ABSTRACT

Background: Bashpasweda, popularised globally as steam bath is a well-established ayurvedic procedure. It is a modified form of ushmasweda in which patient is made to perspire, by setting his body below the neck inside a specially designed horizontal or vertical steam chamber. Bashpasweda relieves stiffness, heaviness, coldness and induces sweating.

Objectives: To evaluate the effect of Sarvangabashpaswedana (SBS) on physical (Blood pressure, pulse rate, body temperature and average time taken to get samyakswinnalakshana (SSL) according to prakriti (constitution), haematological (CBP, ESR) and biochemical parameters (Serum electrolytes, serum urea, serum uric acid, serum creatinine and random blood sugar)

Materials and Methods: The study was conducted during june 2012 to march 2013 at Government Ayurveda hospital, Hyderabad. The study design was open labelled, comparing the baseline variables with values after bashpasweda. The subjects (n=50) chosen gave an informed consent. Sarvangabashpaswedana was preceded by Abhyanga – whole body massage. The subject was made to sit in the vertical steam chamber till the attainment of samyakswinnalakshanas like relieving from coldness and heaviness, likes to take cold things and sweating on fore head and blood sample was taken before and after half an hour of procedure. Student’s paired “t” test was applied to the means + SE of the variables to calculate statistical significance.

Results: The biochemical parameters have shown significant value of ‘p’. Red blood cell count, white blood cell count and platelets were elevated. The Parameters- Random Blood Sugar, Erythrocyte Sedimentation Rate have decreased significantly. The Parameters- Blood Pressure, Pulse Rate have shown insignificant changes. Time taken to attain samyakswinnalakshanas is highest in kaphavata prakriti patients (27.3min), in kaphapitta (20.89min) and least in vatapitta (12.76min).

Conclusion: The parameters were increased or decreased significantly. But the significance is for changes within normal range, increased or decreased showing that bashpaswedana has got no influence on the levels of electrolytes, serum urea, uric acid and creatinine. Samyaksweda leads to increased metabolism by improved agni, specially raktadhatvagni and maintains the homeostasis in circulating body fluids by eliminating the dhatukittamsas without causing dehydration and cardiovascular complications.

Keywords: Ayurveda, Blood Profile, Prakriti, Samyaksweda, Sarvangabashpaswedana.

INTRODUCTION

Analysis of every therapeutic intervention should be in two angles, since it act in two ways – 1. Action of the procedure per se and 2. Action of the drugs/medium used for it. Conventionally, the majority have forgotten the procedure as such, which is more important and are behind the drugs, which have, mostly a secondary role.

Bashpasweda is a sagni, sarvanga, snigdha and ushma type of sweda. Swedana is a method which brings out sweda and opens pores of the body cell membranes. Sweat is secreted from the eccrine glands which are distributed throughout the skin. Sweat is less viscous ad contains the same constituents as the blood, but in lower concentration. Thus “pittamtuswadaraktayo” which denotes sweda, rakt as seat of Pitta and are inter-related. So, any factor which affects the composition of blood may also alter the composition of sweat. Hence sweda has got much relation with rakthadhatu.

During this procedure some amount of fluid is lost in the form of sweat along with vitiated malas from the body; In Ayurveda, no references are found about the impairment of body fluids after samyakSwedana karma. But in
Atiyogalakshana of Swedana karma, some symptoms like, Kaphakhayaja vikara, Murcha, Trishna etc. are mentioned which are similar to fluid loss symptoms. So to assess the actual loss of fluids during Swedana karma present or not is the subject of interest. During the Swedana, the body temperature rises which increases the basal metabolic rate by inducing many metabolic reactions, these releases various ions, metabolites into the blood, some of them are excreted through sweat. Bashpaswedana is a modified form of ushmasweda in which perspiration is brought about by hot medicated vapours. It is a Kaphakshayaja vikara, Murcha, Trishna

**MATERIALS AND METHODS**

**PLAN OF STUDY**

**Selection of subjects:**
All the subjects were selected randomly from outpatient and inpatient of P.G. Department of Panchakarma, Govt. Ayurvedic Hospital; Hyderabad. A special prakriti questionnaire is prepared along with special case sheet. For the study, the prakriti of each subject was assessed using the validated questionnaire (TNMC Prakriti 2004). The sample size for the study was 50 patients (28 males and 22 females), of which 15 are evaluated as vatapitta prakriti, 17 as kaphapitta prakriti and 18 as kaphavata prakriti.

**Inclusion criteria:**
Patients who are indicated for Swedana karma as per classics and patients of age group between 20-60 years.

**Exclusion criteria:**
Patients who are contraindicated for Swedana karma as per classics with age group less than 20 years or more than 60 years, Patients having fatal complications or any serious illness, Pregnant women and lactating mothers, Patients with malignancies, tuberculosis and disorders of blood.

**PROCEDURE OF SWEDANA KARMA**

**Time of procedure:** In between 9.00am-11am Morning times after the evacuation of the bowel and bladder, brushing the teeth, the patient is subjected to Swedana procedure.

**Intake of food and water:**
Food should be given 2 hours before the Swedana karma, if Swedanais done immediately after taking food it may affect the digestion of food in the kosta and may lead to Aama condition. It is said in classics that Swedana should be performed after the digestion of the food \(^6\) (Cakradatta, Yogaratnakara) and even kshuda is contraindicated for Swedana\(^7\). Patient should not have thirst as trishna is contra indicated for Swedana\(^8\), and at the same time he should not be made to drink water after collection of first sample till the collection of second sample.

To begin with, the therapist chants the swasthivachana (hymn or prayer). After this the patient is undressed to minimum clothes. Abhyanga was done for 30 minutes with dhanvantaram oil of nagarjuna pharmacy. Then patient is set inside the vertical steam chamber, where he is exposed to vapours of decoction of Nirgundi (Vitex negundo) till the attainment of SSL for single sitting.

**Application of parameters**
Blood samples were taken half an hour before and after Swedana procedure. Blood Pressure, Pulse Rate, Body Temperature were also recorded at the same time.

**Instruments and Assays:**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Method</th>
<th>Normal range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood pressure (BP)</td>
<td>Mercury sphygmomanometer</td>
<td>90–119/60–79mmHg</td>
</tr>
<tr>
<td>Pulse rate (PR)</td>
<td>Radial pulse count</td>
<td>70-80/minute</td>
</tr>
<tr>
<td>Oral temperature</td>
<td>Mercury glass thermometer</td>
<td>36.5–37.5 °C (97.7–99.5 °F)</td>
</tr>
<tr>
<td>Serum electrolytes</td>
<td>Colorimetric test</td>
<td>Serum Sodium: 135-155 mmol/L</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Serum Chloride: 97-107 mEq/L</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Serum Potassium: 3.5 – 5.5 mmol/L</td>
</tr>
<tr>
<td>Serum urea</td>
<td>Enzymatic method</td>
<td>10 – 40 mg/dl</td>
</tr>
<tr>
<td>Serum creatinine</td>
<td>Jaffé’s method</td>
<td>0.9 – 1.5 mg/dl</td>
</tr>
<tr>
<td>Serum uric acid</td>
<td>Enzymatic uricase method</td>
<td>3.4 – 7.0 mg/dl</td>
</tr>
<tr>
<td>R.B.C, W.B.C and Platelet count</td>
<td>Cell count method</td>
<td>R.B.C:Male: 4.7 to 6.1 m/cmm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Female: 4.2 to 5.4 m/cmm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>W.B.C:4,000 to 11,000 cells/cmm</td>
</tr>
<tr>
<td>Erythrocyte sedimentation rate (ESR)</td>
<td>Westergen’s method</td>
<td>Males: 0-5 mm at the end of 1st hour</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Females:0-7 mm at the end of 1st hour</td>
</tr>
<tr>
<td>Random blood sugar (RBS)</td>
<td>Tinder’s method</td>
<td>70-110mg/dl</td>
</tr>
</tbody>
</table>
Criteria for assessment of results:
A chart for recording Body Temperature, Blood Pressure, and Pulse Rate was prepared.
Time was noted when the patient entered and came out of the steam box respectively, accordingly to which average time taken for samyakswinnalakshana to appear was calculated according to the Prakriti in observations.

Though there are many samyakswinnalakshana described in classics, the lakshana which were practically observed like Seetoparama (relieves coldness), Swedapradrubhava (induction of sweating), Seetasevanescha (likes to take cold things), Lalatasedwa (sweat on fore head) are considered as the samyak yoga lakshana9 which can be assessed to stop the Swedana procedure, the other lakshana appear with course of time.

Perspiration is not the ultimate aim of swedana, but it is an indicator that body has reached the threshold for heat and is responding positively. It is a success sign (samyaklakshana) or an indicator to stop the procedure.

Grouping of the results of parameters were made as follows –
- Parameter values remained same.
- Parameter values increased within normal range.
- Parameter values decreased within normal range.
- Parameter values increased above the normal range.
- Parameter values decreased below the normal range.

Statistical analysis:
Student’s paired “t” test was applied to the basal and follow-up mean± SE values of the group.

RESULTS

Changes in physical parameters (Table1):
Significant increase from the baseline level in pulse rate was observed immediately after bashpaswedana, while it returned to the baseline level after half an hour. Hence, there is no significant sustained effect of SarvangaBashpaSweda on pulse rate.

Systolic blood pressure and diastolic blood pressure showed significant decrease immediately after bashpaswedana, which returned to base line after half an hour, thus, there is no significant sustained effect of SarvangaBashpaSweda on blood pressure.

The Average Time taken to attain Samyakswinnalakshana in Male and Females of 3 Prakritis as follows (figure-1):
The patients of both genders of kaphavata prakriti have have taken more time (27.3min) than pitta kapha prakriti (20.89) patients and least in vatapitta prakriti (12.76) patients.

Changes in oral temperature
A significant increase in the oral temperature was observed immediately after bashpaswedana, and the increase from the base line was 2.2 °F±1.1 °F. It returned to baseline values after half an hour.

Changes in haematological parameters (Table 2):
Erythrocyte count, white blood cell count and platelet count were significantly elevated after bashpaswedana. (p<0.001).

Changes in biochemical parameters (Table 3)
Out of 50 patients, the serum sodium levels in 15 patients (30%) were observed an increase, with a mean 1.8 mmol/L and in 35 patients (70%) were observed with a decrease mean of 2.88mmol/L.the serum potassium levels in 31 patients (62%) were observed to be an increase with a mean 0.168 mmol/L and 19 patients (38%) were observed with a decreased mean of 0.237mmol/L. The serum chloride levels in 17 patients (34%) were observed an increase with a mean 0.168 mmol/L and 19 patients (38%) were observed with a decreased mean of 0.237mmol/L. The serum urea levels in 10 patients (20%) were observed increase mean of -2.20 mg/dl, 34 patients (68%) were observed a decrease mean of 1.91mg/dl and remained same in 6 patients (12%) before and after Swedana. The serum creatinine levels in 13 patients (26%) were observed with increase mean of -0.10 mg/dl, 28 patients (56%) were observed with a decreased mean of 0.143 mg/dl and remained same in 9 patients (18%) before and after Swedana. The serum uric acid levels in 6 patients (12%) were observed with increase mean of 0.5 mg/dl, 41 patients (82%) were observed with a decrease mean of 0.41 mg/dl and remained same in 3 patients (6%) before and after Swedana. The Random Blood Sugar in 50 patients (100%) was observed a decrease with a mean of 9.10mg/dl.

Table 1: Effect of SarvangaBashpaSweda on changes in physical parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean score</th>
<th>S.D</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BT</td>
<td>AT</td>
<td></td>
</tr>
<tr>
<td>Pulse rate in beats/min</td>
<td>73.79</td>
<td>73.32</td>
<td>1.00</td>
</tr>
<tr>
<td>SBP(systolic blood pressure in mm/Hg)</td>
<td>113.6</td>
<td>113.5</td>
<td>0.78</td>
</tr>
<tr>
<td>DBP (diastolic blood pressure in mm/Hg)</td>
<td>75.05</td>
<td>74.71</td>
<td>0.302</td>
</tr>
</tbody>
</table>
before and after half hour of blood pressure and 9.75 in diastolic blood pressure and was baseline level as before decreases about 2% for each 1°C rise in temperature leading to a fall in blood pressure. Due to sudden application resistance Reduced blood viscosity in turn reduces the peripheral resistance, which is also reducing by vasodilatation, leading to a fall in blood pressure. Due to sudden application of hot vapours on the body, due to increased ashnaguna and dravagunas, they counter act on the seetala and rukshagunas of vyana vata, there is reduction in the functions of vyana vata resulting in fall of peedana in the blood (BP) and after half an hour, on the withdrawal of Swedana, vyana vata regains its normal function and restores normal blood pressure and heart rate. A decrease in Blood Pressure indicates the effect of Swedana on vyana vata. Hence, BashpaSweda can be administered safely in controlled hypertensive patients up to attainment of samyakswinnalakshana. Effect of BashpaSwedana on Body temperature (oral)-Oral temperature noted immediately after Swedana has shown a rise in temperature between 99.2°F to 101.4°F, which reached to baseline level after half an hour as before Swedana showing that there has been increase in body temperature due to hot vapours which was normalised after vapours have been removed. Patients of kaphavataprakriti have taken more time (27.3min), than pitta kaphaprakriti (20.89) patients and least (12.76) patients. While discussing the characteristic features of prakriti, our acharyas mentioned that kaphaprakriti people are intolerant to humid weather and are more tolerant to heat application with moderate sweating whereas pitta prakriti people are intolerant to warm weather and heat application by their nature and have profuse sweating and vataprakriti people are intolerant to cold weather and good tolerant to heat application and have scanty sweating. In the study, it was observed that females have taken more time with an average of 21.3 minutes than males with an average of 16.13 minutes and temperature to attain samyakswinnalakshana. The difference may be due to gurutva

**DISCUSSION**

**Effect of sarvangabashpaswedana on physical parameters:**

Effect of BashpaSwedana on Pluse Rate-In the study it was observed that there was no significant change in pulse rate before and after half hour of Swedana with a mean of 4.7. But there was an increase in pulse rate immediately after Swedana with a mean of 10.67. The probable explanation would be Heart rate increases by 10 beats per minute for 1°F rise in temperature. Increase in blood temperature and reflex stimulation of adrenergic cardiac beta-receptors is the likely mechanism of heart rate increase and increased metabolic rate also increases heart rate. But when the temperature is returned to normal level after half an hour, the pulse rate reaches to baseline level as before Swedana. Effect of BashpaSwedana on Blood pressure-It is observed in the study that BP has fallen immediately after Swedana with a mean of 7.94 in systolic blood pressure and 9.75 in diastolic blood pressure and was normalised gradually after half an hour though there is a rise in heart rate which reached to base line level after half an hour. During Swedana, there is temperature rise and so heart rate increases. So this should cause a rise in cardiac output and stroke volume leading to increase in blood pressure. BUT Heat reduces viscosity of blood. So BP decreases. Viscosity decreases about 2% for each 1°C rise in temperature. Reduced blood viscosity in turn reduces the peripheral resistance, which is also reducing by vasodilatation, leading to a fall in blood pressure. Due to sudden application of hot vapours on the body, due to increased ashnaguna and rukshagunas, they counter act on the seetala and rukshagunas of vyana vata, there is reduction in the functions of vyana vata resulting in fall of peedana in the blood (BP) and after half an hour, on the withdrawal of Swedana, vyana vata regains its normal function and restores normal blood pressure and heart rate. A decrease in Blood Pressure indicates the effect of Swedana on vyana vata. Hence, BashpaSweda can be administered safely in controlled hypertensive patients up to attainment of samyakswinnalakshana. Effect of BashpaSwedana on Body temperature (oral)-Oral temperature noted immediately after Swedana has shown a rise in temperature between 99.2°F to 101.4°F, which reached to baseline level after half an hour as before Swedana showing that there has been increase in body temperature due to hot vapours which was normalised after vapours have been removed. Patients of kaphavataprakriti have taken more time (27.3 min), than pitta kaphaprakriti (20.89) patients and least (12.76) patients. While discussing the characteristic features of prakriti, our acharyas mentioned that kaphaprakriti people are intolerant to humid weather and are more tolerant to heat application with moderate sweating whereas pitta prakriti people are intolerant to warm weather and heat application by their nature and have profuse sweating and vataprakriti people are intolerant to cold weather and good tolerant to heat application and have scanty sweating. In the study, it was observed that females have taken more time with an average of 21.3 minutes than males with an average of 16.13 minutes and temperature to attain samyakswinnalakshana. The difference may be due to gurutva
and medhodhatubahulya of strisareera as mentioned by susrutha.

**Effect of sarvangabashpaswedana on haematological parameters:**

Effect of BashpaSwedana on R.B.C, W.B.C and Platelet Count-In the study it was observed that red cells were increased with a mean of 0.2 in 88% patients and W.B.C & platelets increased in 100% patients with a mean of 402 and 39,020 respectively. This increase might be due to ignition of raktadhvatwagani. However, this effect may be a temporary effect due to sudden sprout in deepapagani condition. Further study is required to know the sustained effect which is not in preview of this study.

Effect of BashpaSwedana on E.S.R-Usually ESR rises in pyogenic infections, Rheumatoid arthritis, Nephrosis, which is conditions of samarakta, since samatva is in red blood cells leading to more sedimentation18. In the study it was observed that ESR was significantly reduced both in 1st and 2nd hour with a mean decrease of 16.23 and 20.03 respectively in all patients. This may be due to deepapaktaa, the gurutva in the raktadhatus (red blood cells) gets pachana and attain laghatva, so that they float on the serum and less sedimentation of RBC is resulting in decrease in ESR levels. Also due to increased body temperature during Swedana, the morbid factors or toxins in the body are excreted out through sweat, thus resulting a decrease in E.S.R.

**Effect of sarvangabashpaswedana on biochemical parameters:**

Effect of BashpaSwedana on Serum electrolytes: Fluid Fate – according to Ayurveda: The body is primarily made of jaleeyadhatu, so is accepted in the present science too. Dehamrasajambubhavo by charaka gave a message that major constitution of the body is Ambu-jaleeyadhatu (water). The modern science explains around 60% of the bodily content is fluid. There are two sources of fluid for the body, one is ahara (food) i.e; one among the chaturvidhaahara is jala (water). The second one is kleda (moisture), formed inside the body during the process of digestion and metabolism. All the essentials of the shareeradhatu are carried by the dravadhatu continuously by vyana, there by maintaining the normal function of each and every tissue20.

In the study it was observed that in major cases (70%) were observed a decrease in sodium level with a mean of 2.88mmol/L and 66% decrease in chloride level with a mean of 1.61 mmol/L and a corresponding (62%) increase in potassium level with a mean 0.168 mmol/L was observed.

As sodium and chloride are major cation and anion of extra cellular fluid respectively 21, when there is heat stress or any conditions leading to fluid loss is associated with their loss22. To compensate this loss of sodium and chloride, potassium, which is major cation of intracellular fluid, moves in to extra cellular fluid to maintain homeostasis. This may be the reason for decrease of sodium and chloride with a corresponding increase in potassium levels, however, the changed values are within the normal range.

Thus Swedana done up to the attainment of samyaklakshana does not cause any pathological variations in the serum electrolytes levels but regulates the pathological variation and maintains the physiological balance of electrolytes, thus it is noted that in certain cases, certain electrolytes are decreased and increased, indicating that excessive is eliminated and the lesser is preserved. It further reveals that by Bashpaswedana morbid factors (dushkaamsas) might be eliminated and required are increase to preserve dhawguniamsas, which is the ultimate aim of Bashpaswedana administration.

Effect of BashpaSwedana on Serum urea, uric acid and creatinine: It was observed in the study that urea was decreased in 68% patient with a mean of 1.91mg/dl with a mean of 1.91mg/dl, creatinine decrease in 56% with a mean of 0.14mg/dl and uric acid is decreased in 82% patients with a mean of 0.41mg/dl. The decrease observed may be due to excretion of circulating metabolites as there is profuse sweating during Swedana, though the major route of excretion of these metabolites is through kidneys but by Swedana the load on kidneys is decreased. Urea, uric acid and creatinine are the end products of metabolism, which are to be considered as dhatuskittamshas. All of these are to be considered as dhatuskittamshas in the circulation. Increase in kittamshas results out of dhatuskittamshas. Sweda is considered as one of the trimals, which mostly eliminates the malamsas from the raka directly. Sweda karma is considered as a procedure to increase the sweat through which excess malas are eliminated efficiently without putting load on kidneys. Apart from this, application of heat on the body through BashpaSweda liquifies the Aama (morbid) factors in the circulation and in tissues, thus facilitates to move out of the body through sweda. And also ignites the dhutvaagnis which inturn removes the amatva in the tissues and further facilitates to move freely by removing adhesions (srotapratihihakatvatas).

In this study, the observations of decreased kittamshas like urea, uric acid and creatinine in circulation after Bashpaswedada verifies and consolidates the concept of application of Bashpaswedada in eliminating the morbid factors, and also indicates that achieving samyaksinnalakshana, the values are within the normal range though decreased. Thus it once again proves that Sweda karma done up to samyak yoga is good enough to maintain the homeostasis in the body.

Effect of BashpaSwedana on Random Blood Sugar: It was observed that The Random Blood Sugar in 50 patients (100%) decreased with a mean of 9.10 This would be due to increased metabolic rate when body temperature is raised due to Swedana leading to an increase in enzymatic activities and biological reactions which require ATP for their functioning. However, the decrease is with in normal limits. Usually blood sugar rises in heat exhaustion which is not seen in the study proving that Swedana does not cause any exhaustion if done properly. This indicates that through Sweda karma, ariagni ignites and it raises to samaagni condition on samyaksinnalakshana state. However, the increase or decrease observed in blood chemistry in the present study is within the physiological range. Further, to prove the efficacy of Bashpaswedana in pathological condition is the subject of interest for further study.
CONCLUSION

The parameters - electrolytes, serum urea, uric acid, and creatinine have shown the significant value of ‘p’. But the significance is for changes within normal range, increased or decreased showing samyaksveda maintains the homeostasis in circulating body fluids by eliminating the excess and retaining the useful and also samyaksveda does eliminate the dhathukittansas. The Parameters – Red blood cell count, white blood cell count and platelets have shown highly significant value of ‘p’ showing that there is increased metabolism by improved agni. The Parameters- Blood Pressure, Pulse Rate have shown insignificant value of ‘p’ showing that there is no significant sustained effect of sarvangabashpasveda on blood pressure though there is immediate fall in B.P and raise in P.R observed immediately after swedana. A decrease in Blood Pressure indicates the effect of swedana on vyanavata. Hence, can be administered safely in controlled hypertensive patients up to attainment of samyakswinnaalakshanas. The average time taken to attain samyakswinnalakshanas is observed to be more in females than males because of their sarveera gurutva and medhobahulya. Prakriti plays an important role in time taken to attain samyakswinnalakshanas, where kaphavataprakriti patients have taken more time (27.3min), than pittakapha (20.89min) and least in vatapitta (12.76min). Oral temperature noted immediately after swedana has shown a rise in temperature between 99.2°F to 101.4°F, which reached to baseline level after half an hour as before swedana.

Basing on the observations made in this study, we can conclude that the SarvangaBhaspawedana karma until attaining samyakswinnalakshana is able to maintain the physiological homeostasis in the body by eliminating the morbid factors and retaining the essentials, it also accelerates the metabolic activities by igniting the dhatvagni, especially in amapachana and deepana at raktadhvatvagni level and also controls vyanavata. Thus SarvangaBashpawedana karma helps in maintenance of health and in relieving the disease. We feel that there is a need to conduct this study on larger samples, including kidney function tests and in patients with abnormal levels of parameters which can give a better understanding on the role of swedana in diseased.

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12. Ibid.
17. Ibid.


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