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Variations in the severity of symptoms, DAS28, and Disability Index among different *Vata* predominant *Deha-Prakr*iti individuals of *Amavata* (~Rheumatoid Arthritis) - An Analytical Observational Study

Research Article

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Abstract

Background: *Deha-Prakriti* (DP) phenotypic categorization of Ayurveda will subgroup afflicted populations by severity to help treat the illness more accurately and selectively. But data creation is scarce. *Amavata* (~Rheumatoid Arthritis) is one of such diseases, is caused by the accumulation of *Ama* and exacerbated *Vata* in the joints. Aim: To assess symptom severity, duration of morning stiffness, DAS28, and DI among different *Vata*-dominant DP patients of *Amavata*. Material & Methodology: The CCRAS-PAS scale was used to screen 155 clinically diagnosed *Amavata* patients for DP. Those with Vata predominant DP were divided into Single *Vataja* (V), *Vata-Pittaja* (VP), and *Vata-Kaphaja* (VK) DP based on *dosha* proportion in scale output. demographic profile, symptom intensity, duration of morning stiffness, DAS28, and DI were analysed using SPSS software version 20.0. Results: Kruskal-Wallis test showed that Single *Vata* dominating DP patients had more severe *Sandhi-shula* (joint pain) ($p<0.0001$), *Shunatanga* (joint numbness) ($p=0.0069$), and *Nidra-Viparyaya* (irregular sleep patterns) ($p=0.0012$) than VP and VK DP persons. *Sandhi-Shotha* (joint swelling) ($p=0.0299$), *Angamarda* (generalised body pains) (0.0130), *Alasya* (laziness) ($p<0.0001$), *Gaurava* (heaviness) ($p<0.0001$), and *Apaka* (delayed digestion) ($p=0.0254$) were severe in VK DP, while *Trishna* (thirsty) and *Nidraviparyaya* ($p=0.0012$) were more severe in VP DP individuals. ANOVA analysis showed that morning stiffness (2.03±0.2 hours, p value 0.446), DAS28 (6.85±0.175, p value 0.0035), and DI (1.87±0.54, p value 0.0003) were substantially higher in solitary *Vataja* compared to VP and VK DP. Conclusion: Single *Vataja* DP had more severe morning stiffness, DAS28, and DI. Sign and symptom intensity differed by DP.

Keywords: *Amavata, DAS28, Deha-Prakriti,* Disability Index, Disease severity, *Rheumatoid Arthritis (RA), Vata*.

Introduction

In terms of life science, health, and therapy, Ayurveda is the most ancient and classical knowledge foundation; its antecedents trace back to the scriptures (1,2). Genetics of complicated illness problems have phenotypic heterogeneity, which is the major constraint in current modern medicine. This mandates the use of alternative and combinational therapy (3,4). When it comes to addressing this issue, Ayurveda has a unique technique known as *Deha-Prakriti* (DP), which designates people into *Vata*-predominant, *Pitta*-predominant, and *Kapha*-predominant categories based on their body types (5). It shows that ayurvedic treatises from thousands of years ago defined the notions of individualized and preventative treatment (6,7). The evaluation of DP of an individual is given first and foremost place among the *Dashavidha Pareeksha* (ten-fold examination methods mentioned for the assessment of a patient's strength) (8).

A person's anatomical, physiological, and psychological constitution impacts their biological functions and reactions, according to the DP model (9,10). During conception, DP is determined by the relative preponderance of three *Doshas* (Body humoral factors viz. *Vata*, *Pitta,* and *Kapha*), constituted of *Panchamahabhutas*, namely *Prithvi*, *Ap*, *Tejo*, *Vayu*, and *Akasha*, (earth, water, fire, air, and ether respectively) (11). For example, a healthy person has all three *Doshas* in balance (12). The literature enlisted seven types of DP, namely, Single *Vataja* (V), *Pittaja*, *Kaphaja*; *Dwandwaja* (dual combinations) *Vata-Pittaja* (VP), *Vata-Kaphaja* (VK), *Pitta-Kaphaja* and *Tridoshaja* or *Samadoshaja Prakriti* (13). According to ayurvedic literature, the disease's susceptibility and severity may also be affected by the DP (14). Based on the existence of powerful and comparable etiologies, it is said that a person is more susceptible to illnesses impacted by the same *dosha* of individuals *Prakriti* (15). For instance. *Kapha-vardhaka* or *Kapha-prakopaka* etiological variables produce severe *Kapha* dominant illnesses in *Kapha* dominant DP persons more rapidly and readily than the other DP individuals. *Vata*,

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Pitta, and *Kapha* DP have decreasing odds of being susceptible to certain diseases.

A patient's or healthy person's DP must be determined not only to understand their physiological and psychological characteristics but must be determined to recommend a suitable diet and lifestyle program to maintain health as well to protect against disease or treat it once it has occurred (16). There are several diseases in which DP has an important role to play in the pathophysiology, therapy, and outcome. Subgrouping or stratifying patients based on DP assessment may be utilized to address clinical heterogeneity (17,18). Predictive, Preventative, Personalized, and Participatory Medicine (P4) has been the focus of contemporary scientists and clinicians over the last decade (19). Ayurveda's such tailored approach to treating patients encouraged scientists to explore individual patient-to-individual variances and how drugs operate on them, despite all the current studies (20).

According to modern medical research, the current illness, known as *Amavata*, is linked to Rheumatoid Arthritis (RA) (21). *Amavata* is caused by the regular intake of *Viruddhahara* (incompatible diet), *Guru-Snigdha Bhojana* (consumption of heavy and oily food substances), performing *Viruddhachesthta* (miscode and misconduct), *Nischeshta* (sedentary lifestyle), and *Mandagni* (diminished digestive power), all of which cause indigestion and the subsequent production of *Ama* (undigested material) (22). Because of the way *Amavata's Samprapti* (Pathophysiology) works, it may cause pain, swelling, fever, joint stiffness, lack of appetite, and general exhaustion when it comes into contact with vitiated *Vata dosha* throughout the body (23). Patients with RA are diagnosed with an auto-immune disease that progresses and degenerates over time with an unexplained cause. Adults throughout the world are expected to be affected by this non-communicable disease at a rate of 0.5% to 1%. It mostly affects women, especially those in their mid-thirties and forties (24). When RA is not treated at the correct time, joint degeneration, substantial disability, decreased quality of life, the entrance of comorbidities, and even early mortality are all potential results. Comorbidities include cancer (especially lymphoma and lymphoproliferative diseases, lung cancer, and melanoma), infections, depression, and gastrointestinal illness (25, 26, 27, 28).

Deha-Prakriti and specific illness vulnerability have been the subject of a slew of studies over the last decade, many of which found the prevalence of certain DP in particular disease conditions, as shown in **Table-1.** Joint illness is more common among *Vata*-predominant DP persons, according to Ayurvedic literature (43). *Vata*-predominant DP persons have previously been shown to be more prone to contracting the illness *Amavata* than *Pitta*- and *Kapha*-predominant individuals are susceptible or vulnerable (41,42). Despite this, there is a lack of reliable information to determine the severity of the condition in the various DP people. To fulfill this lacuna partially, the present work has been carried out at Jamnagar with the following aim and objectives.

Aim: To evaluate the variations in severity of symptoms, duration of morning stiffness, DAS28, and Disability Index among different *Vata* predominant *Deha-Prakriti* individuals of *Amavata* (~Rheumatoid Arthritis).

Objectives

- To find out the variations in the severity of symptoms among different *Vata* predominant *Deha-Prakriti* individuals of *Amavata* (~RA)
- To estimate the variations in the duration of morning stiffness, DAS28, and Disability Index among different *Vata* predominant *Deha-Prakriti* individuals of *Amavata*

Materials and Methods

Study design & sampling method

A cross-sectional survey study has been conducted among the patients of *Amavata* meeting the eligibility criteria, attending OPD and IPD of Post-Graduate Teaching Hospital, Jamnagar, Gujarat from 18th April 2018 to 9th January 2020. A total of 250 patients were screened initially, in which a total of 155 subjects, who met the eligibility criteria were enrolled in the present study. The detailed flow of the entire study (STROBE flow diagram) (44) is depicted in the fig.1. Their DP was assessed employing the CCRAS-PAS scale (45). Those who were found to have the *Vata* predominant DP were only included in the study. At first, all the patients of *Amavata* were enrolled in the study by following Simple-Random-Sampling (SRS) and after the assessment of DP, those who were found to have *Vata* predominant DP were stratified under Single *Vataja* (V), *Vata-Pitta* (VP), and *Vata-Kapha* (VK) subgroups, based on the CCRAS-PAS scale output.

Ethical considerations & CTRI registration

The present study was evaluated and approved by the Institutional Ethics Committee of the Gujarat Ayurved University's Institute for Post Graduate Teaching and Research in Ayurveda (IPGT & RA), Jamnagar, **vide letter no. PGT/7-A/Ethics/ 2017-18/3042 dated 19/02/2018.** Before enrolling the patients in the study, the Clinical Trial Registry-India (CTRI) has been notified and registered prospectively vide **registration no. CTRI/2018/04/013241** [Registered on 13/04/2018]**.**

Eligibility criteria

Males and females aged from 18 years to 50 years were diagnosed with *Amavata* (46) along with RA factor positive (quantitative method) with a not more than one year of duration, and fulfilling Jone's criteria – (according to revised criteria of American College of Rheumatology, 1987) were included in the study (47). Those who were below 18 years, above 50 years of both gender, and with other comorbidities such as Diabetes, Hypothyroidism, or any other endocrinal and metabolic

disorders were excluded. All the participants were given their informed written consent before the data collection.

Study Variables

- **Independent variables:** all the enrolled patients of *Amavata* were screened for DP assessment. Based on the relative predominant dosha percentage in DP, the Vata predominant DP individuals were subdivided into three groups, namely Single V, VP, and VK subgroups. The patient's demographic characteristics, height, weight, BMI (Body Mass Index), and DP were considered independent variables.
- **Dependent Variables:** The subjective or qualitative parameters covering the symptoms of *Amavata* such as *Sandhi-shula* (pain in the joints), *Sandhi-shotha* (inflammation of the joints), *Sandhi-graham* (restricted movement in the joint), *Sparshasahatwa* (tenderness of the joints), *Angamarda* (Body ache), *Agnimandya* (Diminished digestive power), *Aruchi* (Anorexia), *Trishna* (Thirst), *Alasya* or *Utsahahani* (Malaise), *Gaurava* (feeling of heaviness), *Jwara* (Fever), *Apaka* (Indigestion), *Shunataanga* (Numbness), *Kukshikathinata* or *Kukshi baddhata* (heaviness of the Abdomen), *Nidra Viparyaya* (Improper sleep), *Bahumutrata* (polyurea) and the quantitative parameters such as the duration of morning stiffness, DAS28, and Disability Index of all the included patients were considered as dependant variables.

Assessment criteria

Deha-Prakriti

Each participant was evaluated for DP using the CCRAS-Prakriti Assessment Scale (CCRAS-PAS) (48), which was delivered in their preferred language to measure distinct qualities, using *Darshana pareeksha* (direct observation), *Sparshana* (tactile examination), and *Prashna pareekshas* (questioning) by a single person (Principal Investigator). Individual DP is determined by the relative percentages of different *doshic* types present in each person, as well as the dominant *doshic* type (output) in each person. The following is the process of evaluation based on the results.

1. 1. 66.6% of a *Prakriti's* qualities are ***Ekadoshaja Prakriti***
2. ***Dwandwaja Prakriti*:** a 25-30 percent disparity between the two Prakriti characteristics and the two Doshas and a near or equal proportion of the two Prakriti characteristics
3. 30-34 percent of the three *Prakriti* are ***Samadoshaja*** or ***Tridoshaja Prakriti***.

DAS28 & Disability Index (DI)

The DAS28 (Disease Activity Score in 28 Joints) and Disability Index (DI) of the subjects were calculated by using the formula, depicted in the fig.2 & 3 respectively.

Method of data collection

The present study was initiated after IEC approval and CTRI registration. The goal of the study, what is anticipated of them, and the predicted participant benefit of observing and analyzing were all stated to all the participants before the start of the study. After getting the informed consent, the data were collected from 18th April 2018 to 9th January 2020. Based on the responses of the participant, the CRF was filled by the Principal Investigator. Open-ended and semi-structured questions were used to gather data from the one-on-one (face-to-face) interviews. The questions on the disease's current status were asked first, followed by a pattern established to elicit historical information about their detailed personal history. The signs and symptomatology of the ailment were assessed and recorded in the predesigned CRF (Case Record Form) based on the duration, severity, type of pain, aggravating time, alleviation time, and patient tolerability towards the symptom and other responses of the patient. For further help, previously published CRFs were used to collect the most honest and genuine information about the subjective variables (49). *Darshana pareeksha* (direct observation), *Sparshana* (tactile examination), and *Prashna pareekshas* (questioning) were also employed to assess the severity of the symptoms. The entire data collection process was completed in 40 minutes for each participant.

Statistical analysis

The percentage (%) was used to depict all the demographic characteristics. Mean ± S.D. was used for all the scale data, whereas mode for the ordinal data like the severity of signs and symptoms. One-way ANOVA was used to analyze more than two normally distributed continuous variables; otherwise, the Kruskal-Wallis test was used for the skewed distribution and the analysis of ordinal variables. Both these tests were made using the Statistical Package for Social Sciences (SPSS Inc., Chicago, Illinois, USA) version 20.0 software. 'P' value <0.05 was considered to be significantly different. The interpretation of P-value is as follows (50). The level of significance was 0.05 (5%).

I. P > 0.05, Not-significant or insignificant
II. P < 0.05, Statistically Significant
III. P < 0.01, Very Significant
IV. P < 0.001, Highly Significant
V. P < 0.0001, Extremely Significant

Results

Various demographic characteristics including Age group, gender, *Deha-Prakriti*, marital status, educational status, socio-economic status, habitat, occupation, religion, type of diet, and type of family of all the subjects included in the study are summarized in terms of frequency and percentage in Table-2. The severity of the symptoms among different *Vata* predominant *Deha-Prakriti* patients and their kruskall-wallis statistic values were documented in the table-3 and 3a respectively. Kruskal-Wallis test revealed that *Sandhi-shula*, *Sandhi-shotha*, *Angamarda*, *Agnimandya*,

Trishna, *Alasya*/ *Utsahahani, Gaurava, Apaka, Shunatanga,* and *Nidra-viparyaya* were found as significant whereas *Sandhi-graha, Sparshasahattwa, Aruci, Jwara, Kukshi-kathinata,* and *Bahumutrata* were found as non-significant. One-way ANOVA of quantitative parameters of different *Vata* predominant *Deha-Prakriti* patients revealed that weight (in kgs), Body Mass Index [BMI= Weight (in Kgs)/ Height^2 in metres], DAS28 (, Disability Index (DI) were found as significant whereas height (in cms), and duration of morning stiffness (in hours) were found as non-significant (Table-4).

Discussion

A total of 155 patients of *Amavata*, who provided informed consent, allowed for DP analysis through CCRAS-PAS, the output was in terms of a three-doshic percentage. In which, 126 subjects (81.3%) were found to have *Vata* predominant DP, further they were sub grouped into Single V (n=35), VK (n=48), and VP (n=43), occupying the 27.78%, 38.10%, and 34.13% respectively. It clearly shows the prevalence of *Vata* DP, particularly VK DP among them. It is evidence of the vulnerability of *Vata* DP, particularly VK DP among the patients of *Amavata*. The majority of subjects belonged to 31-40 (30.95%) and 41-50 (49.21%) years of age group. The female population (83.33%) and married women (87.30%) occupied a major portion as RA particularly affects the middle-aged and female population, hence, the majority of the patients were housewives, those who were having excessive workload at home, low literacy, which represent the Indian culture. The majority of the subjects were less-educated (71.43%) and came under less economic status (84.13%). As the majority of patients were from Jamnagar and its peripheries, the majority of subjects were residing in urban area (76.19%). As the study was conducted at Jamnagar region, majority of the subjects belonged to the Hindu religion (88.89%), and vegetarians (89.68%). Due to the geographical region and culture, majority of the people were deeply devoted to lord Krishna and feel that consumption of meat is as in and they strongly condemn the animal slaughtering. In Gujarat culture, the majority of the families follow joint family patterns. The same pattern was found in the present study too (79.37%). Apart from this, there is excessive physical as well as psychological stress involved in the joint families. The weight and BMI (Body Mass Index) were significantly varied among three *Vata* predominant DP individuals. Weight and BMI were significantly high in VK DP individuals due to the involvement of *Kapha dosha*.

Severity of signs & symptoms

Sandhi-Shula is a pain in the joints, majorly caused by *Prakopa* of *Vata Dosha*. Single *Vata dosha* causes severe pain, whereas it is associated with *Kapha* or *Pitta* as it conjoins with *Snigdha guna* and subsides the severity. All the subjects were found to have *Sandhi-Shula*. Single *Vataja* DP individuals significantly presented with severe pain ($p<0.0001$). In contrast, VK condition pain was majorly moderate or mild as they may have strong, stable joints with *Snigdha* (oiliness) and *Sthira Gunas* (stability) because of *Kapha dosha*. However, when *Vata* is associated with *Pitta*, the pain is severe because it absorbs the synovial fluid quickly and results in severe pain, but it is comparatively less than the single *Vata* DP condition as it is associated with the *Sneha guna* of *Pitta*, which is similar to a synovial fluid of the joints. Analogous findings were represented by statistical analysis. Hence, it is evident that *Vata's* predominance causes more intense *Sandhi-Shula* than other *dosha* predominance with its *Ruksha* (roughness), *Laghu* (lightness), *Sheeta* (cold), *Sukshma* (minuteness), and *Cala Gunas* (unstable). The swelling of the joints is ***Sandhi-Shotha***, which results from the triggering of *Ama*. Considering all these findings depicted in table-3 & 3a, it can be said that the VK DP individuals were significantly (p value at 0.0299) found to have severe *Sandhi-Shotha* as they have more chances of *Mandagni* and it is declined from VK or KV, followed by V and VP DP*s*. It is due to *Vata's* association with *Kapha*, which leads to the frequent formations of *Ama,* thereby manifests in the form of swelling of the joints, whereas the association *Vata* with *Pitta* prevents the formation of *Ama*, identical results are represented through statistical analysis. ***Sandhi-Graha*** stands for restricted joint movements, caused by swelling or reduced joint space. Most of the cases (99.21%) were found to have *Sandhi-Graha*. Overall, *Sandhi-Graha* was found majorly in VK DP individuals. It indicates that *Vata's* association with *Kapha* leads to the joint movement restriction as the more stiffness generated by *Ama* (51), it obstructs the channels with its *Guru* (heavy), *Sthira* (stability) *gunas*. However, the severity levels of *Sandhi-graha* are varying in different DP individuals, which is not inferential. Hence, the Kruskal-Wallis test showed a non-significant association. ***Sparshasahatwa*** is the tenderness of joints, and more tenderness will present in the acute condition than the chronic condition. As the majority of the cases are chronic, 59.53% of the patients (n=85) were found to have *Sparshasahatwa*. Despite the data, as most of the cases are chronic and are on treatment, an appropriate conclusion cannot be drawn on the association between *Sparshasahatwa* and DP. ***Angamarda*** **(generalized body ache) (**52) is the representation of *Ama* in the body. When *Vata* is associated with *Kapha,* the chances for *Ama* formation are more prevalent in VK DP (53). Overall, *Angamarda* was found in 93.65% of the total subjects, consisting of VK (37.29%), followed by VP (32.54%), V (28.81%) DP*s*. Although the intensity of *Angamarda* is varying in different DP, VK DP patients were found to have more severe *Angamarda* than others. single Vataja DP patients were found to have more severe *Angamarda* than VP, the statistical analysis has shown a significant association at p value 0.0130. In general, ***Agnimandya*** is the diminution of *Agni*, resulting from the association of *Kapha*. Although, when *Vata* and *Kapha* mixed, there are more chances for *Agnimandya*, which turns into formation of *Ama* . The intensity of *Agnimandya* is declined from VK, followed by V, and VP. It is evident that either the dominancy or the association of *Vata* with

kapha, increases the severity of *Agnimandya*. These proportions revealed that the VK individuals are found to have severe *Agnimandya* than single *Vata* and *Vata-Pitta* DP as the *Kapha* possess *Snigdha*, *Sheeta*, *Guru*, *Manda*, and *Sthira Gunas*, which are responsible for the diminution of digestive fire. It is also observed that the association or the dominancy of *Pitta Dosha* protects from *Agnimandya* with its *Teekshna* (sharp) and *Ushna* (hot) properties. Hence, it is clear that the association of *Vata* and *Kapha* causes *Agnimandya*, whereas *Vata* association with *Pitta* prevents *Agnimandya*, which is illustrated by the statistical analysis (significant at p value 0.0112). ***Aruci*** is the loss of appetite, which results from domination of *Ama*, which majorly presents in the acute condition. As the majority of subjects of *Amavata* are chronic, 61.91% of the subjects were found to have *Aruci*. Based on the severity, VK DP individuals were found to have severe *Aruci* than other DP individuals, and the severity is varying in different DP, which may not help to draw a proper conclusion, that showed as a non-significant association between DP and *Aruci*. ***Trishna*** an increased thirst condition, that results from the predominance of *Pitta* (54). The association of *Vata* and *Pitta* causes intense *Trishna*. It is a general rule also, that is when the air is associated with fire, it increases the intensity of fire like wild fire spreads and burns out the forest rapidly. Due to *Ratrijagarana* (nigh awakening), depression, *Vata*, and *Pitta Doshas* collectively increase and manifests as *Trishna*. As the majority of cases are chronic, 56.35% of the patients were found to have *Trishna*. Out of them, *Trishna* was majorly found in VP (27.78%), followed by VK (15.87%), and V (12.7%) DP individuals. Grossly, it can be determined that, based on the severity, severe *Trishna* was found majorly in VP DP than others as *Pitta* conjoins with its *Ushna* and *Teekshna* properties with *Vata* and the same has been depicted in statistical analysis ($p<0.0001$). ***Alasya*** **(Lethargy)** is the delayed action or initiation, that results from the increase *Kapha* (55). Altogether, 94.41% of the patients were found to have *Alasya*. Based on the results, it can be confirmed that the VK DP individuals were found to have a severe and moderate type of *Alasya* than others, which is also substantiated by the statistical analysis ($p<0.0001$) as a result of the association *Kapha dosha* association with *Vata* with its *Guru, Manda, Sheeta Gunas*. ***Gaurava*** the increased heaviness of the body, resulting from the predominance of *Ama and Kapha* (55,56). Altogether, 89.68% of the subjects were found to have *Gaurava* and the results showed that the VK DP individuals were found to have more severe *Gaurava* than others. The association of *Kapha* with *Vata* leads to diminution of the digestive power, and leads to the formation of *Ama*, thereby causing heaviness in the body. On the other hand, the association of *Pitta* with *Vata* prevents this process as a result it causes less *Gaurava* in VP DP individuals than in others, the statistical analysis also showed the same ($p<0.0001$). It indicates that the predominant *Pitta* prevents the formation of *Ama* as there is *Tikshnagni* (intense digestive by default with the *Ushna* (hot), *Tikshna* (sharp) *Gunas* of *Pitta*. Hence, it is evident that the association of *Kapha* with *Vata* causes relatively more *Gaurava* because of its *Guru* (heavy), *Manda* (slow), and *Sthira* (stable) *Gunas*. ***Jwara*** **(fever)** is the symbol of standing inflammation in the body. As the present study involved, most cases were chronic, and *Jwara* is only in mild and moderate forms. A total of 36.51% of cases were presented with *Jwara*. As the prevalence of inflammatory markers in *Vataja* DP, the chances for the inflammation and its derivative *Jwara* is also more in *Vataja* DP (34). In the present study also, the severity of *Jwara* is more in *Vataja* DP. But in other DP*s*, it does not have any difference in the severity, which is also reflected through the statistical analysis. Based on these grounds, it is not possible to draw an appropriate conclusion. However, the very acute patients will present with *Jwara*. Fever is present in the early stage of the disease or acute onset conditions particularly. ***Apaka*** **(delayed digestion) m**eans delayed or diminished digestion. By default, *Kapha* predominance causes *Apaka*. Moreover, when *Kapha* has associated with *Vata,* the formation of *Ama* chances are more, which turns into delayed or reduced digestion (55, 57). A total of 84.13% of the patients were found to have *Apaka Lakshana* in which the majority of the portion was occupied by VK (32.54%), followed by VP (26.99%), and V (24.6%) DP patients. based on the results, it can be declared that the severe *Apaka* was found majorly in VK, followed by V and VP DP individuals. It indicates the predominance of *Ama*, which is induced by the association of *Vata* and *Kapha*. These findings are also significant through statistical analysis (p value 0.0254) as the association of *Kapha* and *Vata* resulted in more severe *Apaka*. On the other hand, the dominancy of *Pitta* reduces the *Apaka*. ***Shunatanga*** means numbness of the joints. The persisting *Ama* in the body for longer duration causes the obstruction of the channels result into numbness. As the chronicity increases, the severity of the *Shunatanga* is also increasing. Moreover, with its characteristics, *Kapha* causes obstruction in the channels, which results in the form of Numbness. Overall, VK DP patients were hiving severe *Shunatanga* than others. However, the severity levels of *Shunatanga* are varying in different DP individuals, which is not inferential. Hence, the chi-square test showed a non-significant association in the statistical analysis. ***Kukshikathinata*** **is abdominal tightness,** which denotes the more predominance of *Kapha* with its *Guru*, *Sthira Gunas*. It represents diminished digestion as the predominance of *Ama*. A total of 78.58% of the cases were found to have *Kukshikathinata*, in which VK (30.85%), VP (26.98%), and V (20.63%) DP*s* were occupied. Based on these inconsistently varied findings among different DP individuals, it is not possible to draw concrete conclusions, which is represented by the non-significant association of statistical analysis. However, VK DP individuals were found to have severe as well as moderate type of *Kukshikathinata*. ***Nidra viparyaya*** means irregular sleep patterns, which might be due to persistent pain in the affected joints. Despite DP, other reasons may influence sleep, such as emotional disturbances, socio-economic problems etc. A total of

84.93% patients were found to have sleep disturbances. Altogether, *Nidraviparyaya* was found majorly in VK (30.95%), followed by VP (29.37%), V (15.07%) DP individuals. the results revealed that the *Nidraviparyaya* was found severely in V, followed by VP, and VK DP individuals (very significant at p value 0.0012). At a glance, it indicates that the dominance of *Vata* and the severity of *Nidra-Viparyaya* were having equal proportionate relation as dominant *Vata* causes more severe *Nidra-Viparyaya* with its *Chapala-citta* (unstable mind), *Alpa Sattwa* (psychologically weak), *Rajo-Guna bahulata* (Predominance of *Rajas*). Inflammatory illnesses and major depressive disorder are both linked to sleep difficulties, such as insomnia (58). Because of these discoveries, it's now known that sleep improves the immune mechanism and that afferent signals from immune cells help people sleep better. An immune system that is neutrally integrated is one of the ways that sleep may provide an advantage in the fight against disease and injury. Although prolonged social threats can lead to sleep problems in humans, this can contribute to the dysregulation of inflammatory and antiviral responses (59). To summarise, recent studies suggest that sleep is critical to the normal operation of the immune system as a recuperative process. When a person is depressed or has been drinking, the degree of their sleep disturbances correlates with decreased immunity and changes in the complicated cytokine network. Experimentally produced partial night sleep deprivation mimics clinical sleep loss and generates a pattern of immunological abnormalities that is comparable to what is seen in depressed and alcoholism patients. This suggests a role of sleep loss in these immune changes. We don't yet know the clinical importance of these immunological alterations, although research suggests that sleep and sleep loss affect immune mechanisms and nocturnal cytokine production (60). ***Bahumutrata*** stands for polyurea or frequent urination. In UTI (Urinary Tract Infections) conditions, *Bahumutrata* will be present generally. A total of 62.6% of the subjects were found to have *Bahumutrata*. Overall, VP DP patients were hiving severe *Bahumutrata* than others. However, the severity levels of *Bahumutrata* are varying in different DP individuals, which is not inferential. Hence, the chi-square test showed a non-significant association.

Duration of morning stiffness

Morning stiffness is majorly caused by accumulated *Ama* in the *Kapha sthana* i.e., joints as there is immobility in the nighttime. It signals that the predominance of *Ama* and increased *Kapha* increases stiffness. *Ama* causes swelling in the joint, which grows when the joint is immobile; this results in limited mobility and tightening of muscles around the joints. It makes sense that the stiffness is often worse when the joint has been at rest, like while sleeping or sitting for a long time. It will be too achy to move, and this stiffness improves with activity (61). The contemporary approach proved that morning stiffness in the joints resulted from the circadian rhythm of the pro-inflammatory cytokine, interleukin (IL)-6, where the increase in nocturnal anti-inflammatory cortisol secretion is insufficient to suppress ongoing inflammation, resulting in the morning stiffness (62). Hence, the predominance of *Kapha* and *Ama* causes more stiffness or persistence stiffness for a longer duration. The findings obtained in the present study support this concept. In the present study, Morning stiffness of the joints is severely high in V (2.03±0.2 hours), VK (1.74±0.12 hours), VP (1.72±0.14 hours) DP*s*. The duration of morning stiffness is comparatively high when *Vata* is associated with *Kapha* or *Vata* alone.

By default, Vataja and *Kaphaja* individuals will have *Mandagni* (diminished digestive power) and *Vishamagni* (irregular digestive power), respectively. The domination of *Kapha* with its *Manda* (slowness), *Sthira* (stability), *Sheeta* (cold) *gunas* increases the duration of morning stiffness. It is revealed that the percentage of *Vata* and *Kapha* is equally proportional to morning stiffness duration. The formed *Ama* resulted from the diminished or vitiated *Agni* by *Vata* and *Kapha,* respectively, get accumulated at the joints. The association of *Pitta* prevents the formation of *Ama* as it possesses *Tikshnagni* with its *Ushna* and *Tikshna gunas*, which is observed in VP DP. But the statistics has shown a non-significant difference at the level of p-value 0.446, which is >0.05. (Table 4) However, there is a notable difference in the morning stiffness of different DP *individuals.* Hence, it can be determined that the predominance of *Kapha* causes more stiffness or stiffness for a longer duration as there are more chances for the formation of *Ama* as well as more *Sthiratwa* (stability) which collectively generate morning stiffness.

DAS28 Score (Disease Activity Score in 28 Joints)

The DAS28 in different DP is varied significantly at p-value of 0.0035 (Table-4) through the one-way ANOVA as the data is normally distributed. In general, the DAS28 is calculated by the number of involved both the swollen and tendered joints, ESR, and global patient health (HAQ scale) or VAS score (63). The highest DAS28 was found in V (6.85±0.175), VP (6.58±0.16), and VK (6.11±0.13) as the number of involved joints, the severity of pain, and ESR levels are relatively high in *Vata* DP patients. The involvement of *Kapha* and *Pitta* reduces the number of joint involvement and slows the joint decay process, which also results in less ESR value. Overall, the highest DAS28 was found in V DP. It clearly indicates the vulnerability of *Vata dosha* and the protecting nature of *Pitta*, and *Kapha doshas*.

Disability Index

Disability Index (DI) is the scale to assess the quality of life (QOL) of patients affected by *Amavata* (~RA). The Disability Index assesses the eight categories are 1) Dressing, 2) grooming, 3) eating, 4) walking, 5) Hygiene, 6) reach, 7) grip and 8) everyday daily activities. For each of these categories, patients report the amount of difficulty they have in performing two or three specific activities in the form of 0= without any difficulty; 1= with some difficulty (mild); 2= with much difficulty (moderate); 3=unable to do (severe). The sum of responses obtained in eight categories is

divided by 12; the value is considered the DI score (64). The QOL and DI are inversely proportional. A high DI indicates the poor QOL, whereas a low DI indicates good QOL. The DI is high in V (1.87±0.54), followed by VP (1.51±0.48), and VK (1.43±0.07). The score of DI varies in different DPs, which is very significant at the p-value i.e. 0.0003 (Table-4). Overall, the score of the DI is high in V DP than VP and VK as they have more severe joint pain, which indicates the prevalence of poor QOL among them.

Hence, the disease severity in the form of the DAS28 and Disability Index is high in V DP than in others. Many factors lead to the manifestation of *Amavata*. The majority of them are under the influence of DP. The knowledge of influenced factors by DP helps an individual adopt dietary patterns and regimens that are suitable to him or her and helpful for maintaining health.

Hence, it can be claimed that the severity of signs and symptoms of *Amavata* varied according to different DPs. Based on these findings, the clinical studies can be planned more specifically and the efficacy of single, simple, and compound formulations can be evaluated in different DP individuals. It paves a roadmap toward personalized medicine. Hence, the assessment of DP not only helps to select the drug or treatment, but also to prescribe its dosage, *Anupana*, and the mode of administration (16). This sort of study Prakriti-based study can help to prescribe a specific diet chart to combat the disease quickly and effectively.

Limitations

The present study has been carried out on a small-scale population. If it is conducted on a large-scale population, yields better results.

Conclusion

Overall, it can be determined that the dominancy of *Vata dosha* is equally proportionate to the severity of *Sandhi-Shula*, *Nidra-Viparyaya*. If the levels *Vata dosha* increase, the severity of *Sandhi-Shula* and *Nidra-Viparyaya* also increase. Similarly, the percentage of *Vata* is decreased, the severity of *Sandhi-Shula* and *Nidra-Viparyaya* are also decreased. The association of *Vata* with *Pitta* leads to more *Sandhi-Shula*, *Trishna*, *Nidra-Viparyaya*, and *Bahumutrata*. If the *Vata* is associated with *Kapha Dosha*, it causes *Sandhi-Shotha*, *Sandhi-Graha*, *Angamarda*, *Agnimandya*, *Aruci*, *Alasya*, *Gaurava*, *Jwara*, *Apaka*, and *Kukshi-Kathinya*. The severity of *Sandhi-Shotha*, *Angamarda*, *Aruci, Apaka*, and *Kukshi-Kathinya* is more in *Vata-Kaphaja Deha-Prakritis*. The duration of morning stiffness of the joints is high in *Vata-kaphaja* and the DAS28, DI are significantly high in single *Vataja Deha-parakriti*.

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Conflict of interest: Authors report no conflicts of interest.

Abbreviations

CCRAS- Central Council for Research in Ayurvedic Studies, **PAS**- Prakriti Assessment Scale, **DAS28**- Disease Activity Score in 28 Joints, **DI**- Disability Index (DI), **DP**- Deha-Prakriti, **STROBE**- Strengthening the reporting of observational studies in epidemiology, **V**-Vataja, **VP**-Vata-Pittaja, **VK**- Vata-Kaphaja.

FIGURES

Fig. 1: Study flow chart as per the STROBE statement

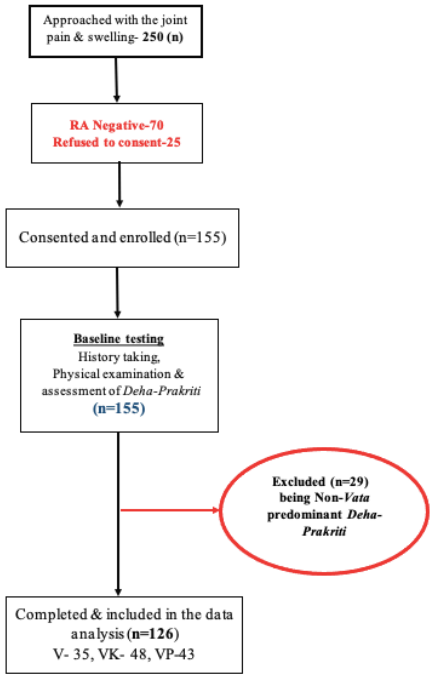


Fig. 2: Measuring DAS score

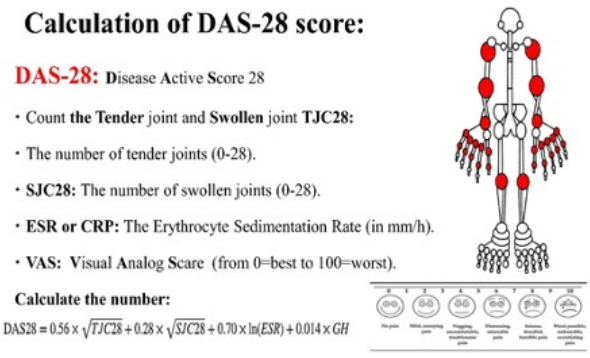
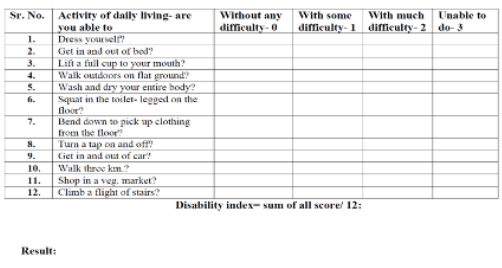


Fig. 3: calculation of the Disability Index



E. DISABILITY INDEX (THE INDIAN HEALTH ASSESSMENT QUESTIONNAIRE)

Sr. No.	Activity of daily living- are you able to	Without any difficulty- 0	With some difficulty- 1	With much difficulty- 2	Unable to do- 3
1.	Dress yourself?				
2.	Get in and out of bed?				
3.	Lift a full cup to your mouth?				
4.	Walk outdoors on flat ground?				
5.	Wash and dry your entire body?				
6.	Squat in the toilet- legged on the floor?				
7.	Bend down to pick up clothing from the floor?				
8.	Turn a tap on and off?				
9.	Get in and out of car?				
10.	Walk three km.?				
11.	Shop in a veg. market?				
12.	Climb a flight of stairs?				

Disability index= sum of all score/ 12:

Result:

Tables

Table-1: Some of the previous works conducted on *Deha-Prakriti* with various diseases

Sr. No.	Authors details	Disease	Prevalent Deha-Prakriti
1	Rohit Sharma & PK Prajapati (29)	Type-II diabetes	Kapha
2	Hetal amin *et al.* (30)		Kapha
3	Gupta *et al.* (31)		Kapha & Kapha-Pittaja
4	Hetal Amin & Rohit Sharma (32)	Obesity & Dyslipidemia	Kapha
5	Amin *et al.* (33)	Hypertension	Pitta
6	Mahalle *et al.* (34)	CAD (coronary artery disease)	Kapha, Kapha-Vataja, Kapha-Pittaja
7	Venkataraghavan *et al.* (35)	Cancer	Pitta
8	Poorvi Trivedi *et al.* (36)	Hyperacidity	Pitta
9	Sujata dhoke & Hitesh Vyas (37)	*Khalitya* (Hairfall)	Pitta-Vataja
10	Amin *et al.* (38)	Psoriasis	Kapha-Pittaja
11	Madhumita *et al.* (39)	*Vyanga*	Vata-Pittaja
12	Ritika V *et al.* (40)		
13	Juyal RC *et al.* (41)	*Amavata* (Rheumatoid Arthritis)	Vata
14	Chinthala R *et al.* (42)		

Table-2: Distribution of various demographic variables among *Vata* predominant *Deha-Prakriti* patients of *Amavata* (~RA)

Sr. No.	Demographic Variable	label	Frequency	Percentage
1	Age group	18-30 years	25	19.84
		31-40 years	39	30.95
		41-50 years	62	49.21
2	Gender	Male	21	16.67
		Female	105	83.33
3	*Deha-Prakriti*	*Vata*	35	27.78
		Vata-Kapha	48	38.10
		Vata-Pitta	43	34.13
4	Marital status	Unmarried	15	11.90
		Married	110	87.30
		Widow	1	0.79
5	Education	Uneducated	15	11.90
		Primary	29	23.02
		Secondary	46	36.51
		Higher-secondary	13	10.32
		Graduate	16	12.70
		Post-graduate	7	5.56
6	Socio-economic status	BPL	35	27.78
		LMC	71	56.35
		UMC	19	15.08
		Rich	1	0.79
7	Habitat	Rural	28	22.22
		Urban	96	76.19
		Slum	2	1.59
8	Occupation	Student	12	9.52
		House-wife	92	73.02
		Business	3	2.38
		Govt. employee	1	0.79
		Private employee	18	14.29
9	Religion	Hindu	112	88.89
		Muslim	12	9.52
		Buddha	1	0.79
		Jain	1	0.79

10	Type of diet	Vegetarian	113	89.68
		Mixed diet	13	10.32
11	Type of Family	Nuclear	26	20.63
		Joint	100	79.37

Table-3: Severity of the symptoms (chief complaints) among different *Vata* predominant *Deha-Prakriti* patients of *Amavata* (~RA)

Sr. No.	Symptom (chief complaint)	Severity type	Vata		Vata-Kaphaja		Vata-Pittaja	
			n	%	n	%	n	%
1	*Sandhi-shula*	Mild	0	0.00	6	4.76	3	2.38
		Moderate	7	5.56	26	20.63	17	13.49
		Severe	28	22.22	16	12.70	23	18.25
2	*Sandhi-shotha*	Absent	0	0.00	6	4.76	3	2.38
		Mild	7	5.56	6	4.76	14	11.11
		Moderate	21	16.67	18	14.29	22	17.46
		Severe	7	5.56	18	14.29	4	3.17
3	*Sandhi-graha*	Absent	0	0.00	1	0.79	0	0.00
		Mild	2	1.59	7	5.56	10	7.94
		Moderate	23	18.25	27	21.43	27	21.43
		Severe	10	7.94	13	10.32	6	4.76
4	*Sparshasahattwa*	Absent	12	9.52	22	17.46	17	13.49
		Mild	14	11.11	8	6.35	14	11.11
		Moderate	7	5.56	10	7.94	12	9.52
		Severe	2	1.59	8	6.35	0	0.00
5	*Angamarda*	Absent	5	3.97	1	0.79	2	1.59
		Mild	4	3.17	4	3.17	14	11.11
		Moderate	16	12.70	26	20.63	20	15.87
		Severe	10	7.94	17	13.49	7	5.56
6	*Agnimandya*	Absent	5	3.97	5	3.97	4	3.17
		Mild	8	6.35	5	3.97	18	14.29
		Moderate	20	15.87	24	19.05	15	11.90
		Severe	2	1.59	14	11.11	6	4.76
7	*Aruci*	Absent	12	9.52	17	13.49	19	15.08
		Mild	10	7.94	11	8.73	13	10.32
		Moderate	11	8.73	15	11.90	8	6.35
		Severe	2	1.59	5	3.97	3	2.38
8	*Trishna*	Absent	19	15.08	28	22.22	8	6.35
		Mild	5	3.97	13	10.32	8	6.35
		Moderate	6	4.76	4	3.17	10	7.94
		Severe	5	3.97	3	2.38	17	13.49
9	*Alasya/ Utsahahani*	Absent	3	2.38	3	2.38	1	0.79
		Mild	2	1.59	2	1.59	19	15.08
		Moderate	15	11.90	18	14.29	16	12.70
		Severe	15	11.90	25	19.84	7	5.56
10	*Gaurava*	Absent	7	5.56	3	2.38	3	2.38
		Mild	7	5.56	3	2.38	22	17.46
		Moderate	18	14.29	14	11.11	13	10.32
		Severe	3	2.38	28	22.22	5	3.97
11	*Jwara*	Absent	20	15.87	31	24.60	29	23.02
		Mild	12	9.52	10	7.94	8	6.35
		Moderate	3	2.38	7	5.56	6	4.76
12	*Apaka*	Absent	4	3.17	7	5.56	9	7.14
		Mild	11	8.73	9	7.14	18	14.29
		Moderate	15	11.90	25	19.84	14	11.11
		Severe	5	3.97	7	5.56	2	1.59

13	*Shunatanga*	Absent	13	10.32	12	9.52	13	10.32
		Mild	13	10.32	15	11.90	17	13.49
		Moderate	8	6.35	15	11.90	10	7.94
		Severe	1	0.79	6	4.76	3	2.38
14	*Kukshi-kathinata*	Absent	9	7.14	9	7.14	9	7.14
		Mild	8	6.35	15	11.90	14	11.11
		Moderate	15	11.90	18	14.29	19	15.08
		Severe	3	2.38	6	4.76	1	0.79
15	*Nidra-viparyaya*	Absent	4	3.17	9	7.14	6	4.76
		Mild	2	1.59	11	8.73	8	6.35
		Moderate	4	3.17	16	12.70	13	10.32
		Severe	25	19.84	12	9.52	16	12.70
16	*Bahumutrata*	Absent	15	11.90	18	14.29	14	11.11
		Mild	7	5.56	9	7.14	14	11.11
		Moderate	7	5.56	14	11.11	3	2.38
		Severe	6	4.76	7	5.56	12	9.52

Table-3a: Depicting the statistical analysis of the severity of the symptoms among different *Vata* predominant *Deha-Prakriti* patients of *Amavata* (~RA)

Sr. No.	Parameter	Groups (n)	Median (Range)	Total Score	Kruskal-Wallis Statistic KW	P Value*
1	*Sandhi-shula*	V (35)	03 (02 – 03)	98	18.527	< 0.0001, Extremely Significant
		VP (43)	03 (01 – 03)	106		
		VK (48)	02 (01 – 03)	106		
2	*Sandhi-shotha*	V (35)	02 (01 – 03)	70	7.017	0.0299, Significant
		VP (43)	02 (00 – 03)	70		
		VK (48)	02 (00 – 03)	96		
3	*Sandhi-graha*	V (35)	02 (01 – 03)	78	3.605	0.1649, Not Significant
		VP (43)	02 (01 – 03)	87		
		VK (48)	02 (01 – 03)	95		
4	*Sparshasahatwa*	V (35)	01 (00 – 03)	37	1.918	0.3832, Not Significant
		VP (43)	01 (00 – 03)	47		
		VK (48)	01 (00 – 03)	39		
5	*Angamarda*	V (35)	02 (01 – 03)	66	8.684	0.0130, Significant
		VP (43)	02 (00 – 03)	75		
		VK (48)	02 (00 – 03)	107		
6	*Agnimandya*	V (35)	02 (00 – 03)	54	8.981	0.0112, Significant
		VP (43)	01 (00 – 03)	66		
		VK (48)	02 (00 – 03)	95		
7	*Aruchi*	V (35)	01 (00 – 03)	38	1.947	0.3777, Not Significant
		VP (43)	01 (00 – 03)	38		
		VK (48)	01 (00 – 03)	56		
8	*Trishna*	V (35)	00 (00 – 03)	32	24.542	< 0.0001, Extremely Significant
		VP (43)	02 (00 – 03)	79		
		VK (48)	00 (00 – 03)	30		
9	*Alasya*	V (35)	02 (00 – 03)	77	18.176	< 0.0001, Extremely Significant
		VP (43)	02 (00 – 03)	72		
		VK (48)	03 (00 – 03)	113		
10	*Gaurava*	V (35)	02 (00 – 03)	52	30.665	< 0.0001, Extremely Significant
		VP (43)	01 (00 – 03)	63		
		VK (48)	03 (00 – 03)	115		
11	*Jwara*	V (35)	00 (00 – 02)	18	0.3914	0.8223, Not Significant
		VP (43)	00 (00 – 02)	20		
		VK (48)	00 (00 – 02)	24		

12	*Apaka*	V (35)	02 (00 – 03)	56	7.342	0.0254, Significant
		VP (43)	01 (00 – 03)	52		
		VK (48)	02 (00 – 03)	80		
13	*Shunataanga*	V (35)	02 (00 – 03)	57	9.948	0.0069, Very Significant
		VP (43)	01 (00 – 03)	51		
		VK (48)	01 (00 – 03)	47		
14	*Kukshi-Kathinya*	V (35)	02 (00 – 03)	47	0.5570	0.7569, Not Significant
		VP (43)	01 (00 – 03)	55		
		VK (48)	1.5 (00 – 03)	69		
15	*Nidra-Viparyaya*	V (35)	03 (00 – 03)	85	13.511	0.0012, Very Significant
		VP (43)	02 (00 – 03)	82		
		VK (48)	02 (00 – 03)	79		
16	*Bahu-Mutrata*	V (35)	01 (00 – 03)	39	0.5650	0.7539, Not Significant
		VP (43)	01 (00 – 03)	56		
		VK (48)	01 (00 – 03)	58		

*Kruskal-Wallis Test (Nonparametric ANOVA)

Table-4: Distribution of quantitative variables among different Vata predominant *Deha-Prakriti* patients of *Amavata* (~RA)

Sr. No.	Parameter	Groups (n)	Mean ± SD	SEM	95% C. I.	p-Value*
1	Height (in cms)	V (35)	155.67 ±9.65	1.7	152.78-159.39	0.619, Not Significant
		VP (43)	156.28 ± 6.21	0.97	154.42-158.18	
		VK (48)	154.75 ± 6.72	0.95	152.93-156.68	
2	Weight (in Kgs)	V (35)	46.87 ± 7.32	1.25	44.34-49.34	< 0.0001, Extremely Significant
		VP (43)	58.77 ± 10.81	1.65	55.85-62.37	
		VK (48)	66.28 ± 14.79	2.09	62.29-70.82	
3	BMI (weight in Kg/height in M^2)	V (35)	19.38 ± 2.91	0.49	18.40-20.39	< 0.0001, Extremely Significant
		VP (43)	24.16 ± 4.48	0.68	22.89-25.58	
		VK (48)	27.55 ± 6.23	0.87	25.89-29.45	
4	Duration of morning stiffness (in Hours)	V (35)	2.03 ± 1.2	0.203	1.66 – 2.48	0.446, Not Significant
		VP (43)	1.72 ± 0.93	0.14	1.46 – 2.02	
		VK (48)	1.74 ± 0.82	0.12	1.53 – 1.98	
5	DAS Score	V (35)	6.85 ± 1.04	0.18	6.50 to 7.21	0.0035, Very significant
		VP (43)	6.58 ± 1.03	0.16	6.26 to 6.90	
		VK (48)	6.11 ± 0.93	0.13	5.85 to 6.38	
6	Disability Index	V (35)	1.87 ± 0.54	0.09	1.69 to 2.06	0.0003, Extremely Significant
		VP (43)	1.51 ± 0.48	0.07	1.36 to 1.65	
		VK (48)	1.43 ± 0.49	0.07	1.29 to 1.57	

***one-way ANOVA**

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