

COMPARATIVE STUDY OF BALA IN RAKTASARA AND MAMSASARA HEALTHY INDIVIDUAL W.S.R TO HARVARD STEP TEST

Sheikh Shirinkausar¹, Topre Sunil², Ansari Rizwan³

¹Assistant Professor, Kriya Sharir Department, B.M.A.C & R.H, Butibori, Nagpur, Maharashtra, India

²Associate Professor, Kriya Sharir Department, Govt. Ayurved College, Nagpur, Maharashtra, India

³Assistant Professor, Kriya Sharir Department, Bhartiya Ayurved College, Gajaraula, Uttar Pradesh, India

Email: shirin.sheikh88@gmail.com

ABSTRACT

Objectives: To validate the relation between the *Bala* of *Raktasarata* and *Mamsasarata* with the help of Harvard Step test. Method: It is an analytical observational study. *Sarata* deals with *Bala* and *Bala* can be assessed with *vyayamshakti*. For evaluation of *Bala* Harvard step test can be used which deals with physical fitness of individual. Each 50 individual of *Raktasarata* and *Mamsasarata* were screened out with the help of simple questionnaire. *Bala parikshan* of healthy individual is carried out with the help of Harvard Step test and fatigue index of each individual is calculated. Result: Mean body fitness is found highly significant in *Mamsasarata* with $p < 0.0001$, t value = 11.9357 by performing independent t test. Conclusion: It is concluded that, fitness of *Mamsasara* individual is highly significant. Hence *Bala* of *Mamsasarata* is more than *Raktasarata* when fitness is carried out with the help of Harvard Step test in healthy individual.

Keywords: *Bala*, *Raktasara*, *Mamsasara*, Harvard Step Test.

INTRODUCTION

Charak has addressed *Bala* as a seat of *Arogya* that is health¹. While, according to *Dalhana*, *Bala* is a *karmsamrathya* which we can predict with the help of *Vyayamashakti*². Nobody can function in absence of *Bala* and can't resist it also. For both aims of *Ayurveda* science, namely, maintenance of health and if diseased to cure the disease and come back to homeostatic condition; one needs to know his *Bala*. Thus, eight types of essence of *Dhatu*s have been described in the *Ayurvedic* classics. The essence of *Dhatu*s is termed as *Dhatu sarata* in *Ayurveda*. It is the unique concept described only in *Ayurveda*. The knowledge of *Sarata* is helpful in deciding the degree

of strength of various *Dhatu*s in the *Sharira*. It is very much helpful to lead life happily for that the knowledge of *Sara* is truly required which deals with *Bala* of an individual.

According to *Chakrapani*, *Sara* means *Vishudhatar Dhatu*. *Sarata* in *Ayurveda* is said to be the *Vishudhatar awastha* or *Utkrushtha awastha* of *Dhatu*s in the body. *Balwan Dhatu* is called as *Sarwan Dhatu*. This proves that *Sara* means *Bala*, moreover *Sthir Bala* of *sharira*³. Thus, *Bala* or strength of *Sharira* depends on the *Sarata* of *Dhatu*s. This *Dhatu sarata awastha* of different *Dhatu*s in *sharira* not only enables an individual to maintain its healthy

status but also helps in combating various ailments. The *Sara Parikshan* is the novel concept described exclusively in the *Ayurvedic* context and the importance of *Sara Parikshan* has been described by Acharya Charaka—

As stated and explained above, eight types of *Sara* have been described by our ancient *Acharyas* for the purpose of knowing the degree of strength or *Sharira Bala*⁴. Thus, *Bala* differs in accordance with *Dhatusarata* from individual to individual. The strength of the body depends upon the muscular tissues viz. *Mamsa Dhatu*.

Mamsa Dhatu gives strength to the body and it is meant for the non-displacement of soft tissues⁵. *Bala* of *Majja Dhatusara* is mainly concerned with the intellectual work rather than physical work whereas the *Bala* of *Shukra Dhatusara* is concerned with the sexual potency of an individual. Though *Asthi Dhatusara* also possesses strength, he is more stubborn for any physical work. So, *Bala* has definite meaning in relation to the function of *Dhatus* in the *Sharira*. In case of *Rakta Dhatusara* and *Mamsa Dhatusara*, the entity *Bala* refers to the *Sharira Bala* of the body means physical strength of an individual.

From the above two references, the *Bala* or the physical strength of *Rakta Sara* and *Mamsa Sara Purusha* need to be evaluated by taking aid of the modern tool like the physical fitness index of a person. Also, the *Bala* or *Karma Shakti* of an individual can be evaluated by the *Vyayam Shakti Parikshana*. So, for the purpose of evaluation of *Bala* or physical fitness of an individual the **Harvard Step Test** can be used as modern tool in this study. It is a type of cardiac stress test for detecting or diagnosing cardiovascular disease and also a good measurement of fitness and a person ability to recover after a strenuous exercise. It is a kind of cardiovascular endurance test, computing the capability to exercise continuously for extended intervals of time without tiring. Physical fitness implies not only the absence of disease but also a sense of physical well being. Fatigue is described as a failure to maintain the required or expected force or power input⁶.

METHOD OF ACTUAL OBSERVATIONAL STUDY:

Material:-

1. Healthy individuals belonging to *Raktasaarta* and *Mamsasaarta* evaluated with the help of CRF.
2. Stopwatch
3. A stable gym bench of 45 cm height and 50 cm height.
4. Metronome.

A. CRITERIA OF SELECTION:

1. Only healthy individuals were selected for this study from same territory (*Desh*)
2. Male and Female individuals between age group 20 years to 40 years were selected.
3. Individuals who co-operated for evaluation of *Dhatusarata* and fatigue index by Harvard Step Test were selected.

B. CRITERIA OF EXCLUSION:

1. Individuals suffering from Auto-immune disorders were excluded.
2. Pregnant, lactating or female in menstrual phase were excluded.
3. Individuals suffering from any Systemic disorders like Hypertension, Diabetes Mellitus, Sickel cell Anaemia, Muscular Dystrophy e.t.c or any chronic illness were excluded.
4. Individual who did not co-operate for evaluation of *Dhatusarata* and fatigue index by Harvard Step test were excluded.
5. Individuals having any addiction like smoking, tobacco chewing or alcoholism were excluded.

METHODS:

2. The selected healthy individuals were screened for *Rakta Dhatusarata* and *Mamsa Dhatusarata*. Written and vocal consent were taken from the participants. Out of these screened healthy individuals, only *Rakta* and *Mamsa Dhatusara* individuals were selected for the study. The "*Dhatusarata*" of these selected individuals was assessed after solving a validated questionnaire.
3. The *Dhatusarata* of these individuals were categorized into three sub groups as *Pravar*, *Madhyam* and *Avar Dhatusarata* groups and individuals belonging to *Pravar Raktasarata* and

Mamsasarata were selected. Individuals having 75% and above score obtained after solving questionnaire were selected. Each 50 individuals of *Raktasarata* and *Mamsasarata* were selected for the study.

Criteria used to assess *Pravar Dhatusararta* are as follows:

1. 75% and more than 75% of all positive features of subjective criteria: *Pravarsara* (Best tissue quality.)
2. Positive features of subjective criteria between 74-25%: *Madhyam Sarata* (Moderate tissue quality.)
3. Positive features of subjective criteria 24% and below: *Asarata* (Poor tissue quality.)
4. *Bala Parikshana* was done with the help of Harvard step test and fatigue index of each individual were calculated as follows:

Procedure of Harvard Step Test: Complete procedure and possible risk factors of Harvard step test were explained to participant. Written and Verbal consent regarding the procedure were taken. The Harvard step test was conducted in following manner.

Step 1- The participant was asked to step up and down on a standard gym bench once every two seconds for 5 min. i.e. total 150 steps.

Step 2- The rate at which the subject step up and down was fixed with help of metronome.

Step 3- The experiment was stopped if the subject gets exhausted earlier than 5 min.

Step 4- The subject was asked to sit on a chair immediately after either exhaustion or completion of 5 min.

Step 5- After finishing the test the pulse rate was counted at an interval of 1-1.5 min, 2-2.5 min, 3-3.5 min

Step 6- The fatigue index was calculated with the help of following formula—

$$\text{Fatigue Index} = \frac{\text{Duration of exercise in sec.} \times 100}{2 \times (\text{Sum of pulse count during Recovery})}$$

Classification of physical fitness—

| Sr.No. | Fatigue index | Fitness |
|--------|---------------|---------|
| 1. | Up to 49 | Poor |
| 2. | 50-80 | Average |
| 3. | 81 and above | Good |

Then with the help of statistical analysis comparative study of *bala* of *Raktasaar* and *Mamsasaar* individuals were done with the help of fatigue index calculated with the help of Harvard Step test.

RESEARCH TOOL:

1. CRF, 2. Haemoglobin percentage, 3. BMI
- Haemoboglobin percentage was estimated with the help of Sahli’s haemoglobinometer.

SAMPLING PLAN:

Healthy individuals were selected for the study and were screened for *Rakta Dhatusarata* and *Mamsa Dhatusarata*. Written and vocal consent were taken from the participants. Out of these screened healthy individuals, only *Rakta* and *Mamsa Dhatusara* individuals were selected for the study. 50 *Raktasara* and 50 *Mamsasara* individuals were selected. The “*Dhatusarata*” of these selected individuals were assessed after solving a simple questionnaire. Individuals with *Pravar Rakta* and *Mamsasarata* were selected, satisfying the criteria for *Pravar Dhatusarata*.

Laboratory investigations like haemoglobin percentage were carried out of selected *Raktasara* and *Mamsasara* individual. Body mass index of selected individuals were calculated with the help of formulae weight in kg divided by height in meter square.

Statistical analysis

All demographic variables included, were expressed in actual frequency and percentages. Haemoglobin, BMI and body fitness index were presented as mean±sd. Mean haemoglobin, BMI and body fitness were compared between two groups, *raktasarata* and *mamsasarata* by performing independent t-test. Correlation coefficient (r-value) was calculated to assess magnitude and strength of correlation between demographic parameters with body fitness in *raktasarta* and *mamsasarata*. Statistical significance was considered at p<0.05 level. Statistical software stata version 13.0 was used for statistical analysis.

OBSERVATIONS AND RESULTS

The study was done in total 120 individuals irrespective of their sex; religion etc. 50 individuals were categorized in *Raktasarata* and 50 individuals in *Mamsasarata* with the help of CRF.

Table 1.1

Table showing Fatigue Index wise distributions in frequency and percentage of 100 individuals:

| FATIGUE INDEX | RAKTASARATA | | MAMSASARATA | |
|-----------------|-------------|----|-------------|----|
| | N | % | N | % |
| <49 (POOR) | 47 | 94 | 13 | 26 |
| 50-80 (AVERAGE) | 3 | 6 | 37 | 74 |
| >80 (GOOD) | 0 | 0 | 0 | 0 |

In *Raktasarata* all 47 individuals comprising 94% were having poor fitness (Fatigue Index <49) while 3 individuals comprising 6% of total population of *Raktasarata* were having average fitness (Fatigue Index 50-80).

In *Mamsasarata* 13 individuals comprising 26% were having poor fitness (Fatigue index i.e. <49) while 37 individuals comprising 74% were having average fitness (Fatigue Index i.e. 50-80).

TABLE 1.2 Table showing Mean Haemoglobin In *Raktasarata* And *Mamsasarata* of 100 individuals.

| | RAKTASARATA | MAMSASARATA |
|---------|-------------|-------------|
| MEAN | 13.95 | 13.07 |
| SD | 1.70 | 1.83 |
| RANGE | 10.3-16 | 9.1-17.2 |
| t-VALUE | 2.4864 | |
| p-VALUE | 0.0146,S | |

The individuals belonging to *Raktasarata* has their Mean Haemoglobin 13.95 with standard deviation 1.70. The individuals belonging to *Mamsasarata* has their Mean Haemoglobin 13.07 with standard deviation 1.83

After applying independent t-test to the Haemoglobin of *Raktasararata* and *Mamsasarata*, results found were significant in *Raktasarata*.

TABLE 1.3: MEAN BMI IN RAKTASARATA AND MAMSASARATA.

| | RAKTASARATA | MAMSASARATA |
|---------|-------------|-------------|
| MEAN | 20.52 | 22.54 |
| SD | 1.83 | 1.76 |
| RANGE | 18.6-24.4 | 18.7-24.9 |
| t-VALUE | 5.6349 | |
| p-VALUE | <0.0001, HS | |

The individuals belonging to *Raktasarata* has their Mean BMI 20.52 with standard deviation 1.83, The individuals belonging to *Mamsasarata* has their Mean BMI 22.54 with standard deviation 1.76, After

applying independent t-test to the BMI of *Raktasararata* and *Mamsasarata*, results found were Highly significant in *Mamsasarata*.

TABLE 1.4: MEAN FATIGUE INDEX RAKTASARATA AND MAMSASARATA.

| | <i>RAKTASARATA</i> | <i>MAMSASARATA</i> |
|---------|--------------------|--------------------|
| MEAN | 28.72 | 50.37 |
| SD | 10.94 | 6.67 |
| RANGE | 13.05-48.38 | 29.03-66.96 |
| t-VALUE | 11.9357 | |
| p-VALUE | <0.0001, HS | |

The individuals belonging to *Raktasarata* has their Mean Fatigue Index 28.72 with standard deviation 10.94., The individuals belonging to *Mamsasarata* has their Mean Fatigue Index 50.37 with standard

deviation 6.67., After applying independent t-test to the Fatigue Index of *Raktasararata* and *Mamsasarata*, results found were Highly significant in *Mamsasarata*.

TABLE NO. 1.5: CORRELATION OF DEMOGRAPHIC PARAMETERS WITH BODY FITNESS IN RAKTASARATA AND MAMSASARATA

| | <i>RAKTASARATA</i> | | <i>MAMSASARATA</i> | |
|-------------|--------------------|------------|--------------------|------------|
| | r-VALUE | p-VALUE | r-VALUE | p-VALUE |
| AGE IN YRS | -0.1423 | 0.3242, NS | -0.1802 | 0.2104, NS |
| HAEMOGLOBIN | 0.3306 | 0.0190, S | 0.2563 | 0.0724, NS |
| BMI | 0.2095 | 0.1443, NS | 0.2632 | 0.0648, NS |

DISCUSSION

The study was carried out in individual who had given consent and selected through the simple and valid questionnaire. Individual who were either *Pravara Raktasara* or *Pravara Mamasasara* were selected for the study. Selected *Pravara raktasara* individual were devoid of other *sarata* and selected *Mamsasara* individual were devoid of other *sarata*. It means selected *Raktasara* individual were having only *Rakta dhatu* in its *Vishuddhatara avastha* and selected *Mamsasara* individual were having only *Mamsa dhatu* in its *Vishuddhatara avastha*. The study was conducted in same *ritu* which was *Vasant* to avoid variation in fitness due to season.

Harvard Step test was used as a fitness test to determine the *bala* of the individuals belonging to above mentioned two groups. Because the test was easy to perform so that individual can give consent to it readily. As it can be performed anywhere and does not require much set up so that individual will also able to perform it in future to know their fitness and can spread the message among their friends and relatives and can become more conscious to fitness.

1) Discussion on Mean Haemoglobin in *Raktasarata* and *Mamsasarata*

In present study, when statistical analysis were done, Mean Haemoglobin was found statistical significant $p < 0.05$ (p value= 0.0146) in *Raktasarata* was 13.95 ± 1.70 while in *Mamsasarata* it was 13.07 ± 1.83 . It may be because the *Rakta dhatu* is in *Vishuttar avastha* in *Raktasarata*. *Rakta dhatu* is correlated with blood which carries Haemoglobin. Hence If, *Rakta dhatu* is *sarvan*, Haemoglobin will also be in its proper range. In contrast to it, in case of *Mamsasara*, *mamsa dhatu* is *sarawan*.

2) Discussion on Mean BMI in *Raktasarata* and *Mamsasarata*

In present study, after statistical analysis Mean BMI was found statistical highly significant $p < 0.0001$ in *Mamsasarata*. Mean BMI was found to be 20.52 ± 1.83 and 22.54 ± 1.76 respectively in *Raktasarata* and *Mamsasarata*. Results were may be due to, in case of *Mamsasarta*, all organs are well covered with muscles and body is proportionate. BMI is weight in kg divided by height in meter square. In *Mamsasarata* mass *dhatu* is *sarwan* and *mamsa dhatu* perform the function of *lepana* i.e. provides covering to body

organ. *Mamsa dhatu* is *parthiv* in nature and *guru* in *guna*. Hence it provides an individual with proper weight or proportionate body while *Raktasara* individuals are delicate in nature.

3) Discussion on correlation of parameters with Body Fitness in *Raktasarata* and *Mamsasarata*

The Parameters like Age and BMI were found Non-Significant in Correlation with Body Fitness in *Raktasarata* and *Mamsasarata*. Haemoglobin is found significant in *Raktasarata* with r value= 0.3306 and $p < 0.05$ with $p = 0.0190$

4) Discussion on Mean Body Fitness in *Raktasarata* and *Mamsasarata*

It is found Highly Significant in *Mamsasarata* with $p < 0.0001$ and t value= 11.9357. Mean Body Fitness in *Raktasarata* and *Mamsasarata* was found to be 28.72+-10.94 and 50.37+-6.67 respectively.

Discussion on Fatigue Index

In present study, it has been found that 74% individuals of *Mamsasarata* were having Average Fitness (Fatigue Index= 50-80) and 26% individuals were having Poor Fitness (Fatigue Index < 49). All individuals of *Raktasarata* were having Poor Fitness (Fatigue Index= 50-80). It may be because *Bala* is a *karmasamrthya* of an individual which we can predict with the help of *Vyayam*. In *Mamsasarata*, individual possess stout body while *Raktasarata*, individual is delicate, unctuous and unable to tolerate any type of stress or any stuff hot in nature either climate or any matter. Hence *Mamsasara* individual can possess more *Vyayamshakti* while *Raktasara* individual lag behind it. In this study, Harvard step test had been used to find fatigue index and comparison of the *Bala* of *Raktasara* and *Mamsasara* individuals. Harvard step test is a cardiovascular endurance test. It is a sort of *Vyayam* only. Hence *Mamsasara* individual can more easily perform it compare to *Raktasara* individual. Hence Fatigue index is found more significant in *Mamsasarata* compare to *Raktasarata*.

CONCLUSION

Bala is an entity differs from individual to individual with various aspects with *Mamsasara* individual

possess highest degree of strength while *Raktasara* individual does not possess enough strength.

Finally it is concluded that, Fitness of *Mamsasarata* individual is highly significant. Hence *Bala* of *Mamsasarata* is more than *Raktasarata* when Fitness is carried out with the help of Harvard step test in healthy individuals.

REFERENCES

1. Shukla V, Charak Samhita Vol II, 2007 edition, Delhi: Chaukhamba Sanskrit Pratishthan, 2007. Cha.Chi.3/141
2. Sharma A, Sushrutsanhita, 2010 edition, Varanasi: Chaukhamba Surbharti Prakashan, 2010. Su.Su.1/28
3. Shastri H, Amarkosh, Delhi: Chaukhamba Sanskrit Pratishthan
4. Shukla V, Charak Samhita Vol I, 2007 edition, Delhi: Chaukhamba Sanskrit Pratishthan, 2007. Cha.Vi.8/102
5. Shastri D, Sharangdharsanhita, 2002 edition, Varanasi: Chaukhamba Surbharti Prakashan, 2002. Sha.Purva. 5/39
6. Majumdar P, Physiology of sports and exercise, New Central Book Agency (P) LTD, 2002
7. Tripathi B, Ashtanghridayam, 2011 edition, Delhi: Chaukhamba Sanskrit Pratishthan, 2011
8. Jain P, Sharirkriya Vidnyana, 2007 edition, Delhi: Choukhamba Sanskrit Pratishthan, 2007
9. Dhargalkar N, Sharirkriya Vidnana, 2nd edition, Varanasi: Choukhamba Sanskrit Series Office, 2010
10. Sembullingum K, Essentials of Medical Physiology, 2012 edition, Jaypee Brothers Medical Publishers Pvt Ltd, 2012
11. Shastri D, Sharangdharsanhita, 2002 edition, Varanasi: Chaukhamba Surbharti Prakashan, 2002,
12. Mahapatra A.B, Essentials of Medical Physiology, 4th edition, Current Book International, 2014
13. Mahajan B.K, Methods in Biostatistics, 7th edition, Jaypee brothers publication, 2010
14. Reddy L, Fundamental of Medical Physiology, 5th edition, New Delhi: Paras Medical Publishers, 2013

Source of Support: Nil

Conflict Of Interest: None Declared

How to cite this URL: Sheikh Shirinkausar et al: Comparative Study Of Bala In Raktasara And Mamsasara Healthy Individual W.S.R To Harvard Step Test. International Ayurvedic Medical Journal {online} 2019 {cited May, 2019} Available from: http://www.iamj.in/posts/images/upload/703_708.pdf