



Contents lists available at ScienceDirect

Journal of Ayurveda and Integrative Medicine

journal homepage: <http://elsevier.com/locate/jaim>

Original Research Article (Clinical)

Relationships among classifications of ayurvedic medicine diagnostics for imbalances and western measures of psychological states: An exploratory study



Paul J. Mills^{a,*}, Christine Tara Peterson^a, Kathleen L. Wilson^a, Meredith A. Pung^a,
Sheila Patel^{a,b}, Elizabeth Weiss^b, Suhas G. Kshirsagar^c, Rudolph E. Tanzi^d,
Deepak Chopra^{a,b}

^a Department of Family Medicine and Public Health, University of California, San Diego, La Jolla, CA, USA^b The Chopra Center for Wellbeing, Carlsbad, CA, USA^c Ayurvedic Healing, Santa Cruz, CA, USA^d Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA

ARTICLE INFO

Article history:

Received 14 November 2017

Received in revised form

5 February 2018

Accepted 8 February 2018

Available online 29 October 2018

Keywords:

Vikruti
Dosha
Mood
Anxiety
Quality of life

ABSTRACT

Background: According to Ayurveda, the traditional medical system of India, *doshas* are a combination of characteristics based on a five-element philosophy that drive our mental and physical tendencies. When the *doshas*, or functional principles, are out of balance in quality or quantity, wellbeing is adversely affected and symptoms manifest.

Objective: This study examined relationships among imbalances in the *doshas* (termed *Vikruti*) reported via questionnaire and Western measures of psychological states.

Materials and methods: Study participants were 101 women (n = 81) and men (n = 20), mean age 53.9 years (SD = 11.7; range 32–80). Participants completed questionnaires to categorize their *Vikruti* type and psychological states, which included depressed mood (CESD), anxiety (PROMIS), rumination & reflection (RRQ), mindfulness (MAAS), stress (PSS), and quality of life (Ryff).

Results: Multivariate general linear modeling, controlling for age, gender and body mass index (BMI), showed that *Vata* imbalance was associated with more anxiety (p ≤ 0.05), more rumination (p ≤ 0.01), less mindfulness (p ≤ 0.05), and lower overall quality of life (p ≤ 0.01). *Pitta* imbalance was associated with poorer mood (p ≤ 0.01) and less mindfulness (p ≤ 0.05), more anxiety (p ≤ 0.05) and stress (p ≤ 0.05). *Kapha* imbalance was associated with more stress (p ≤ 0.05), more rumination (p ≤ 0.05) and less reflection (p ≤ 0.05).

Conclusion: These findings suggest that symptoms of mind-body imbalances in Ayurveda are differentially associated with western assessments of psychological states. Ayurvedic *dosha* assessment may be an effective way to assess physical as well as emotional wellbeing in research and clinical settings.

© 2018 Transdisciplinary University, Bangalore and World Ayurveda Foundation. Publishing Services by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Over the ages, numerous taxonomic systems have been developed to categorize individuals according to constitutional phenotypes, including Hippocrates' humors [1], and in more modern

times Friedman and Rosenman's behavior patterns [2] as well as William Sheldon's somatotypes [3], to name a few.

Ayurvedic Medicine, the traditional medical system of India, is based on Tridoshic theory; the three *doshas* are *vata*, *pitta*, and *kapha* [4]. In Ayurveda, the constitutional phenotype, or psychobiological tendencies, is called *Prakruti*, and refers to the inherent balance of a unique combination of mental and physical qualities which show up as predictable patterns in the mind-body system within an individual [5]. This ideal constitutional balance of an individual is determined at birth and grossly correlates with the individual's

* Corresponding author.

E-mail address: pmills@ucsd.edu (P.J. Mills).

Peer review under responsibility of Transdisciplinary University, Bangalore.

patterns of gene expression [6]. The constitution or physical manifestation of the *doshas* determine physical and structural characteristics, metabolic tendencies, personality, and disease susceptibility. The three *doshas* are forces that contain different proportions of the five elements air, fire, earth, ether and water [5], and thus contain parallels to Hippocrates' humors and Traditional Chinese Medicine's constitutional taxonomy system, which are also related to the elements and elemental classification [1,7].

According to Ayurveda, all living species contain all three *doshas* in unique combinations since each dosha is required for life. In general, vata dosha provides the force of movement and transport, pitta promotes metabolism, and kapha provides structure. Vata contains the elements of air and ether and thus represents the force required for all movement. Pitta contains the elements of fire and water and its governing action focuses on digestion and metabolism. *Kapha* contains the elements water and earth and is the force that promotes structure and stability. *Kapha dosha* also provides lubrication, growth, storage, and strength of immunity. In addition to the body as a whole, the *doshas* reside and operate within each cell of the body. At the cellular level, *Vata* is responsible for the circulation of nutrients and the excretion of the cellular waste products of metabolism. *Pitta* metabolizes nutrients and produces cellular energy; the waste products are removed by *Vata*. *Kapha* provides cellular structure via cell and organelle membranes as well as storage via vesicles.

Ayurvedic theories view that the psychobiological tendencies of each *Prakruti* possess innate vulnerabilities to stress and illness [5,8,9]. Recent studies have sought to examine such vulnerabilities according to Western classification of ailments. Manyam and Kumar, for example, demonstrated greater incidence of idiopathic Parkinson's disease (PD) in individuals with *Vata* constitution, as compared to *Pitta* or *Kapha* constitutions [8]. Telles et al. documented greater day-time somnolence in *Kapha* constitution and greater incidence of nighttime insomnia in individuals with *Vata* constitution, consistent with Ayurvedic theory [10]. Bell et al. reported that *Kapha* constitution appeared to be protective from osteoporosis yet at greater risk for obesity, whereas *Vata* constitution was protective from obesity yet associated with constipation, irritable bowel syndrome, and panic attacks [11]. Seeking potential genetic linkages among constitution types, Prasher et al. examined genome wide expression, biochemical, and hematological parameters and reported significant differences among each constitutional type [6].

In Ayurveda, as with other taxonomic systems, it is understood that when the psychobiological tendencies of the basic constitution are out of balance, illness can ensue [5,8]. The imbalance itself is called *Vikruti* in Ayurveda and is defined as a vitiation of the constitution or inherent doshic imbalance that provides strong tendencies towards pathological states [5,8]. It is not clear from the studies reviewed above on *Prakruti*, whether the *Vikruti* imbalances were also (inadvertently) taken into consideration in those studies, although it is clinically appreciated that in cases of extreme *Vikruti*, the imbalance can mask the constitution. What is most relevant for a diagnosis to inform personalized treatment is the *Vikruti* assessment, which describes the particular state of current imbalance and symptomatology. While *Prakruti* describes the balance of the *doshas* at conception, *Vikruti* refers to the balance of the *doshas* in the present and thus defines the nature of imbalance or illness. Ayurvedic treatment seeks to restore the balanced state of *Prakruti* in the patient.

With these considerations in mind, this study examined associations among *Vikruti* imbalances as assessed via questionnaire and Western descriptions of psychological states. We hypothesize that Western diagnoses and descriptors of psychological status correlate to specific imbalances in the *doshas*. Understanding

correlates among diagnostics used across various medical systems is of interest to integrative researchers and clinicians; studies on this topic are currently lacking and warranted. For psychological states, we used a standardized panel of questionnaires examining anxiety, negative mood, rumination & reflection, mindfulness, stress, and overall quality of life.

2. Materials & methods

2.1. Study participants and design

This study represents a secondary analysis of The Self-Directed Biological Transformation Initiative (SBTI), which was a multi-dimensional Ayurvedic Medicine wellbeing intervention study that has been reported on elsewhere [12,13].

Participants were recruited from the University of California (UC) San Diego in La Jolla, CA and the Chopra Center for Wellbeing in Carlsbad, CA. Eligible individuals were English-speaking women and men aged 30–80 years of age with no current major medical or mental illnesses and willing to refrain from drinking more than one alcoholic beverage per day during the weeklong study. Individuals who had previously participated in a yoga or meditation retreat of any kind within the past 12 months, or who were using illicit drugs, were excluded from participation. There were no expenses for participation in the study. The UC San Diego Institutional Review Board (IRB) approved the study (#140564) and all study subjects provided written informed consent prior to participation (ClinicalTrials.gov number NCT02241226).

2.2. Assessments

The participants completed the following questionnaires to categorize their *Vikruti* type and their psychological states, and the corresponding data was used in our analyses.

Vikruti Questionnaire. This 60-item questionnaire was developed by a team of physicians at the Chopra Center for Wellbeing trained in Ayurvedic Medicine and has been used clinically for the past 15 years. It begins with a brief *Prakruti* assessment, then assesses *Vikruti* for each of the three doshas [11]. The questionnaire is based on classic Ayurvedic descriptions for symptoms that occur when a particular dosha is out of balance, or vitiated. The participant is asked to rate the symptoms as “very often”, “sometimes”, or “not often” with a score of 5, 3, and 1, respectively. A higher *Vikruti* score equates to more imbalance, or accumulation, of that respective dosha.

PROMIS Anxiety Scale. An 8-item scale that is part of the National Institute of Health research initiative, the Patient-Reported Outcomes Measurement System (PROMIS) and Assessment Center, assessing the full range of anxiety symptoms [14].

Center for Epidemiology Studies-Depression (CES-D). A 20-item self-report screening tool for depressive symptoms developed by the National Institute of Mental Health [15,16].

Perceived Stress Scale (PSS). A 10-item scale which assesses the degree to which situations in one's life are appraised as stressful [17].

Mindful Attention Awareness Scale (MAAS). A 15-item scale that assesses trait mindfulness, namely a state of mind in which attention, informed by awareness of the present, observes what is taking place [18].

Rumination-Reflection Questionnaire (RRQ). A 25-item scale that assesses both rumination and reflection, with rumination defined as self-attentiveness motivated by perceived threats, losses, or injustices to the self, and reflection defined as self-attentiveness motivated by curiosity or epistemic interest in the self [19].

Ryff Scale of Wellbeing. This 84-item questionnaire assesses psychological wellbeing [20].

2.3. Data analysis

Using the SPSS Dimension Reduction Factor Analysis program, the respective *Vikruti* Questionnaire scores were reduced to a single factor score for each factor that came out with an Eigenvalue > 1. The data reduction results were as follows: *Vata*: a single factor, Eigenvalue 1.42; 70.8% of variance; *Pitta*: a single factor, Eigenvalue 1.44; 69.3% of variance; *Kapha*: a single factor, Eigenvalue 1.48; 73.9% of variance. For each *Vikruti* factor, we then conducted separate Multivariate General Linear (MGL) models, which are suitable for simultaneous assessment of multiple dependent variables within the same design matrix. Note that unlike how the *doshas* themselves are traditionally examined by a specific category, *Vikruti* are examined more linearly in terms of degree of imbalance. In three separate MGL models, the fixed factors were the respective *Vikruti* mind-body factor, with the other two *Vikruti* factors serving as covariates. For example, in one model *Vata Vikruti* was the fixed factor and *Pitta Vikruti* and *Kapha Vikruti* served as covariates. These covariate controls were used to isolate the unique relationship of each respective *Vikruti* to the dependent variables independent of the influence of the other two *Vikruti*. Age, gender and BMI were also used as covariates. For each MGL model, the dependent variables simultaneously assessed were anxiety, poor mood, mindfulness, rumination & reflection, stress, and quality of life (SPSS version 24.0).

3. Results

In total, 101 women and men (80.2% female) completed the study (see Table 1 for sample characteristics).

Results from the multivariate general linear models are presented in Table 2. Neither age, gender or BMI were significant covariates for any of the models. For *Vata Vikruti*, the overall model was significant ($F = 15.38$, partial eta squared 0.987; $p < 0.001$). Significant dependent variable associations were more anxiety ($F = 2.79$; $p \leq 0.05$) and more rumination ($F = 3.61$; $p \leq 0.01$) and less mindfulness ($F = 2.73$; $p \leq 0.05$) and less quality of life ($F = 5.90$; $p \leq 0.01$). For *Pitta Vikruti*, the overall model was significant ($F = 9.17$, partial eta squared 0.969; $p \leq 0.01$). Significant dependent variable associations were less mindfulness ($F = 2.24$; $p \leq 0.05$), poorer mood ($F = 2.10$; $p \leq 0.01$) and more anxiety ($F = 2.25$; $p \leq 0.05$) and more stress ($F = 2.07$; $p \leq 0.05$). For *Kapha Vikruti*, the overall model was significant ($F = 5.91$; partial eta

Table 1
Participant characteristics.

Characteristics (N=101)	Mean \pm SD or %
Age (years)	53.9 \pm 11.7
Body mass index (kg/m ²)	23.7 \pm 4.1
Gender (% female)	80.2
<i>Vikruti</i> scores	
Vata	42.9 \pm 12.7
Pitta	39.2 \pm 10.6
Kapha	38.5 \pm 12.8
Vata Vikruti Factor	Eigenvalue 1.42 accounting for 70.8% of variance
Pitta Vikruti Factor	Eigenvalue 1.44 accounting for 69.3% of variance
Kapha Vikruti Factor	Eigenvalue 1.48 accounting for 73.9% of variance
Anxiety (PROMIS)	17.6 \pm 6.6
Mood (CESD)	11.7 \pm 11.1
Stress (PSS)	13.7 \pm 6.9
Mindfulness (MAAS)	4.08 \pm 0.88
Rumination (RRQ)	3.05 \pm 0.94
Reflection (RRQ)	4.10 \pm 0.68
Wellbeing (Ryff)	396.8 \pm 56.5

Table 2
Predictors of *Vikruti* imbalances.

Vata Vikruti Factor
More anxiety*
Less mindfulness*
More rumination**
Less quality of life**
Pitta Vikruti Factor
More anxiety*
Less mindfulness*
Poorer mood**
More stress*
Kapha Vikruti Factor
More stress**
More rumination*
Less reflection*

* $p \leq 0.05$; ** $p \leq 0.01$.

squared 0.948; $p < 0.001$). Significant dependent variables were more stress ($F = 2.81$; $p \leq 0.01$), more rumination ($F = 2.07$; $p \leq 0.05$) and less reflection ($F = 2.27$; $p \leq 0.05$).

4. Discussion

Prior studies examining Ayurvedic dosha classifications focused almost exclusively on *Prakruti* [5,8–11], the basic constitutional classification. The *Vikruti* classification of imbalances, however, has received very little attention in the literature. As *Vikruti* is descriptive of the current state of imbalance, it has more implications for personalized treatment options, whereas the *Prakruti* has more predictive implications.

We found that those with more imbalanced, or vitiated *Vata*, as measured via the Ayurvedic questionnaire had more anxiety and rumination as well as less mindfulness and poorer overall quality of life. Individuals with more dominant *Vata* dosha are understood to be inherently more vulnerable to anxiety, panic attacks, and insomnia [10,11]. Interestingly, neural models of brain types among the constitutions have been proposed [21] with the '*Vata* brain-type' having a high range of activity in the prefrontal cortex and limbic systems, leading to experiencing high arousal and over-reacting, and being vulnerable to have excessive fears and phobias [21]. Constitutionally, *Vata* is understood to be associated with signaling pathways that regulate cell growth and differentiation [6]. Interestingly, in the current exploratory analysis, we observed greater anxiety and rumination with lower quality of life and levels of mindfulness in subjects reporting *Vata*-type symptoms.

For those with reporting symptoms of imbalanced *Pitta*, we found more anxiety and stress as well as less mindfulness. *Pitta*-dominant individuals tend to experience more ulcers, bleeding disorders, and skin diseases [22]. In aging investigations, *Pitta*-dominant individuals had a higher basal metabolic rate and energy usage which predisposes such individuals to greater tissue loss and premature aging compared to *Kapha* individuals who tended toward delayed aging [23]. Studies correlating metabolic differences among *Prakruti* types with metabolic markers have revealed that *Pitta*-dominant individuals are fast- and *Kapha*-dominant individuals are slow-metabolizers based on drug metabolizing enzyme markers. In a rheumatoid arthritis (*Vikruti*) cohort stratified into 3 dosha-dominant subtypes (i.e. *Vata*, *Pitta*, *Kapha*), the *Pitta*-dominant patient subgroup had more mutations in oxidative stress pathways compared to the *Vata* or *Kapha* subgroups [24]. Genopsyo-somatotyping of different types classified *Pitta*-dominant types as more androgenic with tendencies towards frustration, aggression, irritability, and impatience when out of balance [25]. Interestingly, in the current study we have observed poorer mood and less mindfulness in the individuals with *Pitta*

imbalance which may be related to the inherently higher androgen levels in these subjects that may increase further during states of *Vikruti*.

Higher *Kapha Vikruti* scores were associated with more stress and rumination and less reflection. In a study of coronary artery disease (CAD) patients divided into *dosha* subgroups, the *Kapha*-dominant subgroup correlated with more inflammatory markers, CAD risk factors (hypertension, diabetes, dyslipidemia), and insulin resistance compared to the other groups [26]. Studies report that *Kapha*-dominant individuals display greater markers for metabolic syndrome, cardiovascular disease and chronic inflammation. *Kapha* individuals tend towards higher blood lipids (e.g. high total cholesterol, triglycerides, and LDL/HDL ratio), uric acid which is a predictor of cardiovascular mortality, and atherosclerotic risk factors (e.g. high LDL and downregulation of genes in fibrinolysis pathways) [6]. We speculate that this slower metabolism in *Kapha*-dominant types induces metabolic stress that is later perceived as stressful by the individual and could manifest later as an imbalance.

Limitations of this study include that *Vikruti* was assessed by questionnaire and not by other traditional methods such as pulse method of diagnosis [27,28]. In addition, we studied individuals who were relatively healthy and had no overt disease.

How do Ayurvedic physicians approach treating *Vikruti* imbalances? Disharmony among the *doshas* are managed by dietary and lifestyle interventions, including herbs, proper diet, massage, daily routine, meditation, yoga and detoxification. Herbal treatments with *Withania somnifera* or *Ashwagandha*, for example, are used to treatment stress and anxiety [29,30]. Treatments often include what is called *Panchakarma*, a form of cleansing and detoxification [13,31]. These Ayurvedic approaches help eliminate the *Vikruti* and restore the foundational constitution and are found to improve wellbeing and health [12,13,32]. For example, we recently examined the effects of a brief intensive multi-dimensional Ayurvedic intervention which included herbs, vegetarian diet, meditation, yoga, and massage and found significant improvements in psychosocial wellbeing and metabolomics profiles related to health [12,13].

5. Conclusion

In summary, these findings provide further insight into traditional Ayurvedic diagnostic methods for assessing imbalances in mental wellbeing, which we found mapped with several Western measures of psychological states. Ayurvedic *dosha* assessment tools such as questionnaires may represent effective means to help assess physical as well as emotional wellbeing in research and integrative clinical settings. Demonstrating correspondence between *Vikruti* and such Western markers may help inform biomedical research and personalized therapy by informing diagnostics. While *Prakruti* is relevant for insight into the genetic background and disease susceptibility of patients, the *Vikruti* assessment is important to inform personalized treatment for the particular state of current imbalance, symptomatology, and pathology. Understanding the current *Vikruti* in an individual informs treatment to systematically restore the balanced state of *Prakruti*. Understanding associations between Ayurvedic *Vikruti* diagnoses and genetic or biochemical markers is of interest to integrative health researchers and will, where applicable, facilitate further understanding and potential integration of Ayurveda with modern scientific and clinical investigation.

Source of support

One or more authors have received funding and/or advisory fees from health companies for other projects. C.T.P. is a UC San Diego Post-Doctoral Fellow partially supported by the Chopra Foundation.

S.P. and L.W. are employed by the Chopra Center. S.G.K. is a consultant to the Chopra Center.

Conflict of interest

Chopra centre for wellbeing, CA.

Acknowledgements

Authors acknowledge the support by The Fred Foundation, The MCJ Amelior Foundation, The Chopra Foundation, The National Philanthropic Trust, and The Walton Family Foundation. Authors also thank the many individual donors who supported the study.

Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jaim.2018.02.001>.

References

- [1] Yapijakis C. Hippocrates of Kos, the father of clinical medicine, and Asclepiades of Bithynia, the father of molecular medicine. Review. *In Vivo* 2009;23(4):507–14.
- [2] Friedman M, Rosenman RH. Type A Behavior Pattern: its association with coronary heart disease. *Ann Clin Res* 1971;3(6):300–12.
- [3] Sheldon WH. The somatotype, the morphophenotype and the morphogenotype. *Cold Spring Harb Symp Quant Biol* 1950;15:373–82.
- [4] Pandey MM, Rastogi S, Rawat AK. Indian traditional ayurvedic system of medicine and nutritional supplementation. *Evid Based Complement Alternat Med* 2013;2013:376327.
- [5] Chopra A, Doiphode VV. Ayurvedic medicine. Core concept, therapeutic principles, and current relevance. *Med Clin North Am* 2002;86(1):75–89. vii.
- [6] Prasher B, Negi S, Aggarwal S, Mandal AK, Sethi TP, Deshmukh SR, et al. Whole genome expression and biochemical correlates of extreme constitutional types defined in Ayurveda. *J Transl Med* 2008;6:48.
- [7] Cheng S-C, Lin C-H, Chang Y-J, Lee T-H, Ryu S-J, Chen C-H, et al. Fire-heat and Qi deficiency syndromes as predictors of short-term prognosis of acute ischemic stroke. *J Altern Complement Med* 2013;19(8):721–8.
- [8] Manyam BV, Kumar A. Ayurvedic constitution (Prakruti) identifies risk factor of developing Parkinson's disease. *J Altern Complement Med* 2013;19(7):644–9.
- [9] Samarakoon SM, Chandola HM, Ravishankar B. Effect of dietary, social, and lifestyle determinants of accelerated aging and its common clinical presentation: a survey study. *Ayu* 2011;32(3):315–21.
- [10] Telles S, Pathak S, Kumar A, Mishra P, Balkrishna A. Ayurvedic doshas as predictors of sleep quality. *Med Sci Monit* 2015;21:1421–7.
- [11] Bell C, Heidel RE, Sunega J, Drisko J. Ancient wisdom. Can ayurvedic prakruti provide invaluable insights into integrative medicine? *Ayurveda J Health* 2017;27:27–34.
- [12] Mills PJ, Wilson KL, Pung MA, Weiss L, Patel S, Doraiswamy M, et al. The self-directed biological transformation initiative and well-being. *J Altern Complement Med* 2016;22(8):627–34.
- [13] Peterson CT, Lucas J, John-Williams Lisa St, Will Thompson J, Arthur Moseley M, Patel S, et al. Identification of altered metabolomic profiles following a panchakarma-based ayurvedic intervention in healthy subjects: the self-directed biological transformation initiative (SBTI). *Sci Rep* 2016;6:32609.
- [14] Broderick JE, DeWitt EM, Rothrock N, Crane PK, Forrest CB. Advances in patient-reported Outcomes: the NIH PROMIS((R)) measures. *EGEMS (Wash DC)* 2013;1(1):1015.
- [15] Radloff LS. The use of the center for epidemiologic studies depression scale in adolescents and young adults. *J Youth Adolesc* 1991;20(2):149–66.
- [16] Andresen EM, Malmgren JA, Carter WB, Patrick DL. Screening for depression in well older adults: evaluation of a short form of the CES-D (Center for Epidemiologic Studies Depression Scale). *Am J Prev Med* 1994;10(2):77–84.
- [17] Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav* 1983;24(4):385–96.
- [18] Brown KW, Ryan RM. The benefits of being present: mindfulness and its role in psychological well-being. *J Pers Soc Psychol* 2003;84(4):822–48.
- [19] Trapnell PD, Campbell JD. Private self-consciousness and the five-factor model of personality: distinguishing rumination from reflection. *J Pers Soc Psychol* 1999;76(2):284–304.
- [20] Ryff CD, Singer B. Psychological well-being: meaning, measurement, and implications for psychotherapy research. *Psychother Psychosom* 1996;65(1):14–23.
- [21] Travis FT, Wallace RK. Dosh brain-types: a neural model of individual differences. *J Ayurveda Integr Med* 2015;6(4):280–5.

- [22] Dey S, Pahwa P. Prakriti and its associations with metabolism, chronic diseases, and genotypes: possibilities of new born screening and a lifetime of personalized prevention. *J Ayurveda Integr Med* 2014;5(1):15–24.
- [23] Purvya MC, Meena MS. A review on role of prakriti in aging. *Ayu* 2011;32(1):20–4.
- [24] Juyal RC, Negi S, Wakhode P, Bhat S, Bhat B, Thelma BK. Potential of ayurgenomics approach in complex trait research: leads from a pilot study on rheumatoid arthritis. *PLoS One* 2012;7(9):e45752.
- [25] Rizzo-Sierra CV. Ayurvedic genomics, constitutional psychology, and endocrinology: the missing connection. *J Altern Complement Med* 2011;17(5):465–8.
- [26] 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(3):150–7.
- [27] Kurande V, Waagepetersen R, Toft E, Prasad R. Intrarater and interrater reliability of pulse examination in traditional Indian Ayurvedic medicine. *Integr Med Res* 2013;2(3):89–98.
- [28] Niemi M, Stahle G. The use of ayurvedic medicine in the context of health promotion—a mixed methods case study of an ayurvedic centre in Sweden. *BMC Complement Altern Med* 2016;16:62.
- [29] Pratte MA, Nanavati KB, Young Y, Morley CP. An alternative treatment for anxiety: a systematic review of human trial results reported for the Ayurvedic herb ashwagandha (*Withania somnifera*). *J Altern Complement Med* 2014;20(12):901–8.
- [30] Chandrasekhar K, Kapoor J, Anishetty S. A prospective, randomized double-blind, placebo-controlled study of safety and efficacy of a high-concentration full-spectrum extract of ashwagandha root in reducing stress and anxiety in adults. *Indian J Psychol Med* 2012;34(3):255–62.
- [31] Deshpande H, et al. Assessment of quality of life in patients with skin disorders undergoing ayurvedic Panchakarma (biopurification) as management. *J Evid Based Complement Altern Med* 2016;21(3):215–20.
- [32] Deshpande H, Shivakumar, Kavita MB, Tripathy TB, Chaturvedi A. Healthcare and disease management in Ayurveda. *Altern Ther Health Med* 2001;7(2):44–50.