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RESEARCH ARTICLE

# A comparative study of anthropometric and body composition analysis variables in different human constitution types of Indian Traditional Medicine

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## ABSTRACT

**Background:** There has been keen research interest in exploring Indian Traditional Medicine of Ayurveda which comprises thousands of medical concepts and hypothesis. Due to increase in scientific validation in various concepts, Ayurveda has got its deserved recognition and its scientific endeavor has increased significantly in the past decade. **Aims and Objectives:** The aim of this study is to compare different anthropometric indices along with body composition analysis parameters in individuals with dominant primary dosha of Ayurvedic Tridosha Concept. **Materials and Methods:** A cohort study was designed and conducted from January 2016 to December 2016. Healthy participants aged between 18 and 22 years willing to participate in the study were included in the study. Questionnaires were administered to collect information including demographic data, certain physical and psychological characteristics to assess the Ayurvedic Prakriti of the individual. The individuals were examined by an Ayurvedic Physician for assessment of Prakriti by physical examination. Anthropometric parameters such as waist circumference, height, weight, body mass index (BMI) and hip circumference were measured. Total body composition was assessed using Bodystat1500MD. **Results:** The participants with the dominance of kapha prakriti had significantly higher BMI, fat mass index and basal metabolic rate compared to vata and pitta groups. **Conclusions:** This study highlights the use of an assessment of Prakriti as a screening tool for obesity.

**KEY WORDS:** Ayurvedic Prakriti; Body Mass Index; Body Composition Analysis

## INTRODUCTION

Ayurveda is India's traditional health care system, with fundamentals which focus on understanding of the unique nature of every person and its interaction with the environment. This traditional science has gained renaissance of universality for the past three decades. Our knowledge of the 'Human Body' as stated in evidence-based medicine is the acquaintance from anatomical dissection. However, according to the core principle of Ayurveda human body is homogenous to the nature being comprised five elements: ether (akasha), wind (air), fire (agni), water (jal), and earth (prithvi), three doshas which are biological energies, seven dhatus (tissues), and numerous srotas (channels).[1] These five elements will arrange to form the three doshas or forces within the body. These doshas focus on the balance of energies

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for the maintenance of the internal processes and metabolic activity.[2] They are given the names as Vata, Pitta, and Kapha in Charaka Samhita. The word vata derives its roots from Sanskrit meaning "wind" or "that which moves"; hence its dosha is associated with the movement. Pitta is interpreted as "fire" or "heat" and is a combination of fire and water. Kapha represents water and earth. The hypothesis put forth by Alex Hankey states that, vata is associated with input/output, pitta to turnover and kapha to storage. Vata is responsible for colon and kidney function, pitta for heat production and kapha is aggravated by lipid storage.[3] The concept of Tridosha is basis of the Ayurvedic theory of human physiological regulation through the integration of characteristics of the three doshas. The individual's constitution at birth, known as *Prakriti* or *Dosha* configuration, represents the individual's unique combination of physical and physiological characteristics. According to Ayurveda, health manifests by the grace of absolute acting of laws of nature. However, disturbance in homeostasis is caused by fluctuations at the emotional, mental, social and environmental levels (e.g., passions, stress, irregular diet, food, weather changes, air or water pollution, etc.) Any imbalance in the natural level of any of the three doshas confers a risk of developing a health disorder or disease. Deficiency or excess of dosha would increase the chance of manifestation of the disease or disorder linked with that dosha.[4] The predominant dosha reveals the main energies and qualities within the individual and their predisposition to health or disease.[5]

The disturbance in equilibrium of these doshas can make an individual susceptible to a disease which can be identified according to the prakriti of the person. According to Ayurvedic literature,a pitta prakriti person is described as moderately built nourished, is said to be more susceptible to develop peptic ulcers, hypertension and skin diseases, a vata prakriti person has thin body frame work, weakly developed musculature, is more prone for backache, joint aches while individuals with kapha prakriti manifest diabetes, obesity and atherosclerosis.[6,7] Ayurvedic treatment emphazises on balancing the doshas through lifestyle modifications regarding dietary habits, physical exercise and personal habits.[8]

Bio-impedance body composition analysis is a non-invasive, inexpensive method which works on the principle of the potential of the biological tissue to impede electric current. Body composition analysis variables include obesity indices such as lean mass, fluid volumes estimation, basal metabolic rate (BMR), and body mass index (BMI).[9] Earlier studies have tried to establish a statistically significant relationship between primary doshas of Ayurvedic Tridosha concept and risk factors of cardiovascular or inflammatory diseases along with inflammatory and oxidative stress-related genes.[10,11] A study done by Prasher *et al*. described the variation in gene expression and biochemical parameters among three constitutional prakriti types.[12] According to Ayurvedic texts each prakriti exhibit differences with respect to physiological, physical, and psychological characteristics which totally depends upon involvement of each dosha in an individual[13] One of the future research goals is scientific validation of different physiological characteristics of the Ayurvedic Prakriti. This could establish the informational background of integrating Ayurveda and evidence-based modern medicine for both the treatment and prevention of chronic conditions through lifestyle modifications Hence, the present study was performed to evaluate the physiological body composition parameters, obesity indices within dominant prakriti that could be utilized for understanding prakriti based disease manifestation.

### Objectives of the Study

To compare variations of anthropometric measurements and body composition analysis parameters in individuals with three constitutional types of dominant prakriti.

## MATERIALS AND METHODS

This study was conducted in the Department of Physiology, Kasturba Medical College, Manipal from January 1st to December 30th, 2016. The research protocol was approved by Institutional Ethics Committee, Kasturba Hospital Manipal, Karnataka, India (IEC No – 633/2015). This project was a prospective study with a sample size of 79 of the total 100 volunteers who were screened at the start of the study.

### Inclusion Criteria

The study population recruited for this study comprised of healthy participants between the age group of 18 and 22 years of either gender willing to participate with the written informed consent given.

### Exclusion Criteria

Subjects with pacemakers or any implantable device were excluded from the study. Participants with a history of chronic illness or on the treatment of diuretics were excluded. Participants were requested to abstain from eating or drinking 4 h before the record and physical activity 12 h before the test. The participants were asked to empty the bladder completely before the start of the test.

The study was conducted in a 2 step manner.

Step 1 – The participant was asked to answer the questionnaire having 50 items which had multiple choice questions. The questions had three options for which the participant could choose the best-suited response referring to physical and psychological characteristics assigned to Kapha (K) Vata (V) or Pitta (P). The responses were collected by the investigators and analyzed. The total score secured by a participant for

answers in K, V, and P domain and accordingly the participant was identified as having a particular prakriti.[14] The participants were also assessed by an Ayurvedic physician for determination of prakriti by physical examination.

Step 2 – After the participants were examined by the interviewers, anthropometric features including height, weight, waist circumference (WC), hip circumference, and BMI were measured using a standard method. A stadiometer was used to measure the standing height which was rounded off to the nearest 0.1 cm. An electronic scale was used to measure the weight with readings accurate to 0.1 kg. BMI was calculated, using the standard formula (kilograms per meter squared). WC was measured with an anthropometric stretchable tape at the midpoint between the last rib and the iliac crest.[15] Body composition parameter analysis was performed on the participants using Bodystat apparatus (Bodystat1500 MDD model).It involves the technique of bioelectrical impedance analysis configured with two lead wires which are removable.[9] Various parameters used for the study of body composition analysis is as follows: Lean mass, BMI, total body water, BMR, fat-free mass index (FFMI), and body fat mass index (BFMI).

### Statistical Analysis

Descriptive and inferential statistical analysis was performed using SPSS package version 20.0. Results on continuous measurements acquired using Student's t-test for quantitative variables with mean ± standard devition (min–max) and results on categorical measurements presented in percentage (%). Significance value was assessed at 5% level of significance. Independent analysis of variance used to find the significance of study parameters between three groups of subjects. *Post-hoc* Tukey test had been used to find the pairwise significance. Student *t*-test (two-tailed, dependent) was used for continuous variables.

## RESULTS

Table 1 summarizes the baseline anthropometric characteristics of the subjects. The results are suggestive of higher weight and BMI in a group of participants who have kapha predominance prakriti. Table 2 summarizes the analysis of body composition parameters in three different groups. The results are suggestive of higher fat content and BMR in participants who have kapha predominance.

## DISCUSSION

According to Ayurvedic texts an individual's Prakriti represents distinct phenotypic constitution.[2] The current study demonstrated that adiposity indices such as BMI, FFMI, Body fat and extracellular water content significantly differed according to an individual's prakriti.

**Table 1:** Baseline anthropometric characteristics of the study population

| Characteristics | Vata (*n*=30) | Pitta (*n*=30) | Kapha (*n*=19) |
|---|---|---|---|
| Weight (kg) | 52.92±8.1 | 60.39±5.92* | 65.76±15.08$^{\#}$ |
| Height (m) | 1.62±0.07 | 1.64±0.07 | 1.66±0.09 |
| WHR | 0.92±0.06 | 0.92±0.05 | 0.91±0.09 |
| BMI | 20.28±2.84 | 22.64±2.69* | 23.87±4.81$^{\#}$ |

Values are expressed as mean±SD. Vata v/s Pitta* $P$<0.05. Vata v/s Kapha$^{\#}$ $P$<0.001 (very highly significant). SD: Standard deviation, BMI: Body mass index, WHR: Waist-to-hip ratio

**Table 2:** Comparison of body composition parameters among different Prakritis

| Parameters | Vata (*n*=30) | Pitta (*n*=30) | Kapha (*n*=19) |
|---|---|---|---|
| Fat (kg) | 10.4±3.82 | 13.2±6.68 | 15.1±8.34* |
| Lean (kg) | 41.7±10.01 | 46.29±8.79 | 50.58±12.55* |
| TBW (L) | 31.35±5.47 | 33.61±4.8 | 35.45±7.93* |
| ECW (L) | 12.77±2.74 | 12.6±2.35 | 14.51±2.5*$^{\#}$ |
| ICW (L) | 18.78±4.01 | 20.79±3.79 | 20.877±6.45 |
| BMR | 1427.83±191.59 | 1543.93±131.89 | 1639.63±304.63* |
| BFMI | 4.08±1.72 | 5.09±2.77 | 5.64±3.35 |
| FFMI | 16.19±2.28 | 17.57±1.35$^{@}$ | 18.26±3.15** |

Values are expressed as mean±SD. TBW: Total body water, ECW: Extracellular water, ICW: Intracellular water, BMR: Basal metabolic rate, BFMI: Body fat mass index, FFMI: Fat-free mass index. Vata v/s Kapha* $P$<0.05, ** $P$<0.01. Pitta v/s Kapha$^{\#}$ $P$<0.05. Vata v/s Pitta$^{@}$ $P$<0.05

Based on the characteristics of the three human constitution types of Indian traditional medicine, kapha body types are more to develop obesity. This predisposition for obesity is associated with chronic diseases such as coronary artery disease, hypertension, and diabetes.[6,7] Similar to the present study, most of the studies reported that BMI in vata-pitta prakriti was significantly lower as compared to kapha-pitta prakriti.[14,16] Obesity is defined as the abnormal or excessive accumulation of fat that may impair health.[17] According to Ayurvedic sciences kapha dosha has been associated with storage of lipid and fat molecules.[3] According to the traditional Ayurvedic texts, that participants with kapha prakriti predominance have sluggish metabolic rates with plump (upachita) or well built (paripurnasarvanga) features.[16] At molecular level, the human body is composed of lipids,water,proteins,minerals, and carbohydrates.[18] Of these, lipids are often considered in studies of obesity which are stored in the human body as triglycerides.[18] The concept of body composition analysis is that body is divided into fat (stored triglycerides) and water which forms a fixed fraction of the FFMI.[19] A study done by Mitali Mukherji, reported increased levels of triglycerides, total cholesterol, LDL, VLDL, LDL/HDL with lower HDL levels in kapha males compared to vata. This study was suggestive of increased levels of markers of metabolic syndrome combined with over expression of genes involved in inflammatory response

in individuals with kapha predominance.[20,21] The study has similar results suggestive of kapha prakriti individuals having higher body fat with higher BFMI. Ayurveda describes sedentary lifestyle contributes to vitiation of kapha, meda (fat) and mutra (urine); that in turn is responsible for the commencement of Madhumeha or Diabetes.[22,23] According to evidence-based medicine, the prevalent epidemic of type 2 diabetes has been recognized as the result of a genetically predisposed population that is progressively more sedentary and a victim of the high-calorie dense diet with obesity as the chief risk factor.[24-27]

The individuals with different prakriti have distinct metabolic activities. According to the Tridosha concept, catabolism of the body is regulated by vata dosha, metabolism is regulated by pitta and anabolism is governed by kapha dosha.[28] A study hypothesized the role of prakriti in aging, concluded that the individuals with pitta predominance had a higher BMR and energy consumption which resulted in tissue destruction and premature aging while individuals with kapha prakriti displayed longer lifespan combined with delayed manifestation of aging.[29] A previous study observed that higher BMR was seen in individuals with dominant vata prakriti.[30] Our results differed from this study as we have found that kapha prakriti individuals have higher BMR. The difference is because the majority of study participants were selected from student population studying at Manipal Academy of Higher Education. A large percentage of the study participants were classified with the pitta predominance and vata predominance least belonging to kapha predominance. An even distribution of the primary doshas in the study population may have yielded a different result, as Ayurveda practitioners expect the equal distribution of all three doshas and subdoshas within the general population. A more broadly diversified selection of participants may have yielded a different result.

Strengths of our study being anthropometric measurements and body composition analysis was performed using standardized protocols by trained professionals. An individual's prakriti assessment was done with a validated questionnaire and cross verified by clinical examination by Ayurvedic physician. To eliminate bias the results of Prakriti assessment through questionnaire was not revealed to the Ayurvedic physician.

Limitations of the study being small sample size, less diversified selection of participants and a large percentage of participants having pitta and vata predominance.

## CONCLUSION

The dosha questionnaire is a simple and inexpensive method to identify the phenotype of those who are genetically susceptible to obesity for clinical and public health purposes. The relationship between the prakriti and chronic disease would help in early diagnosis of the disease.Since there is a significant increase in the prevalence of lifestyle diseases in India which is quite alarming. Mass screening of the patients using the prakrithi assessment as a tool could be beneficial. Primordial prevention can be implemented in individuals with the particular prakriti.

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