Association of constitutional type of Ayurveda with cardiovascular risk factors, inflammatory markers and insulin resistance

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ABSTRACT

Context: Ayurveda propounds that diseases manifest from imbalance of doshas. There, have been attempts to indicate biochemical basis of constitutional types described in Ayurveda. Aims: The study was intended to assess the association of constitutional types (Prakriti) with cardiovascular risk factors, inflammatory markers and insulin resistance in subjects with coronary artery disease (CAD). Settings and Design: Hospital based cross sectional study. Materials and Methods: Three hundred patients with CAD > 25 years were studied. Assessment of Prakriti was done by using Ayusoft software. Biochemical parameters, inflammatory markers (hsCRP, TNF-alpha and IL-6) and insulin resistance (HOMA-IR) were measured. Statistical Analysis: Was done using EPI INFO, version 3.5.3. Results: Mean age of patients was 60.97 ± 12.5 years. Triglyceride, VLDL and LDL was significantly higher (P<0.0001, P<0.0001 and 0.0355, respectively) and HDL cholesterol (P<0.0001) significantly lower in vatta kapha (VK) Prakriti when compared with other constitution type. VK Prakriti was correlated with diabetes mellitus (r = 0.169, P = 0.003), hypertension (r = 0.211, P ≤ 0.0001) and dyslipidemia (r = 0.541, P ≤ 0.0001). Inflammatory markers; IL6, TNF alpha, hsCRP and HOMA IR was highest in VK Prakriti. Inflammatory markers were correlated positively with both VK and Kapha group. Conclusions: There is strong relation of risk factors (diabetes, hypertension, dyslipidemia), insulin resistance, and inflammatory markers with Vata Kapha and Kapha Prakriti.

Key words: Cardiovascular disease, HOMA IR, IL6, Vata Kapha

INTRODUCTION

In the Ayurvedic system of medicine, predisposition to a disease as well as selection of a preventive and curative regime is primarily based on the assessment one’s body constitution termed Prakriti. Prakriti of an individual is based on the dominance of any single or a combination of two or three Doshas (Trī-Doshas), Vata (V), Pitta (P) and Kapha (K), which are not only genetically determined (Shukra Shonita), but also influenced by season (Ratu), maternal diet and lifestyle (Matur Abarta Vibata), and age of parents and female reproductive system (Kala-Garbhashaya).1 According to Ayurveda, constitutions are classified into seven varieties namely vataja, pitta, kaphaja, vata-kaphaja, vatapittaja, kapha-pittaja and sama Prakriti, among which the first three are considered as extremes.2-4 Distinct properties and functions have been ascribed to each Dosha. For instance, Vata contributes to manifestation of shape, cell division, signalling, movement, excretion of wastes, cognition and also regulates the activities of Kapha and Pitta. Kapha is responsible for anabolism, growth and maintenance of structure, storage and stability. Pitta is primarily responsible for metabolism, thermo-regulation, energy homeostasis, pigmentation, vision, and host surveillance.2-5

An individual may have a natural predominance of one or more doshas. Accordingly disorders arise from an augmentation or depletion of doshas or combination of...
both in conglomerations with dashyas manifest disease, whereas maintaining balance of the doshas results in good health. Over time, the natural balance of the doshas in an individual can be disturbed by a number of factors, such as improper diet, poor digestion, day-to-day stress levels and environmental pollution and chemicals.\[6\]

In recent years, there have been several studies indicating biochemical basis of constitutional types described in Ayurveda.\[2,7-13\] Coronary artery disease (CAD) has elements of cellular proliferation and metabolic abnormalities. Hence, an anomalous expression of certain element in the Prakruti of the individual will be more prevalent in CAD. No study has demonstrated the association of risk factors (diabetes, hypertension), inflammatory markers and insulin resistance with Prakruti in established cardiovascular patients. This study has been done with objective to find correlation of constitutional types with cardiovascular risk factors, inflammatory markers and insulin resistance among the subjects with established CAD.

**MATERIALS AND METHODS**

Three hundred patients having age more than 25 years, with known coronary disease were included in the study. Patients, who were admitted in cardiology department for evaluation of chest pain and found angiography positive, were selected in the study. Exclusion criteria were presence of chronic kidney disease; hepatic dysfunction; known endocrinal or rheumatological diseases or chronic infections. The inflammatory markers are significantly elevated in rheumatological disorders. Insulin secretion and synthesis are strongly influenced in endocrine disorders.\[12,13\] Chronically ill patients have multiorgan dysfunction. Hence, these were excluded from the study.

**Assessment of Prakruti**

Prakruti assessment tool of AyuSoft, which is in the form of a questionnaire was used for the study. Experienced staff, under the guidance of a Vaidya, accurately assessed the Prakruti of each individual. The AyuSoft database (www.ayusoft.cdac.in) includes more than 5 lakh records, and information from nine texts, including the Brihadrtyee and Madhava Nidana.\[14\] The standardized and validated software has been used by other authors in published studies\[8,10\] and being used in ongoing trial.\[15\]

The classification broadly takes into account features like body built, physical and mental endurances, and physiology. Besides, the multiple-choice questionnaire also captures the information pertaining to history of disease. Each option further refers to a property attributed to Vata, Pitta or Kapha constitution. Individuals those showing characteristics of two doshas were considered that of dual constitution.\[5\] While defining a dual constitution dominance and sub-dominant among these two doshas were ignored. The individuals with dominant Vata and sub-dominant Pitta (Vata-Pitta individuals) and the individuals with dominant Pitta and sub-dominant Vata (Pitta-Vata individuals) were considered equivalent and were grouped as Vata-Pitta. Similarly, the Pitta-Kapha and Kapha-Pitta individuals were grouped as Pitta-Kapha, while Vata-Kapha and Kapha-Vata individuals were grouped as Vata-Kapha. Otherwise, we would have created six groups of dual Prakruti instead of three, which would have been a deviation from the Ayurveda classics.

**Prakruti** of these volunteers was designated as Vata-Pitta, Pitta-Kapha, or Vata-Kapha. While designating the Prakruti, the individuals with Vata as the primary Dosha and Pitta as the secondary Dosha (i.e., Vata-Pitta individuals) and the individuals with Pitta as the primary Dosha and Vata as the secondary Dosha (i.e., Pitta-Vata individuals) were considered to be equivalent and were grouped under Vata-Pitta. Similarly, the Pitta-Kapha individuals and the Kapha-Vata individuals were treated to be equivalent and were grouped under Pitta-Kapha. On similar lines, the Vata-Kapha individuals and the Kapha-Vata individuals were treated to be equivalent and were grouped under Vata Kapha. This was done to avoid the necessity of creating six groups of dual Prakruti, which would have been a deviation from the Ayurveda textbooks.

**Physical measurements**

Data of all subjects were obtained on smoking, physical activity, height, weight, waist, and hip circumference. Body mass index (BMI) is weight (kg) divided by square of height in meters, and waist hip ratio (WHR) is waist circumference divided by hip circumference.

**Biochemical measurements**

Cardiovascular diseases are associated with traditional risk factors,\[16-18\] insulin resistance\[19\] and chronic systemic inflammation.\[20,21\] Hence we assessed biochemical parameters according to these risk factors. Fasting blood samples were collected after 14 hour fasting. Total Cholesterol, Triglyceride, HDL (high density lipoprotein), LDL (low density lipoprotein) and VLDL. Cholesterol (very low density lipoprotein) were analysed. Cholesterol, triglyceride, HDL were measured by using CHOD PAP, LIP/GK, enzymatic clearance method, respectively, and LDL and VLDL were calculated by Friedewald formula. Interleukin-6 (IL6), tumor necrosis factor (TNF) alpha, highly sensitive C-reactive protein (hsCRP) and Insulin was done by ELISA and MEIA method.\[22\] Separated serum samples were stored at −80°C till analysis. Samples were processed together to reduce variabiity. Strict
quality control measures were followed. Intra and inter assay precisions were <5% and <10%, respectively, for all parameters. The HOMA Model was used to calculate insulin resistance (IR). The formula is as follows:

\[ \text{Insulin resistance} = FI \times \frac{G}{22.5} \]

where \( FI = \text{Fasting insulin} \) μIU/ml, and \( G = \text{Fasting glucose} \) (mmol/l).

Liver function and renal function test were also done. Data on clinical history of hypertension (HTN), diabetes mellitus (DM), smoking, physical activity, and medications (antihypertensive and oral hypoglycemic agents) was also acquired. The study was approved by Institutional Ethics Committee of Deenanath Mangeshkar Hospital, Pune (Maharashtra). Informed consent was obtained from all individuals.

**Definitions**

Dyslipidemia was defined as Triglyceride level ≥150 mg/dl and HDL. Cholesterol level <40 mg/dl (NCEP ATP III). Conventional risk factors were defined as follows: Body mass index (BMI); Normal <25 kg/m², Overweight/Obese <25 kg/m², DM (by history and treatment), HTN (systolic and diastolic blood pressures above 140 and 90 mmHg, respectively).

**Statistical method**

Statistical analysis was carried out using EPI INFO, version 3.5.3 (CDC; Atlanta; USA). Data were presented as mean±SD, median (range) or number (%) unless specified. All parametric data (age and biochemical parameters) were analysed by student’s t-test. If Barlett’s Chi-square test for equality of population variances was <0.05 then Kruskal-Wallis test was applied. All non-parametric data (sex, smoking, and presence of DM, HT or dyslipidemia, etc.) were analysed by Chi-square test. Pearson correlation coefficient was used to assess association between Prakriti and cardiovascular risk factors. Multiple linear regression analysis was used to assess the strength of association between Prakriti as outcome measure and cardiovascular risk factors and biochemical parameters as variables after adjusting for age, sex and BMI. A \( P \) value <0.05 was considered statistically significant.

**RESULTS**

Three hundred patients with known cardiovascular disease (M: 216; F: 84, age: 25-92) were studied. Mean age was 60.9±12.4 years. There was no age difference between males and females (M: 60.95±12.3; F: 61.03±12.9; P=0.10). Constitution types which were identified in this study were Kapha, Pitta Kapha, Vata Kapha and Vata Pitta. VK was more prevalent (62.3%) compared to others; K - 5%, KP - 15.7%, VP - 17%.

A comparison of cardiovascular risk factors with different constitution types (Prakriti) are given in [Table 1]. Anthropometric parameters were comparable in all constitution types. There was no correlation between body mass index, waist hip ratio and physical activity with Prakriti [Table 1]. Total cholesterol, triglycerides, VLDL and LDL cholesterol were significantly higher and HDL cholesterol significantly lower in VK when compared with other constitution type. For triglyceride, VK had highest and HDL has lowest values compared to all groups (K, PK, VP). Serum Cholesterol levels were also significantly high in VK group but in individual comparison VK was significantly high compared to VP only. Similarly, LDL was high in VK type but compared to VP only. All lipids levels were positively correlated with KV except HDL, which was correlated negatively in univariate analysis. Significance was maintained even after adjustment with age, sex and BMI [Tables 3 and 4].

DM and DM with HTN has significant association with VK Prakriti, it was highest in VK group compared to VP. There was no association between K and PK group. HTN was highest in VK group compared to PK and VP group but not associated with K group. 26.7%, 36.2%, 48.1% and 27.5% in K, PK, VK, VP types were diabetics, respectively [Tables 1 and 2].

Cytokines (IL6) and inflammatory markers (TNF alpha and hsCRP) were analysed, IL6 and hsCRP was highest in VK but TNF alpha had significantly highest values in K Prakriti. In univariate analysis IL6 was positively correlated with KV but not with K (r: 0.083, P: 0.150). However, TNF alpha and hsCRP were positively correlated with both KV and K group. (TNF-α; r: 0.137, P: 0.018, hsCRP; r: 0.123, P: 0.033) [Table 3]. Even after adjustment with age, sex and BMI significance level was maintained [Table 4].

Insulin and HOMA-IR was highest in VK compared to all Prakriti types [Tables 1 and 2]. Insulin resistance showed positive correlation VK (beta coefficient: 13.97, P<0.0001).

However, other biochemical parameters which were done in this study were Liver function test, serum electrolytes, calcium, phosphorus and magnesium. There was no correlation between Serum bilirubin, ALT, AST, Alkaline phosphatase, total protein, albumin, globulin, calcium, phosphorus, uric acid, sodium, potassium and chloride with individual constitution (data not shown).
DISCUSSION

The entire description of human physiology in Ayurveda is based primarily in the theory of Tridosha. The “homeostatic mechanisms” as conceptualized in modern biomedicine have a very close resemblance with this theory.

This is possibly the first study to report an association of risk factors, inflammatory markers and insulin resistance with Prakriti type in angiographically proved cardiovascular patients. More than half of patients (62.3%) were of Vata Kapha type and it was more prevalent compared to other prakriti; VK>VP>PK>K. CAD have element of cellular proliferation and metabolic abnormalities. Vata contributes to manifestation of shape, cell division; Kapha is responsible for anabolism, growth and maintenance of structure and Pitta is primarily responsible for metabolism. Hence, combined abnormalities will be more prevalent in CAD, which is observed in this study. There have been many studies to provide an evidence base to the traditional systems of medicine. Investigators have tried to provide interesting genetic, biochemical, hematological or anatomical basis to the concept of Ayurveda constitution.

| Parameters         | Kapha mean±SD, Median (range) | Pitta Kapha mean±SD, Median (range) | Vata Kapha mean±SD, Median (range) | Vata pitta mean±SD, Median (range) | P value |
|--------------------|-------------------------------|-------------------------------------|-----------------------------------|------------------------------------|---------|
| Age                | 60 ± 12.5                     | 58.8 ± 11.3                         | 61.2 ± 12.1                       | 61.9 ± 14.5                        | 0.5955  |
| Sex, % (n)         | M-86.7 (13)                   | M-76.6 (36)                         | M-69 (129)                        | M-74.5 (38)                        | 0.3771  |
| Cholesterol (mg/dl)| 160 ± 23                      | 174 ± 44.9                          | 184.6 ± 49.1                      | 166.4 ± 32.5                       | 0.0661  |
| Triglyceride (mg/dl)| 144.8 ± 35.7                 | 146.6 ± 31.5                        | 184.7 ± 47.6                      | 152 ± 35.3                         | <0.0001 |
| HDL (mg/dl)        | 47.1 ± 5.8                    | 44.9 ± 8.3                          | 35 ± 7.6                          | 45.3 ± 8.1                         | <0.0001 |
| LDL (mg/dl)        | 83.9 ± 21.6                   | 100.4 ± 48.6                        | 112.6 ± 54.6                      | 90.7 ± 35.8                        | 0.0355  |
| VLDL (mg/dl)       | 86.2 ± 39.2-116.6             | 86.2 ± 32.2-262.6                  | 96 ± 32.2-273.8                   | 88.2 ± 32.2-229.8                  | 0.0001  |
| Smoking % (n)      | 28.9 ± 7.1                    | 29.2 ± 6.3                          | 36.9 ± 9.5                        | 30.4 ± 7.0                         | <0.0001 |
| WHR                 | 46.7 (7)                      | 29.8 (14)                           | 40.6 (76)                         | 27.5 (44)                          | 0.1944  |
| BMI (kg/m²)        | 28.1 ± 2.9                    | 27.6 ± 4.2                          | 27.9 ± 3.8                        | 27.7 ± 3.5                         | 0.9352  |
| DM, % (n)          | 26.7 (4)                      | 36.2 (37)                           | 48.1 (90)                         | 27.5 (44)                          | 0.0241  |
| HTN, % (n)         | 53.3 (8)                      | 48.9 (33)                           | 70.6 (132)                        | 49 (25)                            | 0.0038  |
| DM and HTN, % (n)  | 26.7 (4)                      | 27.7 (33)                           | 36.9 (69)                         | 13.7 (7)                           | 0.0145  |
| Physical inactivity, % (n) | 40.6 (6)   | 40.4 (19)                           | 39.8 (74)                         | 33.3 (17)                          | 0.8616  |
| Dyslipidemia, % (n) | 6.7 (1)                      | 8.5 (4)                             | 62 (116)                          | 5.9 (3)                            | <0.0001 |
| IL-6, pg/ml        | 91.8 ± 74.8                   | 6.3 ± 4.5                           | 92.5 ± 77.9                       | 7.3 ± 4.5                          | <0.0001 |
| TNF-alpha, pg/ml   | 49.6 ± 24.2                   | 8.1 ± 6.1                           | 32.3 ± 48.8                       | 8.1 ± 24                           | <0.0001 |
| hsCRP, pg/L        | 50.1 (9-101)                  | 8.0 (8-12)                          | 14.1 (8.0-52.8)                   | 8.0 (8-8.9)                        | <0.0001 |
| Insulin, mU/L      | 16.8 ± 2.5                    | 2.3 ± 2.1                           | 16.0 ± 9.0                        | 2.6 ± 2.2                          | <0.0001 |
| HOMA-IR            | 14.3 (3.0-78.5)               | 29.2 (3.0-135.4)                    | 49.3 (2.14-274.8)                 | 22.6 (2.4-212.4)                   | 0.0002  |
| HOMA-IR            | 7.5 ± 6.03                    | 11.3 ± 10.7                         | 22.9 ± 24.4                       | 10.4 ± 16.6                        | <0.0001 |
| HOMA-IR            | 7.4 (0.58-39.19)              | 7.24 (0.63-51.8)                    | 15.7 (0.5-335.7)                  | 7.7 (0.65-68.4)                    | <0.0001 |
hematological parameters and at genome wide expression levels. They also reported that biochemical profiles like liver function tests and lipid profiles and hematological parameters like hemoglobin levels exhibited differences between Prakriti types. Thus, they concluded that Ayurveda-based method of phenotypic classification of extreme constitutional types may be utilized to uncover genes that may contribute to system level differences in normal individuals.\[2\]

Prakriti fundamentally and dosha as its applied extension, presented themselves as the central dogma of Ayurveda. Fascinated by its possible application to Ayurvedic diagnostics and for its being as an evidence to help decision making for personalized treatment, it has recently evoked the scientific community to look at the issue in their own perspectives.\[20\] The identification of biochemical correlates and whole genome expression to the extreme constitutional types as described in Ayurveda,\[2\] Almost a decade back, Prakriti was seriously thought as an important factor determining the final outcome of any therapeutic intervention in a given population. Dahanukar and Thatte in a revealing study were able to correlate the therapeutic outcomes with phenotypical specifications as described in Ayurveda.\[27\] A definitive role of Prakriti to the prevalence and prognosis of rheumatoid arthritis (RA) was identified by Rastogi et al. This report identified a vata-pitta constitutional subtype as more prone yet fairly treatable fraction among the RA population.\[28\] Tripathi and others suggest that these basic cardiovascular responses do not vary significantly as per the dual constitutional types and noted a significant fall in the diastolic blood pressure immediately after performing the isotonic exercise for five minutes, in Vata-Kapha individuals in

### Table 2: P values of different biochemical parameters during individual comparison of Prakriti

| Parameters | K-VK | PK-VK | VK-VP | K-PK | K-VP | PK-VP |
|------------|------|-------|-------|------|------|-------|
| Cholesterol | 0.1007 | 0.2102 | 0.0419 | 0.5158 | 0.4789 | 0.9518 |
| Triglyceride | 0.0018 | <0.0001 | <0.0001 | 0.8704 | 0.4917 | 0.4103 |
| HDL | <0.0001 | <0.0001 | <0.0001 | 0.3558 | 0.4339 | 0.8233 |
| LDL | 0.0611 | 0.1652 | 0.0242 | 0.5268 | 0.6298 | 0.7328 |
| VLDL | 0.0018 | <0.0001 | <0.0001 | 0.8704 | 0.4917 | 0.4103 |
| DM | 0.1820 | 0.1910 | 0.0331 | 0.7159 | 0.6158 | 0.4777 |
| HTN | 0.2699 | 0.0884 | 0.0066 | 1.000 | 1.000 | 0.8461 |
| DM and HTN | 0.6070 | 0.3097 | 0.0029 | 0.6106 | 0.2100 | 0.1445 |
| Dyslipidemia | <0.0001 | <0.0001 | <0.0001 | 0.6505 | 0.6532 | 0.4539 |
| IL-6 | 0.9715 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| TNF-alpha | 0.0013 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |
| hsCRP | 0.0014 | 0.0307 | 0.0087 | 0.1362 | 0.2143 | 0.7147 |
| Insulin | 0.0005 | 0.0002 | <0.0001 | 0.3121 | 0.4218 | 0.6709 |
| HOMA-IR | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 | <0.0001 |

K-VK = P value between kapha and Vata Kapha, PK-VK = P value between Pitta Kapha and Vata Kapha, VK-VP = P value between Vata Kapha and Vata pitta, K-PK = P value between kapha and Pitta Kapha, K-VP = P value between kapha and vata pitta, PK-VP = P value between Pitta Kapha and vata pitta

### Table 3: Correlation of Prakriti with risk factors

| Parameters | Vata Kapha n=187 | Vata Pitta n=51 | Pitta Kapha n=47 | Kapha n=15 | r value | P value |
|------------|------------------|-----------------|------------------|------------|---------|---------|
| Cholesterol | 0.165 | 0.004 | -0.122 | 0.035 | -0.038 | 0.598 | -0.094 | 0.104 |
| Triglyceride | 0.378 | <0.0001 | -0.188 | 0.001 | -0.231 | <0.0001 | -0.031 | 0.023 |
| HDL | -0.546 | <0.0001 | 0.314 | <0.0001 | 0.281 | <0.0001 | 0.203 | <0.0001 |
| LDL | 0.180 | 0.002 | -0.133 | 0.021 | 0.044 | 0.452 | -0.098 | 0.090 |
| VLDL | 0.378 | <0.0001 | -0.188 | 0.001 | 0.231 | <0.0001 | -0.131 | 0.023 |
| DM | 0.169 | 0.003 | -0.130 | 0.024 | -0.048 | 0.407 | -0.070 | 0.228 |
| HTN | 0.211 | <0.0001 | -0.128 | 0.027 | -0.122 | 0.034 | -0.044 | 0.445 |
| DM and HTN | 0.164 | 0.004 | -0.169 | 0.003 | -0.031 | 0.591 | -0.021 | 0.711 |
| Dyslipidemia | 0.541 | <0.0001 | -0.326 | <0.0001 | -0.287 | <0.0001 | -0.162 | 0.005 |
| IL-6 | 0.480 | <0.0001 | -0.344 | <0.0001 | -0.334 | <0.0001 | 0.083 | 0.150 |
| TNF-alpha | 0.222 | <0.0001 | -0.191 | 0.001 | -0.181 | 0.002 | 0.137 | 0.018 |
| hsCRP | 0.585 | <0.0001 | -0.425 | <0.0001 | -0.415 | <0.0001 | 0.123 | 0.033 |
| Insulin | 0.212 | <0.0001 | -0.118 | 0.041 | -0.085 | 0.140 | -0.127 | 0.027 |
| HOMA-IR | 0.286 | <0.0001 | -0.167 | 0.004 | -0.140 | 0.015 | -0.115 | 0.046 |

r value: Correlation of Prakriti with risk factors
comparison to the other two groups, namely, Pitta-Kapha and Vata-Pitta.[9] Udupa KN and others reported that the normal persons with features of Vata, Pitta and Kapha constitutions exhibited a relative preponderance of Blood Cholinesterase, Monoamine oxidase and Histaminase activity, respectively.[7] Ghodke and others carried out CYP2C19 genotyping in 132 unrelated healthy subjects of comparison to the other two Prakriti groups. Nevertheless, we did not find any correlation between WHR and BMI with type of Prakriti, but rather to our study, Hankey A said that age and BMI correlates with Prakriti of individual.[29] Most of the population based studies have reported relation between WHR and BMI.[30] However, in this study we have taken subjects who underwent coronary angiography and detected CAD. Most of our patients had mean WHR >0.9 and mean BMI >25 which were already higher than normal population. Most of the population based studies have reported relation between WHR and BMI. However, in this study we have taken subjects who underwent coronary angiography and detected CAD. Most of our patients had mean WHR >0.9 and mean BMI >25 which were already higher than normal population according to International and Indian Guideline.[31,32] Hence, probably we did not find the association. Perhaps due to higher individual of dual Prakriti, larger study may be required.

Dyslipidemia was more common in kapha vata subjects and lowest prevalence of 5.9% was found in vata pitta subjects. Total cholesterol, triglycerides, VLDL and LDL cholesterol were significantly higher and HDL cholesterol significantly lower in subjects with VK. All lipid parameters had positive correlation with VK except HDL; which was negatively correlated with VK. Prasher et al. found high levels of triglyceride, total cholesterol, VLDL and low levels of HDL in Kapha individuals in healthy subjects.[2]

Vata Kapha group had higher number of patients with cardiovascular risk disease than other groups. There are significantly higher number of subjects of DM, HTN and dyslipidemia in Vata Kapha type indicating VK is common in these conditions. All these risk factors were more prevalent in VK type. We could not find any correlation between WHR and BMI with type of Prakriti, but contrary to our study, Hankey A said that age and BMI correlates with Prakriti of individual.[29] Most of the population based studies have reported relation between WHR and BMI.[30] However, in this study we have taken subjects who underwent coronary angiography and detected CAD. Most of our patients had mean WHR >0.9 and mean BMI >25 which were already higher than normal population according to International and Indian Guideline. Hence, probably we did not find the association. Perhaps due to higher individual of dual Prakriti, larger study may be required.

Cytokines and inflammatory markers IL6, TNF alpha and hsCRP were high in Kapha Prakriti when compared with VK and VP, however, in Vata Kapha inflammatory markers were high compared to Vata Pitta only. However, HOMA-IR and Insulin was more prevalent in only KV (P<0.0001 for both) Prakriti. Insulin resistance were correlated positively with VK. IL6 was positively correlated with KV but not with K. Inflammatory markers; TNF alpha and hsCRP were positively correlated with both VK and K group. From an ayurvedic perspective the inflammation (pericarditis) is associated with Pitta, while fluid accumulation (pericardial effusion) with Kapha and stiffness (constrictive pericarditis) with Vata.[33]
Ayurveda identifies five distinct kinds of heart diseases as per their clinical description. This disease classification is essentially the etiological classification where the symptoms originating as result of some specific cause are grouped under the heading of disease. As per the doshic distinction of causes, the heart diseases of Ayurveda can either be caused by independent doshas (vata, pitta, and kapha) or a combination (tridoshaja) or else as a complication (krimiya).[34]

The aetiological factors are generally classified as psychological factors, diet, activity, excessive sexual indulgence, suppression of natural urges, alcohol in excess, bacteria, viruses, worms and other toxins, iatrogenic, causes effects of drugs, improper management of disease, abnormal or excess use of emetics, purgatives or enemas, trauma to the heart, complications of other diseases. These will cause abnormal increase or decrease in Vata, Pitta and Kapha and in turn Rasa which enters the heart and gives rise to the cardiovascular disease.[11] In summary, the eight basic elements that maintain the integrity of the cellular structure and functions of the heart are, Rasa, Rakta, Mamasa, Ojas, Prana vata, Vyana vata, Sadhaka pitta and Avaramshaka kapha. Rasa vruddh (dominance) and rasa viktuni (vitiated) may lead to kaphaja heart disease. On the other hand congestive cardiac failure can lead to increased blood volume, due to impaired circulation.[10]

Ayurveda provides insights into the development of the disease process, showing how the doshas when aggravated by certain aetiological factors affect the dbatu (tissue) and srotas (channel) of the body, eventually manifesting in disease. Degeneration of the blood vessels is caused by increased Vata in the blood vessels, which make them hard, thin, dry and rough. Deposits of lipids and calcium represent deposition of Kapha (water and earth element) in the degenerated vessels resulting in irregular thickening of blood vessels. However, no separate data was collected to find out abaar (dietary), vihaar (lifestyle), manas (psychological) and hetus (causes). Moreover, Hridya is kapha predominant organ hence not predisposed to pitta viktuni.

It is important to maintain and protect the volume and composition of Rasa, the body fluids, at all times. Any disturbance in Rasa can impair the movement of essential nutrients to our bodies cells and organs. This will then affect all our tissues (dbatui), Rakta (blood), Mamasa (muscle), Muda (fat), Asthi (bone), Majja (nervous tissue), Shukra (reproductive tissue), Ojas (vital fluid) which in turn will effect our sense organs and mind. Any effect to the channel that carries Rasa (Rasa Vaha Srotas) will cause imbalance in Rasa. Rasa can be vitiati (rasa-dusthi), increased (rasa-vruddh) or decreased (rasa-kshaya). As per modern understanding meda dhatu is the adipose tissue. It provides support to asthi dhatu and also lubricates the body. The abnormality of meda dhatu leads to obesity, accumulation of fat, early syndromes of polyuria, glycosuria, undesirable growth of glands, hyperglycaemia, excessive sweating, etc. However, attributes like Shhira, manda, guru, snigdha and sheeta which in combination with ruksha, khara, tend to cause a Vata Kapha viktuni in form of CAD. Any Prakriti can develop CAD but VK were more predisposed due to aforementioned reasons.

Heart disease occurs as a complication of many diseases: Anemia, infectious fever, rheumatic fever, vatarakta, diabetes, chronic respiratory disease, vomiting, bleeding disorders, worms, alcoholic intoxication, side effects of drugs, neurological disorders.[13] There was no association between Serum bilirubin, ALT, AST, Alkaline phosphatase, total protein, albumin, globulin, calcium, phosphorus, uric acid, sodium, potassium and chloride with individual constitution but study by Prasher et al. showed elevated levels of serum uric acid in kapha and serum phosphorus in pitta individuals in healthy subjects.[2]

Though, the present study does not suggest any significant association of PK and VP with risk factors and biochemcials but a strong association was found between risk factors (Diabetes, Hypertension and dyslipidemia), Insulin resistance and serum magnesium with individual having VK type of Prakriti. Similarly, association was found of IL6, TNF alpha, hsCRP with individual having VK and K type of Prakriti. VK was strongly associated with CAD risk factors, whereas other Prakriti was not associated and showed reverse association with risk factors, hence other factors like “ahar, vihar, manas” may be contributing factor in them.

It may be presumed that dominance of VK group has got some positive relationship with cardiovascular risk factors. Insulin resistance, Cytokines and inflammatory markers has got positive relation with VK and K group both. These factors may be taken as a lead and further studies may be designated to explore this relationship.

Limitation of the study was male predominance and less number of cases in some groups of Prakriti. Further, no detailed data was collected to find out abaar (dietary), vihaar (lifestyle), manas (psychological) and hetus (causes).

CONCLUSIONS

Half of cardiovascular disease patients have Vata Kapha constitution type. It may be concluded that as there is dominance of Vata Kapha Prakriti and there is strong correlation with risk factors, insulin resistance, cytokine (IL6) and inflammatory markers. But IL6, TNF alpha
and hsCRP is positively correlated with Kapha group also. Hence, identifying an individual with Vata Kapha and Kapha Prakriti will help in taking precautionary measures for future risk of cardiovascular disease.

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14. How to cite this article: Mahalle NP, Kulkarni MV, Pendse NM, Naik SS. Association of constitutional type of Ayurveda with cardiovascular risk factors, inflammatory markers and insulin resistance. J Ayurveda Integr Med 2012;3:150-7.

15. Source of Support: We thank Deenanath Mangeshkar Hospital and Research Centre, Pune, for providing necessary facilities.

16. Conflict of Interest: None declared.

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