Research Paper

INTERPRETING WRIST CIRCUMMETRIC SIGNS OF TRADITIONAL SIDDHA MEDICINE [TSM] WITH STANDARD ANTHROPOMETRIC VARIABLES FOR QUALITY DATA ANALYSIS

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Abstract

Anthropometric work in Traditional Siddha Medicine [TSM] involves thread measurements to calculate the wrist circumference (WC) with the number of fingerbreadths of the same subject. Descriptive features for each finger inputs obtained are correlated with the clinical picture of the subject for successful predictions and diagnosis. Since WC reflects the values of fingerbreadths for each subject, there is a need of further understanding the standard anthropometric variables. The Siddha Anthropometric scale, SKS were studied and interpreted through random observational research involving 39 subjects belonging to both sexes. Other established variables like Height, Weight, Body Mass Index (BMI), Wrist Circumference (WC) and Body Frame Size (BFZ) were assessed along for quality data analysis and tool validation. The total study were divided into 4 groups based on the SKS reading results. The mean values of weight, BMI and WC were highest in Group I followed by Group II, Group III and finally IV. The sequential decline of values of Anthropometric variables with each group is the leading finding of this study. This ironically means body composition, BMI and finally BFZ of an individual varies with pathological conditions as reflected in WC and SKS measurements. The study justified the relevance of SKS with BMI, weight and WC.
Key words: *Siddha Anthropometry, Soodamani Kayaru Soothiram (SKS), Wrist Circumference, Body Frame Size, Body Mass Index.*

INTRODUCTION

From Ancient period itself, the human body has been measured in several aspects, particularly for understanding the morphological pattern of an individual. [1] Anthropometry is the science dealing with the systematic measurement of human individual particularly dimensions of body calculations. The measurement concept rooted in its interaction with several factors like the basic nutrition of the individual, psychological conditions, environmental and seasonal influences, and infections. [2] The major link of socioeconomic status and nutrition with body size is an indicator for the Quality of life. This approach has numerous applications in the field of preventive medicine especially for predicting the risk factors of Diabetes, Cardiovascular ailments, Cancers and various chronic diseases.[3] The most prelevant variables included in Anthropometric calculations are Body Mass Index (BMI), Wrist, Waist and hip circumferences, percentage of body fat, water content and lean body mass. [4] Anthropometric indices like Wrist Circumference (WC) are considered as simple, inexpensive measurements free from distractions or influence from respiratory and abdominal movements as when compared with other conventional indexes.[5,6] It is a promising tool to assess body frame size.[6]

In Siddha medicine, *Soodamani Kayaru Soothiram* (SKS) is a treatise compiled by sage *Agathiyar* which deals with the diagnostic predictions by measuring ones wrist circumference with no: of Finger Breadths (Fb). Eleven finger breadth inputs with sub divisions (1/4, ½, ¾ and full Fb) includes a total of 26 finger measurements and 96 descriptions. [7] The validity of this siddha Anthropometric concept is better understood with sample studies integrated with other established variables like Height, Weight, Body Mass Index (BMI), Wrist Circumference (WC) and Body Frame Size (BFZ). This may help in quality data analysis and authenticity of this diagnostic tool.

Aim and Objectives

To Study the co relation of SKS with other conventional Anthropometric Measurements like Wrist Circumference (WC), Body Mass Index (BMI) and Body Frame Size (BFZ).

MATERIALS AND METHODS

Study Design: Random Observational / Exploratory Research.

Sample Size: 39

Place of Study: Various medical camps across Kerala.

Study Period: 1 year from August 2015- August 2016.

Criteria of Selection of samples: The subjects who participated in this study were randomly recruited from both sexes belonging to age group (20 to 85 yrs). The study commenced after getting the consent.

Repetion of the study: Three Repetions per sample.

Tool for study

1. Non elastic Toin: Standard length - 30 cm (Fig. 1)
2. Weight meter and Height scale.
3. Reference Data.
4. Document Form.

Standard Operating Procedure and Data Collection

WC and SKS measurements were done for the subjects in a comfortable seated position. The subjects were asked to place all the fingers altogether (Except thumb) without bending or deviation. This is the ideal position for measurement (IPM) (Fig. 2). The next step is to locate the middle position of the four fingers. By keeping the middle finger of opposite hand perpendicular to the root of the middle finger of measuring hand, the outer border of the middle finger is taken as the mid location (Ideal Location for measurement (ILM) (Fig. 3). The total four finger breadth were measured by using the standard toin (Soodamani Kayaru) (Fig. 4). The length obtained in the toin is measured towards back of the forearm starting from the wrist line to reach a point that is marked (Fig. 5). This point is called Manikkadai Circumference point (MCP). The Circumference of this wrist region is measured from this mark by using the same toin and the total length is calculated in no: of Fbs from ILM ((Fig. 6 & 7). Fb of each finger is divided into 4 quarters representing the division into 0 – ¼, 0- ½, 0 -3/4 and 0- 1 ie, Full Breadth of the finger (Fig. G). The no: finger Inputs converted from the WC length is interpreted from the Texts.

Apart from this other supporting Anthropometric indices like Height, weight, BMI, WC were also taken into account. WC was measured by using an inch tape (Fig 8).

Both measurements were performed thrice by well trained siddha health professionals for reducing possible diagnostic errors. BMI was calculated from the obtained height and weight measures by using the formula kg/m^2 and the subjects were categorized into underweight, normal weight, overweight and obese based on the range [8] (Table. 1). BFZ is reached from the values of Height and WC of the individual [8] (Table. 2).

Each Finger inputs have a set of symptom features. The presenting complaints, the case history, obtained SKS measurements of the subjects were compared with the textual references. The entire data was documented in a clinical research form.

RESULTS AND DISCUSSION

The study included 39 subjects belonging to both sexes (Males = 24, Females = 15) randomly participated for the assessment of Anthropometric indices like Height, Weight, BMI, WC, BFZ and SKS readings (Table. 3).

The interpretation of Anthropometric indices is as follows:

1. Out of 39 volunteers, 7 belonged to Obese class I, 15 were overweight and 17 had normal BMI. (Table. 4)

2. Among the total participants, 28 fall under Large Body Frame Size category (73%), nine subjects under Medium Body Frame Size (23%) and only one under Small Frame Size (Fig. 9).

3. The total study can be divided into 4 groups based on the SKS reading results and all the participants presented true positive symptoms as described in the text that was found relevant to their clinical picture and findings. Last 4 Fb readings ie, 10.25, 10.5, 11.25 and 12 had no textual descriptions but all were showing features of 10 Fb (Table. 5 & 6)

4. Subjects of Group I were totally large body frame sized and of IV were small Body Frame Sized. Group II and III included both Large and medium frame sized subjects.

5. The Average measures of Weight, BMI and WC were highest in Group I and least in Group IV. There was sequential decline in the Anthropometric values with each group. (Table. 5 and Fig 10).

Anthropometric tools are effective predictors that is used globally in preventive medicine. Various studies on WC found it as a measure of peripheral fat and skeletal frame size in children. [9, 10] Increased BMI and WC and their combination were found

to be directly associated with hypertension in children. [11] There is validated correlation of WC with Atherogenic factors in obese children. [12] Another study reported a close relationship between WC, bone components and occurrence of Insulin Resistance in overweight children and adolescents. [13] A research work by Amini et al reported the possibility of using WC as a clinical marker for finding the risk for Cardio metabolic disorders in individuals.[14] The predictor role of WC for future development of Diabetes in both genders has been studied by Jahangiri - Noudeh et al. [15] These studies opened up a new perspective for CVD prediction, Diabetes by using WC as markers. [16] BMI is an approach to quantify the body mass directly related with the persons mass in terms of amount of body fat, muscle tissue and bone density. Through the BMI range one can categorize the person into underweight, normal weight, over weight and obese. [8] BFZ categorizes the constitution of the subject according to the skeletal size as it is directly related with the bone density and BMI.

Siddha system of medicine also uses various circummetric approaches of measurements and Fingerbreadth measures for anatomical location of vital energy points and its clinical applications called Varma Maruthuvam. [17] SKS is an ancient anthropometric tool that is popular for its reliability in predicting clinical associations. The science depends on the variation of WC to that of No: of Fbs due to pathological influences. There are descriptive features for each finger inputs obtained through this reading, which is correlated with the clinical picture of the subject for successful predictions and diagnosis. Since WC reflects the values of fingerbreadths for each subject, there is a need of further understanding the standard anthropometric variables.

The study was undertaken to study the correlativity of SKS with other conventional Anthropometric Indices. There were definite findings of BMI, weight, WC and BFZ with SKS readings. The largest no: of subjects belonged to group I category was having SKS readings above 10 Finger Inputs, five subjects from group I category were moderately obesed. The obese subjects were showing higher SKS finger inputs from 9 - 12 relevant to the BMI values. The mean values of weight, BMI and WC were highest in Group I followed by Group II, Group III and finally IV. There was no significant variation of height variables in each group. As BFZ of each individual varies and reflects in WC measures, the study justified the relevance of SKS with BMI, weight and WC. The variation of above values with finger inputs is the scientific justification of our studies.

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig (1-8). Procedure of SKS Measurements

Table. 1 Body Mass Index (BMI) Categorization

< 18.5 kg/m²	Underweight
18.5 – 25 kg/m²	Normal
25 – 30 kg/m²	Overweight
30 - 35 kg/m²	Obese class I (Moderately obese)
35 - 40 kg/m²	Obese class II (Severely obese)
40 - 45 kg/m²	Obese class III (Very Severely obese)

Table. 2 Body Frame Size (BFZ) calculations

SEX	Body Frame Size (BFZ)		
	SMALL (In inches)	**MEDIUM (inches)**	**LARGE (inches)**
Women with height 5 Ft 2" and below (157 cm)	<5.5"	5.5"-5.75"	>5.75"
Women with height between 5 Ft 2" and 5 Ft 5" (165 cm)	<6"	6"-6.25"	>6.25"
Women taller than 5 Ft 5" (165 cm)	<6.25	6.25-6.5"	>6.5"
Men taller than 5 Ft 5" (165 cm)	5.5''- 6.4''	6.5''- 7.5''	>7.5''

Table. 3 Study for Assessing different Anthropometric variables with SKS (n=39)

Case	Sex	Height	Weight	BMI	WC	BFZ	SKS
1	m	172	81	27.37	8.4	L	9.5
2	m	172	86	29.06	9	L	11
3	m	161	55	21.21	6	M	8
4	m	155	48	19.97	5.1	S	7.5
5	m	154	52	21.92	7.1	L	8
6	m	158	67	26.83	7.8	L	10
7	m	168	71	25.15	8	L	9
8	m	156	75	30.81	8	L	10.5
9	m	172	62	20.95	6.2	M	8
10	m	170	57	19.72	6.2	M	8.25
11	m	164	65	24.16	7.5	L	8.5
12	m	156	79	32.46	8.5	L	11.25
13	m	181	90	27.47	7.9	L	10.5
14	m	171	90	30.77	7.1	L	9.5
15	m	165	66	24.24	7.2	L	9.25
16	m	170	78	26.98	7.8	L	10
17	m	164	76	28.25	8.2	L	10.25
18	m	160	74	28.90	7	L	9.25
19	m	165	91	33.42	9.3	L	12
20	m	177	65	20.74	6.8	M	9.25
21	m	168	58	20.54	6.2	M	8
22	m	174	75	24.77	7	M	9.25
23	m	163	62	23.33	7.2	L	8.5
24	m	171	65	22.22	6.6	M	9
25	f	150	60	26.66	6.2	L	10
26	f	150	65	28.88	7.2	L	10.5
27	f	152	50	21.64	5.5	M	8.75
28	f	153	58	24.77	6.2	L	8.75
29	f	153	60	25.63	6	L	8
30	f	154	46	19.39	6	L	9.5
31	f	154	75	31.62	6	L	8
32	f	156	82	33.69	7.9	L	11.25

33	f	157	85	34.48	7	L	10.75
34	f	158	67	26.83	7.5	L	10
35	f	161	75	28.93	7	L	10
36	f	157	65	26.37	6.5	L	8.5
37	f	148	60	27.39	7.5	L	10
38	f	150	50	22.22	5.8	M	9.25
39	F	151	50	21.92	6	L	9.5

Table. 4 Body Mass Index (BMI) Categorization of Cases

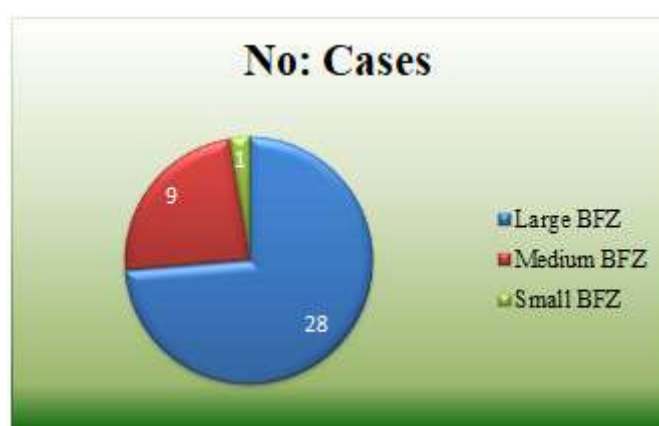| 18.5 – 25 kg/m^2	Normal	17
25 – 30 kg/m^2	Overweight	15
30 - 35 kg/m^2	Obese class I (Moderately obese)	7

Fig. 9 Distribution of Cases according to BFZ

Table. 5 Distribution of SKS readings and finger breadth descriptions (n= 39)

+SKS Readings (in Fb)	DESCRIPTION
7.5	Gaseous disturbances, flatus , distension of abdomen, burning sensation all over the face.
8	Anasarca, *Peenisam* (Sinusitis and other paranasal conditions), Throat Pain, Abdominal discomfort like flatus or gaseous disturbances, *Mantham* (Dyspepsia's).
8.25	*Prammiyam* (Genito urinary tract diseases), Pyrexia (*Pitham* Vitiations)
8.5	*Irumal* (cough), Increased body heat, *Thathunattam* in men (Spermatorrhoea), Skin diseases.
8.75	Dryness of the body, Pallor of the Extremities, Eyes and oral cavity signifying *Pitha* diseases. Gaseous disturbances with pricking sensation in abdomen.
9	Pricking sensation inside the ears, Heaviness inside the ears, Pain in the hip

	region, Weakness of both thighs and hence difficulty in walking.
9.25	Urinary stranguary, Burning sensation of eyes, Insomnia, *Peenisam* (Sinusitis and other paranasal conditions).
9.5	Extreme sensation of heat in the body, Pallor, Fever with signs of *Megha* diseases, Food aversion.
10	*Venpini* (Anemia), Pain in the extremities and body, Gaseous disturbances, *Gunmam* (Gastro intestinal ailments).
*10.25	-
*10.5	-
*11.25	-
*12	-

+SKS = Manikkadai Nool Reading, *No descriptions in the text

Table. 6 Study for Assessing different Anthropometric variables with SKS

*Anthropometric Measures	VALUES			
	Group I (n=15)	**Group II (n=11)**	**Group III (n=12)**	**Group IV (n=1)**
SKS	**10 – 12 Fb**	**9 - $9^{3/4}$ Fb**	**8 - $8^{3/4}$ Fb**	**7.5 Fb**
Height (In cm ± SD)	160.1 ± 9	164.8 ± 9.6	160 ± 7.2	155
Weight (In cm ± SD)	75.73 ± 10.1	66.63 ± 13.7	59.9 1± 6.6	48
BMI (In cm ± SD)	29.48 ± 2.7	24.34 ± 3.5	23.49 ± 3.3	19.97
WC(In cm ± SD)	7.78 ± 0.79	6.9 ± 0.80	6.38 ± 0.58	5.1

*SKS = Manikkadai Nool Reading, BMI = Body Mass Index, WC = Wrist Circumference.
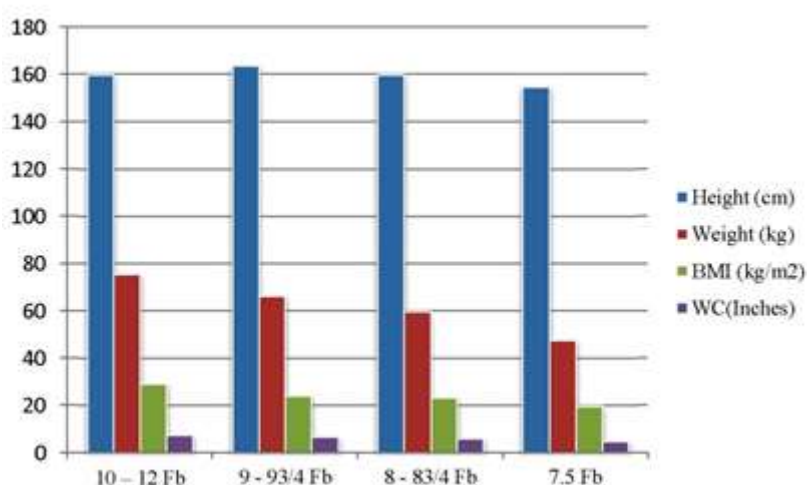n= No: subjects out of total samples SD = Mean Standard Deviation.

Fig. 10: Study for assessing different Anthropometric variables with SKS.

CONCLUSION

The sequential decline of values of Anthropometric variables with each group is the leading finding of this study. This ironically means that body composition, BMI and finally BFZ of an individual varies with pathological conditions as reflected in WC and SKS measurements. The tool is practiced successfully for identifying the hidden aetiogenesis of many of the diseases and in its management. The study will be more fruitful, if the body constitution as per the siddha science is included, to get a deeper view on the anthropometric analysis of each individual. SKS may be used a valid diagnostic tool along with other anthropometric measures to improve the accuracy of prediction inputs and its correlativity. Like other conventional Anthropometric measures, SKS may be put forward for further clinical research and validation on large-scale samples, considering the fundamental approach of body constitution and its variation according to humoral pathologies.

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