

Validation of Ayurvedic Concept of Anthropometry in Children: A Survey Study

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ABSTRACT

The descriptions regarding the concept of *Anguli Pramana* are available in *Ayurvedic* classics including the *Veda*, *Purana* as well as other texts. It has been described in different contexts as *Angul Pramana* of different parts of human body in *Pramana Pareeksha*. *Pramanas* are considered as the tool for gaining knowledge in *Ayurveda*. *Angula Pramana* is used to quantitative expression the dimensions of the human body and its parts. *Charaka* considered it as one among the *Dashavidha Pareekshya Bhavas*. *PramanaShareer* is explained in detail in reference to measurement of healthy adult, but there is some errors occur/observed when we apply these findings of measurement in the children. In this present study work efforts regarding *Pramana Shareer* have been made to compile, translate for better understanding and the data presented in tabular form as observed in children. Attempt has also made to analyse and interpret the data given in the various *Samhitas* by rearranging and reclassifying the data according to need of analysis to arrive at newer conclusions. Thus this exercise is an effort to provide a better understanding the concepts related to human body measurements which were mentioned in *Ayurvedic Samhitas*

Keywords: Angul, Pramana, anthropometry, children.

INTRODUCTION

The descriptions regarding the concept of *Anguli Pramana* are available in *Ayurvedic* classics including the *Vedas*, *Puranas* as well as other classical texts. It can be traced up to prehistoric era as well. It has been described in different contexts as *Pramana* of different parts of human body, as *Pramana* of different instruments utilized in *Shalya Shastra*, *Panchakarma* etc. as a unit measurement for measuring distance between two points and also measuring depth, length of different things. A general inquiry regarding *Pramana* was prevalence since time immemorial which can be traced even up to pre-historical era. This is evident from its notion in the earliest literature like *Vedas* & oldest medical and other texts.

Detailed description of references related to *Praman Sharir* as described in *Ayurvedic* literature, mainly *Brihatrayees* and also from available commentaries such as that of *Dalhana*, *Cakrapani*, *Gangadhara*, *Haranachandra* and *Indu*. *Loka Purusha Saamya* is one of the most fundamental principles. This principle states that the human form (called the microcosm) is a smaller representation of the universe (or macrocosm), both are reflection of each other. Thus, all the factors incorporated in the microcosm are represented in some similar form in the macrocosm. In this context some questions arise; why the human body so formed, why the various body parts exist in the proportions as is seen today etc. The answer for these questions

lies in; observing the similarity of human body with the world; as discussed in above cited lines. Ancient *Ayurvedic* scholars were observed the proportional arrangement of various body parts and recorded them in the form of '*Angula Pramana*'. Where a modern researcher develops newer concept for measurement of the body and its parts in specific *constant* measuring unit; known as anthropometry.

Pramana Shareer is explained in detailed for healthy adult, but it is not explained properly regarding the children in our *Samhitas*. In this present study work efforts regarding *Pramana Shareer* have been made to compile, translate for better understanding and the data presented in tabular form as observed in children. Attempt has also made to analyze and interpret the data given in the various *Samhitas* by rearranging and reclassifying the data according to need of analysis to arrive at newer conclusions. Thus this exercise is an effort to provide a better understanding the concepts related to human body measurements which were mentioned in *Ayurvedic Samhitas*.

HISTORICAL REVIEW

VEDIC KALA

Angula Pramana mentioned in *Yajurveda* for *Homa Kunda* preparation, length of *Darbha*; *Dharba* should be cut in 6 *Angula Pramana*. Whereas in *Rigvada* one reference explains that *Paramatma* (God) resides in *Dasha Angula Pradesha*.

PURANA-UPANISHAD KALA

In *Varaha-mihikya*, the ancient *Brihat Samhita*, a reference of 5 types of *Purusha* with their *Anguli Pramana* is available. *Agni Purana* contains the *Pramana* of different body parts; *Hridaya*, *Prishta*, and *Kati* etc. and *Sama Ayama Vistara Angula Pramana*¹. *Shrimat Tantrasara Sangraha* by *Shrimadananda Thirtha* in the context of *Pratima Yoga Lakshana* various *Pramanas* of different body parts has been mentioned for making statues which is based upon *Swa-Angula* concept².

SAMHITA KALA

Samhita period is considered as the golden period of *Ayurveda*. *Ayurveda* developed immensely during *Samhita* period. Classical text books of *Samhita Kala* give much importance to the *Pramana Pareeksha*.

Charaka Samhita:

Acharya Charaka explained *Pramana Shareera* in *Dasha Vidhpareeksha Bhavas* of the patient³. He has mentioned the *Anguli Pramanas* of *Anga-Pratyangas* of human body in which *Hasta*; 12 *Angula* in length & *pada*; 14 *Angula* in length⁴. These are some examples those indicate the proper measurement of body parts and body measurement in different dimension, which shows important nance of *Sama Shareera* and be a useful tool to assess the *Ayu* of the *Aatura*⁴.

Sushruta Samhita:

Acharya Sushruta has explained the *Anguli Pramanas* of different body parts⁵; *Hasta*-24 *Angula*. *Sushruta* says if person having appropriate *Pramana* of *Anga-Pratyangas* is believed to good health & long life⁶. *Acharya* also explained *Pramana Pariksha*; criteria for assessing the *Ayu* of the individual, before proceeding the treatment of the patient⁷.

Kashyapa Samhita:

Acharya Kashyapa explained the *Anjali Pramana* for *Stanya*, *Rakta*, *Ras*, *Meda*, *Oja* etc. But no explanation of *Anguli Pramana* found in available *Kashyapa Samhita*⁸.

Bhela Samhita:

Only one reference for *Angula Pramana* available in *Bhela Samhita* in '*Ayurlakshanendriya*' chapter; if person having *Lalata*, *Nasika* and *Karna* - 6 *Angulas* each, then he will attain the life span of 100 years⁹.

SANGRAHA KALA

Ashtanga Samgraha:

Vruddha Vagbhata has also explained the *Pramana* of different parts of the body & *Sama Shareera* concept; *Hasta* - 12 *Angula* and *Pada* - *Angula*¹⁰.

Ashtanga Hridaya: Detailed description regarding the *Pramana Shareera* is not found in *Ashtanga Hridaya*, but *Acharya* explained that the appropriate height of a person is equivalent to $3^{1/2}$ time length of his *Hasta*¹¹.

MADHYA KALA

Sharangadhara Samhita:

Anguli Pramana is main component of *Maanaparibhasha*, here it is mentioned for measuring the length/depth/breadth of *Kudav*. Which is the main measuring unit to measuring volume of Drugs, liquids etc., in the commentary description regarding the *Angula* and *Yava* also available¹².

Vangasena Samhita:

In *Nidanapanchaka* chapter *Acharya* has considered knowledge of *Pramana* as one of the key to achieve success in field of medicine¹³. In the same chapter while explaining about the *Kudava Mana*, he has mentioned about the *Anguli Pramana*¹⁴.

Rasatarangini:

Many references regarding *Angula Pramana* are available in relation to preparation of different *Putas*; *Mahaputa* - $\frac{1}{2}$ *Vyama* depths & 2 *Hasta* widths. The word *Vyama* is synonym for *Ayama* which is of 84 *Angulas*¹⁵.

Kautilya Arthashastra:

Definitions of *Angula* has explained in '*Deshakalamanam*' chapter. One *Angula* is that measurement which is obtained by sewing 8 *yavas* in the middle, and according to another; one *Angula* is the measurement of the *Madhyama Prakarsha* of the *Madhyama Anguli* of the *Madhyama Kaya Purusha*¹⁶. In '*Tulamanapautavam*' chapter, the concept of *AnguliPramana* has been applied for preparing different types of weighing tools to measure the weight of gold, silver etc¹⁷.

DESCRIPTION REGARDING ANGULI PRAMANA:

Mana is the parameter for measuring different items which shown in specific units; *Tula*, *Anguli*, and *Prasta*. *Anguli Pramana* is an ancient measuring unit specially useful for measuring length, height, width and circumference of body, body parts, instruments –*Yantra*, *Shastra* etc. and other articles useful in preparing medicine performing treatment and also useful in daily life.

ANGULA CAN BE TAKEN AS:

- 1) Width of the *Madhyama Parva* of the *Madhyama Angula*.
- 2) Measurement obtained by taking the length of the *Madhyama Angula* and dividing it by five⁵.
- 3) Measurement obtained by taking the width of the *Palm* and then dividing by four.
- 4) *Nakha*, *Tala Bhaga* of *Angushtha*.
- 5) In this study; measured *Angul Praman* is different in each individual.

DIFFERENT OPINIONS ON STANDARDISATION OF ANGULA

There are so many opinions available regarding actual measurement of one *angula*, some of them mentioned here -

- i. It is the average breadth of the digits of hand excluding thumb,
- ii. It is the breadth of the digit of hand excluding thumb having maximum breadth
- iii. It is the maximum breadth of the thumb
- iv. It is the greatest inter-nodal distance of the digits of hand
- v. The average inter-nodal distance of the digits of upper limb

If we consider the first condition, hence it is an average, derived by taking the total width of fingers (average of maximum and minimum breadth), dividing by the number of fingers. The thumb is excluded in this technique. It can be done either by taking digits of one hand or both hands. It is a most practically possible measuring method. Measurement of four *Angul-Pramana*

(Maximum Width of Four Finger + Minimum Width of Four finger)/2

One Angul Pramana = (Four Angul Pramana)/4

If we want to measure the length of any individual; measuring with single digit is very difficult but when taken together it makes measuring procedure very simple. The breadths of fingers are different, one *Angula* would be breadth of index finger only; two *Angula* would be combined width of index and middle finger or any two finger etc. Thus four *Angulas* doesn't mean twice of two any *Angula*; the ring finger and little finger are less broad than the first two.

One *Angula Pramana* is the mean of all four finger of same hand and it will constant in all conditions, Therefore this technique adopted to measure the *Angula* in this study.

Need and Significance of Study

1. There are very elaborate descriptions available in the Classics regarding measurement of body and its parts in *Angula Pramana*, but till now authenticity of *Angula Pramana* in reference to children are not established.
2. Therefore this present study was rationalized i.e. comparison between classical *Angula Pramana* and observational values of particular body part to validate the *Angula Pramana* w.s.r. to anthropometry.
3. The study can be done by a survey study which is most feasible in *Ayurvedic* research as it is cost effective and yields accurate results. The requirements of the research are easily fulfilled.

Name of organ

1. Length of <i>PADA</i>	Proximal End of 1 st Finger to Post. of Heel
2. Height of <i>PADA</i>	Base of Feet to Mid of Medial Moliolus
3. Length of <i>JANGHA</i>	Mid of Medial Moliolus to Upper Border of Tibial Tuberosity
4. Circum. of <i>JANGHA</i>	Fullest Part of Calf Circumference
5. <i>JANU</i>	Upper Border of Tibial Tuberosity to Upper Border of Patella
6. Length of <i>URU</i>	Upper Border of Patella to Anterior Superior Iliac Supine
7. Circum. of <i>URU</i>	At Mid Point of Total length of Uru

4. The study gives a clear cut output and has direct contribution to *Ayurvedic Paediatrics*.

5. The topic can help develop new branches of *Ayurveda*.

a. Anthropometry in children through *Ayurveda Angula Pramana*.

AIMS AND OBJECTIVES

The Present research study has been planned to conduct with following main objectives.

- To explore and validate the *Ayurvedic* concept related to anthropometry in children.
- To abolish the sign & symptoms of calcium deficiency by use of study drug.
- To find out a better answer for calcium supplementation in children.

MATERIAL AND METHOD

Phase- I: Validation of Ayurvedic Concept anthropometrical parameters.

- Review of *Ayurvedic* classics including relevant commentaries regarding the Concept of anthropometry.
- Review of all available literature related to modern anthropometry.
- Validations of *Ayurvedic Sharir pramana* on the basis of modern concept (Parameters).

Selection of Children

For the study normal health & ill children of age group between 0-15 years were selected from IPD & OPD of Bal-Roga Department of N.I.A Jaipur and also by survey method.

50 cases were included in the study.

The data was recorded in a Pre designed format.

8. Circum. of <i>SHIRAH</i>	Around the Head at the Level of Glabella in Front and Behind at the Level of Protuberance
9. Total Height	Distance From the Floor to The Heighest Point of Head

The measurements were taken in centimetres for standardization as per metric system & then converted into Anguli Pramana based on Swa-Anguli Pramana according to direct and indirect references mentioned in the classics. Pramana of one angula was obtained by measuring Measurement of four *Angul-Pramana* (Maximum Width Of Four Finger + Minimum Width Of Four finger)/2
 One *Angul Pramana* = (Four *Angul Pramana*)/4

OBSERVATIONS AND RESULTS

INCIDENCE OF AGE

Table No. 1: Frequency Distribution According to Age

Age in Years	No. of Patients	Percentage
At Birth to 3years	54	21.60 %
3-6	48	19.20 %
6-9	52	20.80
9-12	50	20.00
12-15	46	18.40
Total	250	100.00

Out of 250 patients 54 (21.60%) belongs to age Group birth to 3 years followed by 52 (20.80%) in age Group 6 to 9 years, minimum 46 (18.40%) patients were found in 12-15 years age Group as shown in Table No.1.

INCIDENCE OF SEX

Table No. 2: Frequency Distribution According to Sex

Sex	No. of Patients	Percentage
Male	125	50.00
Female	125	50.00
Total	250	100.00

Out of 250 patients 125 (50%) patients were male child and 125 (50%) patients were females.

INCIDENCE OF RELIGION

Table No. 3: Frequency Distribution According to Religion

Religion	No. of Patients	Percentage
Hindu	156	62.40
Muslim	94	37.60
Total	250	100.00

Maximum no. of patients 156 (62.40%) were Hindu and 94 (37.60%) patients were from Muslim community none of the patients in the study were Sikh and Christian as data shown in Table No.3.

INCIDENCE OF SOCIO-ECONOMIC STATUS

Table No. 4: Frequency Distribution according to Socio Economic Status

Economic Status	No. of patient	Percentage
Higher	5	2.00
Middle- Higher	17	6.80
Middle	27	10.80
Middle- Lower	61	24.40
Lower	140	56.00
Total	250	100.00

In present study majority of patients 140 (56%) found from lower class and 24.40%, 10.80% were from middle lower class & middle class respectively, only 2% of patients were from higher socio-economic status as shown in Table No. 4.

RESULTS

The values of important 13 body part's measurement obtained in 250 individuals are shown in the form of tables, each table contain comparison of sample mean of body part measurement values from birth to 15years with classical *Angul Pramana* value of respective body part as described in *Ayurvedic Samhitas*. Each body part's measurement is divided into two Groups i.e. Male and Female Group in separate table.

Table No.5: Measurement Length of PADA in Boys and Samhita value is 14 Angul

Age in Years	No. of Patients	Measured Angul Minimum	Measured Angul Maximum	Mean
Birth to 1Year	9	6.93	13.01	9.66
1-2year	9	8.57	12	10.41
2-3Year	10	10.8	12.15	11.10
3-4Year	9	9.37	12.84	11.13
4-5 Year	8	10.66	13.79	11.59
5-6 Year	7	11.10	13.92	12.39
6-7 Year	7	10.18	13.10	12.12
7-8 Year	9	11.20	13.42	12.39
8-9 Year	8	11.52	13.76	12.96
9-10 Year	6	11.55	13.48	12.46
10-11 Year	10	11.90	14.08	12.89
11-12 Year	9	10.76	13.92	12.66
12-13 Year	10	11.08	14.22	12.99
13-14 Year	6	12.10	14.02	12.79
14-15 Year	8	11.92	13.78	12.33

Table No.6: Measurement Length of PADA in Girls and Samhita value is 14 Angul

Age in Years	No. of Patients	Measured Angul Minimum	Measured Angul Maximum	Mean
Birth to 1 year	8	8.6	11.2	9.97
1-2year	9	10.0	12.17	10.83
2-3Year	9	10.86	12.09	11.91
3-4Year	7	10.5	12.54	11.52
4-5 Year	9	11.13	13.65	12.13
5-6 Year	8	11.43	13.78	12.40
6-7 Year	9	11.48	13.80	12.25
7-8 Year	8	11.62	14.18	12.97
8-9 Year	11	11.26	13.90	12.61
9-10 Year	10	11.58	14.71	12.81
10-11 Year	7	11.68	14.31	12.97
11-12 Year	8	11.08	14.17	12.35
12-13 Year	6	11.27	13.84	12.42
13-14 Year	9	11.84	13.92	12.61
14-15 Year	7	12.24	14.28	12.37

Table No.7: Measurement Height of PADA in Boys and Samhita value is 4 Angul

Age in Years	No. of Patients	Measured Angul Minimum	Measured Angul Maximum	Mean
Birth to 1 year	9	3.44	4.50	3.98
1-2year	9	3.07	5.12	4.28
2-3Year	10	3.72	5.03	4.05
3-4Year	9	3.86	5.92	4.13
4-5 Year	8	3.82	5.33	4.66
5-6 Year	7	4.07	5.24	4.48
6-7 Year	7	4.04	5.73	4.74
7-8 Year	9	4.11	5.90	5.02
8-9 Year	8	3.97	5.43	4.74
9-10 Year	6	4.08	5.13	4.65
10-11 Year	10	4.12	5.38	4.53
11-12 Year	9	4.13	5.28	4.59
12-13 Year	10	4.21	5.10	4.64
13-14 Year	6	4.53	5.46	4.78
14-15 Year	8	4.37	5.29	4.34

Table No.8: Measurement Height of PADA in Girls and Samhita value is 4 Angul

Age in Years	No. of Patients	Measured Angul Minimum	Measured Angul Maximum	Mean
Birth to 1 year	8	3.42	4.33	4.02
1-2year	9	3.75	5.63	4.44
2-3Year	9	3.36	4.71	4.03
3-4Year	7	3.48	4.92	4.10
4-5 Year	9	4.40	5.20	4.79
5-6 Year	8	4.24	5.44	4.64
6-7 Year	9	4.06	5.38	4.42
7-8 Year	8	4.11	5.29	4.66
8-9 Year	11	4.28	5.52	4.96
9-10 Year	10	4.32	5.20	4.80
10-11 Year	7	4.19	5.38	4.46
11-12 Year	8	4.28	5.18	4.32
12-13 Year	6	4.62	5.47	4.52
13-14 Year	9	4.39	5.41	4.42
14-15 Year	7	4.10	5.36	4.28

Table No.9: Measurement Length of JANGHA in Boys and Samhita value is 18 Angul

Age in Years	No. of Patients	Measurd Angul Minimum	Measured Angul Maximum	Mean
Birth to 1 year	9	10.0	14.59	13.94
1-2year	9	12.76	17.14	15.10
2-3Year	10	16.34	19.25	17.95
3-4Year	9	14.62	19.82	18.11
4-5 Year	8	16.0	22.07	19.03
5-6 Year	7	16.94	20.13	18.03
6-7 Year	7	15.35	21.22	18.41
7-8 Year	9	17.14	27.53	18.11
8-9 Year	8	17.93	21.84	18.86
9-10 Year	6	18.09	22.13	19.73
10-11 Year	10	18.56	24.61	20.32
11-12 Year	9	17.91	23.08	20.18
12-13 Year	10	18.62	24.72	20.51
13-14 Year	6	18.93	24.83	20.14
14-15 Year	8	19.41	22.37	20.94

Table No.10 Measurement Length of JANGHA in Girls and Samhita value is 18 Angul

Age in Years	No. of Patients	Measured Angul Minimum	Measured Angul Maximum	Mean
Birth to 1 year	8	13.44	17.96	15.98
1-2year	9	15.19	18.03	16.50
2-3Year	9	17.43	19.09	18.25
3-4Year	7	17.28	18.96	18.04
4-5 Year	9	17.39	18.53	17.97
5-6 Year	8	17.41	18.77	18.12
6-7 Year	9	17.02	18.90	18.24
7-8 Year	8	17.44	20.97	18.94
8-9 Year	11	18.13	20.71	19.21
9-10 Year	10	17.94	22.64	19.82
10-11 Year	7	18.92	22.75	20.13
11-12 Year	8	19.08	21.17	20.24
12-13 Year	6	18.90	21.93	20.53
13-14 Year	9	19.61	22.02	20.12
14-15 Year	7	19.42	21.84	21.03

Table No.11 Measurement Circumference of JANGHA in Boys and Samhita value is 16 Angul

Age in Years	No. of Patients	Measured Angul Minimum	Measured Angul Maximum	Mean
Birth to 1 year	9	13.79	17.0	14.94
1-2year	9	14.73	18.71	16.53
2-3Year	10	15.21	19.25	17.03
3-4Year	9	15.17	19.76	16.95
4-5 Year	8	15.31	18.60	16.92
5-6 Year	7	15.56	19.12	17.64
6-7 Year	7	15.35	19.59	16.83
7-8 Year	9	15.86	19.62	17.31
8-9 Year	8	15.24	19.17	17.60
9-10 Year	6	16.03	19.24	17.58
10-11 Year	10	16.15	18.41	17.94
11-12 Year	9	16.00	18.93	17.84
12-13 Year	10	16.47	18.82	17.63
13-14 Year	6	16.13	18.54	17.23
14-15 Year	8	15.94	18.74	17.53

Table No.12 Measurement Circumference of JANGHA in Girls and Samhita value is 16 Angul

Age in Years	No. of Patients	Measured Angul Minimum	Measured Angul Maximum	Mean
Birth to 1 year	8	14.4	15.0	14.72
1-2year	9	17.22	20.00	18.64
2-3Year	9	15.45	18.60	17.34
3-4Year	7	16.28	19.20	17.92
4-5 Year	9	16.34	19.72	18.53
5-6 Year	8	16.26	20.12	17.84
6-7 Year	9	16.04	19.92	17.45
7-8 Year	8	15.94	20.04	17.62
8-9 Year	11	17.26	20.74	17.89
9-10 Year	10	17.28	19.87	17.87
10-11 Year	7	17.14	19.56	18.03
11-12 Year	8	17.02	20.12	18.14
12-13 Year	6	15.48	19.82	17.68
13-14 Year	9	16.30	19.64	17.74
14-15 Year	7	17.12	19.92	17.80

Table No.13 Measurement Length of JANU in Boys and Samhita value is 4 Angul

Age in Years	No. of Patients	Measured Angul Minimum	Measured Angul Maximum	Mean
Birth to 1 year	9	2.50	4.16	3.85
1-2year	9	2.87	4.38	3.94
2-3Year	10	3.47	4.26	4.12
3-4Year	9	3.52	4.94	4.23
4-5 Year	8	4.02	5.51	4.46
5-6 Year	7	3.52	5.34	4.28
6-7 Year	7	4.10	5.12	4.61
7-8 Year	9	4.23	5.60	4.76
8-9 Year	8	4.08	5.21	4.48
9-10 Year	6	3.95	5.14	4.35
10-11 Year	10	4.01	4.98	4.30
11-12 Year	9	4.17	5.37	4.59
12-13 Year	10	4.07	5.10	4.78
13-14 Year	6	4.23	5.88	4.64
14-15 Year	8	3.92	4.93	4.27

Table No.14 Measurement Length of JANU in Girls and Samhita value is 4 Angul

Age in Years	No. of Patients	Measured Angul Minimum	Measured Angul Maximum	Mean
Birth to 1 year	8	3.69	4.33	4.06
1-2year	9	3.85	5.00	4.38
2-3Year	9	3.55	4.71	4.09
3-4Year	7	3.74	4.91	4.19
4-5 Year	9	4.08	5.21	4.79
5-6 Year	8	4.11	5.07	4.62
6-7 Year	9	3.92	5.13	4.58
7-8 Year	8	4.19	4.93	4.34
8-9 Year	11	4.22	5.10	4.64
9-10 Year	10	4.02	5.17	4.72
10-11 Year	7	4.17	5.04	4.44
11-12 Year	8	4.00	5.03	4.38
12-13 Year	6	3.98	5.24	4.51
13-14 Year	9	4.12	5.32	4.42
14-15 Year	7	3.84	5.14	4.28

Table No.15 Measurement Length of URU In Boys and Samhita value is 18 Angul

Age in Years	No. of Patients	Measured Angul Minimum	Measured Angul Maximum	Mean
Birth to 1 year	9	10.66	18.21	13.90
1-2year	9	12.30	17.42	14.39
2-3Year	10	17.67	20.26	18.24
3-4Year	9	15.63	21.73	18.53
4-5 Year	8	17.77	22.07	20.12
5-6 Year	7	17.14	22.53	20.04
6-7 Year	7	18.12	24.16	21.82
7-8 Year	9	17.71	27.53	21.88
8-9 Year	8	18.20	25.29	22.54
9-10 Year	6	20.51	23.93	22.08
10-11 Year	10	22.66	24.61	23.17
11-12 Year	9	20.49	24.66	22.19
12-13 Year	10	21.93	25.48	23.25
13-14 Year	6	21.51	24.72	22.58
14-15 Year	8	22.24	25.54	23.04

Table No.16 Measurement Length of URU in Girls and Samhita value is 18 Angul

Age in Years	No. of Patients	Measured Angul Minimum	Measured Angul Maximum	Mean
Birth to 1 year	8	13.84	15.36	14.73
1-2year	9	16.36	19.16	17.56
2-3Year	9	17.78	19.53	18.71
3-4Year	7	17.64	20.06	18.84
4-5 Year	9	18.66	21.80	20.23
5-6 Year	8	18.82	21.59	20.34
6-7 Year	9	18.94	21.63	20.36
7-8 Year	8	19.10	24.86	21.17
8-9 Year	11	22.52	23.94	23.94
9-10 Year	10	23.31	25.86	23.94
10-11 Year	7	22.32	24.17	23.12
11-12 Year	8	22.61	25.14	23.22
12-13 Year	6	22.54	25.24	23.42
13-14 Year	9	22.76	25.52	23.18
14-15 Year	7	22.68	25.04	23.20

Table No. 17 Measurement Circumference of URU in Boys and Samhita value is 30 Angul

Age in Years	No. of Patients	Measured Angul Minimum	Measured Angul Maximum	Mean
Birth to 1 year	9	14.22	22.00	19.69
1-2year	9	20.00	27.14	24.94
2-3Year	10	22.69	28.12	24.31
3-4Year	9	22.07	27.53	25.12
4-5 Year	8	23.25	28.51	24.88
5-6 Year	7	23.52	28.10	25.47
6-7 Year	7	23.67	27.92	24.93
7-8 Year	9	23.80	27.53	25.42
8-9 Year	8	24.17	28.41	25.60
9-10 Year	6	22.92	29.44	26.23
10-11 Year	10	21.38	30.04	26.46
11-12 Year	9	22.68	28.67	25.93
12-13 Year	10	22.19	29.41	26.21
13-14 Year	6	21.14	30.12	25.97
14-15 Year	8	24.08	30.41	26.48

Table No.18 Measurement Circumference of URU in Girls and Samhita value is 30 Angul

Age in Years	No. of Patients	Measured angul Minimum	Measured angul Maximum	Mean
Birth to 1 year	8	17.60	23.33	20.82
1-2year	9	23.63	27.50	25.62
2-3Year	9	24.54	27.69	25.51
3-4Year	7	24.92	28.10	25.64
4-5 Year	9	24.34	27.92	25.36
5-6 Year	8	24.68	28.00	25.52
6-7 Year	9	23.27	28.18	25.10
7-8 Year	8	24.56	28.36	25.68
8-9 Year	11	22.64	30.01	25.85
9-10 Year	10	23.72	30.54	26.72
10-11 Year	7	23.49	29.18	26.12
11-12 Year	8	22.64	29.72	25.80
12-13 Year	6	23.22	30.17	25.94
13-14 Year	9	24.18	29.52	26.18
14-15 Year	7	23.43	30.12	26.27

Table No.19 Measurement of Head Circumference in Boys and Samhita value is 32 Angul

Age in Years	No. of Patients	Measured Angul Minimum	Measured Angul Maximum	Mean
Birth to 1 year	9	38.22	49.92	45.16
1-2year	9	42.85	50.52	45.86
2-3Year	10	43.64	49.84	46.78
3-4Year	9	43.23	48.16	45.33
4-5 Year	8	39.18	45.99	42.66
5-6 Year	7	39.60	45.10	41.82
6-7 Year	7	39.61	44.28	41.60
7-8 Year	9	38.72	45.71	42.30
8-9 Year	8	38.40	44.62	41.84
9-10 Year	6	36.61	40.31	39.16
10-11 Year	10	35.28	41.50	38.24
11-12 Year	9	32.95	38.12	34.62
12-13 Year	10	31.08	37.87	34.19
13-14 Year	6	31.76	36.13	33.94
14-15 Year	8	31.52	36.04	33.26

Table No.20 Measurement of Head Circumference in Girls and Samhita value is 32 Angul

Age in Years	No. of Patients	Measured Angul Minimum	Measured Angul Maximum	Mean
Birth to 1 year	8	50.2	54.6	52.77
1-2year	9	40.52	53.75	46.64
2-3Year	9	42.72	49.23	46.96
3-4Year	7	40.88	46.81	43.56
4-5 Year	9	40.62	45.87	43.40
5-6 Year	8	41.08	46.00	44.06
6-7 Year	9	35.63	44.26	42.16
7-8 Year	8	37.02	44.80	41.95
8-9 Year	11	36.92	41.02	38.16
9-10 Year	10	38.14	42.58	39.84
10-11 Year	7	32.38	38.11	36.12
11-12 Year	8	32.18	37.64	35.56
12-13 Year	6	33.20	37.26	34.83
13-14 Year	9	32.94	36.90	34.26
14-15 Year	7	32.15	35.98	34.12

Table No.21 Measurement of Total Height in Boys and Samhita value is 84 Angul

Age in Years	No. of Patients	Measured Angul Minimum	Measured Angul Maximum	Mean
Birth to 1 year	9	62.2	74.66	69.44
1-2year	9	69.79	82.05	77.05
2-3Year	10	72.10	91.18	80.24
3-4Year	9	78.84	94.86	84.26
4-5 Year	8	81.63	99.35	87.49
5-6 Year	7	80.68	98.24	86.66
6-7 Year	7	80.84	104.34	90.28
7-8 Year	9	84.12	106.71	93.07
8-9 Year	8	88.00	107.21	98.64
9-10 Year	6	91.85	105.62	99.20
10-11 Year	10	94.12	104.82	99.07
11-12 Year	9	85.01	103.64	98.12
12-13 Year	10	86.34	101.47	97.16
13-14 Year	6	90.58	102.79	96.94
14-15 Year	8	91.43	100.24	96.34

Table No. 22 Measurement of Total Height in Girls and Samhita value is 84 Angul

Age in Years	No. of Patients	Measured Angul Minimum	Measured Angul Maximum	Mean
Birth to 1 year	8	72.00	79.38	75.46
1-2year	9	78.18	87.5	82.57
2-3Year	9	86.36	90.25	88.08
3-4Year	7	90.66	94.00	90.79
4-5 Year	9	89.78	93.38	91.64
5-6 Year	8	90.84	97.65	92.36
6-7 Year	9	90.22	96.54	92.36
7-8 Year	8	91.42	98.02	93.50
8-9 Year	11	94.81	105.56	98.73
9-10 Year	10	93.24	105.17	99.02
10-11 Year	7	90.53	100.14	98.62
11-12 Year	8	94.17	102.13	97.32
12-13 Year	6	93.47	101.06	96.77
13-14 Year	9	94.82	99.80	96.82
14-15 Year	7	90.64	99.63	95.80

DISCUSSION ON SWA-ANGULA

PRAMANA:

The *Swa-Angula Pramana* concept is explained in the context of *Pramana*

Shareera. This concept of measurement for the individual with his/her specific unit seems to be more scientific & applicable

rather than measuring one's body with some other standards.

Ayurveda in its principles has given importance to individualistic approach rather than a generalized. Application of this principle can be clearly seen like even though two children suffering from same disease, the treatment modality may change depending upon the results of *Dashavidha Pareeksha*. Application of this *Swa Angula* concept can be seen in different contexts like in preparing the different *Shastras*, *Yantras* related to *Shalya*, *Shalakyas* and *Pancha karma* also different instruments like *Bastinetra*, *Dhoom netra* etc. and probably these are prepared by assessing the *Swa-AngulaPramana* of *Rogi* who is under treatment. Specificity is the characteristic property of *Swa-Angula Pramana*. This can be applicable in present era. If a person loses both his legs then rather than using the present anthropometric knowledge to make average based artificial limbs we can utilize the *Swa Angula* based *Pramana Shareera* concept and prepare proportionate artificial limbs. *Swa Angula* concept can also be utilized in the field of sport and designing industries etc.

DISCUSSION ON METHODOLOGY:

The study was conducted on 250 children male and female in the age Group of birth to 15yrs. All the measurements were taken in the morning as the height normally diminishes in the day time and increases in the morning after rest at night due to the compression of inter vertebral discs and joint cartilage. The reduction in the stature may range from 1 to 10mm.

The landmarks for each measurement were carefully fixed. All the measurements were taken in cms and then converted into *Angula Pramana*. The measurements were taken from the right side of the body.

DISCUSSION ON RESULTS

Ayama and *Utseda* of different organs are mentioned by *Caraka*, *Sushruta* and *Vagbhata*, but they are not described separately in children. No landmarks have

been mentioned, neither by the authors nor the commentators so the modern anthropometric procedure and technique were used.

The purpose of this study is to verify the references related to body measurements described in *Praman Pareeksha* are same or different in children as mentioned in *Brahtriya Samhitas* i.e. *Charak*, *Sushrut* and *Vagbhat Samhita*.

DISCUSSION ON PADA LENGTH:

Pada length was measured by using the *Swa Angula Pramana* (Patients own *Angul Pramana*) in different age Groups. In present study mean value of *Pada* length is 9.66 *Angul* in male and 9.97 *Angul* in births to 1 year female children. In the 4 to 5years age the mean *Pada* length was found 11.59 *Angul* in male and 12.13 *Angul* in female. At the age 9 to 10 year the mean *Pada* length found 12.46 *Angul* in male and 12.81 *Angul* in female. In the age 14 to 15years the mean *Pada* length were found 12.33 *Angul* in male and 12.37 *Angul* in female respectively as showing in Table No.5 & 6. The measured mean *Pada* length in present study was differ from *Samhita's Angul Pramana* values; it may be due to improper somatic growth in beginning or error in selecting the landmarks for *Pada* length in *Samhita* and modern anatomy. But near the puberty at the age 14 to 15 years the measured mean *Pada* length in patients were found 12.33 *Angul* in males and 12.37 *Angul* in females it was quiet near the *Angul Pramana* value of *Pada* Length i.e. 14 *Angul* as mention in *Samhita*.

DISCUSSION ON (SHIRAH PARINAH) HEAD CIRCUMFERENCE

In present study observed mean value of head circumference is 45.16 *Angul* in male and 52.77 *Angul* in female from births to 1 year age. In the 4 to 5years age the mean head circumference found 42.66 *Angul* in male and 43.40 *Angul* in female children. In the age 9 to 10 years the mean head circumference were found 39.16 *Angul* in male and 39.84 *Angul* in female children. In

the age 14 to 15 years the mean head circumference was found 33.26 *Angul* in male and 34.12 *Angul* in female children as showing in Table No.19 & 20. The obtained value in case of head circumference 43.40 to 52.77 *angul* was higher than the 32 *Angul* value of *Shirah Parinaha* as described in *Samhita's Angul Pramana* in infantile to toddler age Groups. It is may be due to higher brain/neuronal growth in early age i.e. up to 5 year almost 90% brain growth achieved. The observed mean head circumference value at the 15 years age 33.26 *Angul* is near about *Samhita's Angul Pramana* value of 32 *Angul*. The observation findings do not satisfy the measurement mentioned in the classics in initial age Group of child, but as the child reaches to puberty the measurements becomes similar the classical *Samhita's Angul Pramana*, its shows that all the measurement of *Angul Pramana* mentioned in *Samhitas* are related to adult.

DISCUSSION ON TOTAL HEIGHT

Height is measured by using the *Swa Angula Pramana* (Patients *Angul Pramana*) in boys and girls in different age Groups. In present study the obtained mean value of length was 69.44 *Angul* in male and 75.46 *Angul* in female births to 1 year age. In the age 4 to 5 years mean height were found 87.49 *Angul* in male and 91.64 *Angul* in female children. In the age 9 to 10 years mean height were measured 99.20 *Angul* in males and 99.02 *Angul* in female children. In the age 14 to 15 years mean height were found 96.34 *Angul* and 95.80 *Angul* in female children as shown in Table No.29 & 30. The mean observed value of length was in between the range of 69.44 *Angul* in male and 75.46 *Angul* in female children from birth to 1 year age to 96.34 *Angul* male and 95.80 *Angul* in female children at 14 to 15 year age, it is quiet lower in starting but as age increases or children reaches to puberty there are slightly higher mean value of height observed in comparison to *Samhita's total height 84 Angul Pramana* as described in *Charak Samhita*. Its difference may be

due to different growth sprouts found in life i.e. in beginning neuronal growth sprouts and around puberty somatic growth sprouts.

DISCUSSION ON EXTERMITIES

Various parts of extremities like *Hasta tala, Prapani, Prabahu, Uru and Jangha* was measured by *Swa Angul Pramana* in both sexes at different age Group from birth to 15 years. All of the measured data were not satisfying the measurement mentioned in the classics *Angula Pramana*. It is may be due to different growth pattern in different age Group from birth to puberty. In initial stage the observed mean values of extremities found shorter than the *Angula Pramana* values as mentioned in *Samhitas*, but as the children reaches near about puberty all the measurement of body becomes similar the classical *Samhita's Angul Pramana*.

CONCLUSION

Following conclusion can be drawn from the present research work:

- ❖ Anthropometry was well developed in *Samhita* period.
- ❖ The average *Anguli Mana* of 250 individuals was found differ according to age group in this study.
- ❖ The observational findings do not satisfy the measurement mentioned in the classics in initial age Group of child but as the child reaches to puberty these particular measurements becomes similar the classical *Samhita's Angul Pramana*.
- ❖ In our opinion *Praman Sharir* described in *Ayurvedic Samhitas* for a healthy adult person not for the child.
- ❖ To validate the *Ayurvedic Pramana Pareeksha* in present Era on modern parameters further studies are needed in large group or greater sample size for an accurate verification and analysis.
- ❖ A *Prakriti* based analysis of anthropometric measurements will help in qualitative analysis and appreciating the difference in physical appearance between the individuals of different

Prakritis; toward better understanding the concept of Prakriti.

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