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Body Morphology and Occupation: An Anthropometric determination of Tailors

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ABSTRACT

While living in the era of industrialization, assessment of variations on body morphology due to continuous exposure of the occupation is the prime need for health professionals. Anthropometric data of various traditional occupational groups is still lacking.

Present cross-sectional research is focused on Traditional occupational group of Punjab viz. Tailors. A total of 200 adult men ranging in age from 30-40 years were
examined for various anthropometric and physiological measurements. Proportionality profiles, Body Composition analysis has been calculated using various standard equations. Prevalence of

hypertension and risk of developing CVDs and CHDs has been also assessed using WHO classification criterion.

Results of the present indicates that Tailors showed balanced endomorphic type of body physique (4.51 - 3.12 - 2.85) and foreground the more relative development of adipose tissue on the upper region of the body. About 14.6% of the Tailors run the risk of developing CVDs and CHDs as per diagnosed from the values of their WHR. Only 1% of them fall under the category of isolated systolic hypertension (ISH).

Occupation has great impact on the body morphology of the person involved in it. Sedentary physical activity resulted into the deposition of more adipose tissue on the upper region of the body and run the risk of developing CVDs and CHDs.

Key words
Anthropometry, Occupation, Tailors, Body Composition, Body Mass Index, Waist-Hip Ratio, Somatotyping.

INTRODUCTION

In this 3G world physical appearance of the person plays an important role in day to day life. From child to adult and from adult to old age everybody is very much conscious about their physical health. An anthropometry is highly prevailing method for morphometric analysis of an individual or specific population. It provides quantitative information and proves to be a valuable addition in the clinical forum for studying or acquiring the knowledge about the rapidity of cell and tissue increment and in adults it is effective caloric accumulation indicator [1] **.** Physical appearance of the person and its occupation shows significant relationship like heavy physical work makes the body muscular and light or sedentary type of work resulted into fatness. Various scientific investigations reported that either occupational or non-occupational higher physical activity levels might lowers the risk of developing obesity and related health complications. Life style of the person shows good association with the lipid profile which further spotlight the secondary risk factors such that intra-abdominal obesity, hypertension, hyperlipidaemia, stroke etc in relation to the values of BMI and WHR [2-5] .

The purpose of the present study is to assess the impact of habitual physical activity or traditional occupation particularly on the body morphology of the person involved in it and to find out the prevalence of developing cardiovascular or coronary heart disorders.

MATERIAL AND METHODS

The present cross-sectional study has been conducted on one of the traditional occupational group of Punjab, viz., Tailors. People involved in this type of traditional occupation of Punjab stitches cloth. They are called '*Darji*' in the region of Punjab. Most of the work performed by Tailors in sitting position. Sewing machine is one of the most important tool of this occupation. Working on this machine involves right arm of the body only whereas left arm is used to handle the cloth. So the upper limbs of the body of Tailors are more involved while sewing clothes. They entirely perform very light physical labor. Their working hours vary with the demand of work i.e. contracts of marriages and parties etc. increases the working schedule up to 10-12 hours otherwise they work for maximum of 6-7 hours daily. Tailors work in their own shops or they acquire on rent.

A total of 200 adult males ranging in age from 30 to 40 years were measured for anthropometrical (height, weight, skinfold thicknesses, body circumferences, segmental lengths and body breadths) and physiological measurements (Systolic and Diastolic blood pressure, pulse rate, maximum expiratory pressure) using standard techniques [6]. Data collection was done during April 2002 to January 2004 from various urban and rural areas of Punjab state including Amritsar, Bathinda, Kapurthala, Ludhiana, Moga, Muktsar and Patiala Districts. Subjects were measured in their free hours of work. They were contacted personally and appointment for their investigation has been taken accordingly. No specific method of sampling has been used for the data collection as most of the subjects refused to become the part of the study. All procedures and protocol were approved by the Institutional Review Board of Punjabi University, Patiala.

Statistical Analysis

Data has been collected and fed into the computer for calculation of descriptive statistics using MS Excel. All the three primary components of physique have been calculated from standard equations [7] . The Phantom is a conceptual unisex bilaterally symmetrical model derived from reference male and female data [8] .Gross phantom specifications are used to calculate z-score values [9] and various fractional body masses [10].

Brachial Adipo Muscular Ration (BAMR), Femoral Adipo Muscular Ratio (FAMR) and Mean

Adipo Muscular Ratio (MAMR) have been calculated [11] for finding relative development of adipose and muscle tissue in the upper or lower region of the body**.** Body Mass Index (BMI) is also known as Quetlet's index and is calculated as follows:

$$BMI = Weight\ (Kg)/\ (Height\ (m))^{2}$$

Further classification of body mass index has been done using the criteria given by World Health Organization standards [12].

Waist Hip Ratio is calculated as follows:

$$WHR = Waist\ circumference\ /Hip\ circumference$$

Grading of WHR [13] has been used to find out the prevalence of risk of developing cardiovascular diseases. Criteria given by WHO/ISH[14] for the classification of blood pressure levels has been used for the present study to diagnose the prevalence of Normal, Optimal, High-Normal, Isolated Systolic Hypertension and different grades of hypertension.

RESULTS AND DISCUSSION

Table 1 depicts the mean and SD values for all the anthropometric and physiologic parameters of Tailors.

Table 1. Anthropometric Parameters of Tailors.

Parameter	Mean ± SD
Gross Body Measurements	
Height (cm)	166.5±6.3
Weight (Kg)	61.7±9.9
Somatotyping Ratings	
Endomorphy	4.5±1.2
Mesomorphy	3.1±1.3
Ectomorphy	2.8±1.3
Somatotype Dispersion Mean (SDM)	4.4±2.5
Somatotype Attitudinal Mean (SAM)	2.0±1.0
Skinfold thicknesses (mm)	
Tricep Skinfold	12.1±4.1
Bicep Skinfold	8.2±2.9

Forearm Skinfold	5.5±1.7
Subscapular Skinfold	17.0±5.5
Suprailiac Skinfold	15.5±6.0
Thigh Skinfold	13.5±4.8
Calf Skinfold	9.7±3.4
Abdominal Skinfold	18.4±4.4
Body Circumferences (cm)	
Upper Arm Circumference (UAC)	26.2±3.0
Forearm Circumference (FAC)	24.7±2.4
Wrist Circumference (WC)	16.3±1.0
Thigh Circumference (THC)	47.5±4.2
Calf Circumference (CAC)	32.1±2.7
Chest Circumference (CC)	90.1±7.0
Waist Circumference (WC)	86.1±9.9
Hip Circumference (HIPC)	91.5±8.1
Body breadths (cm)	
Humerus bicondylar width (HBW)	6.4±0.6
Femur bicondylar width(FBW)	8.5±0.9
Hand breadth (HB)	8.5±1.2
Biacromial width (BIAC.W)	40.7±3.9
Bi-iliac width (BIIL.W)	32.8±3.9
Transverse chest depth (TCD)	29.5±3.1
Antero-posterior chest depth (APCD)	21.5±2.8
Segmental Lengths (cm)	
Upper Arm Length(UAL)	34.0±2.2
Forearm Length(FL)	27.6±2.2
Hand Length(HL)	17.1±1.2
Proportionality profiles	
Body Mass Index (BMI)	22.2±3.0
Waist hip ratio (WHR)	0.9±0.1
z-score values	
z-weight	0.1±1.0
z-Tricep Skinfold	-0.6±0.9

z-Bicep Skinfold	0.2±1.4
z-Subscapular Skinfold	0.1±1.1
z-Suprailiac Skinfold	0.1±1.1
z-Abdominal Skinfold	-0.8±0.6
z-Thigh Skinfold	-1.5±0.5
z-Calf Skinfold	-1.2±0.7
z- Upper Arm Circumference	-0.1±1.3
z- Forearm Circumference (FAC)	0.1±1.7
z-Wrist Circumference (WC)	0.4±1.6
z- Chest Circumference (CC)	3.6±2.3
z- Waist Circumference (WC)	0.8±1.4
z-Hip Circumference (HIPC)	-0.1±1.4
z-Thigh Circumference (THC)	-1.6±1.0
z-Calf Circumference (CAC)	-0.9±1.2
z- Humerus bicondylar width (HBW)	0.3±1.8
z- Femur bicondylar width(FBW)	-1.5±1.9
z- Hand breadth (HB)	0.9±2.6
z- Biacromial width (BIAC.W)	1.9±2.0
z- Bi-iliac width (BIIL.W)	2.7±2.3
z-Transverse chest depth (TCD)	1.3±1.8
z- Antero-posterior chest depth (APCD)	3.2±2.1
z- Upper Arm Length(UAL)	1.2±1.3
z- Forearm Length(FL)	2.6±1.6
z- Hand Length(HL)	-1.5±1.5

Body Composition Analysis

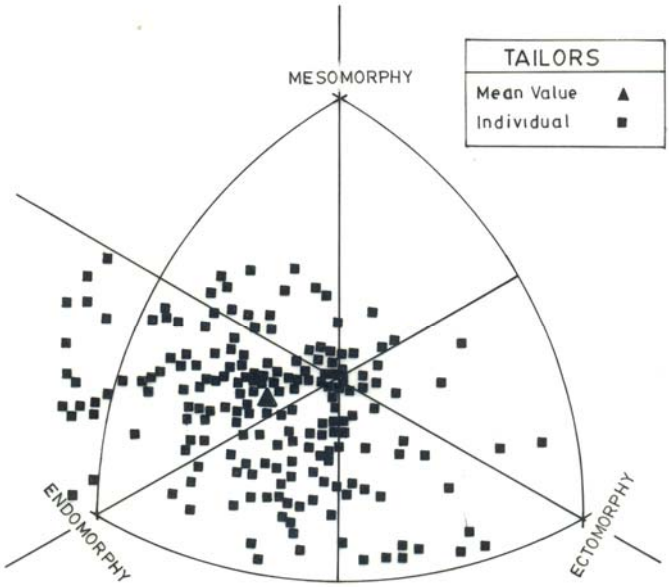
Fat Mass	9.2±2.4
Skeletal Mass	9.4±1.9
Muscle Mass	24.2±3.0
Residual Mass	18.8±6.7
Arm Muscle area	36.2±8.7
Arm Fat area	19.4±7.4
Brachial-adipo muscular ratio (BAMR)	0.5±0.2
Thigh Muscle area	150.8±26.9
Thigh Fat area	31.0±11.9
Femoral-adipo muscular ratio (FAMR)	0.2±0.1
Mean Adipo Muscular Ratio (MAMR)	0.3±0.1

Physiological Profiles

Systolic Blood Pressure(mmHg)	124.8±8.9
Diastolic Blood Pressure (mmHg)	83.9±8.4
Pulse rate(beats/min.)	78.2±10.3
Max.Expiratory Pressure (mmHg)	64.1±19.7

Mean somatotypes of Tailors is 4.51 - 3.12 - 2.85. Tailors possess maximum value for endomorphy component among all the three component of the somatotype. Individual somatotypes of Tailors are mostly present in the meso-endomorphic followed by ecto-endomorphic regions of the somatocharts. Their mean somatoplot shows balanced endomorphs type of body physique. **(Fig.1).**

Figure 1. Somatoplots in Tailors



Somatotype distributions provide the information about the magnitude of dispersion or scatter of somatotypes about their mean values. Higher value of endomorphy in Tailors indicates a predominance of body fatness, which might be due to their habitual sitting job. While the body remains static, it is the upper limbs, which performs all tasks. Very little activity of the whole body is involved which seems to be the cause for the dominance of endomorphic components of

the somatotype. Sedentary activities generally have a little higher endomorphic value than that for the person involved in heavy and hard physical labor. Habitual physical activity plays a significant role in restricting the endomorphic component to a certain extent. Though genetic factors may also be responsible for the same [15]. Height varies from person to person and so does body weight, therefore simple comparison of actual weight and height does not present a clear picture about the proportionate differences. In order to find out the relationship of one measurement to another proportionality values or z-values are calculated for weight [8]. Proportional development of body weight in relation to height indicates that Tailors have proportionally more weight in comparison to their height demonstrated that tallness is associated with relative lightness and smallness with relative heaviness or ponderosity and thus explained the human architectural design with normal biological variance [16]**.** Out of all the skinfold thicknesses maximum proportional development has been observed for bicep skinfold (z-score value 0.2). Pattern of regional subcutaneous fat distribution is also influenced by age, sex, nutritional status, habitual physical activity patterns and possibly ethnic background [17,18] . Reduction in the subcutaneous fat over the extremities happens and concurrent with the fat deposition over the trunk region of the body in older subjects [19] **.** Body circumferences are considered to be the independent means of predicting body fat and adequate indicators of protein reserve and muscularity [20,21] . Maximum proportional development out of all the body circumferences has been observed for chest circumference in Tailors (z-score value 3.6). Body breadths provide useful indication of fat free mass and are considered to be an independent estimate of relative fatness. Moreover it is the better measure of frame size 22-24] **.** Maximum proportional development of body breadths in relation to height has been observed for antero-posterior chest depth (z-score value 3.2) and for segmental lengths it is maximum for forearm length (z-score value 2.6). Mean and SD values of fractional body masses indicates that muscle mass (24.2kg) dominates over the other two components whereas overall relative development of fat mass is more in the upper region of the body in comparison to the lower region as indicated by the higher value of BAMR(0.5) than FAMR(0.2). Light physical work and sedentary nature of jobs are mainly responsible for the more fat development in the particular region of the body. Impact of regular physical activity on the muscle and body fat stores probably would also depend upon the total food intake and type of activity pattern adopted. Moreover, food intake is not only required to balance the acute energy expenditure of physical activity but also to maintain existing

tissues and to allow repair of tissue injuries. Nutrient requirements of the body also depend upon the age, sex and size of the individual and the activity pattern needed in a given habitat [25] **.** Prevalence of overweight and obesity is increasing fastly around the world. Developed countries have reached epidemic proportions and developing countries might be falling into its grip [26,27] **.** BMI classification **(Table 2)** indicates that maximum number (54%) of subjects have BMI values in the normal category whereas 32.5% of the subjects lie under the grade-1-overweight category.

Table 2 : Body Mass Index (BMI) classification of Tailors .

Body Mass Index (BMI)	**Grade**	**Tailors (n=200)**
< 16	Grade-3-Thinness	2(1%)
16- 16.99	Grade-2-Thinness	6(3%)
17- 18.49	Grade-1-Thinness	16(8%)
18.5-22.99	**NORMAL**	**108(54%)**
23-29.99	Grade-1-Overweight	65(32.5%)
30-39.99	Grade-2-Overweight	3(1.5%)
≥ 40	Grade-3-Overweight	-

Generally very low and very high values of BMI indicate an increased mortality risk almost among all the cultures [28-31].Waist –hip ratio (WHR) is one of the important predictor of cardiovascular diseases (CVD) and coronary heart diseases (CHD) with universal application in individuals with different body builds. It may also proved to be a more appropriate and universal indicator of risk of ethnically diverse populations such that small framed Asian and Indian groups and large framed Polynesians [32-34]**.** Results indicate that 14.5% of the Tailors run the highest risk of developing CVD and CHD as per the higher values of WHR **(Table 3).**

Table 3: Waist Hip Ratio (WHR) classification of Tailors.

WHR	Tailors
≤ 0.95	131 (65.5%)
0.96 -0.99	40(20%)
≥1	29(14.5%)

Waist-hip ratio also provides the information regarding degree of android distribution of adipose

tissue. Thus more value of WHR are reflecting greater risk of non-insulin dependent diabetes mellitus and are also associated with impaired glucose tolerance (IGT) in both males and females after controlling for age [35,36].

Table 4 indicates that prevalence of hypertension in Tailors. It has been generalized that 19% are in high normal, 8% in grade -1-hypertension, 1% in grade-2-hypertension and 1% in isolated systolic hypertension categories.

Table 4 : Prevalence of hypertension in some traditional occupational groups.

CATEGORY	Tailors (N=200)
Optimal	20(10%)
NORMAL	**122(61%)**
High-Normal	38(19%)
Grade -1-Hypertension.	16(8%)
Grade -2-Hypertension	2(1%)
Grade -3-Hypertension	0(0%)
Isolated Systolic Hypertension	2(1%)

Work stress has adverse effect on health particularly the risk of cardiovascular disease. These health risks were derived from the mismatch between high efforts at work and low reward received in turn [37] .

Conclusion:

It is concluded from the present study that habitual physical activity shows its great impact on the well being and health status of the person involved in it. Genetic factors, types of environmental conditions and socio-economic conditions also play a significant role in bringing out the variations in the body morphology and cardiovascular health. More the sedentary type of work, more you trapped in the fatty world that takes you to the bed of CVDs and CHDs.

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