International Journal of Applied Ayurved Research ISSN: 2347- 6362
Published online in: https://ijaar.in

A CRITICAL ANALYSIS OF ANTHROPOMETRIC VARIATIONS OF UNDERGRADUATE STUDENTS WITH SPECIAL REFERENCE TO *ANGULI PRAMANA*

Research article

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ABSTRACT

Anthropometry is the science of obtaining systematic measurements of the human body. *Shareera Pramana* (body measurements) can be determined by one's own *Anguli Pramana* (width of the widest part of the thumb*)* in terms of height, breadth, and length. *Anguli Pramana* has been used in different aspects such as Acharya Susruta while describing M*arma* (vital points), N*etra* (eye), measurements of surgical instruments and *Acharya* Charaka in *Pramana Pareeksha* to determine *Shareera Bala* (Physical strength) and life span of the patient. The objectives of this study were to identify the measurements of the human body of an individual using *Anguli Pramana* and to evaluate the findings with measurements mentioned in Charaka Samhita. A total number of 109 adults including 11 males and 98 females belonging to ages 21-25 were selected. The breadth of the thumb on the widest place (*Angushta Udara*) of the right hand was measured and, the height, the length of the upper arm, forearm, hand, sole, circumference of the calf region, and head of the participants were recorded in *Anguli Pramana*. Data were analyzed, the mean value, median value, and standard deviation were taken and the results were evaluated with measurements mentioned in Charaka Samhita. The lowest *Anguli Pramana* was 1.1 cm and the highest was 2.2 cm. Findings showed wide variations of measurements within the sample and with the measurements in Charaka Samhita. Mean of the length of the hand was the closest measurement while the mean of the height showed the widest difference with measurements in Charaka Samhita. Further studies should be carried out using different measurements, sampling methods, and sizes to evaluate more findings.

Key Words: *Anguli Pramana*, Anthropometry, Ayurveda, *Pramana Pareeksha, Shareera Pramana*

INTRODUCTION: Anthropometry is defined as the science in which systematic measurements of the human body can be obtained.[1] The word Anthropometry is a combination of the words-Anthropo-man/ human, and metron-measure, both are used for understanding the purpose of comparative measurements of the human

body or parts of the human body.[1] In anthropometry, the measurements of the human body dimensions such as lengths, breadths, girths, and skinfolds are taken using surface landmarks for reference.[1]

Pramana is the measurement of *Shareera*, measured by one's own *Anguli (*width of the *Angushta Udara /*widest part of the thumb*)* in terms of height, breadth, and length of the *Anga*, *Prathyanga*, (parts and sub parts of the human body) and *Shareera* (Human body or parts of the human body).[2] Ayurveda explained the nature of the human body with comprehensive observation of the physical constitution in various aspects and dimensions of life and to preserve the health of living beings.

Pramana Shareera in Ayurveda can be correlated with Anthropometry. Anthropometry provides a valuable assessment of the nutritional status of the individual through physical measurements, while the *Anguli Pramana*, not only gives the measurements of the body but gives insight and information on the life span of the individual.[2] *Pramana* has been mentioned in main Ayurveda authentic texts such as Susruta Samhita, Charaka Samhita, Astanga Sangraha, and Sharangadhara Samhita. In Susruta Samhita, *Pramana* is mentioned in *Sutrasthana*, 35th chapter, while describing the examination of the patient.[3] Charaka *Acharya* describes *Pramana* in *Vimansthana*, 8th chapter in the context of *Pramana Pareeksha* that the physician should examine the strength of the patient, to get an idea about the life span of the patient before commencing treatment. Measurements of the body parts are mentioned in Charaka Samhita in terms of *Utsedha* (height), *Vistara* (breadth), and *Ayama* (length) respectively.[2] Also *Pramana* has been mentioned in Ashtanga Sangraha, *Shareerasthana* 8th chapter.[4]

Anguli Pramana : *Anguli pramana* has been used as a tool of measurement in different fields of Ayurveda.[5] It has been used to describe measurements of the surgical instruments, measurements of *Netra* (eyes), measurements of *Marma* (vital points of the body), and measurements of *Bastinetra* in *Panchakarma*.[5] Also *Anguli Pramana* has been used as a tool for the measurement of the body of an individual in Ayurveda.[3] In Susruta Samhita *Anguli* has been described as the distal movable parts of the limbs which are 20 in number.[6] Types of *Anguli* have been mentioned as *Angushta*, *Pradeshini*, *Madhyama*, *Anamika*, and *Kanishtika*.[7-8] Though there are several opinions have been discussed regarding the *Anguli Pramana*, Susruta *Acharya* describes *Anguli Pramana* in Susruta Samhita, *Uttarasthana* in the context of *Netra Shareera* which gives a clear understanding of *Anguli Pramana*.[7]

In Susruta Samhita, *Uttarasathana*, it has been mentioned that *Nayana budbuda* (eyeball) should be identified as two *Anguli* in depth. And it can be, measured by *Angushta Udara* (width of the widest part of the thumb) of *Swa Angushta* (ones' own thumb) and this can be taken as the measurement of *Anguli Pramana*.[7]

In Charaka Samhita, *Anguli Pramana* has been mentioned as a tool to determine the life span of the individual and to determine the compactness of the body through measurements of the body parts. Therefore, this study has been carried out to highlight the use of *Anguli Pramana* to measure the human body and to evaluate the data with the measurements mentioned in Charaka Samhita.

OBJECTIVES

1. To identify the measurements of the human body of an individual using *Anguli Pramana*
2. To evaluate the findings with measurements mentioned in Charaka Samhita

MATERIALS AND METHODS

A total number of 109 adults including 11 males and 98 females belonging to ages 21-25 were selected from 1st Professional Then 7 measurements of the body were taken while considering the convenience of measuring, to evaluate the findings with the measurements mentioned in Charaka Samhita. Measurements of the Charaka Samhita was taken because these measurements are mentioned in *Pramana Pareeksha*, which is one of the components of the *Dasha Vidha Pareeksha*. *Dasha Vidha Pareeksha* is an important method in patient examination used by Ayurveda physicians. Therefore, height, length of the upper arm, length of the forearm, length of the hand, length of the sole, circumference of the calf region, and circumference of the head of the participants were recorded. The standard measurements were taken as follows.

undergraduate students of Faculty of Indigenous Medicine, University of Colombo. The sampling method was non-probability convenience sampling. The gender, age, height, and weight of each participant were recorded. The breadth of the thumb on the widest place (*Angushta Udara*) of the right hand of each participant was measured using a caliper. The jaws of the caliper were not pressed hard against the sides of the thumb.

Figure 1: Measurement of the breadth of the thumb on the widest place (*Angushta Udara*)

Height [9-11]

The participant was asked to stand with the feet together and the heels, buttocks and upper part of the back touching the scale of the Stadiometer. The head-board was firmly placed down on the vertex, compressing the hair as much as possible. And made sure that the feet did not come off the floor and that the position of the head was maintained in the Frankfort plane.[9]

Length of the upper arm [9-11]

The upper arm length where the distance is measured between Acromian process of the right arm and radial landmark of the right elbow . The participant was asked to stand erect with the palms slightly off the thighs. Measurement was taken by measuring the length between the Acromion process of the tip of the shoulder and the radial landmark of the right elbow. The measuring tape was used parallel to the long axis of the arm.

Length of the forearm [9-11]

The distance between the marked radial landmark of the right elbow and the Stylion landmark of the right wrist . The participant was asked to stand erect with

the palms slightly off the thighs. The distance between the Radial landmark of the right elbow and the Stylion landmark of the right wrist was measured using measuring tape. The measuring tape was used parallel to the long axis of the radius.

Length of the hand [9-11]

The measurement was taken using the measuring tape as the distance from the marked Mid-stylion line of the wrist to the Dactylion with fingers outstretched (but not hyperextended). The subject was asked to place the hand in a supinated position (palms facing up) and the fingers extended. Distance between the marked Mid-stylion line to the most distal point of the third digit was measured using measuring tape.

Length of the sole [9-11]

The distance from the anterior point on the longest toe to the most posterior point on the heel of the foot of the right foot . The subject was asked to stand with the weight equally distributed on both feet and arms hanging by the sides. The measuring tape was kept parallel to the long axis of the foot.

Head circumference [9-11]

The girth of the head was obtained in the Frankfort plane, perpendicular to the long axis of the head. It was measured at the level immediately above the Glabella (mid-point between the brow) while the subject was seated. The hair was compressed by tightly pulling the tape. The tape was Hairpins, clips, or similar items in the hair were removed before the measurement.

Circumference of the calf [9-11]

The maximum girth of the calf at the level of the Medial calf skin fold site of the right leg . It was measured perpendicular to the long axis of the leg. The subject was asked to stand in a relaxed position with the weight evenly distributed.

After taking the above measurements in centimeters, each measurement was divided by the *Anguli Pramana* in centimeters of each individual, and the results were taken in *Anguli Pramana*.

Results: Measurement of height, length of the upper arm, length of the forearm, length of the hand, length of the sole, circumference of the calf region, and the circumference of the head of the 109 participants were taken according to standard measurement guidelines. Gathered measurements were analyzed, the mean, median, and standard deviation were taken and the results were evaluated. (Table 1-3)

Table 1 – Measurements of the parts of the body in height, breadth and length according to Charaka Samhita[2]

Body Part	Height in *Anguli*	Breadth in *Anguli*	Length in *Anguli*
***Pada* (Feet)**	04	06	14
***Jangha* (Shanks/Calf region)**		16	18
***Janu* (Knee)**		16	04
***Uru* (Thighs)**		30	18
***Vrsana* (Testicles)**		08	06
***Shepha* (Penis)**		05	06
***Bhaga* (Vulva)**		12	
***Kati* (Waist)**		16	
***Udara* (Abdomen)**		10	12
***Parsva* (Sides/lateral aspects)**		10	12
***Stanantara* (Interval between the breasts)**			12

***Urah* (Chest)**	12	24	
***Prabahu* (Upper arm)**			16
***Prapani* (Forearm)**			15
***Hasta* (Hand)**			12
***Trika* (Sacral region)**	12		
***Prushtha* (Back)**	18		
***Shirodhara* (Neck)**	04	22	
***Anana* (Face)**	12	24	
***Shirah* (Head)**	16	32	
***Ayama* (Height)**	84		
***Vistara* (Breadth of the body)**		84	

The above table shows the measurements of the body parts mentioned in Charaka Samhita *Vimansthana*.[2] All these measurements are given in *Anguli Pramana* and the measurements of each body part are explained in height, breadth, and length.

Table 2 – Measurements of the parts of the body according to Charaka Samhita[2]

Body Part	Measurements in *Anguli*
Bastishira	10
***Sthana paryantha* (Margins of the breast)**	02
***Hrdaya* (Apex of the heart)**	02
***Skanda* (Shoulder)**	08
***Amsa* (Shoulder blade)**	06
***Kaksha* (Axilla)**	08
***Asya* (Mouth)**	05
***Chibuka* (Chin)**	04
***Ostha* (Lips)**	04
***Karna* (Ear)**	04
***Akshimadya* (Middle of the eyes)**	04
***Nasika* (Nose)**	04
***Lalata* (Forehead)**	04

This table shows the measurements mentioned in Charaka Samhita where the measurement of the body part is not mentioned clearly as height, breadth, or length.

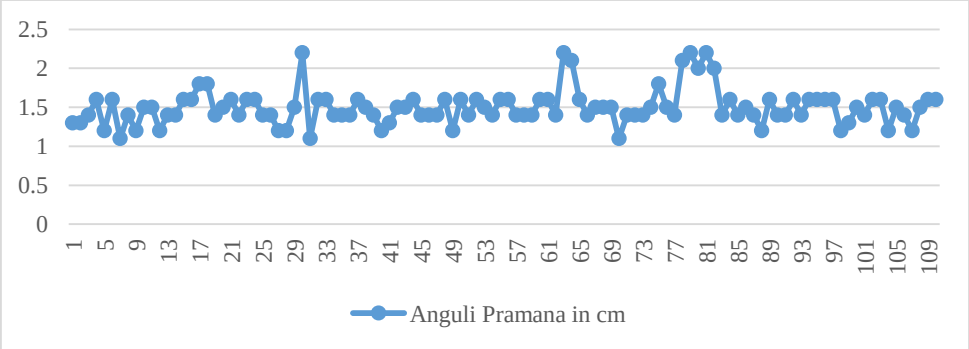

Figure 2: *Anguli Pramana* variation in the sample

Table 3 – Statistical data of the sample with the measurements of Charaka Samhita

Measurement	Measurements according to Charaka Samhita	Mean of the measurements of the sample	Median of the measurements of the sample	Standard deviation of the measurements of the sample

Height	84	107.9	108.6	13.5
Length of the upper arm	16	22.7	23	4.1
Length of the forearm	15	17.9	17.5	3.9
Length of the hand	12	11.9	12	1.7
Length of the Sole	14	15.8	15.7	2.5
Circumference of the calf region	16	22.2	22.1	3.7
Circumference of the head	32	36.3	36	5.5

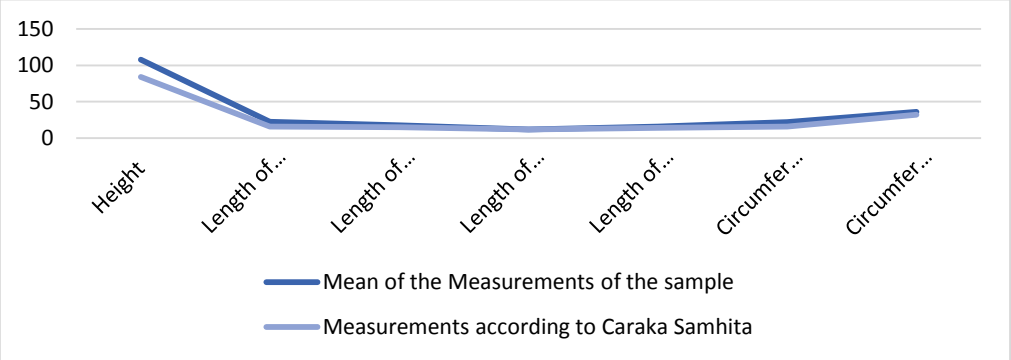

Figure 3: The mean of the measurements of the sample with measurements according to Charaka Samhita

DISCUSSION: Today the measurement of the body parts is mostly measured in centimeters. But if we take the measurements of a body part in *Anguli Pramana*, two individuals having the same measurement in centimeters have different measurements in *Anguli Pramana*. Because *Anguli Pramana* is a unique and individualized measurement where the anthropometric measurement of an individual is taken with his or her own *Anguli Pramana*.[12] In this study the measurements of the *Anguli Pramana* of the participants showed variation from 1.1 cm as the lowest and 2.2 cm as the highest as shown in Figure 2. Also, the mean was 1.5, the median was 1.51, and SD (Standard Deviation) was 0.22. Among the measurements of *Anguli Pramana*, the highest measurements were found from the male participants while the lowest were found from the female participants. These *Anguli Pramana* measurements were used to divide the measurements of body parts and *Anguli Pramana* of the measurements were taken. It was seen that when the *Anguli Pramana* of the individual is low the body parts measurements of the individual are also relatively less so that when the measurement is divided the result becomes aligned with the results of the individuals whose *Anguli Pramana* is higher.

According to Charaka Samhita, several measurements of the body were mentioned as indicated in table 1 and table 2. Among these measurements, 7 measurements that are convenient and most comfortable for

the participant were chosen. The mean of the measurements was evaluated with the measurements mentioned in Charaka Samhita (Table 3 and Figure 2). In Charaka Samhita, the *Ayama* (height) of an individual is mentioned as 84 *Anguli*. The mean of the measurements of the height of the sample shows a difference of 23 *Anguli* with the measurement of Charaka Samhita (Figure 3). Also, the length of the upper arm is mentioned as 16 *Anguli* in Charaka Samhita. When comparing the mean of the length of the upper arm with measurement in Charaka Samhita, it shows a difference of 7 *Anguli* (Figure 3). According to Table 3, the length of the forearm of an individual is 15 *Anguli* as per Charaka *Acharya*. In this sample, the mean shows a 2.9 difference with the measurement of Charaka Acharya. When analyzing the length of the hand of the sample, the mean was 11.9, the median was 12 and SD was 1.7, while the measurement mentioned Charaka Samhita was 12 *Anguli*. The mean or the median of *Anguli Pramana* of the length of the hand of the sample does not show a wide difference when evaluated with the measurements in Charaka Samhita. The measurement of the sole of the sample shows a 1.8 difference with Charaka *Acharya*. The mean of the circumference of the calf and the circumference of the head shows a 6.2 and 4.3 difference respectively with the measurement of Charaka Samhita. By considering these differences it can be suggested that most of the measurements in the sample show slight differences except the length of the hand. According to Charaka Samhita *Vimansthana* 8th chapter these measurements are mentioned in order to determine the life span and strength of the patient before commencing the treatment. Also, it is mentioned that if an individual possesses the normal measurements mentioned in Charaka Samhita individuals are endowed with longevity, strength, immunity, happiness, supremacy, wealth, and other desired qualities and those having a body with less or more measurements have qualities contrary to these.[2] While considering the measurements of the sample it can be suggested that they are slightly deviated from the normal measurements mentioned in Charaka Samhita. Therefore, these qualities can vary according to Charaka Samhita.

CONCLUSION: In conclusion, the *Anguli Pramana* is a unique tool that has been mentioned in Ayurveda where individualized measurements are used and which can be used to determine the compactness of the body before commencing the treatment. Findings showed wide variations of the measurements within the sample and when evaluated with the measurements in Charaka Samhita. The mean of the length of the hand was the closest measurement to the measurements in Charaka Samhita while the mean of the height showed the widest difference with the measurements in Charaka Samhita. Also, the changes in data showed that when the *Anguli Pramana* of a participant decrease, proportionately the other measurements also decrease. In Ayurveda *Swa-anguli Pramana* or one's own finger measurement has been used to measure that person's body parts which can be suggested as more unique and scientific than measuring one's body parts using other standards. Further studies should be carried out using different measurements,

sampling methods, and sizes to evaluate more findings.

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Source of support: Nil Conflict of interest: None Declared

Cite this Article as : [Chathurika L.A.W.J. et al: A Critical Analysis of Anthropometric Variations of Undergraduate Students with Special Reference to Anguli Pramana] *www.ijaar.in : IJAAR VOL VI ISSUE III JUL - AUG 2023Page No:-61-68*