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## A cross-sectional study to assess the incompatible dietary behavior of patients suffering from skin diseases: A pilot study



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## ABSTRACT

**Background:** Ayurveda implies the importance of diet and dietary habits in various human diseases. Confirmatory evidence regarding role of diet and dietary practices in diseases of skin are lacking.

**Objectives:** To assess incompatible dietary behavior in acne, psoriasis, fungal infections, and vitiligo patients using a questionnaire tool.

**Materials and methods:** A questionnaire-based, cross-sectional case control study was conducted in the skin out-patient department of a tertiary care hospital. Patients were enrolled in each diseased group and their control groups. Perception of patients regarding the role of diet in skin diseases was evaluated. Study participants were subjected to 2 validated questionnaires to assess consumption of incompatible diet and incompatible dietary habits.

**Results:** Diet was perceived to be more important in patients of acne compared to their controls ( $P < 0.05$ ). Mean composite score regarding the assessment of consumption of incompatible diet of acne ( $19.594 \pm 4.613$  vs.  $16.719 \pm 3.457$ ,  $P = 0.006$ ) and psoriasis ( $17.531 \pm 2.688$  vs.  $16.281 \pm 2.630$ ,  $P = 0.0497$ ) patients was higher than their controls. Mean composite score regarding assessment of incompatible dietary habits was higher in acne ( $19.031 \pm 4.589$  vs.  $15.688 \pm 4.645$ ,  $P = 0.0054$ ), psoriasis ( $18.875 \pm 5.014$  vs.  $15 \pm 3.069$ ,  $P = 0.0009$ ), and fungal infection ( $16.469 \pm 3.538$  vs.  $14.5 \pm 2.627$ ,  $P = 0.0115$ ) patients compared to controls. Mean composite scores of both the questionnaires in vitiligo patients were similar to controls.

**Conclusion:** Scores for consumption of incompatible diet and dietary habits were found to be higher in acne and psoriasis patients compared to controls. Patients with fungal infections had higher scores for the presence of incompatible dietary habits but similar scores for the consumption of incompatible diet, whereas both scores in patients of vitiligo were similar to controls.

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### 1. Introduction

Association between dietary pattern and diseases has always been a field of interest among the health professionals. A number of diseases such as depression, chronic obstructive pulmonary disease, and obstructive sleep apnea have been found to be significantly affected by the dietary pattern of the patients [1–3]. Similarly, some skin disorders have been studied for their association with the dietary pattern of the patients. A positive association between the dietary pattern and skin diseases such as squamous cell carcinoma of the skin has been shown by Ibiebele et al. [4] Cui et al. studied the

dietary pattern in Korean children with atopic dermatitis and found that lower nutrient intake is associated with increased severity of atopic dermatitis [5]. Pierce et al. proved that diet-rich in gourds and root vegetables significantly reduces the skin lesions owing to arsenic exposure [6]. However, comparative studies between the diseased and healthy subjects regarding the dietary pattern and skin diseases have never been studied. Moreover, the concept of incompatible diet has not been explored in modern medicine.

Ayurveda states, diet (*Aahar*), sleep (*Nidra*), and abstinence (*Brahmacharya*) as the three absolute factors responsible for the maintenance of good health, physical strength, vitality of the skin and body [7].

Diet is an important part of our day-to-day life. Ayurveda mentions the appropriate diet for daily consumption and in persons with and without diseases. Diet which predisposes an individual to

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diseased states and cannot provide benefits to the human body is unfit for human consumption and is termed as “unhealthy diet” [8]. This unhealthy diet can be due to the intake of incompatible dietary items as per Ayurveda or incompatible dietary mannerisms. Incompatible diet forms an integral part of unhealthy diet. Ancient texts define an incompatible diet (*Virudhdha-aahara*) when the food constituents in the preparation are in wrong combination, have been subjected to under or over-processing or if the food preparation is consumed in inappropriate quantities, and/or at an incorrect period of the day and/or in the wrong season [8].

Two or more healthy food constituents when mixed can cause effects to the body which might be unhealthy. Such a diet is termed as combination incompatible diet (*Sanyoga-virudhdha-aahara*) [9]. Charaka and Sushruta Samhita have mentioned a number of incompatible diet preparations. Charaka stated that milk should be avoided along with diet which is sour in taste such as fermented food items (e.g., *kanji, idli, medu wada, dhokla*, etc.), fruits (e.g., *amla, banana, pineapple, pomegranate*, etc.), curd, butter-milk, rock salt, fish, etc. [9,10].

Ancient ayurvedic texts such as *Vimana Sthana* of Charaka Samhita, have laid down rules or habits which should be followed when a diet has to be consumed, for example, it is inappropriate to eat very fast or very slow or talking too much while eating, etc. [9,10] Neglecting these rules while consuming the diet are termed as incompatible dietary mannerisms (*Vidhi-virudhdha-aahara*), which is responsible for many unhealthy outcomes over the body. Over the years, with the progress achieved by the humans, many new habits have been acquired by the people while eating which are considered to be wrong, for example, watching television, talking on a cellphone, standing, etc., while eating.

Ayurveda states that the consumption of incompatible diet is an important factor causing a number of skin diseases such as acne and vitiligo. Very few studies have associated such skin diseases with consumed diet. However, the data regarding this association are lacking, especially in the Indian population. A survey in Australia showed that, 30% of medical students believed that unhealthy diet might be a causative factor for acne [11]. Smith et al. observed that the low glycemic, non-Westernized diet is beneficial in acne [12]. Nutrition/diet has been shown to affect skin diseases such as vitiligo and psoriasis [13,14].

In view of this background, the type of diet consumption among the patients with common skin diseases was assessed to study the pattern of incompatible diet/dietary mannerisms in comparison to the dietary habits of healthy individuals. The skin diseases focused in this study were selected on their basis of prevalence in the Indian setting and/or the disease has been hypothesized to be associated with abnormal diet. Based on these criteria, the authors selected four diseases namely acne, psoriasis, vitiligo, and fungal infection. Fungal infection is the second most common acquired skin disease next to allergic skin diseases [15]. Psoriasis and vitiligo have a high prevalence among the skin disease patients with a point prevalence of 8% and 9.98%, respectively, in a hospital-based study [16]. Acne is an universal skin disease with Indian incidence of 50.6% in boys and 38.6% in girls [17].

This study was conducted to find out the prevalence of presence of consumption of incompatible diet and incompatible dietary habits, collectively both (for the purpose of the study) called as incompatible dietary behavior, among the people with common skin diseases (acne, psoriasis, fungal infection, and vitiligo) in comparison to healthy controls.

## 2. Materials and methods

This was a cross-sectional, questionnaire-based case control study conducted in skin out-patient department (OPD) in a tertiary

health care Hospital in Mumbai from January 2014 to June 2014. Permission from the Institutional Ethics Committee was obtained (EC/OA-113/2013). An informed consent was obtained from the participants of the study.

### 2.1. Study sample

Patients of age group 18–60 years of either sex attending the dermatology OPD of KEM Hospital were included in the study. Patients suffering from any one of the confirmed diseases namely acne, psoriasis, vitiligo, and fungal infection with a duration of maximum of 6 months were selected. The total number of patients (i.e., Group 1) to be enrolled was 128 which was stratified on the basis of the disease in 1:1:1:1 to have 32 patients in each disease strata: acne, psoriasis, vitiligo, and fungal infection. Literate patients, who could read and write in any language, were included in the study. Patients who were pregnant and lactating (as they are advised special high-fat diet), and those advised special diet due to medical condition/ayurvedic treatment were excluded from the study.

Age- and sex-matched 32 healthy individuals (devoid of any disease and not on any medication) per strata were selected to serve as controls. Both cases and controls with any other medical conditions, on ayurvedic treatment, advised special diet, pregnant and lactating females were excluded from the study.

### 2.2. Assessment tool: Questionnaire

The participants (both cases and controls) in the study were subjected to 2 questionnaires regarding their dietary habits. The questionnaires were prepared based on the rules stated for the dietary habits by the ancient ayurvedic texts such as the Charaka Samhita, Sushruta Samhita, and Ashtanga Hridaya. The questionnaires were developed in English. The questionnaires were filled by the investigator after asking questions to the patients in their local language.

### 2.3. Validation of the questionnaires

Content validity was done for the 2 questionnaires used in the study. The questionnaires were subjected to 6 ayurvedic experts and 6 dermatologists for validation. Rate of agreement for the items in the questionnaire was 0.6.

Questionnaire 1 [Table 1] entitled, “Assessment of extent of consumption of combination incompatible diet” in cases and controls. It comprised 13 closed-ended questions and the response to the items in the questionnaire were scored as per the Likert scale (1–5), where 1 = never and 5 = always. The minimum score for Questionnaire 1 was 13, which represented no consumption of combination incompatible diet and the maximum score was 65, which represented highest consumption of incompatible diet by an individual.

In the Questionnaire 1, Q1–4 and Q11–12 were related to consumption of foods that are to be avoided with hot beverages/drinks. Q5–Q10 focused on consumption of milk and milk products along with food that should have been avoided when consumed together. Q13 was noted if any other food combinations which were incompatible were consumed.

Questionnaire 2 [Table 2] entitled, “Assessment of the incompatible dietary habits/mannerisms” in cases and controls. It comprised 8 closed-ended questions and the response to the items in the questionnaire were scored as per the Likert scale (1–5), where 1 = never and 5 = always. The minimum score for Questionnaire 2 was 8, which indicated the absence of incompatible dietary habits whereas the maximum score was 40, which indicated the presence of all incompatible dietary habits.

**Table 1**

Questionnaire 1 – Assessment of the extent of consumption of combination incompatible diet in patients and healthy individuals.

Item number	Question
1	Consumption of hot beverages with chips/chivda/biscuits
2	Consumption of hot beverages with fermented foods
3	Consumption of hot beverages with chapati and sabji (e.g., leafy vegetables, pulses, sprout, etc.)
4	Consumption of hot beverages with chaat/panipuri/Chinese food
5	Consumption of milk with banana/coconut/pomegranate/jackfruit/amla or pineapple/mango/papaya milkshake
6	Consumption of buttermilk with banana
7	Consumption of milk with fruit salad with or without salt in it
8	Consumption of milk with garlic (lasuna) chatni
9	Consumption of ice-cream with cold-drink
10	Consumption of lassi/curd with chicken/mutton/fish
11	Consumption of honey with hot drinking water
12	Consumption of hot beverages immediately after a nonvegetarian diet
13	Others

**Table 2**

Questionnaire 2 – Assessment of the incompatible dietary habits in patients and healthy individuals.

Item number	Question
1	Used to speak/laugh/gossip a lot while eating
2	Used to eat what you like
3	Time to finish lunch/dinner? (fast/slow)
4	Used to eat without proper posture (e.g., standing/bending forward, sitting in squatting position, etc.)
5	Used to do any other activity while eating such as watching TV/talking on cell phone?/reading
6	Used to eat food only by getting tempted by its garnishing or external appearance
7	Used to enjoy your lunch/dinner or eat when angry or in other negative mood states
8	Used to eat regularly at crowded area/noisy site/road side

In Questionnaire 2, Q1 and Q5 focused on the activities during which concentration was not fixed on eating. Q2 and Q6 focused on the food preferences by the participant. Q3 and Q4 considered the habits of the participants while eating such as the time consumed and posture during eating. Q7 concerned with the mood associations with eating. Q8 was related with places where the diet was consumed. This questionnaire tried to cover most of the incompatible dietary habits that were found to be present in the present day situation.

A score of 4 or more for an item in the individual questionnaire was considered positive for the consumption of combination incompatible diet and incompatible dietary habits, respectively. Composite score was calculated as the sum of scores of all the individual items in the questionnaire.

Other than the questionnaires, the participants were also asked following questions to obtain their perception about the dietary habits and skin diseases.

- Q1. Do you feel diet plays an important role in skin diseases?
- Q2. Do you feel that it is necessary to modulate diet for skin diseases?
- Q3. Have you come across/read articles on the association of skin diseases and diet? This question was asked whether they had come across the articles on skin diseases in nonmedical journals like newspapers, magazines, etc.

The responses to the above 3 questions on perception were noted as “yes” or “no.”

## 2.4. Statistical analysis

GraphPad Instat version 3.06 (Copyright by GraphPad Software, Inc) was used for analysis of the data. Mean  $\pm$  standard deviation of the composite scores was calculated for Questionnaires 1 and 2 and were compared using Mann–Whitney test between the diseased and control groups. The mean composite scores of the control groups were compared using Kruskal–Wallis test. Responses to dietary perceptions between the diseased and control groups were compared using Chi-square tests.

## 3. Results

### 3.1. Demographics

The mean age of the patients with acne was  $22.84 \pm 4.67$  years, with psoriasis was  $41.6 \pm 10.3$  years, with fungal infection was  $32.1 \pm 10.6$  years, and with vitiligo was  $35.3 \pm 11.11$  years. In patients with acne, 20 were males and 12 were females. Other skin diseases had an equal proportion of males and females. After stratifying the study population as per the modified Kuppuswamy scale, it was found that the incidence of acne was higher in the middle class (19 patients) and that of fungal infections was higher in the lower class (26 patients) whereas the incidence of psoriasis and vitiligo was similar in the middle and lower class. History of skin diseases was present in 20 patients with skin diseases and none of the healthy individuals.

The responses of the cases and controls on 3 cardinal questions of dietary perception are depicted in Figs. 1–3.

As shown in Fig. 1, diet was perceived as important for skin diseases by acne diseased (25) significantly more than their controls (14) ( $P < 0.05$ ). In vitiligo control group (28), the diet importance was significantly more perceived than the vitiligo diseased participants (11) ( $P < 0.0001$ ). The importance of diet in skin diseases was similarly perceived between the diseased and controls in the psoriasis and fungal infection groups.

As shown in Fig. 2, changes in diet for modulation of skin diseases was felt by acne diseased (27) significantly more than their controls (15) ( $P < 0.01$ ). In vitiligo control group (28), it was significantly more felt than the vitiligo diseased participants (12) ( $P < 0.0001$ ). The need for changes in the diet for skin disease modulation was similar between the diseased and controls of psoriasis and fungal infection groups.

As observed in Fig. 3, the participants who had come across/read articles on the association of diet and skin diseases was similar in the diseased and control sample of the skin diseases except for that in the acne group. It was observed that acne-diseased patients (27) had come across/read articles significantly more than their controls (6) ( $P < 0.0001$ ).

After assessment of the dietary perception of the subjects, they were evaluated regarding the extent of consumption of combination incompatible diet.

Fig. 4 shows the comparison of the mean composite score of the disease and controls for the assessment of questionnaire regarding assessment of the extent of consumption of incompatible diet. In the acne ( $19.594 \pm 4.613$  vs.  $16.719 \pm 3.457$ ,  $P = 0.006$ ) and the psoriasis ( $17.531 \pm 2.688$  vs.  $16.281 \pm 2.630$ ,  $P = 0.0497$ ) patients, the mean composite score was significantly higher than the mean composite scores of their control groups. In the patients with fungal infection and vitiligo, the mean composite scores for Questionnaire 1 were comparable with their control groups. The mean composite scores of the control groups for each disease were compared using Kruskal–Wallis test and no significant difference ( $P = 0.892$ ) was found between them.

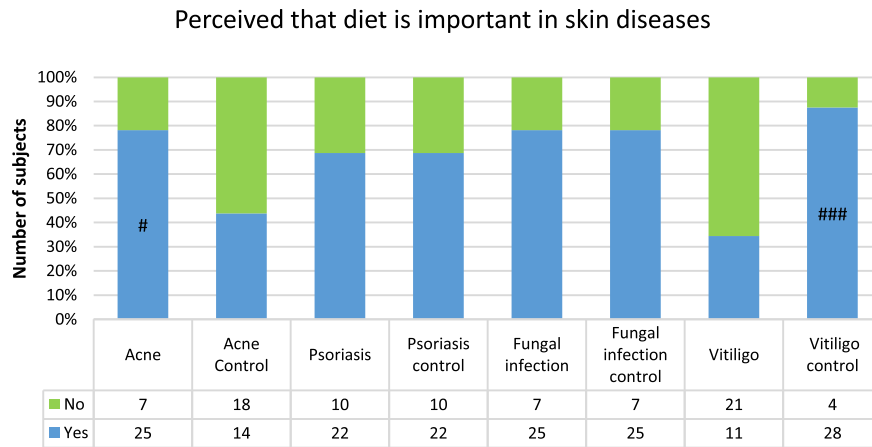


Fig. 1. Number of participants who perceived importance of diet in skin. Disease versus control, # $P < 0.05$ , ### $P < 0.0001$ , Chi-square test.

After evaluation of the consumption of combination incompatible diet, the cases and controls were evaluated for the presence of incompatible dietary habits by Questionnaire 2.

Fig. 5 shows the comparison of the mean composite scores regarding the presence of incompatible dietary habits of the disease patients with their controls. The mean composite scores of the acne ( $19.031 \pm 4.589$  vs.  $15.688 \pm 4.645$ ,  $P = 0.0054$ ), psoriasis ( $18.875 \pm 5.014$  vs.  $15 \pm 3.069$ ,  $P = 0.0009$ ) and fungal infection ( $16.469 \pm 3.538$  vs.  $14.5 \pm 2.627$ ,  $P = 0.0115$ ) patients were significantly higher in comparison to their controls. The mean composite scores of the vitiligo patients for Questionnaire 2 were comparable to their controls. The mean composite scores of the control groups were compared using Kruskal–Wallis test and no significant difference ( $P = 0.394$ ) was found between them.

The study participants were assessed for consistent consumption of the incompatible diet and having persistent incompatible dietary habits.

Any individual with a score of 4 for any 2 items and a score of 5 for any 1 item in the Questionnaire 1 was considered as consistently consuming incompatible diet.

The number of individuals consistently consuming incompatible diet was higher in the acne and vitiligo patients in comparison to the other groups [Table 3].

Any individual with a score of 4 for any 2 items and a score of 5 for any 1 item in the Questionnaire 2 was considered as having persistent incompatible dietary habits.

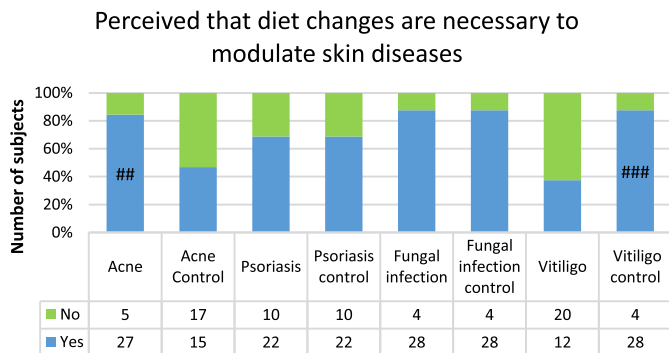


Fig. 2. Number of participants who perceived that diet changes are necessary to modulate skin diseases. Disease versus control, ## $P < 0.01$ , ### $P < 0.0001$ , Chi-square test.

The number of individuals having persistent incompatible dietary habits was more than 70% in all the groups [Table 4].

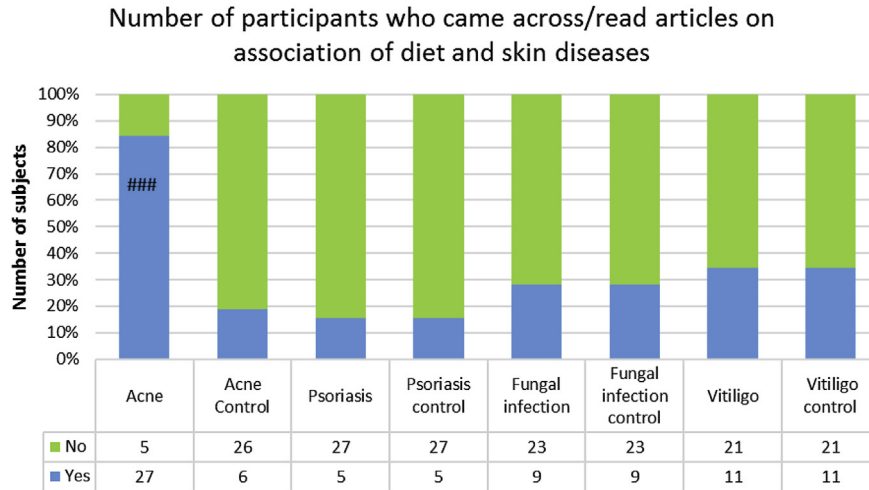
#### 4. Discussion

The ayurvedic texts have always focused maintenance of diet in the origin of various ailments. Skin diseases have been mentioned to be associated with *Virudhdha-aahara* in the ancient texts [7,8]. However, validating proof regarding this aspect is scarce. This study assessed the presence of consumption of incompatible diet and incompatible dietary habits of the patients with skin diseases with the normal healthy population.

Patients with acne had read/come across more articles related to diet and skin disease association. This may be due to the approach of these patients in search of preventive measures for the occurrence of acne. A number of articles in newspapers and magazines in routine circulation emphasize on the maintenance of good diet to prevent acne. This might have ultimately led to their increased perception, in comparison to their controls, that the diet and its modulation are important in skin diseases. In spite of the awareness of diet in skin diseases, the patients with acne showed higher composite scores for the consumption of incompatible diet and presence of incompatible dietary habits in comparison to their controls. Perception being a subjective response, the questionnaires evaluated the presence of *Virudhdha-aahara* objectively. This shows that only perceiving importance of diet in skin diseases is not enough for avoiding *Virudhdha-aahara*. Knowledge of proper diet in the acne patients seems to be inadequate. Having correct and adequate knowledge regarding diet appears to be important than just awareness of the importance of diet in skin diseases. The acne patients should be made aware of the correct diet and dietary habits.

The awareness and importance of diet in skin diseases was equally perceived in the patients of psoriasis and their controls. However, the patients with psoriasis showed higher composite scores of the consumption for the incompatible diet and incompatible dietary habits compared to their controls. Diet seems to play a role in the incidence of psoriasis. The patients of psoriasis should be assessed and taught about the compatible diet and proper dietary practices. Studies regarding intervention through proper diet and dietary practices in psoriasis patients should be carried out to ascertain the role of diet in the psoriasis patients.

In the patients with fungal infections, the role of diet in skin diseases was equally perceived in comparison to their



**Fig. 3.** Number of participants who came across/read articles on the association of diet and skin diseases. Disease versus control,  $####P < 0.0001$ , Chi-square test.

controls. Though these patients showed similar consumption of incompatible diet to their controls, they showed higher scores of incompatible dietary habits to their controls. This observation shows that dietary habits may also play a role in the skin diseases, which is independent of the diet consumed by the patients.

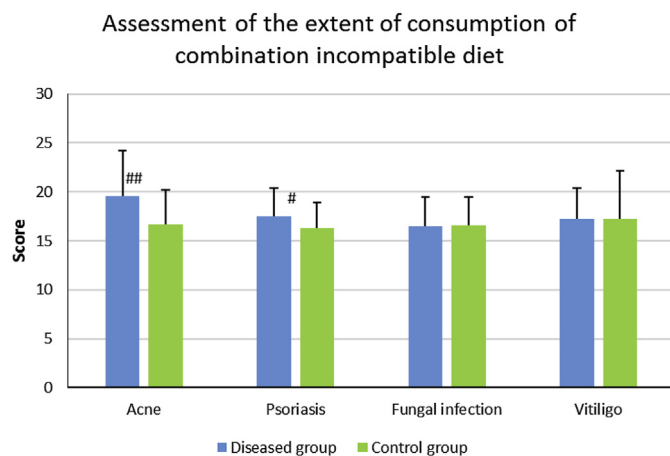
It was observed that the perception regarding the importance of diet and its role in skin modulation was lacking in the vitiligo patients in comparison to their controls. Compared to the patients with acne, psoriasis, and fungal infections, this finding was contradictory and so conclusion cannot be drawn. Awareness about the importance of diet should be inculcated among the vitiligo patients. However, the consumption of the incompatible diet and dietary habits was found to be similar between the vitiligo patients and their controls. Diet and dietary habits may not play a role in the incidence of vitiligo as observed from the study findings, as the percentage of patients consistently consuming incompatible diet was high and in par with that in the acne patients and those having persistent incompatible dietary habits was higher than the other disease groups.

The study findings were in accordance with the incompatible diets and incompatible dietary mannerisms as laid down by ayurvedic texts in Vimana Sthana of Charaka Samhita [7,8]. The current study confirmed the ayurvedic texts of involvement of

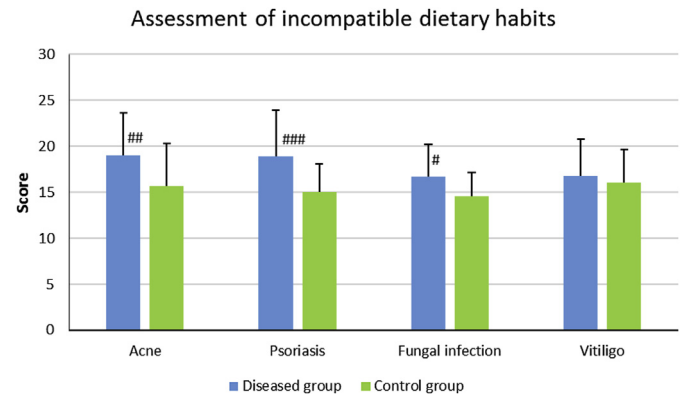
incompatible diet with acne. The incompatible diet and incompatible dietary mannerisms have evolved and changed since the times of Charaka. However, the principle related to dietary practices laid by the ancient texts withstand even today. Thorough study about the dietary principles as laid down by the ancient texts should be done and be followed in modern medicine. Patients with skin diseases should be counseled regarding their dietary pattern and practices and accordingly changes need to be modulated. Since more than 70% of the subjects in the study were having persistent incompatible dietary habits, more awareness of the dietary habits needs to be inculcated within the population. Proper diet and dietary habits need to be included as a part of the educational programs among the students to educate the masses regarding their importance.

**4.1. Limitations and recommendations**

The current study was conducted at a single dermatology clinic in a government hospital, which is often visited by majority of lower socioeconomic strata. Hence, it is not appreciable to associate the incidence of skin diseases with socioeconomic status in our study. Whether the reading of the articles related to skin diseases was purposeful or incidental was not noted in the study. In this study, we did not evaluate the effect of counseling (right dietary practices) on the improvement of skin diseases as well as the



**Fig. 4.** Assessment of the extent of consumption of combination incompatible diet. Diseased group versus control group,  $#P < 0.05$ ,  $##P < 0.01$ , Mann–Whitney test.



**Fig. 5.** Assessment of incompatible dietary habits. Diseased group versus control group,  $#P < 0.05$ ,  $##P < 0.01$ ,  $###P < 0.001$  Mann–Whitney test.



**Table 3**  
Number of individuals consistently consuming incompatible diet.

Group	Questionnaire 1	Questionnaire 1 (%)
Acne	11	34.38
Acne control	5	15.63
Psoriasis	8	25.00
Psoriasis control	4	12.50
Fungal	5	15.63
Fungal control	5	15.63
Vitiligo	11	34.38
Vitiligo control	7	21.88

**Table 4**  
Number of individuals having persistent incompatible dietary habits.

Group	Questionnaire 2	Questionnaire 2 (%)
Acne	23	71.88
Acne control	21	65.63
Psoriasis	26	81.25
Psoriasis control	24	75.00
Fungal	26	81.25
Fungal control	25	78.13
Vitiligo	28	87.50
Vitiligo control	31	96.88

mechanism by which diet consumption affects the occurrence of the skin diseases is not clear and this needs to be evaluated further. In addition, studies regarding this aspect need to be carried out in a larger sample size. The questionnaire of the incompatible dietary pattern and practices should be framed and validated according to local food habits and consumption as this may vary from population to population. In this study, association between the incompatible dietary behavior and prevalence of skin disease was studied. The cause-effect relationship between the incompatible dietary behavior and skin diseases was not studied. In this study, the responses of the participants to the items in the questionnaire relied on the short term memory of the participants and, hence, a study with longer time duration needs to be conducted, especially in diseases of longer duration such as psoriasis and vitiligo. Further studies, if conducted, should consider only one disease for evaluation for a longer duration.

## 5. Conclusion

The scores for the consumption of incompatible diet and dietary habits were found to be higher in acne and psoriasis patients compared to their controls. Patients with fungal infections had higher scores for the presence of incompatible dietary habits but similar scores for consumption of incompatible diet. The scores for

consumption of incompatible diet and dietary habits were in the patients of vitiligo were similar to their controls.

## Source of support

Nil.

## Conflicts of interest

None declared.

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