

# Prevalence of Metabolic Syndrome in Vitiligo Patients and its Relation to Vitiligo Severity – A Cross-Sectional Study

## Abstract

**Background:** In vitiligo, there is a significant decrease in melanocytes and melanin. The decrease in melanin causes oxidative stress, with a chance of causing metabolic syndrome. Hence, there is a need to look for metabolic syndrome in vitiligo. **Aim and Objectives:** To estimate the prevalence of metabolic syndrome in vitiligo patients and to evaluate the relationship between the severity and progression of vitiligo and metabolic syndrome. **Materials and Methods:** A hospital-based cross-sectional study was conducted on 178 vitiligo cases and 178 controls who were age- and sex-matched. The type of vitiligo, stability by vitiligo disease activity score (VIDA), and severity by vitiligo area severity index (VASI) were noted. The waist circumference, blood pressure, fasting lipid profile, and fasting blood sugar were measured for cases and controls. Metabolic syndrome was diagnosed based on Harmonization Asian criteria. **Results:** The mean age in cases was 34.38 years, and in controls, it was 35.67 years. The majority were females in both cases (52.2%) and controls (55.6%). Most have a VIDA score of 2+ (41.6%). The mean VASI score was 2.54. The percentage of metabolic syndrome was higher in cases (36%) compared to controls (24.2%) ( $P = 0.015$ ). The mean age was lower in vitiligo cases with metabolic syndrome (38.83 years) compared to controls with metabolic syndrome (43.14 years). Metabolic syndrome was more frequent in the vitiligo vulgaris type (48.9%) than in acral and segmental vitiligo. Metabolic syndrome was more common in patients with high VIDA (45%) and VASI (52.3%) scores compared to patients with low VIDA (25%) and VASI (27.3%) scores. **Limitation:** It is a hospital-based study, so controls were not from the general population. **Conclusion:** The prevalence of metabolic syndrome was higher in vitiligo patients compared to controls, and it was higher in patients with active and severe disease. Screening and close monitoring of vitiligo patients help in the early diagnosis of metabolic syndrome and reduce the risk of cardiovascular disease.

**Keywords:** Melanin, metabolic syndrome, oxidative stress, vitiligo

## Introduction

Vitiligo is an auto-immune, chronic, and progressive disease with remissions and exacerbations relating to triggering events such as genetic, immunological, cytotoxic, and other inflammatory factors.<sup>[1]</sup>

Melanocytes contain melanin, which has anti-inflammatory effects, scavenges reactive oxygen species, and abates oxidative stress. The absence of melanocytes and melanin may induce more oxidative stress.<sup>[2,3]</sup> Oxidative stress causes metabolic syndrome by causing damage to lipids, proteins, and deoxyribonucleic acid.<sup>[3,4]</sup>

Pro-inflammatory cytokines such as tumor necrosis factor, interleukin 1, 6, and other inflammatory factors engaged in vitiligo are known to be involved in evoking insulin

resistance and other complications in metabolic syndrome.<sup>[5]</sup>

Though there were a few studies of metabolic syndrome with vitiligo, studies comparing the metabolic syndrome with the severity and activity of vitiligo were scarce. Hence, this study was aimed to estimate the prevalence of metabolic syndrome in vitiligo patients and to evaluate the relationship between the severity and progression of vitiligo and metabolic syndrome.

## Materials and Methods

A hospital-based cross-sectional study was conducted in our outpatient department from December 2020 to May 2022. Ethical approval was obtained from the

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Institutional Ethics Committee (GSLMC IEC/IRB Ref No: 703-EC/703-11/2020 on November 12, 2020). The sample size was estimated at 35% prevalence of metabolic syndrome in vitiligo.<sup>[6]</sup> A total of 178 vitiligo patients and 178 control group patients were included after informed consent. The control group included patients with non-vitiligo dermatoses not known to be associated with metabolic syndrome and appropriately matched for age and sex. Patients aged less than 18 years, pregnant and lactating women, patients who were using the systemic treatment for the past 3 months, and patients with non-vitiligo dermatoses, known to be associated with metabolic syndrome, were excluded.

A detailed history of the vitiligo, its duration, and associated precipitating factors were noted. A complete general examination was carried out in a systematic pattern. Blood pressure (BP) was measured twice at an interval of 5 minutes. The weight and height were measured. The waist circumference was measured as suggested by the World Health Organization (midway between the lowest ribs and iliac crest).<sup>[7]</sup> A dermatological examination was carried out for all patients, and the location of the lesion, stability by vitiligo disease activity score (VIDA), and severity by vitiligo area severity index (VASI) score were documented.

VIDA is a six-point scale grading from +4 to -1. It was used to evaluate the disease activity of vitiligo. Scoring was based on an individual's perception of current disease activity over time. A high VIDA score implies active disease.<sup>[8]</sup> VASI score was calculated by the formula  $VASI = \sum \text{All body sites [Hands units]} \times [\text{Residual depigmentation}]$ . The possible range of VASI was 0–100. As high VASI indicates the involvement of more body surface area, VASI is useful for measuring disease severity and for treatment evaluation.<sup>[9]</sup>

Investigations were done by collecting the blood sample after 12 hours of fasting, and the ensuing serum was used for determining high-density lipoproteins, triglycerides, and fasting blood sugar. Using Harmonization Asian criteria, metabolic syndrome was identified.<sup>[7]</sup>

Statistical analysis was performed using SPSS software version 20.0 and MS Excel 2010. Descriptive data were tabulated as mean  $\pm$  standard deviation and percentages. Data were also tabulated and graphically represented. The Chi-square test was used to assess the association among various categorical variables. For all statistical analyses,  $P < 0.05$  was considered statistically significant.

## Results

A total of 178 vitiligo patients and 178 control group patients participated in the current study. The majority of cases and controls were between the ages of 18 and 30 years old (47.8% and 46.6%, respectively), followed by 31–40 years of age group (28.1% and 24.7%, respectively).

The mean age in cases and controls was 34.38 years and 35.67 years, respectively. Most of them were females in both cases (52.2%) and controls (55.6%). There was no statistically significant difference among the age and sex groups between cases and controls.

The majority of patients belong to the vitiligo vulgaris type (90, 50.6%), followed by lip tip vitiligo (49, 27.5%) patients. Patients with facial and segmental vitiligo constitute the least percentage of patients (3.4% each). The mean duration of vitiligo was 16.12 months, with a minimum duration of 1 month and a maximum duration of 96 months. The majority of patients, that is, 74 (41.6%), had a VIDA score of 2+, and VIDA scores of 0 and 4+ constitute the least percentage of patients (11.2% each). The maximum VASI score was 29.2, and the mean VASI score was 2.54.

The percentage of metabolic syndrome was higher in cases (36%) compared to controls (24.2%) and it was significant ( $P = 0.015$ ). Cases with metabolic syndrome had a lower mean age (38.83 years) compared to controls with metabolic syndrome (43.14 years). Females were more associated with metabolic syndrome compared to males in both cases (54.7% vs. 45.3%) and controls (74.4% vs. 25.6%).

On comparing the metabolic syndrome with the type of vitiligo, metabolic syndrome was more common in the vitiligo vulgaris type (48.9%), followed by lip tip vitiligo (28.6%). Patients with facial and segmental vitiligo did not have metabolic syndrome. Metabolic syndrome was more common in patients with high VIDA scores (4+, 45%) compared to patients with low VIDA scores (0, 25%) [Figure 1]. Metabolic syndrome was more common in patients with a high VASI score (52.3%) compared to patients with a low VASI score (27.3%) [Figure 2]. Patients with metabolic syndrome had a higher mean VASI score (2.76) compared to patients without metabolic syndrome (2.41).

Patients with a lower mean duration (3.8 months) had high VIDA scores compared to patients with a higher mean duration (38.45 months), who had low VIDA scores. The mean duration of vitiligo in patients with metabolic syndrome was lower (13.09 months) than in patients without metabolic syndrome (17.82 months).

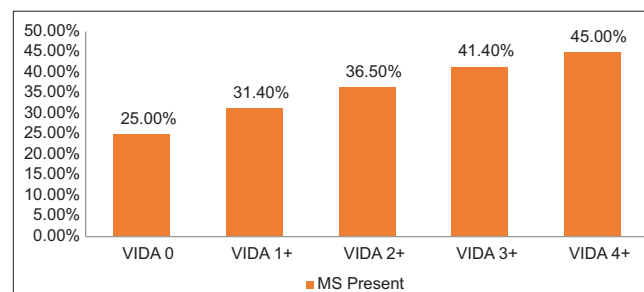
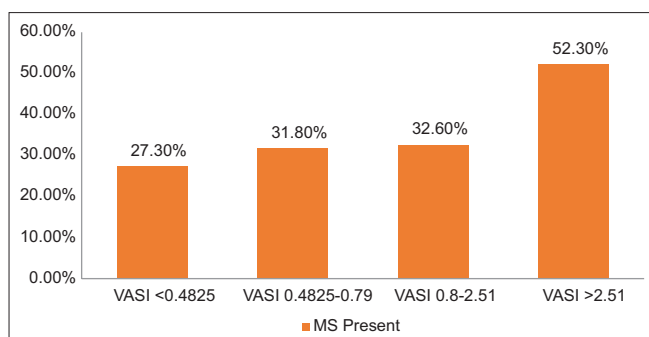


Figure 1: Comparing metabolic syndrome with VIDA scores



**Figure 2: Comparing metabolic syndrome with VASI scores**

## Discussion

Metabolic syndrome and vitiligo are thought to be the results of an unbalanced oxidative system. Reduced melanogenesis and melanocyte counts may lessen the anti-inflammatory activity of melanocytes and raise the amounts of free radicals in vitiligo, causing metabolic syndrome.<sup>[2-4]</sup>

Most of the individuals in our study belong to the 18 and 30 years of age group, and the mean age was 34.48 years and 35.67 years in cases and controls, respectively. These findings were similar to the mean age group of cases and controls in studies done by Tanacan *et al.*<sup>[10]</sup> (37.04 years and 37.37 years, respectively) and Sallam *et al.*<sup>[11]</sup> (32.7 years and 34.5 years, respectively). However, the mean age group of cases and controls was slightly higher in the studies done by Atas *et al.*<sup>[12]</sup> (40.1 years and 40.3 years, respectively) and Sharma *et al.*<sup>[13]</sup> (43.5 years and 42.3 years, respectively).

Females were more prevalent in both cases (52.2%) and controls (55.6%). This is similar to the studies done by Sallam *et al.*<sup>[11]</sup> and Atas *et al.*<sup>[12]</sup> where females were predominant in both cases and controls. However, in the studies done by Rashed *et al.*<sup>[6]</sup> Tanacan *et al.*<sup>[10]</sup> and Sharma *et al.*<sup>[13]</sup> males constituted the majority in cases and controls.

In our study, vitiligo vulgaris accounted for the majority of patients (50.6%), followed by lip tip vitiligo (27.5%). Patients with facial and segmental vitiligo constituted the least percentage (3.4% each). This is comparable to Tanacan *et al.*<sup>[10]</sup> study, where most of the patients belonged to non-segmental vitiligo (92.9%), followed by segmental vitiligo (7.1%). The mean duration of vitiligo was 16.12 months, which is comparable to the study done by Rashed *et al.*<sup>[6]</sup> where the mean duration of disease was 18.34 months, but in contrast to Atas *et al.*<sup>[12]</sup> where the mean duration was 9.5 years.

The percentage of metabolic syndrome in cases and controls was 36% and 24.2%, respectively, which shows a high percentage of metabolic syndrome in cases than controls and it was found to be significant ( $P = 0.015$ ).

Studies done by Tanacan *et al.*<sup>[10]</sup> Atas *et al.*<sup>[12]</sup> Sharma *et al.*<sup>[13]</sup> and Varma *et al.*<sup>[3]</sup> also showed a significant correlation, except in the study by Rashed *et al.*<sup>[6]</sup> However, Sallam *et al.*<sup>[11]</sup> have reported that metabolic syndrome was greater in controls (30.3%) than in cases (20.6%), with no significant difference [Table 1].

In our study, cases with metabolic syndrome had a lower mean age (38.83 years) compared to controls with metabolic syndrome (43.14 years) and there were no studies showing a comparison of the mean age of cases and controls with metabolic syndrome. Metabolic syndrome was more common in females (54.7%) than in males. This is similar to the Sallam *et al.*<sup>[11]</sup> (67%) and Atas *et al.*<sup>[12]</sup> (58.3%) studies. In a study done by Rashed *et al.*<sup>[6]</sup> males (56.3%) with metabolic syndrome outnumbered females with metabolic syndrome [Table 2].

In the context of the relationship between metabolic syndrome and the type of vitiligo, the present study showed metabolic syndrome was more commonly associated with the vitiligo vulgaris type (48.9%) and was not seen in patients with facial and segmental vitiligo. Tanacan *et al.*<sup>[10]</sup> reported that metabolic syndrome was more commonly associated with non-segmental type (39.6%) and less commonly with segmental vitiligo (9.1%), but Atas *et al.*<sup>[12]</sup> reported metabolic syndrome in higher numbers in segmental vitiligo (70%).

In our study, metabolic syndrome was more associated with high VIDA scores (4+, 45%) compared to low VIDA scores (0, 25%). This is similar to the study done by Tanacan *et al.*<sup>[10]</sup> (high VIDA: 34.8%, low VIDA: 0.6%). However, Rashed *et al.*<sup>[6]</sup> study showed metabolic syndrome was higher with the non-progressive type of vitiligo. Patients with high VASI scores (52.3%) were more associated with metabolic syndrome compared to patients with low VASI scores (27.3%). This is similar to studies done by Tanacan *et al.*<sup>[10]</sup> Sallam *et al.*<sup>[11]</sup> and Atas *et al.*<sup>[12]</sup> who also reported more metabolic syndrome with high VASI, but Rashed *et al.*<sup>[6]</sup> did not find any relation between metabolic syndrome and disease severity [Table 2].

In our study, patients with a lower mean duration (3.8 months) had high VIDA scores compared to patients with a higher mean duration (38.45 months). The association between metabolic syndrome and the duration of vitiligo showed that the mean duration in patients with metabolic syndrome was lower (13.09 months) compared to the mean duration in patients without metabolic syndrome (17.82 months), but there was no significant correlation. Sallam *et al.*<sup>[11]</sup> Atas *et al.*<sup>[12]</sup> and Varma *et al.*<sup>[3]</sup> reported that metabolic syndrome was more prevalent with longer duration of disease. The relation between metabolic syndrome and lower mean duration in the current study could be because of the association of high VIDA scores with lower mean duration.

**Table 1: Comparison of present study with various studies on metabolic syndrome in cases and controls**

Metabolic syndrome	Present study (Andhra Pradesh, India)	Varma et al. <sup>[3]</sup> (MP, India, 2021)	Sharma et al. <sup>[13]</sup> (Pune, India, 2016)	Tanacan et al. <sup>[10]</sup> (Turkey, 2020)	Atas et al. <sup>[12]</sup> (Turkey, 2017)	Rashed et al. <sup>[6]</sup> (Egypt, 2019)	Sallam et al. <sup>[11]</sup> (Egypt, 2016)
Cases	36%	37.5%	24%	37.4%	38.1%	35.6%	20.6%
Controls	24.2%	15%	12%	19.4%	21.5%	33.3%	30.3%
P	0.015	0.022	0.027	<0.001	0.04	0.779	0.084

**Table 2: Metabolic syndrome with various variables in different studies**

	Present study (Andhra Pradesh, India)	Tanacan et al. <sup>[10]</sup> (Turkey, 2020)	Sallam et al. <sup>[11]</sup> (Egypt, 2016)	Atas et al. <sup>[12]</sup> (Turkey, 2017)	Rashed et al. <sup>[6]</sup> (Egypt, 2019)
MS with gender	Females	-	Females	Females	Males
MS with the type of vitiligo	Most common (MC) - Vitiligo vulgaris Least common (LC) – Segmental and facial	MC – Non-segmental (Vitiligo vulgaris) LC - Segmental	-	MC –segmental LC - Focal	-
MS with VIDA	High VIDA scores	High VIDA scores	-	High activity	Non-progressive
MS with VASI	High VASI scores	High VASI scores	High VASI scores	High affected body surface area	No relation found

MS=Metabolic syndrome, VIDA=Vitiligo disease activity score, VASI=Vitiligo area severity index

### Limitations

It is a hospital-based study, so controls were not from the general population. Thus, our observations may not represent or reflect the general population.

### Conclusion

The prevalence of metabolic syndrome was more common in vitiligo patients than in controls. Metabolic syndrome was more associated with a lower mean age in vitiligo patients, female patients, vitiligo vulgaris type, and patients with high VIDA and VASI scores. Screening and close monitoring of vitiligo patients help in the early diagnosis of metabolic syndrome and reduce the risk of cardiovascular disease, thereby decreasing the morbidity and mortality of the patients.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Nil.

### Conflicts of interest

There are no conflicts of interest.

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