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Risk Factors Contributing to Facial Melanosis in Women-Insights from a Case Control Study

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ABSTRACT
Facial melanosis, commonly known as hyper pigmentation or melasma, is a prevalent skin condition affecting women, particularly in urban populations. The etiology is multi factorial, involving genetic, environmental and hormonal factors. However, specific risk factors contributing to facial melanosis in women remain inadequately understood. This case-control study aimed to evaluate these risk factors in a sample of women with facial melanosis. A case-control study was conducted with 50 women, divided equally into cases (n=25) with facial melanosis and controls (n=25) without. Data were collected through structured interviews and clinical examination. Socio-demographic, lifestyle, hormonal and environmental factors were assessed. Statistical analysis was performed using Chi-square tests for categorical variables and t-tests for continuous data. The study revealed significant associations between facial melanosis and prolonged sun exposure (88% vs. 40%, p=0.001), use of skin-lightening products (68% vs. 28%, p=0.004), and hormonal imbalance (44% vs. 16%, p=0.032) in cases compared to controls. Additionally, the use of oral contraceptives was more frequent among cases (56% vs. 24%, p=0.028). No significant difference was found in smoking history between cases and controls (p=0.180). This study suggests that environmental factors such as sun exposure, use of skin-lightening products and hormonal influences play a significant role in the development of facial melanosis in women. These findings highlight the need for targeted prevention strategies, including sun protection and regulation of cosmetic use.

INTRODUCTION

Facial melanosis denotes a series of hyper pigmentation disorders that most commonly involve facial skin and thus have significant cosmetic and psycho social impact on the affected patients, especially females. The more common forms include melasma, post-inflammatory hyper pigmentation and lentigines. Involving the interplay between genetic, hormonal, environmental and lifestyle factors, these diseases can present differently among populations[1,2]. Facial melanosis predominantly affects women of reproductive age and its prevalence is higher in darker skin types, especially Fitzpatrick skin types III to V. Studies have shown that melasma, one of the most common types of facial melanosis, has a prevalence of 8-30% among women visiting dermatology clinics in Asia and 1.5-33% globally, depending on the region and the diagnostic criteria used. Although the condition is generally benign, it significantly affects the quality of life, hence the need for focused research into its risk factors and management[3]. Some studies have examined the risk factors related to facial melanosis, citing UV radiation, hormonal changes and the use of cosmetics. In a study conducted by Godec[4], a strong association was found between long-term exposure to UV rays and melasma in Hispanic and Asian populations. Hormonal causes include oral contraceptive pills and pregnancy as also being relevant to the pathogenesis of melasma[5]. In addition, lifestyle and dietary aspects, such as insufficient sun protection and nutrient deficiency, have been related to diseases characterized by hyper pigmentation. The majority of the studies only target certain groups of people or particular risk factors., therefore, only a small amount of literature is found on this topic while conducting a study using a multi-causal approach for identifying one cohort[2,6]. Despite the growing recognition of facial melanosis as a most important dermatological and cosmetic concern, there really is a need for comprehensive study on its multi causal etiology in different populations. This makes India an ideal setting due to the relatively high UV index and diversity of cultural practices of skin care and usage of cosmetics. The knowledge obtained in the present study on the socio-demographic, hormonal, and environmental determinants of facial melanosis in women might help in designing effective preventive strategies for better management of the disease burden. Therefore, this study tried to fill up the gap using a case-control study design aiming at identifying and evaluating the determinants that precipitate facial melanosis among women.

Aims and Objectives:

Aims: To identify and evaluate the risk factors, which contribute to facial melanosis in women utilizing a case-control study.

Objectives:

- To evaluate the relationship between socio-demographic, lifestyle and environmental factors and the incidence of facial melanosis among women.
- To analyze the role of hormonal, dietary and cosmetic-related factors in the development of facial melanosis in women.

MATERIALS AND METHODS

Study Design: This was a case-control study conducted to identify and evaluate the risk factors contributing to facial melanosis in women.

Study Setting and Duration: The study was conducted in the outpatient department of dermatology in a tertiary care hospital over a period of six months from January 2024 to June 2024.

Study Population: The study population consisted of women aged 18-60 years presenting to the outpatient department.

- **Cases:** Women diagnosed with facial melanosis by clinical examination by a dermatologist.
- **Controls:** Age-matched women with no signs of facial melanosis.

Sample Size: A total of 50 participants were recruited with 25 cases and 25 controls chosen using purposive sampling.

Inclusion Criteria:

- **Cases:** Women aged 18-60 years diagnosed with facial melanosis.
- **Controls:** Women between 18-60 years without clinical evidence of facial melanosis.
- All participants provided informed consent to participate in the study.

Exclusion Criteria:

- Systemic diseases known to cause facial melanosis (e.g., Addison's disease) in women.
- Those who are receiving treatment for facial melanosis or other dermatological conditions.
- Pregnant or lactating women.
- Women with a history of recent facial cosmetic procedures.

Data Collection: A structured questionnaire was administered to collect information on:

- **Demographic Information:** Age, residence, educational level and socio-economic background.
- **Lifestyle Factors:** Sun exposure, sun screen use, smoking habits and cosmetic product usage.
- **Medical History:** Hormonal disorders, use of oral contraceptives, family history of melanosis and history of pregnancy.

- **Dietary Habits:** Consumption of fried foods, fruits, vegetables and any noted nutritional deficiencies.

Clinical Assessment: All participants underwent a detailed dermatological examination in order to confirm the diagnosis of facial melanosis and rule out other skin conditions.

Statistical Analysis: The data collected were entered into a spreadsheet and analyzed using statistical software. Categorical variables were presented as frequencies and percentages and continuous variables as means with standard deviations. The chi-square test or Fisher's exact test was used for the comparison of categorical variables, while t-tests were used for continuous variables. A p-value of <0.05 was considered statistically significant.

RESULTS AND DISCUSSIONS

Table 1: Demographic and Socio-Economic Characteristics of Cases and Controls

Variable	Cases (n=25)	Controls (n=25)	p-value
Mean Age (years)	35.8 ± 8.2	34.2 ± 7.6	0.450
Urban Residence (%)	72%	64%	0.548
Education Level ≥High School (%)	60%	84%	0.037*
Monthly Income >30,000 (%)	68%	76%	0.521

*Significant at p<0.05

The table compares demographic and socio-economic factors between women with facial melanosis and controls. Education levels showed a significant difference, suggesting educational awareness may prevent the condition. Urban residence and income showed no significant differences.

Table 2: Lifestyle and Environmental Factors in Cases and Controls

Factor	Cases (n=25)	Controls (n=25)	p-value
Daily Sun Exposure >2 hrs (%)	88%	40%	0.001*
Regular Use of Sun screen (%)	24%	60%	0.017*
Smoking History (%)	16%	4%	0.180
Use of Skin-Lightening Products (%)	68%	28%	0.004*

*Significant at p<0.05

The study reveals that prolonged UV exposure, regular sun screen use and use of skin-lightening products are critical risk factors for facial melanosis, with smoking being more frequent but not statistically significant.

Table 3: Hormonal and Medical History in Cases and Controls

Parameter	Cases (n=25)	Controls (n=25)	p-value
History of Hormonal Imbalance (%)	44%	16%	0.032*
Use of Oral Contraceptives (%)	56%	24%	0.028*
Family History of Melanosis (%)	36%	8%	0.014*
History of Pregnancy (%)	80%	72%	0.531

*Significant at p<0.05

The table reveals a higher prevalence of hormonal imbalances, oral contraceptive use and a positive family history of melanosis in cases, suggesting a genetic predisposition, but pregnancy history does not significantly influence risk.

Table 4: Dietary Patterns and Nutritional Factors in Cases and Controls

Dietary Factor	Cases (n=25)	Controls (n=25)	p-value
Frequent Intake of Fried Foods (%)	76%	44%	0.021*
Low Intake of Fruits/Veggies (%)	68%	36%	0.031*
Vitamin D Deficiency (%)	48%	28%	0.171
Iron Deficiency Anemia (%)	40%	20%	0.085

*Significant at p<0.05

The table shows a higher prevalence of fried foods and lower fruits and vegetables in cases, suggesting an unhealthy diet may contribute to facial melanosis, either directly or indirectly.

The present study tried to identify risk factors contributing to facial melanosis in women, relating to socio-demographic, lifestyle, hormonal and dietary parameters. Our study found that urban residence was slightly more common among cases than controls, but the association was not statistically significant. This result is in agreement with the study by Roberts[7], which reported a higher prevalence of facial melanosis among urban women, possibly related to greater pollution and sun exposure. Furthermore, lower levels of education were significantly associated with facial melanosis in our study (p=0.037). This finding agrees with results from Ahmad[8], who suggested that women with lower levels of education may be less aware of preventive measures, such as the use of sun screens. Daily sun exposure >2 hours was significantly associated with facial melanosis in our study (p=0.001). This result is consistent with the findings of Gideon[9], who highlighted the role of ultraviolet radiation as a key environmental factor exacerbating hyper pigmentation. Our data showed that regular use of sunscreen was considerably lower among cases (24%) compared to controls (60%) (p=0.017). This corroborates the findings of Megan[6], who highlighted the protective role of sunscreen against melanosis. Besides, the application of skin-lightening products was more frequent among cases (68%) compared to controls (28%) (p=0.004). Similar observations were noted by Dey[10], who stated that inappropriate use of such products is often associated with rebound pigmentation due to overuse or misuse of topical steroids. A significant association of hormonal imbalance with facial melanosis was found in our study (44% in cases vs. 16% in controls, p=0.032). This agrees with the findings of Filoni[11], who reported that hormonal changes, particularly during pregnancy and the use of oral contraceptives, significantly affect the development of melanosis. Moreover, family history of melanosis was significantly more frequent in cases (36% vs. 8%, p=0.014), which further supports the hereditary component reported by Ole[12]. Dietary factors also played a significant role in facial melanosis. Frequent intake of fried foods and low consumption of fruits and vegetables were significantly associated with

melanosis in our study (p=0.021 and p=0.031, respectively). These findings are in agreement with Jiang[13], who emphasized the role of oxidative stress induced by unhealthy diets in aggravating pigmentation disorders. Although our findings were in agreement with many previous studies, some discrepencies were noted. For example, in the present study, the association between iron deficiency anemia and facial melanosis was not statistically significant (p=0.085), which is contrary to Padhi[14], who reported a strong link between anemia and hyperpigmentation. This may be attributed to variations in study populations or sample sizes. This study provides insights into multiple risk factors contributing to facial melanosis and is one of the few to examine a combination of socio-demographic, hormonal and dietary factors. However, it has limitations including a small sample size and reliance on self-reported data, which may introduce recall bias.

CONCLUSION

This case-control study shows the multifactorial etiology of facial melanosis in women, with significant associations observed with sun exposure, inadequate sun screen use and application of skin-lightening products. Hormonal factors, including a history of hormonal imbalance and the use of oral contraceptives, also played a substantial role. In addition, dietary habits, including low consumption of fruits and vegetables and a preference for fried foods, were found to be contributory factors. These findings call for targeted interventions that promote protective skincare practices, hormonal balance and healthier dietary habits to reduce the risk of facial melanosis in women. Further studies are warranted to investigate these associations in larger populations and diverse settings.

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