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Observational Study of *janu Pramana* (knee) in various geographical regions of India

Research Article

Pavan R Gulhane[1*], Girish Kulkarni[2], Nitin Chandurkar[3]

1. Ph.D. Scholar and Assistant Professor, Department of Rachana Sharir,
3. Ph.D. Guide, Professor and HOD, Department of Rachana Sharir,
Dr. D. Y. Patil College of Ayurved and Research Centre, Dr. D. Y. Patil Vidyapeeth (Deemed to be University), Pimpri, Pune. Maharashtra. India.
2. Professor and HOD, Department of Rachana Sharir, Sumatibhai Shah Ayurved Mahavidyalaya, Hadapsar, Pune. India.

Abstract

Context: *Pramana Sharir* (Anthropometry) is described as one of the tool to examine the patient and healthy individuals under the concept of *dashvidh parikshabhava* (tenfold examination) by *Aacharya Charaka*. *Janu pramana* (Knee joint measurement) is taken as one of the marker for *sampramana* (equal body measurement) which is 14 *anguli* in *parinaha* (circumference) cited by *Aacharya Sushruta*. Aim- the main aim of the study is to evaluate *janu pramana* (Knee joint measurement) in healthy individuals in this era. Methods and material- *janu pramana* (Knee joint measurement) of 400 healthy individuals from four geographical regions (100 from each region) of India was taken in four groups. *Swanguali pramana* (Individuals finger measurements) of individuals was taken with the help vernier callipers in centimeter and *janu pramana* was taken with the help of measuring tape in cm. Both this reading then converted into *anguli pramana* (Measurement tool by finger) and mean was drawn. Statistical analysis used- ANOVA test was used to draw the result. Result- it is observed that there is difference in the *janu pramana* stated by *Aacharya Sushruta* and *janu pramana* in this individuals and also there is difference in the *janu pramana* of individuals residing in different regions of India. Conclusion: This difference may be due to changing lifestyle and also due to some evolutionary changes. It may altered and affect the human anatomy.

Key Words: *Janu parinaha,* Knee circumference*, Pramana Sharir, Swanguli Pramana.*

Introduction

In the holistic science of *Ayurveda*, different tools to examine the patient are described. *Dashvidh parikshabhava* described by *Aacharaya Charak* includes *pramana sharir* (Anthropometry) as one of the tool to examine the healthy individual and the patient also (1). So *pramana sharir* is the part of clinical examination to look for and having importance in day to day practice. *Pramana sharir* in modern science can be termed as anthropometry. In *samhitas, pramana sharir* is described as measurement for internal organ as well as external body parts. So in simple way it can be described as a measurement tool for that time. *Swanguli pramana* is described in *ayurvedic samhita* i.e. measurement taken by that particular individual by his own finger (2). So, all body measurements explained in relation with *swanguli pramana*. As far as *pramana sharir* is concerned; it has given different roles from different point of view. For this, *Aacharyas* have given its usefulness and importance separately. *Acharya Sushrut* cited that the person having proportionate body measurement i.e. *Pramana* of body parts may have *dirghayu* (longer lifespan) (3).

*Janu sandhi (*knee joint*)* is described under the *marma sharir* (Vital point) as *vaikalyakar marma* (causing permanent deformity) (4). It is necessary to study *janu* (knee) as whole with its all aspects. *Janu* (knee joint) can be taken as one of the markers for *sampramana*. *Acharya Sushrut* cited the *janu parinaha* (knee circumference) as 14 *anguli*(5).

Bhoomi desh (surrounding environment / geographical area) of an individual definitely affects the human being anatomically and physiologically as well. So in *Ayurveda*, *pathya-apathya, aahara-vihar*a etc. are described according to *bhoomi* or *desha* (surrounding environment / geographical area)

In modern science also there is not a specific tool to measure knee joint. International Knee Documentation Committee (IKDC) Subjective Knee Form is used as a general knee measure than other different methods. Although the IKDC can be used as a general knee measure, no instrument is currently universally applicable across the spectrum of knee disorders and patient groups (6). So individualistic approach of measuring once knee joint and collecting data of the specific region can help clinicians in their practices.

In this study, healthy individuals from four different geographical regions (north, south, east and

*** Corresponding Author:**

Pavan R Gulhane

Ph.D. Scholar and Assistant Professor, Department of Rachana Sharir, Dr. D. Y. Patil College of Ayurved and research Centre, Pimpri, Pune – 411018, Dr. D. Y. Patil Vidyapeeth, Pimpri, Pune(Deemed to be University) Maharashtra. India.

Email Id: drpavanrg@gmail.com

west) of India were selected and their *janu pramana* (knee measurement) was taken and compared with the *janu pramana* (knee measurement) stated by *Acharya Sushruta* and also among these regions. This study can help to know the changes in *pramana sharir* (Anthropometric study) in this era due to effect evolution and also due to change in lifestyle.

Aim

To evaluate *Janu pramana* (knee measurement) in healthy individuals in various geographical regions of India.

Objectives

- To evaluate *Janu pramana* (knee measurement) according to *ayurvedic* and modern prospective.
- To study the *pramana sharir* in detail.

Materials and Methods

The study has been observational survey study which was conducted in 2 phases:-

Conceptual study:

Ayurvedic literature from samhitas has been reviewed thoroughly. Modern texts were referred for related topics.

Observational Study:

This phase contains following steps

Selection criteria

Inclusion criteria

I. Age group-20 to 40 years
II. Both gender
III. Normal healthy individual
IV. The individuals residing in that specific region since birth up to completion of minimum 20 years of their age.

Exclusion criteria

I. Traumatic, Surgical and Accidental deformities at knee
II. Congenital knee deformities
III. Auto immune diseases causing knee deformities
IV. Infective osteoarthritis
V. Hormonal disorders

Sample Size

Study was conducted over 400 individuals from 4 geographical regions of India with age group between 20 to 40 years. From each region 100 individuals were selected.

Instruments used

1) Vernier callipers 2) Measuring tape

Method

At first individual were informed about topic for which he/she should be examined. Written informed consent was taken. Measurement of individual's *anguli pramana* in terms of Cm with the help of vernier callipers was taken. For taking the measurements of female, female attender was present. *Janu pramana* of both knees was taken with the help of measuring tape in Cm. Both the measurements were converted into anguli pramana. Actual measurements of an individual was formulated and compared with standard measurements (i.e. 14 *anguli*).

Study Design –

- First of all, literature was thoroughly reviewed regarding *pramana sharir, janu sandhi, janu pramana, desha* (regions) and *dashvidh pariksha bhava* from *samhita*. Modern literature was studied for Anatomy of knee joint and related literature for geography was studied.
- Before collection of observations, each and every (400) individual was screened according to criteria. Then individuals were informed about topic and procedure of taking measurements. Consent of all willing individuals was taken. All the essential information was collected as per the Case Record Form.

Measurement of *Swanguli Pramana* (Individuals finger measurements)

For the measurement of *swanguli pramana* of an individuals, the width of mid phalanges of four finger (little finger's distal) excluding thumb of right hand was taken using vernier callipers. Reading was taken three times then mean was calculated. The mean width divided by four, represents the *swanguli pramana* in centimeter of an individual. According to these criteria *swanguli pramana* of an individual was determined.

Measurement of *Janu* (Knee Joint)

Before measurement of knee joint examination of knee joints were done and all related history was taken. Surface landmarks of knee joints were identified. Measurements were taken in the mid of upper border of patella to lower border of patella in standing position with the help of measuring tape. Both side *janu pramana* (knee measurements) were taken in standing position one by one and noted in Cm. Then observed measurements were converted into *anguli pramana* (Finger measurement) by dividing it by *Swanguli Pramana* (individuals finger measurements) For e.g. if *Swanguli Pramana* (individuals finger measurements) of an individual is 1.97 cm and right knee is 35.4 cm, then right knee in *Anguli* will be 35.4/1.97 =17.97 *Anguli*.

Observations and Results

A. Age wise distribution of individuals

1. East region - From age group 21 to 30 were 59 individuals and from 31 to 40 were 41 individuals.
2. North region - From age group 21 to 30 individuals were 58 and from 31 to 40 were 42 individuals.
3. South region - From age group 21 to 30 individuals were 60 and from 31 to 40 were 40 individuals.
4. West region - From age group 21 to 30 were 64 individuals and from 31 to 40 were 36 individuals.

Table 1 - Age wise distribution of individuals

REGIONS	AGE	
	21 TO 30	31 TO 40
EAST	59	41
NORTH	58	42
SOUTH	60	40
WEST	64	36

B. ***JANU PRAMANA*(Knee Measurement) – Statistical Analysis**

1. Mean *janu pramana* for **East region** is 16.92 *anguli* with standard deviation of 0.78 *anguli*, with minimum value of 15.05 *anguli* and maximum of 19.71 *anguli*. At the 95% Confidence interval for mean *janu pramana* was 16.77 to 17.08 *anguli* for East Region.
2. Mean *janu pramana* for **North region** is 17.18 *anguli* with standard deviation of 1.18 a*nguli*, with minimum value of 15.28 *anguli* and maximum of 19.45 *anguli*. At the 95% Confidence interval for mean *janu pramana* was 16.46 to 19.30 *anguli* for North Region.
3. Mean j*anu pramana* for **South region** is 17.36 *anguli* with standard deviation of 0.98 *anguli*, with minimum value of 15.15 *anguli* and maximum of 19.75 *anguli*. At the 95% Confidence interval for mean *janu pramana* was 17.56 to 15.15 *anguli* for South Region.
4. Mean *janu pramana* for **West region** is 16.98 *anguli* with standard deviation of 0.79 *anguli*, with minimum value of 15.27 *anguli* and maximum of 19.58 anguli. At the 95% Confidence interval for mean j*anu pramana* was 16.83 to 17.14 *anguli* for West Region.

Fig 1: Mean *Janu pramana* (Knee Measurement) – various regions of India

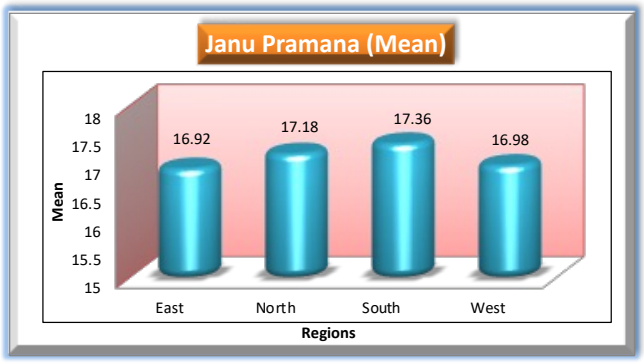


Table 2 – *JANU PRAMANA* (Knee Measurement) – Statistical Analysis

Region	NO.	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
East	100	16.92	0.78	0.08	16.77	17.08	15.05	19.71
North	100	17.18	1.18	0.11	16.46	19.30	15.28	19.45
South	100	17.36	0.98	0.10	17.17	17.56	15.15	19.75
West	100	16.98	0.79	0.08	16.83	17.14	15.27	19.58
Total	400	17.11	0.96	0.048	17.01	17.20	15.05	19.75

C. Comparison of *Janu Pramana* of different Region with Standard Value of 14 anguli.

Value for East, North, South and West region is less than 0.05 hence we conclude that there is significant difference between *janu pramana* in each of the region and the standard *janu pramana* of 14 *anguli*. Also we can observe that average *janu pramana* of all the four regions is significantly greater than standard value (14 *Anguli.)*

Table 3 - Comparison of *Janu Pramana* of different Region

Region	Mean	Standard Value	Mean Difference	Z Value	P-Value	Result
East	16.92	14	2.9	37.518	0.000	Significant
North	17.18	14	3.2	26.792	0.000	Significant
South	17.36	14	3.4	34.210	0.000	Significant
West	16.98	14	3.0	37.849	0.000	Significant

D. ANOVA TEST

For comparison among *janu pramana* of four Regions, ANOVA test were carried out. It is observed that P-Value is less than 0.05 hence It can be concluded that there is significant difference between the average of *janu pramana* of four Regions.

Table 4 - ANOVA TEST

Regions	East	North	South	West	ANOVA	P-value
Mean	16.92	17.18	17.36	16.98	4.426	0.004

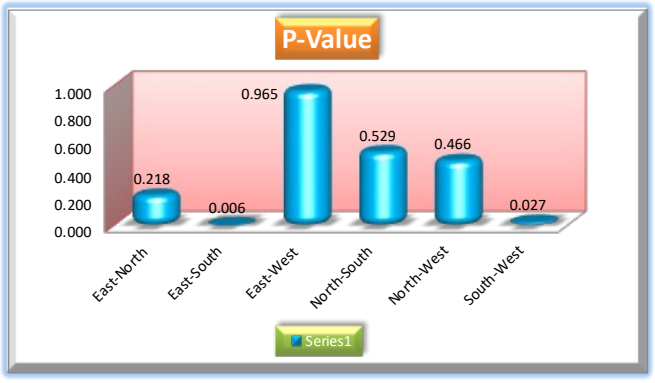
E. Pairwise Comparison between the Regions

East- South and West - South are less than 0.05 hence we conclude that *janu pramana* in East region and South region differs significantly also there is significant difference is observed between South region and West region also.

Table 5 - Pairwise Comparison between the Regions

Group 1	Group 2	Mean Difference	Std. error	P-value
East	North	-0.25870	0.13	0.218
	South	- 0.44050*	0.13	0.006
	West	-0.06340	0.13	0.965
North	South	-0.18180	0.13	0.529
	West	0.19530	0.13	0.466
South	West	0.37710*	0.13	0.027

Fig 2 - Pairwise Comparison between the Regions



Discussion

Janu parinaha cited by *Aacharya Sushruta* is 14 *anguli*, but actual observed mean *janu parinaha* in four regions is 17.11 *anguli*. This observation concludes that there is significant difference in *janu pramana* in present era with that time.

Also there is difference in *janu pramana* in four different regions of India which is greater than 14 *anguli*.

This observations show that South and North region individuals having more *janu pramana* compared to others which in terms not showing so much differences.

Also as compared to other pairs of regions, East-South and West-South regions differs significantly than others comparisons of pairs of regions.

So it can be said that *janu pramana* in four different geographical regions of India is not the same.

Reasons for difference in *Janu pramana*

This change can be due to change in lifestyle, diet, changes in occupation as compare to that time, type of work, surrounding climate (hot/cold) etc.

Also as explained by Aacharya Charaka; aahara (type of diet), *vihara (*type and extent of exertion and exercise), *aachara* (type of behaviour including gait), *bala(strength), satva, saatmya* (adaptation to the certain habits including environmental), *dosha, bhakti, hita and ahita* (favourable and unfavourable factors) are liable to differ in the person according to desha (region)(7). So, this conclude that as region changes there are changes in height, weight, type of diet, extent of exercise, thinking, strength, stature etc. accordingly.

Conclusion

So after having statistical analysis and observations, it is concluded that:

Janu parinaha (Knee joint circumference) has some relation with geographical regions, environment of individuals which affects the human being in all aspects.

Evolutionary changes may have altered the human body proportions.

Janu parinaha (Knee joint circumference) differs in various geographical regions which is not identical in normal healthy individuals within each region.

Janu parinaha (Knee joint circumference) is not 14 *anguli* in every geographical regions of India which is greater than standard 14 *anguli* in the subjects selected in this study.

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