweet aromatic odor.

1. Drug powder was mixed with water and shaken thoroughly, after some hours it settles at the bottom by giving slightly tinted solution, on heating produces aroma of essential oil.

2. Powdered drug when mixed with 5% KOH solution, powder settled at the bottom by giving a brown color solution.

3. On mixing powder drug with 5% H₂SO₄ solution, most of the powder settled at the bottom and a small quantity floated on surface giving light colored solution.

4. About 2 g of the powder was shaken with 5 ml of alcohol (80 %) for 10 minutes and filtered. Placing 1 drop of filtrate on filter paper, dry and examined under ultraviolet light, a bright bluish-white florescence was seen (Dey Depali et al., 1990; Handa S.S, 2000). The overall results obtained on testing the samples have been tabulated in Table 2.

Common identification test:-

Slightly tinted solution was obtained when powder was mixed with water and shaken thoroughly and also settlement at the bottom of the flask. Brown solution was obtained on addition of 5% KOH solution on powder & also it settled at the bottom. Light straw colored solution was obtained when powder was mixed with 5% H₂SO₄ with settling of most of the powder at the bottom & small quantity floated on the surface. This was observed in Sample B &C. 80 % of alcoholic extract of drug shows bluish white color fluorescence under ultraviolet light in Sample B & D, where as Sample C & A shown light bluish white and grayish white color respectively. These all observations were made on Sample B which indicates maximum purity in comparison to other tested samples.

3. Physico-chemical analysis:-

In Physical constant analysis quantitative standards were determined (Khandelwal K.R, 2012; Kokate C.K., 1994; Anonymous, 1996; Dey Depali et al., 1990; Gokhale S.B et al., 2008).

Foreign matter should not be more than 5% as per the Ayurvedic Pharmacopoeial standard. Sample- B had 5.6 % of foreign matter which was very close to this standard limit. In place, the other three samples were having much higher percentage i.e., Sample A, C & D were respectively 13%, 8.9% & 11.2 %.

Percentage of moisture content should not be more than 5% as per the Ayurvedic Pharmacopoeial standard. Sample B had less percentage of moisture content (i.e. 14.2 %) which was comparatively less than the other samples (Table. 3).
Table 3: Physico-Chemical Analysis

<table>
<thead>
<tr>
<th>Name of the Test</th>
<th>Sample-A</th>
<th>Sample-B</th>
<th>Sample-C</th>
<th>Sample-D</th>
<th>Standard Pharmacopoeia Value (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign matter</td>
<td>13</td>
<td>5.6</td>
<td>8.9</td>
<td>11.2</td>
<td>NMT 5%</td>
</tr>
<tr>
<td>Total % of moisture</td>
<td>15.35</td>
<td>14.2</td>
<td>16.8</td>
<td>17.25</td>
<td>NMT 5%</td>
</tr>
<tr>
<td>Total ash value</td>
<td>23.9</td>
<td>10.6</td>
<td>15</td>
<td>21</td>
<td>NMT 9%</td>
</tr>
<tr>
<td>Acid insoluble ash value</td>
<td>10</td>
<td>5.3</td>
<td>7</td>
<td>8.1</td>
<td>NMT 5%</td>
</tr>
<tr>
<td>Water soluble ash value</td>
<td>0.9</td>
<td>2.1</td>
<td>1.8</td>
<td>1.4</td>
<td>-</td>
</tr>
<tr>
<td>Water soluble extract value</td>
<td>4.1</td>
<td>7.1</td>
<td>8</td>
<td>6.6</td>
<td>NLT 5%</td>
</tr>
<tr>
<td>Alcohol soluble extractive value</td>
<td>3.8</td>
<td>5.2</td>
<td>4.6</td>
<td>4.3</td>
<td>NLT 2%</td>
</tr>
<tr>
<td>Total % of volatile oil w/v</td>
<td>2.25</td>
<td>2.90</td>
<td>1.25</td>
<td>1.55</td>
<td>NLT 0.1%</td>
</tr>
<tr>
<td>Specific gravity of aqueous extractive value</td>
<td>0.825</td>
<td>1.028</td>
<td>0.780</td>
<td>0.660</td>
<td>-</td>
</tr>
<tr>
<td>pH of aqueous extractive value</td>
<td>6.5</td>
<td>7.6</td>
<td>7.1</td>
<td>8.9</td>
<td>-</td>
</tr>
<tr>
<td>Total % of resin</td>
<td>1.2</td>
<td>2.3</td>
<td>1.8</td>
<td>1.5</td>
<td>-</td>
</tr>
</tbody>
</table>

The total ash value should not be more than 9 % w/w as per the Ayurvedic pharmacopoeial standard. The obtained value in sample B was 10.6 % w/w which is nearly close to this standard pharmacopeial limit. This value of total ash was much higher in other three samples. The standard pharmacopeial limit for Acid insoluble ash is not more than 5 %. The result obtained in Sample B i.e 5.3 % is nearly closer to this reference value than others. Water soluble ash values were higher in Sample B & C i.e, 2.1 % & 1.8 % in comparison to others. Value of water soluble extract were higher in Sample C, B & D i.e 8 %, 7.1 % & 6.6 % which were more than the standard pharmacopeial limit i.e, not less than 5%. Alcohol soluble extract value was higher in Sample B i.e 5.2 %; Values in other three samples were also above to the standard pharmacopeial limit i.e, not less than 2 %. Standard pharmacopeial limit of volatile oil is not less than 0.1 %. All the four samples had the value as per the reference. But the Sample B was higher in percentage than the other three i.e., 2.90 %. Specific gravity of aqueous extractive value was higher in Sample B i.e, 1.028 %.

pH of aqueous extractive value were higher in Sample B & D i.e, 7.6% & 8.9 %. Total % of resin was higher in Sample B i.e. 2.3 % in comparison to others. These show the maximum genuinity of Sample B which was procured from Delhi.

4. Preliminary Phytochemical Study:-

In Physical constant analysis b. Qualitative chemical tests were also done for aqueous extracts to analyze & identification of the phyto-constituents present in it (Khandelwal K.R., 2012; Kokate C.K., 1994; Anonymous, 1996; Dey Depali et al., 1990; Gokhale S.B et al., 2008). The results obtained on screening for preliminary phytochemicals have been tabulated in Table 4.
Table 4: Preliminary Phytochemical Study

<table>
<thead>
<tr>
<th>Tests</th>
<th>Sample-A</th>
<th>Sample-B</th>
<th>Sample-C</th>
<th>Sample-D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbohydrates (Molish’s test)</td>
<td>Negative</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Reducing test (Fehling’s test)</td>
<td>Negative</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Reducing test (Benedict’s test)</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Tannic test for starch</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Proteins (Biuret test)</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Proteins (Million’s test)</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Steroids (Liebermann-Burchard’s reaction)</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>(Steroids Salkowski) reaction</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Alkaloids (Dragendorff’s test)</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Alkaloids (Mayer’s test)</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Tannin and phenolic compounds (FeCl3)</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Tannin &amp; phenolic compounds(lead acetate)</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Fat</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Glycosides (Legal’s test)</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Glycosides (Liebermann-Burchard’ test)</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Flavonoids (Shinoda test)</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Flavonoids (lead acetate solution)</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Saponin (Foam test)</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Saponin (Haemolytic test)</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Gum</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Mucilage (Ruthenium red solution)</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Mucilage (KOH)</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Volatile oil (Sudan III solution)</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Volatile oil (Tincture alkana)</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
</tr>
</tbody>
</table>

Positive result obtained in reducing sugar test (Benedict’s test) & test for Fat. Negative result observed in test for Steroids (Liebermann-Burchard’s reaction) / Salkowski reaction, Glycosides (Legal’s test) / (Liebermann-Burchard’ test), Flavonoids (Shinoda test) / (lead acetate solution), Saponin (Foam test) / (Haemolytic test) and test for Gum. Carbohydrates by Molish’s test shows negative result in both the samples of A & D. Test for reducing sugar (Fehling’s test) shows positive result for all three samples except Sample A. Except sample D positive result obtained in all three samples under Tannic test for starch, test for Proteins (Biuret test) / (Million’s test), test for Alkaloids (Dragendorff’s test) / (Mayer’s test), test for Tannin and phenolic compounds (with FeCl₃) / (with lead acetate), test for Mucilage (ruthenium red solution) / (KOH) and the test for Volatile oil (Sudan III solution)/ (tincture alkana). Based on the discussion, Sample B shows more genuinity.

5. Chemical Test For Detection Of In-Organic Constituents:-

Chemical tests for detection of inorganic matters were conducted with the following result. (Khandelwal K.R., 2012; Kokate C.K., 1994; Anonymous, 1996; Dey Depali et al., 1990; Gokhale S.B et al., 2008).
Table No-5: Chemical test for detection of in-organic constituent

<table>
<thead>
<tr>
<th>Tests</th>
<th>Sample-A</th>
<th>Sample-B</th>
<th>Sample-C</th>
<th>Sample-D</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
</tr>
<tr>
<td>Chloride</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Sulphate</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
<td>Negative</td>
</tr>
<tr>
<td>Calcium</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Magnesium</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Aluminium</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
</tr>
<tr>
<td>Sodium</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
<td>Positive</td>
</tr>
<tr>
<td>Potassium</td>
<td>Positive</td>
<td>Positive</td>
<td>Negative</td>
<td>Positive</td>
</tr>
</tbody>
</table>

Calcium, Magnesium & Sodium were present irrespective of all four samples. Chloride & Sulphate were absent in all four samples. Except sample C Iron & Potassium were present in other three samples. Aluminium was present in all three samples except sample D (Table 5). These discussions suggest presence of in-organic constituents in Sample B and A.

CONCLUSION:-

The following important conclusions were drawn from the above five different parameters. These were as below- From the organoleptic study Sample B & D were more nearer to the standard pharmacopoeial value comparing to other two samples i.e., Sample A & C. Again among the Sample B & D the prior one i.e, B had better standard with highly aromatic and agreeable. On common identification test Sample B & D were more nearer to the result of standard observation than other two Samples. But the overall observation indicates towards the better quality of Sample B than Sample D. On Physico-chemical analysis presence of foreign matter & total ash values in higher percentage in Sample A, C & D suggest their adulteration. Sample B have nearly standard acid insoluble ash value and higher percentage of alcohol soluble extractive-volatile oil and resin. In preliminary photochemical study Sample B & C were having more positive result than others. In chemical test Sample A & B were having more inorganic constituents. Considering above all it had concluded that the Sample B i.e, procured from Delhi was more genuine than others. This study gives clear evidence about the practices of adulteration in available market samples of Spikenard. Our motto is to cure the patient with confidence by the help of good quality medicines. But when such raw drugs used in medicinal formulations definitely it will have less potency to combat the disease. It may produce so many health problems. Further studies for adulteration can be confirmed by techniques like TLC, HPTLC etc.

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AN AYURVEDIC LOOM TOWARDS METABOLIC SYNDROME

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ABSTRACT

Ayurveda is widely regarded as the oldest form of healthcare in the world. It uses the inherent principles of nature and it helps to maintain the health of a person by keeping the individual’s body, mind and spirit in perfect harmony with nature. In present era of modernization and fast life everybody is busy and living stressful life. Consumption of fast food having high calories is also increasing day by day. We have the ocean of comfort with a drop of physical activity which results in rise in total body fat along with cholesterol, it invites disorder like hypertension, heart diseases, hyperlipidemia and truncal obesity which constitute Metabolic Syndrome. In Ayurveda similar clinical entity has been mentioned which could be roughly correlated to Medoroga and Sthaulya. By keeping in view the burning health problem of present and it’s associated dreadful complications. The latter have compelled research on Metabolic Syndrome and their Ayurvedic aetiopathogenesis with certain classic remedies. Consequently some latest researches and efforts are afoot for solving the same consequences of Metabolic Syndrome. The latest endeavor will pave the way for solution to the ever increasing attendant ill effects of Metabolic Syndrome.

KEYWORDS: Ayurveda, Metabolic syndrome, Sthaulya, Santarpanjanita vyadhi

Cite this article:

INTRODUCTION:

Although the Metabolic Syndrome has only been recognized since 1988 this looming threat to Indian’s health has already been known by several names – syndrome x, the insulin resistance syndrome (Liese A. D, Mater Davis E. J, Haffner S. M et al., 19980) and the deadly quartet. When we call it a syndrome, we mean that there is a cluster of problems running together. This also indicates that the problems should not be treated in isolation; they need a comprehensive approach. Obesity is the fundamental factor in the Metabolic Syndrome, and the rapid increase in our girth accounts for the rapid emergence of the syndrome. Since over weight is becoming the major problem for many Indians, even among young adults it’s easy to see that the metabolic syndrome is on the rise. In India more than 35% of the adult Indian population falls in the Metabolic Syndrome category (Bharat P.G et al., 2011). National health and nutritional examination survey (NHANES) 1999-2000, the age adjusted prevalence of the metabolic syndrome in US adults who did not have diabetes is 28% for men and 30% for women (Robert H. Eckel et al., 2012). Obesity is most common nutritional disorder in affluent society (Sharma H, Chandola HM et al., 2011). Obesity bears linear relationship to diabetes mellitus, hypertension, angina pectoris and myocardial infarction etc. through atherosclerosis (Cornier M. A et al., 2008).

More often than not obesity is the result of excessive dietary intake and lack of physical exercise. Acharya Charaka has quoted Sthaulya under the eight varieties of impediments which is designated as AstaNindititya Purusha (Charaka Sutra 23/26) (Jadavji TA, 2008); Ati-sthoola comprises one of them. Acharya Charaka also listed Sthaulya (obesity) under Santarpanajanita vyadhi (anabolic disorder) (Charaka Sutra 21/3) (Jadavji TA, 2008). He listed eight defects underlying Sthaulya purusha viz- Ayuhrasa (decrease lifespan), Javaprodha, Alpavyavayita (decrease sexual power), Daurbalya (weakness), Daurgandhya (foul smelling from body), Ati-sweda (excessive sweating), Ati-trishna (excessive thirst) and Ati-kshudha (increased appetite) (Charaka Sutra 21/4) (Jadavji TA, 2008). So as per Ayurveda, Sthaulya is a cluster of conditions and the Metabolic Syndrome described in modern literature is also a cluster of similar condition viz- Central obesity, overweight with adipose tissue accumulation mainly around the waist and trunk, high blood pressure, abnormal cholesterol level, impaired fasting glucose, insulin resistance, hyperuricemia, fatty liver progressing to non alcoholic fatty liver degeneration, poly cystic ovarian syndrome (in women) erectile dysfunction (in man) and acanthosis nigricans (Murray langmore et al., 2010).

PROBABLE AYURVEDIC CONCEPT OF METABOLIC SYNDROME:

These conditions arise by derangement in metabolism at various levels. According to Ayurveda, the food we eat (Vijateeya i.e. foreign materials) is to be converted in to the body (Sajateeya i.e. native materials) is the function of Agni. The main function of Agni (digestive fire), is to make a change in the matter, but it never produces matter (Byadgi P. S et al., 2011). If this Agni gets pacified or does not function properly, the process of transformation of a substance gets hindrance and the resulting condition is known as Ama (metabolic toxins). When Doshas, Dhatus and Malas get vitiated by Ama the condition known as Sama (amalgam of Ama with body tissue) and the disease evolved is called as Saama roga. Achary Charaka has explained that cluster of diseases develops due to Agnidosha (Charaka Chikitsa 13/9) (Jadavji TA, 2008). In Metabolic Syndrome we see that there is basically Agnimandya at various levels reflected by intermediary products formation and accumulation in the body. Although Agni is of 13 types, disturbance at one level may lead to dysfunction of others also. Acharya Vaghbatta also describe the Sapta Pachakamsha are the representative of Jatharagni and are responsible for proper Dhatu-poshana (Astanga Hridaya Sutra 11/34) (Bramhanand Tripathi, 2003).
The Person who is genetically predisposed (Beej Swabhavat) indulges in excessive intake of Guru (heavy in digestion), Madhura (sweet), Snigdha (unctuous), Kapha–medo Vardhaka Ahara (high caloric diet) and Vihara like Ayvyayam, Dwashayan (eg. sedentary life style) etc will get Kapha predominant Dosha Vridhi and Jathragnimandyata (pacify digestive fire). Jatharagni (digestive fire) when incorporate with Kapha Dosha for long period it will lead to Madhurtar Sama-anmara (free fatty acids) formation irrespective to any type of Rasa taken (Madhav Nidan 34/1-2) (Bramhanand Tripathi, 2005).

The Madhurtara Sama-anmara (essence) of all Dhatus but more of Medo poshakamsha / snehamsha, because these Poshakamsha are incorporated with Aama i.e. Sama-poshakamsha & they will further not get converted into Poshya Dhatu due to Dhatvagnimandhyata especially Medodhatwagnimandhyata. As Jatharagni (main digestive fire) is already Manda (weak) so it is unable to enrich Dhatvagni (tissue digestive fire).

So ultimately the flux of Sama-poshakamsha is running in the circulation but not finally gets converted in to their respective poshakadhatus. These Sama-poshakadhatus due to Picchila guna (sliminess) of Ama Dosha will deposit in various parts of the body which was not their real fate. This will lead to disruption in the normal physiology of that particular part and ultimately cluster of pathological conditions i.e. Metabolic Syndrome results. In Ayurveda, Acharya Charaka described term Dhamanipratichaya in Kaphanatmaja vikara (Charka Sutra 20/17) (Jadavji TA, 2008) is very similar to atherosclerosis the prime pathological event which leads to various pathological disorders like hypertension, coronary artery disease, cerebrovascular accident, peripheral vascular disease etc.

SAMPRAPTI GHATAKA (PATHOGENESIS):

Dosha-

| Samanya | Kapha predominant |
| Vishesha | Kledaka kapha |

Dushya - Medo dhatu & Rasa dhatu

Agni - Jatharagnimandyata & Medodhatwagnimandhyata

Srotasa - Rasavaha & Medovaha

Srotodushti Prakara - Sangatmakha

Adbhava sthana - Aamashaya

Prasara - Rasayani

Rogamarga - Bahya & Madhyama

Swabhava - Chirkari

MANAGEMENT OF METABOLIC SYNDROME WITH AYURVEDA:

Metabolic Syndrome can be managed effectively by following the Ayurvedic principles of treatment enumerated below

1. Nidana Parivarjana (avoidance of cause)  
2. Langhana (Fasting)  
3. Vyayama & Pranayama (physical & breathing exercise)
4. Kapha Medo nashaka Chikitsa/ Deepan Pachana Chikitsa (hypolipidaemic and digestive)
5. Shodhana Chikitsa (bio-purification)
6. Samshamana Chikitsa (drug therapy)
1. **Nidana Parivarjana** - Prevention is better than cure ‘an ounce of prevention in worth pound of cure’. Avoid all Kaphamedovardhaka Ahara like ghee, butter, curd, pizza, burger, rice, fried potato etc. Life style related disorder may be cured with therapeutic life style changes i.e. avoid day time sleep and not to sleep within 2 hr of meal, avoid prolonged sitting and avoid excessive alcohol intake.  

2. **Langhana** - A patient must take diet low in caloric with more minerals and vitamins and should eat less at dinner. Langhana will lead to Agni vridhhi and pacify the Kaphabhuistha Dosa vridhi (Charaka Sutra 22/9) (Jadavji TA, 2008).

3. **Vyayama & Pranayama** - Patient should adopt an active life style. Exercise is not solely concerned with burning excessive calories but is also the best way to combat mental stress (Charaka Sutra 7/32) (Jadavji TA, 2008). Many Pranayama & Yogasana explained in Hathayogapradeepika (Hathayogapradeepika on page 31) (Swami Sri Dwarika Dash Shastri, 2009), are very helpful in homeostasis of Dosha, Dhatu & Mala including revitalizing the many organ system. In Mayurasana there is a gentle massage of abdominal organs including liver which is considered as a seat of Bhutagni & Dhavagni. So in this way they improve Agni and may be more beneficial for these patients.

4. **Dipana, Pachana & Kapha-Medonashaka Chikitsa** - Doing Ama Pachana at various levels and improving the status of Agni will help in restoring the normal homeostasis. Katu & Tikta Rasa dravya also Lekhana dravya will correct Agnimandya and normalized the Agni both in Koshtha and Dhatu level.

5. **Shodhana Chikitsa** - Because there is Kapha Dosa predominantly takes part in pathogeneses (increase in quantity) the Vamana should be considered in all those patients who fit in the criteria.

6. **Samshaman Chikitsa** – Following drug formulations may be used in managing a patient of Metabolic Syndrome (Table 1).

### Table 1: Formulations in managing Metabolic syndrome

<table>
<thead>
<tr>
<th>Dosage Form</th>
<th>Dosage</th>
<th>Anupana</th>
<th>Formulations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ras/ Bhasma</td>
<td>125–250 mg BD</td>
<td>Honey, warm water</td>
<td>Medohara vidangadi lauha, Shilajatvadi lauha, Vyoshadya Lauha, Shodhita shilajatu, Tapyadi lauha etc.</td>
</tr>
<tr>
<td>Vati / Guggulu</td>
<td>250–500mg TDS</td>
<td>warm water, empty stomach</td>
<td>Arogyavardhni vati, Navaka guggulu, Triphala guggulu, Amritadi guggulu, Medohara guggulu, Giloya ghanavati etc.</td>
</tr>
<tr>
<td>Churna</td>
<td>3–6gm BD</td>
<td>warm water</td>
<td>Pippaliyadi churna, Haritakyadi, Vidangadi churna, Mustadi churna, Arjuna twak churna, Katuki churna etc.</td>
</tr>
<tr>
<td>Kwatha</td>
<td>100 ml BD</td>
<td>–</td>
<td>Phalatrikadi kwatha, Bhunimbadi Kwatha, Mustadi Kwatha, Avgimanthaka kwatha</td>
</tr>
<tr>
<td>Asavarishta</td>
<td>20 ml BD</td>
<td>warm water, after meal</td>
<td>Abhayarista, Kumaryasava, Vidangasava, Lohasava etc.</td>
</tr>
</tbody>
</table>

**DISCUSSION:**

*Sthaulya* is a nutritional and lifestyle related disorder. In the pathogenesis of *Sthaulya, Jatharagni mandyata* and *Medodhatwagni mandyata* play an important role. But Acharya Charaka mentioned that there is state of Agni vridhdi due to Kumbhkarpavan nyaya (Charaka Sutra 21/5) (Jadavji TA, 2008) so the question arises that how *Jatharagni mandyata*
and medodhatwagni mandyata is found in Sthaulya person. In Astanga Hridaya it is mentioned that all diseases are due to Mandagni (Astanga Hridaya Sutra 12/1) (Bramhanand Tripathi, 2003). The commentator of Madhava Nidana mentioned that the cause of Agnimandya in this condition is due to Kaphabhuistha Ahara and Kalavyatikrama of eating (Madhava Nidana 34/5) (Bramhanand Tripathi, 2005). One more reason may be the causative factor in Agnimandya is influx of more and more Kapha bhuistha Ahara and Kala vyatikrama of eating (Madhavakar, Nidana 34/5) (Bramhanand Tripathi, 2005). One more reason may be the causative factor in Agnimandya is influx of more and more Kapha bhuistha Ahara and Sammedoposakamsa which causes overload to Agni and finally leads to Jatharagni and Dhatwagni Mandyata. Here excessive Annarasa is produced which in turn creates the production of Ama by causing retrovert pressure on Agni. Excess of Medo Dhatu is formed from Rasa Dhatu by passing Rakta and Mamsa Dhatu. But disruption of Rakta and Mamsa also occur because once Jatharagni is impaired, the proper functioning of Dhatwagni are also arrested. In Sthaulya Medodusti occurs which can also be present in other disorders like Prameha, Medoroga etc. It is one of the diseases where importance of Dushya is more than Dosha.

CONCLUSION:

The present work entitled “An Ayurvedic loom towards Metabolic Syndrome” emphasized on the probable Ayurvedic Sampapti of Metabolic Syndrome and its probable best Ayurvedic line of treatment. At the end of study following points can be concluded. Excessive intake of high calorie fatty foods in diet, sedentary lifestyle, Divaswapna, manasika factors like stress, Manasonivrita etc. along with genetic predisposition plays a major role in aetioapathogenesis of Sthaulya. Jatharagni when incorporated with Kapha Dosha for long period it will lead to Madhuratara Samannarasa formation irrespective to any types of Rasa taken. Nidanparivarja and regular physical exercise is the gold standard in management of Metabolic Syndrome. Amapachaka, Agnideepaka and Srotosodhaka drugs those are specifically works at the level of Jathragni and Medodhatwagni are the drugs of choice in the management of Metabolic Syndrome. Ayurvedic management which in claim to be absence of any hazardous effect which is really a great benefit to the patient.

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A STUDY ON DHATUSARATA IN MENTALLY RETARDED CHILDREN

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ABSTRACT

Sarata or excellence is described with respect to Sapta dhatu (seven body tissues) viz. Rasa (skin), Rakta (blood), Mansa (muscle tissue), Meda (adipose tissue), Asthi (bone tissue), Majja (marrow), Shukra (semen) and Satwa (mind) i.e. Ashtavidhasarata (eightfold Excellency). Sarata is quality assessment of seven dhatu and Satwa. Examination of sarata is done at physical and psychological level. The present study aims at assessing and comparing sarata of mentally retarded children (study group) and healthy children (control group). The participants of the study were included 24 mentally retarded children and 24 healthy children between age group of 8 months to 12 years. A proforma, specially designed on the basis of classical descriptions of sara was utilized to assess the sarata. Findings of the study revealed that the difference in sarata between mentally retarded and healthy children was statistically highly significant (p<0.001) except in Mansa and Asthisarata. Satwa-sarata was almost nil in mentally retarded children

KEYWORDS: Mental retardation, dhatu, dhatusarata, sarata, sara, satwa.

Cite this article:
INTRODUCTION:

People’s appearance influences both their self-concept and their relationships with others. During socialization, we develop an increasingly complex set of normative expectations, or schema, about how people should appear in their manner, speech, movement, posture, gestures, facial configuration, body size, structure, proportions and behaviour. We become accustomed to some variability, but when, we encounter someone whose appearance, manner, or behaviour exceeds the limits of our expectations, we react with emotional arousal, anxiety, and fear, and behave differently toward that person (Richardson SA, 1976). Atypical appearance is more among people with mental retardation than among non-retarded individuals (Richardson et al., 1985).

People with mental retardation experience disparaging behaviour from others due to low intellect or atypical appearance (Richardson and Koller, 1996). Atypical appearance is more among people with mental retardation that means in mentally retarded not only the mind but also various tissues of the body have been affected. The physical and health characteristics of mildly retarded persons do not differ dramatically from those of non-retarded individuals. The more severe the retardation, however, the more pronounced the corresponding physical defects and health problems (Payne and Pattan, 1989).

Sarata is the essence of dhatus (Acharya JT, 1994). Assessment of sarata is one of the most important examinations which give an idea about qualitative state of dhatus. To determine the strength of dhatu or strength of person sarata examination is essential. Dhatus which shows maximum characters which are mentioned in Ayurvedic classics are called as best dhatus of that individual. The higher percentage of characteristics represents the good quality of dhatus. The characters of dhatus are explained at structural and/or functional level. Total eight types of sara are narrated in Ayurvedic classics (Acharya JT, 1994) viz. Rasa (skin), Rakta (blood), Mamsa (muscle tissue), Meda (adipose tissue), Asthi (bone tissue), Majja (marrow), Shukra (semen) and Satwa (mind). In mental retardation dhatus are affected structurally and/or functionally. Chawla Deepa N. (2000) found in a survey undertaken between retarded and normal children, sarata were poor or nil in the mentally retarded. The present study was undertaken with an objective to assess and compare sarata of mentally retarded and healthy children.

METHODOLOGY

For assessing the sarata of mentally retarded, children were selected from outpatient department of Basic Principles, Govt. Ayurveda College Hospital, Thiruvananthapuram, Kerala, India - Study group. For assessing sarata of healthy individual, children were selected from St. Mary’s School, Pattom, Thiruvananthapuram, and The Nest Day Care Centre and Kinder Garten, M.G. Road, Thiruvananthapuram, Kerala, India – Healthy (control) Group.

Total 24 children between age group 8 months to 12 years were selected for each group. Well-designed proforma, prepared by post graduate Department of Basic Principles, Government Ayurveda College, Thiruvananthapuram, Kerala, India, was used for assessing sarata. Proforma was prepared on the basis of subjective parameters (characteristics) described in Ayurvedic classics (Acharya JT, 1994).

The research design was approved by the Research Review Committee of Kerala University. Permission of concerned authority, Principal and parents was taken. Before assessing sarata parents of children were made clear about the purpose of this study and told that the result of the study would be kept strictly confidential and would be used for research purpose only.

Dhatus attain their maximum Excellency only during adulthood. They are in developing condition in the children. Hence it is always expedient to assess sarata of adults. But as
patients of study group (for clinical trial) were of the age in between 8 months to 12 years, it was not advisable to compare that group with healthy adults. Hence for comparison normal healthy children of same age were taken. Hence much limitation was there and chances of some inevitable errors cannot be denied.

**Statistical Analysis**

Each positive parameter (subjective characteristic) of sarata was given one score. The positive points were analysed under 8 different categories viz. Rasa-sarata, Rakta-Sarata etc separately for both groups. Mean score and its percentage were calculated for each dhatu. Percentage values of individual dhatu and satwa of the healthy (control) group were compared with the study group. To see whether the difference of each sarata is statistically significant or not, “unpaired t-test for equal samples” was used (Table 1).

OBSERVATION

Table 1 shows that percentages of each sarata were higher in healthy (control) group than study group. In healthy children, percentage of Twaka sarata (62 %) and Rakta Sarata (39.65 %) were found maximum than other sarata. The difference was statistically highly significant at 0.001 level in Twak, Rakta, Meda, Majja, Shukra and Satwa sarata. Percentage of Mansa and Asthisarata did not differ significantly in both groups. The corresponding t-values were statistically insignificant. Satwa sarata was almost nil (0.944 %) in study group.

DISCUSSION

Mental retardation is a disability characterized by significant limitations both in intellectual functioning and in adaptive behaviour manifested during the development period (American Association for Mental Retardation, 2002). In mentally retarded people, atypical appearance is more than among non-retarded one that means in mentally retarded various tissues (dhatu) of the body have been affected

Sarata is described with respect to seven dhatu i.e.Twak (skin), Rakta (blood), Mansa (muscle tissue), Meda (adipose tissue), Asthi (bone tissue), Majja (marrow), Shukra (semen) and Satwa (mind). It is a quality assessment of seven dhatu and satwa (mind). Examination of dhatusarata is done at physical and psychological level. In Ayurvedic classics characteristics are mentioned to determine dhatusarata. The higher percentage of characteristics represents good quality of dhatu.
Assessment of sarata is important for knowing bala (strength/physical fitness) and ayupramana i.e life span of person. The objective of the present study was to examine dhatu sarata in healthy (control group) and mentally retarded (study) children.

The present study revealed that Dhatusarata in healthy children was better than mentally retarded one. Twak sarata was found more developed than any other dhatu in healthy group followed by Rakta sarata since sarata of Rasa and Rakta dhatu starts developing early in the life. Characters of Twak sarata like unctuous, smooth, soft, clear skin manifest early in the life. Likewise characters of Rakta sarata like unctuous, red and handsome ear, eye, face, tongue, nose, lips, palm etc. develop at early age. In this study, Insignificant difference in Mansa sarata and Medasarata between healthy and study group was found because their development manifest during adulthood. Characters of Mansa dhatu like temples, forehead, nape shoulder, axillae, joints etc. equipped with firm, heavy and good looking muscles develop later on during adulthood. Likewise characters of Asthi dhatu like prominent heels, ankles, knees, elbows, collarbones etc. develop during adulthood.

Satwa (mind) sarata was found very less developed in mentally retarded children. Excellence of mental faculties were almost nil in study group.

The physical and physio-psychological characteristics of different sara described in the classical texts of Ayurveda are the reflections of status of the dhatu in the form of structure and functions. The symptoms mentioned for Satwasara are the reflection of the state of mind with respect to the presence of predominant level of satwika qualities.

Sarata is mentioned for the assessment of bala (strength) and Ayu-pramana (lifespan) of individual. Bala means strength or power to perform body activities and also resistance towards diseases. Earlier Scientific study revealed the positive correlation of dhatusarata and physical fitness (Jagruti Chaple et al., 2013).

CONCLUSION

The present study revealed that dhatu sarata in mentally retarded children was less developed than healthy children. Satwa sarata was almost nil in mentally retarded children.

Inference and recommendation

Present study will be helpful to know the quality and strength of dhatu (body tissues) in mentally retarded. Further study on dhatu sarata in mentally retarded adults needs to be conducted. Clinical study to assess effect of Rasayana chikitsa (rejuvenation therapy) on dhatu sarata in mental retardation needs to be carried out.

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