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Prevalence of metabolic syndrome in Vitiligo patients and its relation to Vitiligo severity: A case control study

Dr. Fayaz Ahmed Tak[1], Dr. Naina Kala Dogra[2], Dr. Ummer Yaseen[3]

[1]Senior Resident, Department of Dermatology, Government Medical College (GMC), Anantnag, India
[2]Associate Professor, Department of Dermatology, Government Medical College (GMC), Jammu, India
[3]Assistant Professor, Department of Dermatology, Government Medical College (GMC), Anantnag, India

Corresponding Author

Dr. Ummer Yaseen

Assistant Professor, Department of Dermatology, Government Medical College (GMC), Anantnag, India

Email: drummeryaseen@gmail.com

Keywords:

Vitiligo, Metabolic Syndrome (MS), Pigmentary Disorder, Case-Control Study, Lipid Profile, Fasting Blood Sugar

Abstract:

Vitiligo is a common pigmentary disorder with a potential link to metabolic syndrome (MS).This study investigates the prevalence and clinical implications of MS among vitiligo patients. A case-control study was conducted atPost graduate department of Dermatology, Venereology & Leprosy, SMGS Hospital, Government Medical College, Jammu from November 2019 to October 2020 after obtaining approval from institutional ethical committee. This study involving 60 vitiligo patients and 60 matched controls. Key parameters such as lipid profile, fasting blood sugar, blood pressure, and abdominal circumference were assessed. Statistical analysis revealed significant variations in HDL, triglyceride levels, and fasting blood sugar between the groups. The prevalence of MS in vitiligo patients was 18.3%, with increased severity correlating with metabolic risk factors. These findings suggest that early screening and management are crucial for vitiligo patients with metabolic disturbances.

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Introduction

Vitiligo is an acquired autoimmune disorder characterized by progressive depigmentation due to the destruction of melanocytes, the pigment-producing cells in the skin1. The condition affects 0.5–2% of the global population, with varying prevalence across different ethnic groups and geographic regions.2 The exact pathogenesis remains multifactorial, involving genetic predisposition, oxidative stress, immune dysregulation, and environmental triggers.3 Recent studies suggest a potential association between vitiligo and metabolic syndrome (MS), a cluster of metabolic abnormalities that includes abdominal obesity, dyslipidemia, hypertension, and insulin resistance.4 MS is a major risk factor for cardiovascular diseases and type 2 diabetes, and its prevalence is increasing worldwide.5 The shared pathophysiological mechanisms between vitiligo and MS, such as oxidative stress, chronic inflammation, and insulin resistance, indicate a possible systemic metabolic disturbance in vitiligo patients.6 Despite these findings, the link between vitiligo and systemic metabolic disturbances remains underexplored, necessitating further research to analyze statistical data and determine the prevalence and impact of MS in vitiligo patients.7 Understanding this association could help in early screening, prevention, and management

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strategies for individuals with vitiligo who may be at risk of developing metabolic complications.

Methodology

This case-control study was, where 60 vitiligo patients and 60 age-matched controls were enrolled. Data on demographics, disease characteristics, and metabolic parameters were collected through structured clinical examinations and laboratory investigations. The severity of vitiligo was assessed using the Vitiligo Area Scoring Index (VASI), and the presence of metabolic syndrome was determined based on the International Diabetes Federation (IDF) criteria.The study was conducted in the Post graduate department of Dermatology, Venereology & Leprosy, SMGS Hospital, Government Medical College, Jammu from November 2019 to October 2020 after obtaining approval from institutional ethical committee.Vitiligo patients attending the Outpatient Department, fulfilling Inclusion and exclusion criteria were evaluated.

Inclusion Criteria

1. Clinically diagnosed Vitiligo patients with depigmentation greater than 10%.
2. Age more than 18 years (both cases and controls).
3. No systemic or local therapy 3 months before the beginning of the study.

Exclusion Criteria

1. Age less than 18 years.
2. Other skin diseases associated with metabolic syndrome like Psoriasis.
3. Patients with Hypertension, Diabetes mellitus, thyroid disease, Physical stress, atherosclerotic vascular disease, malignancy, amyloidosis, using corticosteroids (topical as well as oral) or smoking history in both Patients and Control groups.
4. Patients on drugs that are known to cause hyperglycaemia, hyperlipidaemia, hypertension.

The Vitiligo Area Scoring Index was calculated as follows:
The percentage of vitiligo involvement was calculated in terms of hand units. One hand unit (which encompasses the palm plus the volar surface of all digits) approximately equivalent to 1% of the total body surface area was used as a guide to estimate the baseline percentage of vitiligo involvement in each body region. The body was divided into five separate and mutually exclusive regions: hands, upper extremities (excluding hands), trunk, lower extremities (excluding feet) and feet. The axillary and inguinal regions were included with the upper and lower extremities, respectively, whereas the buttocks were included with the lower extremities. The face and neck were included in the overall evaluation. The extent of vitiligo was measured according to the VASI score.

The degree of pigmentation was estimated to the nearest of one of the following percentages: 100% – complete depigmentation, no pigment is present; 90% – specks of pigment present; 75% – depigmented area exceeds the pigmented area; 50% – pigmented and depigmented areas are equal; 25% – pigmented area exceeds depigmented area; and 10% – only specks of depigmentation present.The VASI score for each body region was determined by the product of the area of vitiligo in hand units and the extent of depigmentation within each hand unit-measured patch (possible values of 0, 10, 25, 50, 75, 90, or 100%).

The total body VASI score was then calculated using the following formula by considering the contributions of all body regions (possible range 0–100):

$$\text{Total body VASI} = \sum_{\text{All body sites}} (\text{Hand units} \times \text{residual depigmentation}$$

Biometric data such as weight, height, waist and hip circumference were taken. Height measurement was taken twice and average was considered.Weight measurements were taken in participants with light clothes and without shoes. To determine waist circumference, a nonexpandable measuring tape was placed at the level of umbilicus and the widest part of hip for hip circumference. Blood pressure was taken as average of two measurements taken 5

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minutes apart after subject have been sitting for 5 minutes.

The following investigations were carried in both cases and controls after 12 hours of overnight fasting.
Serum levels of fasting blood sugar.
Total cholesterol.
Triglycerides (TG).
Low-density lipoprotein cholesterol (LDL).
High density lipoprotein cholesterol (HDL).
Very low-density lipoprotein cholesterol (VLDL).
All these were determined by using enzymatic methods.
Routine investigations like haemogram, liver function Tests and renal function tests were done in all cases.
Thyroid profile, serum fasting insulin levels were done when required.
Diagnosis of Metabolic Syndrome was made according to National Cholesterol Education Programme (NCEP) Adult Treatment panel (ATP3) by the presence of 3 of following:
Abdominal circumference greater than 102 cm in men and 88 cm in women.
Hypertriglyceridemia greater than 150mg/dl.
High density lipoprotein cholesterol (HDL-C) less than 40mg/dl in men and less than 50mg/dl in women.
Blood pressure greater than 130/85 mmHg.
Glycaemia greater than 110mg/dl.
A diagnosis of vitiligo was made based on detailed history, detailed cutaneous examination and Wood's lamp examination. The lesions which did not show accentuation on wood's lamp were excluded. The control group included healthy, age-matched and sex-matched volunteers who had visited OPD for cosmetic procedures and other skin conditions other than vitiligo. Any person having diseases like psoriasis, lichen planus etc. which have association with metabolic syndrome were excluded. A detailed history of all patients was taken which included, age, sex, occupation, age of onset, duration of the disease, progression, triggering/aggravating factors, history of vitiligo, distribution of lesions, clinical type, history of trauma prior to onset, presence of any other skin condition, treatment history, family history of cardiovascular disease, diabetes, hypertension, personal habits like smoking and alcohol intake. Thorough and complete general physical examination was performed under good lighting conditions. The Diagnostic Criteria used was from the Vitiligo European Task Force Consensus 2005 which classifies vitiligo into Generalised vitiligo (Non-segmental) with Vitiligo vulgaris, acrofacial and vitiligo universalis as subtypes and Localised (Segmental). The control group was examined for the same hematological and other parameterssuch as lipid profile, fasting blood sugar, blood pressure, and abdominal circumference were assessed.

Statistical Analysis

The recorded data was compiled in Microsoft Excel and subsequently exported to SPSS Version 20.0 (SPSS Inc., Chicago, Illinois, USA) for analysis. Continuous variables were presented as Mean±Standard Deviation (SD), while categorical variables were summarized using frequencies and percentages. The data was graphically represented using bar charts and pie diagrams to enhance visualization of study findings.For statistical comparisons, Student's independent t-test or Mann-Whitney U-test was employed to analyze continuous variables, based on feasibility. Chi-square test or Fisher's exact test was used for comparing categorical variables, depending on appropriateness. A p-value of less than 0.05 was considered statistically significant, and all p-values were two-tailed to ensure accuracy in hypothesis testing.

Results

The study highlights significant metabolic variations between vitiligo patients and controls. Although age and gender distribution were comparable, vitiligo patients exhibited notable alterations in lipid profiles, fasting glucose levels, and metabolic syndrome prevalence. HDL levels were significantly lower ($p = 0.024$), while triglyceride levels were markedly higher ($p < 0.001$) in vitiligo cases, suggesting a potential predisposition toward dyslipidemia. Additionally, fasting blood sugar was elevated in vitiligo patients ($p = 0.042$), reinforcing a link to insulin resistance. The prevalence of metabolic syndrome was higher among vitiligo patients (18.3%) than controls (11.7%), though not statistically significant ($p = 0.307$). Interestingly, vitiligo severity and duration correlated with increasing metabolic syndrome prevalence, reaching 40% in patients with disease

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duration beyond 18 months. These findings underscore the importance of metabolic monitoring in vitiligo patients, particularly those with progressive disease, to mitigate long-term health risks. Results are summarised as under.The study analyzed demographic and metabolic parameters in vitiligo patients and controls, revealing key findings regarding age distribution, gender variation, disease characteristics, and metabolic syndrome prevalence. The mean age of vitiligo cases was 26.7 ± 5.82 years, similar to controls at 25.6 ± 5.24 years, with a p-value of 0.317 indicating no significant age difference. Gender distribution was also comparable, with males comprising 66.7% of cases and 70.0% of controls, and females 33.3% of cases versus 30.0% of controls. The most prevalent type of vitiligo was vitiligo vulgaris (73.3%), followed by acrofacial vitiligo (Pic1) (20.0%), while segmental vitiligo was the least common (6.7%). Disease activity varied, with 61.7% of cases showing progressive vitiligo and 38.3% remaining stable (Pic2). The mean onset age was 25.9 ± 5.71 years, ranging from 18 to 40 years, and the average disease duration was 8.9 ± 5.75 months. Severity assessment using VASI indicated that 45.0% of cases had scores between 4-6, with higher scores correlating with increased metabolic syndrome risk, though not statistically significant (Table 1). Metabolic syndrome prevalence was higher among vitiligo patients (18.3%) compared to controls (11.7%) but lacked statistical significance ($p = 0.307$). Metabolic parameters showed notable differences, with vitiligo cases exhibiting lower mean HDL levels (51.6 ± 8.14 mg/dl) compared to controls (55.1 ± 8.63 mg/dl, $p = 0.024$). Conversely, triglyceride levels were significantly elevated in vitiligo patients (137.8 ± 13.98 mg/dl) compared to controls (121.4 ± 15.36 mg/dl, $p < 0.001$). Fasting glucose levels were also significantly higher in vitiligo cases (93.4 ± 12.21 mg/dl) versus controls (88.7 ± 13.51 mg/dl, $p = 0.042$) (Table 2). Blood pressure comparison showed no significant variation between the two groups. Longer disease duration was associated with an increased prevalence of metabolic syndrome, reinforcing the potential link between vitiligo progression and metabolic risks. (Table 3)

Discussion

The link between vitiligo and metabolic syndrome appears to stem from a complex interplay of genetic, inflammatory, and oxidative stress-related mechanisms. Metabolic syndrome, which includes abdominal obesity, dyslipidemia, hypertension, and insulin resistance, has increasingly been observed in patients with autoimmune conditions like vitiligo.8The study analyzed demographic and metabolic parameters in vitiligo patients and controls, revealing key findings regarding age distribution, gender variation, disease characteristics, and metabolic syndrome prevalence.9 The mean age of vitiligo cases was 26.7 ± 5.82 years, similar to controls at 25.6 ± 5.24 years, with a p-value of 0.317 indicating no significant age difference(Pic 4). Gender distribution was also comparable, with males comprising 66.7% of cases and 70.0% of controls, and females 33.3% of cases versus 30.0% of controls. The most prevalent type of vitiligo was vitiligo vulgaris (73.3%), followed by acrofacial vitiligo (20.0%), while segmental vitiligo was the least common (6.7%) (Fig 5). Disease activity varied, with 61.7% of cases showing progressive vitiligo and 38.3% remaining stable10 (Pic 5). The mean onset age was 25.9 ± 5.71 years, ranging from 18 to 40 years, and the average disease duration was 8.9 ± 5.75 months. Severity assessment using VASI indicated that 45.0% of cases had scores between 4-6, with higher scores correlating with increased metabolic syndrome risk11, though not statistically significant (Table 1). Metabolic syndrome prevalence was higher among vitiligo patients (18.3%) compared to controls (11.7%) but lacked statistical significance ($p = 0.307$). Metabolic parameters showed notable differences, with vitiligo cases exhibiting lower mean HDL levels (51.6 ± 8.14 mg/dl) compared to controls (55.1 ± 8.63 mg/dl, $p = 0.024$). Conversely, triglyceride levels were significantly elevated in vitiligo patients (137.8 ± 13.98 mg/dl) compared to controls (121.4 ± 15.36 mg/dl, $p < 0.001$). Fasting glucose levels were also significantly higher in vitiligo cases (93.4 ± 12.21 mg/dl) versus controls (88.7 ± 13.51 mg/dl, $p = 0.042$) (Pic 5). Blood pressure comparison showed no significant variation between the two groups. Longer disease duration was associated with an increased prevalence of metabolic syndrome, reinforcing the potential link between vitiligo progression and metabolic risks.The findings align with previous studies indicate a relationship between vitiligo and metabolic disturbances. Several reports have emphasized the role of chronic inflammation and

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oxidative stress in vitiligo, contributing to systemic metabolic imbalances.12 Additionally, studies on lipid metabolism have highlighted how vitiligo patients often present with dyslipidemia, reinforcing the need for routine lipid profile assessments10. The correlation between vitiligo severity and metabolic risk, although not statistically significant in this study, has been explored in prior investigations, with some studies showing stronger associations12. Given the evidence supporting this link, clinicians should consider regular metabolic evaluations for vitiligo patients to minimize long-term health risks.

Conclusion

Vitiligo patients exhibit an increased risk of metabolic syndrome, warranting routine metabolic screening and lifestyle modifications. Clinicians should monitor lipid profiles, glycemic control, and cardiovascular risks in patients with vitiligo, particularly those with progressive disease and higher VASI scores.

Tables and Charts

Table 1: Prevalence Based on Vitiligo Severity and Duration:

Total body VASI	Metabolic Syndrome (%)
< 4	10.5%
4-6	18.5%
≥ 6	28.6%
Duration of vitiligo	**Metabolic Syndrome (%)**
< 6 Months	10.0%
6-12 Months	19.2%
12-18 Months	22.2%
≥ 18 Months	40.0%

Table 2: Resuta and Observations

Parameter	Vitiligo Cases	Controls	P-value
Mean Age	26.7 ± 5.82 years	25.6 ± 5.24 years	0.317
Gender (M/F)	66.7% / 33.3%	70.0% / 30.0%	0.317
Vitiligo Vulgaris	73.3%	-	-
Acrofacial Vitiligo	20.0%	-	-
Segmental Vitiligo	6.7%	-	-
Progressive Vitiligo	61.7%	-	-
Stable Vitiligo	38.3%	-	-
Mean Onset Age	25.9 ± 5.71 years	-	-
Disease Duration <6 Months	33.3%	-	-
Disease Duration 6-12 Months	43.3%	-	-
Disease Duration 12-18 Months	15.0%	-	-
Disease Duration ≥18 Months	8.3%	-	-

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Mean Duration	8.9 ± 5.75 months	-	-
VASI <4	31.7%	-	-
VASI 4-6	45.0%	-	-
VASI ≥6	23.3%	-	-
HDL Levels	51.6 ± 8.14 mg/dl	55.1 ± 8.63 mg/dl	0.024
Triglyceride Levels	137.8 ± 13.98 mg/dl	121.4 ± 15.36 mg/dl	<0.001
Fasting Glucose	93.4 ± 12.21 mg/dl	88.7 ± 13.51 mg/dl	0.042
SBP	122.4 ± 6.29 mmHg	121.2 ± 5.51 mmHg	0.302
DBP	78.7 ± 4.57 mmHg	78.1 ± 4.12 mmHg	0.464
Metabolic Syndrome Prevalence	18.3%	11.7%	0.307
Metabolic Syndrome <6 Months	10.0%	-	-
Metabolic Syndrome 6-12 Months	19.2%	-	-
Metabolic Syndrome 12-18 Months	22.2%	-	-
Metabolic Syndrome ≥18 Months	40.0%	-	0.457

Table 3: Comprehensive Statistical Summary of Cases vs. Controls

Parameter	Vitiligo Cases (N=60)	Controls (N=60)	P-value
Age (years)	26.7 ± 5.82	25.6 ± 5.24	0.317
Gender (Male/Female)	66.7% / 33.3%	70.0% / 30.0%	0.317
Most Common Vitiligo Type	Vitiligo Vulgaris (73.3%)	—	—
Disease Activity (Progressive/Stable)	61.7% / 38.3%	—	—
Onset Age (years)	25.9 ± 5.71	—	—
Disease Duration (months)	8.9 ± 5.75	—	—
Total Body VASI (<4 / 4-6 / ≥6)	31.7% / 45.0% / 23.3%	—	—
Abdominal Circumference (cm)	92.3 ± 9.62	92.5 ± 7.74	0.907
HDL (mg/dl)	51.6 ± 8.14	55.1 ± 8.63	0.024*
Triglycerides (mg/dl)	137.8 ± 13.98	121.4 ± 15.36	<0.001*
Fasting Blood Sugar (mg/dl)	93.4 ± 12.21	88.7 ± 13.51	0.042*
Blood Pressure SBP / DBP (mmHg)	122.4 ± 6.29 / 78.7 ± 4.57	121.2 ± 5.51 / 78.1 ± 4.12	0.302 / 0.464
Metabolic Syndrome (Present/Absent)	18.3% / 81.7%	11.7% / 88.3%	0.307
Prevalence Based on Vitiligo Severity (<4 / 4-6 / ≥6)	10.5% / 18.5% / 28.6%	—	0.416
Prevalence Based on Disease Duration (<6M / 6-12M / 12-18M / ≥18M)	10.0% / 19.2% / 22.2% / 40.0%	—	0.457

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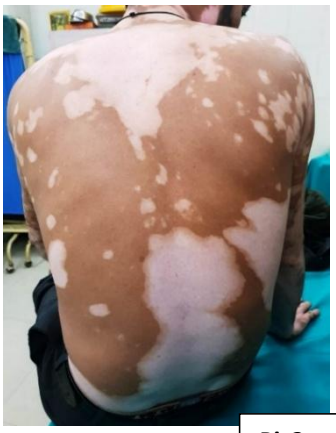
(*Statistically significant difference, P-value < 0.05)

Pic1

VITILIGO VULGARIS:SCATTERED MACULES OVER TRUNK

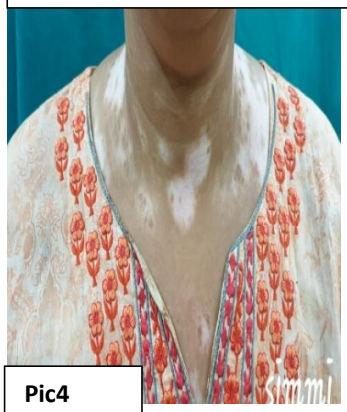
Pic2

VITILIGO VULGARIS WITH GENERLAISEDBODYNVOLVEMENT



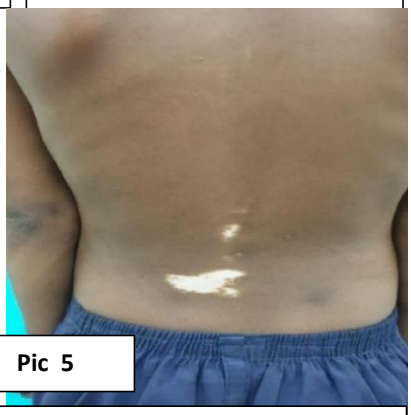
Pic3

VITILIGO VULGARIS WITH LARGE CONFLUENT MACULES



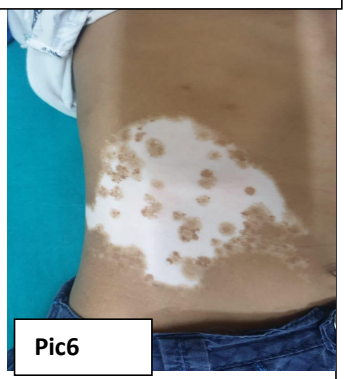
Pic4

VITILIGO VULGARIS WITH DISCRETE AS WELL AS



Pic 5

SEGMENTAL VITILIGO: HYPOPIGMENTED MACULE OVER LOWER BACK



Pic6

SEGMENTAL VITILIGO WITH AREAS OF SPARING

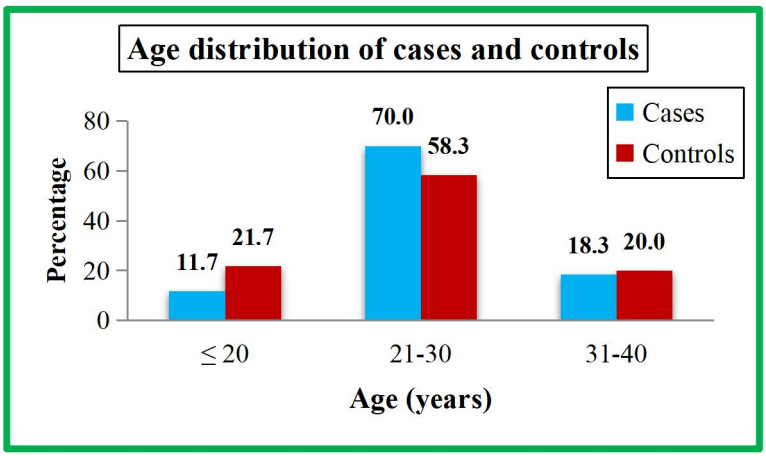


FIG 1: Age Distribution of cases and controls

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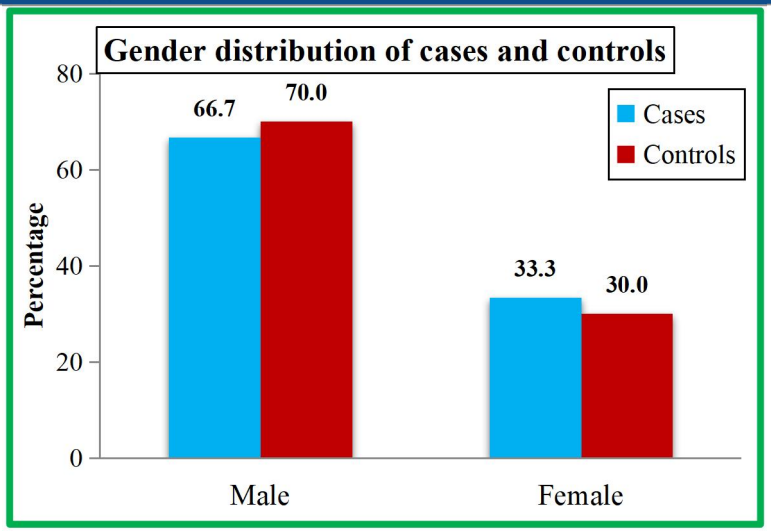

Fig 2: Gender Distribution of cases and Controls

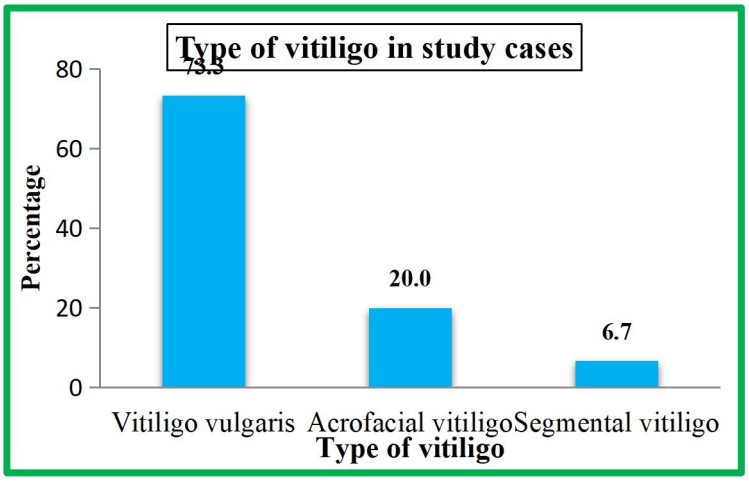

Figure 3: Types of vitiligo in cases

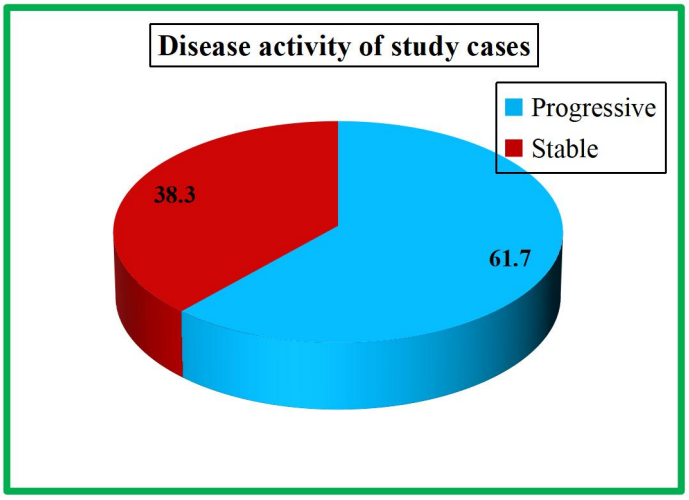

FIGURE 4: Disease Activity of cases

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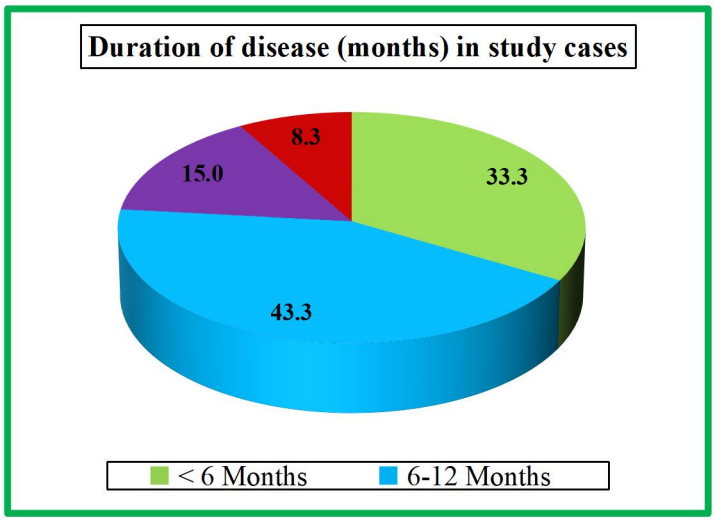

FIGURE 5: Duration of Disease in Cases

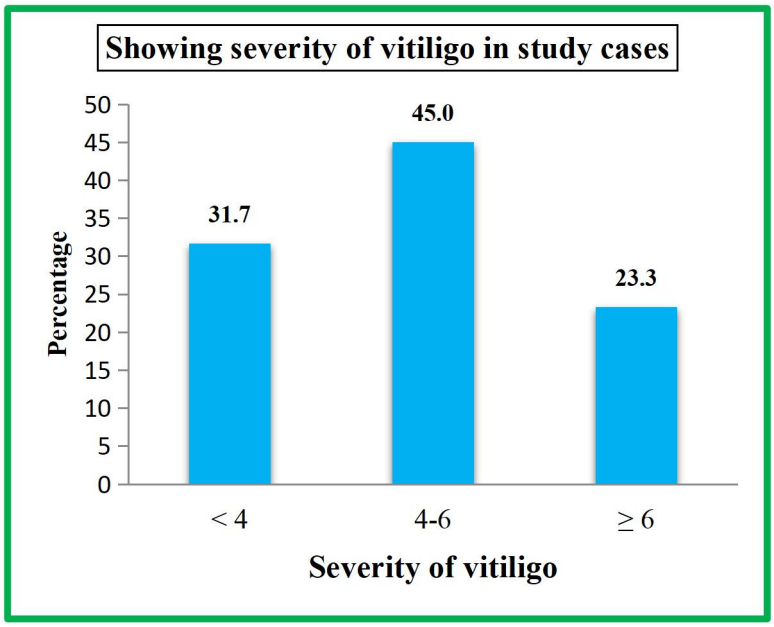

Figure 6: DISESE Severity in Cases

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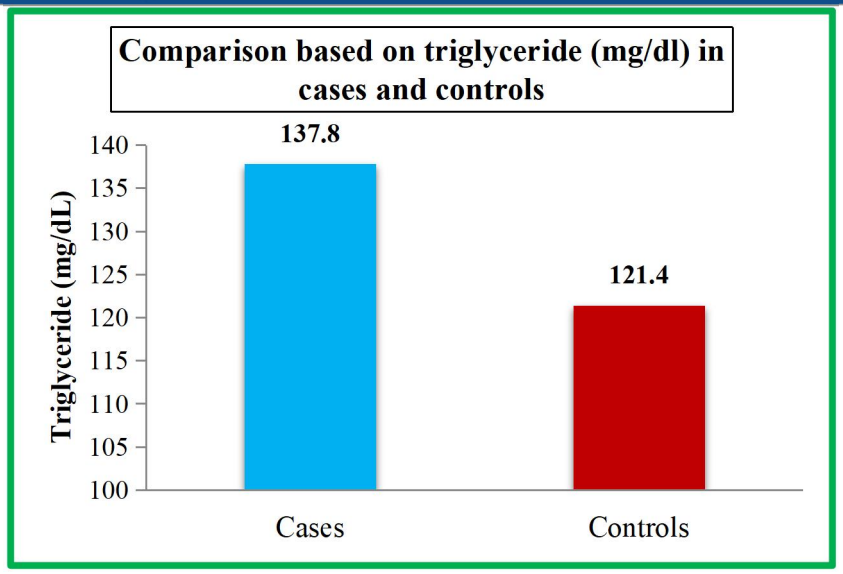

Figure 7: Comparison of Triglycerides

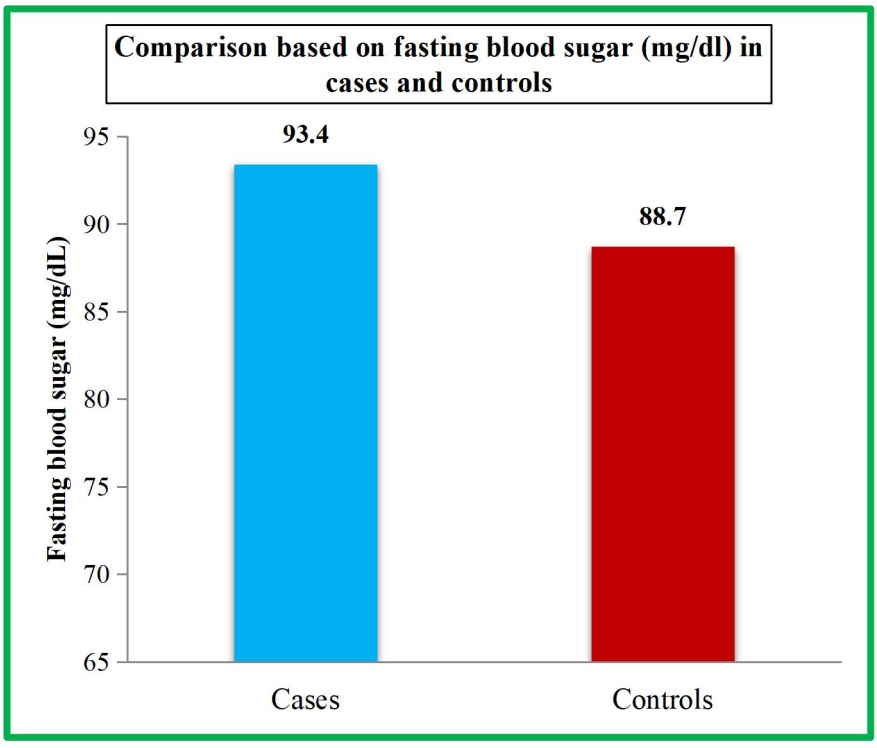

Figure 8: Comparison of fasting Blood Sugar

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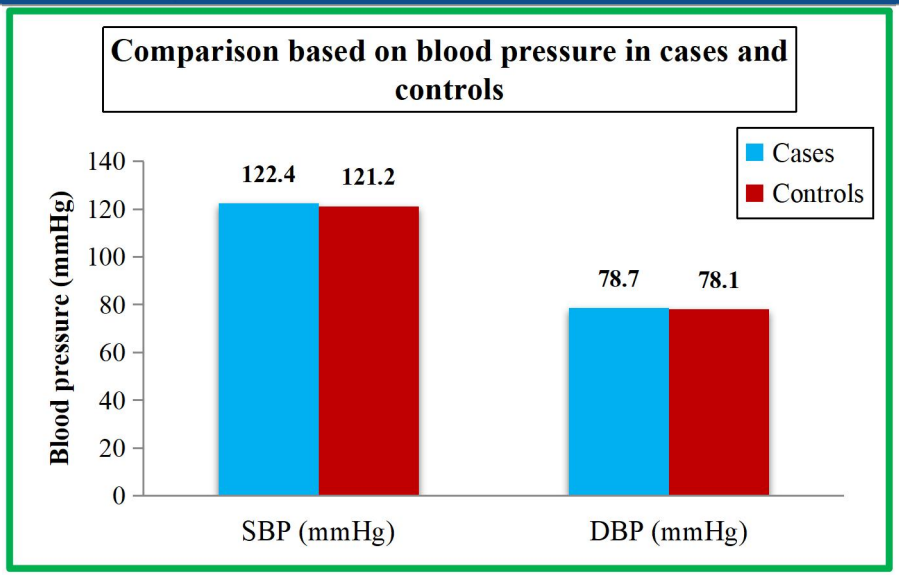

Figure 9 : Comparison Based on Blood Sugar

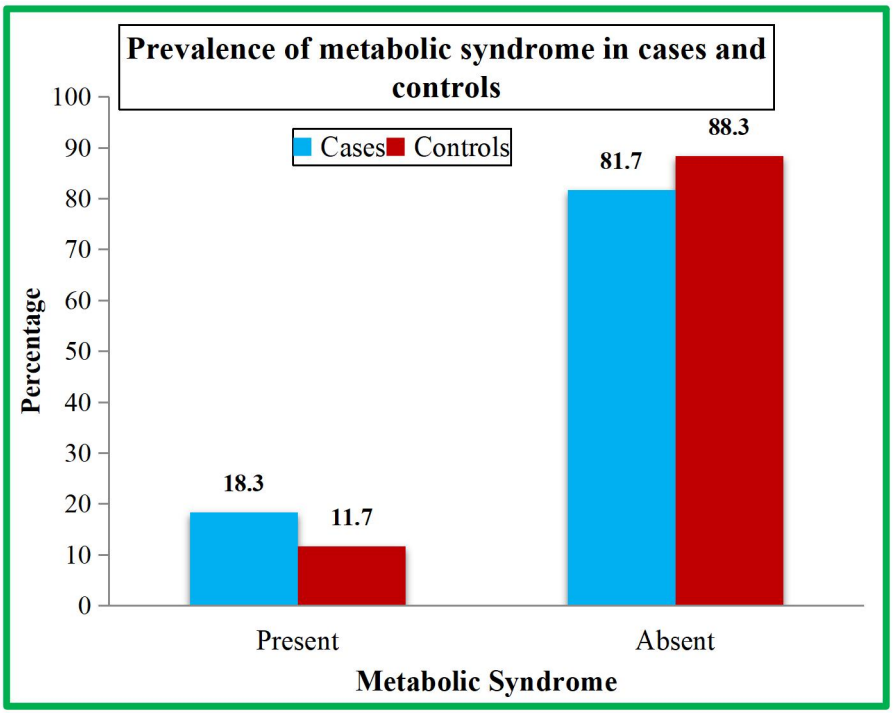

FIGURE 10: Prevalence of Metabolic Syndrome in cases and controls

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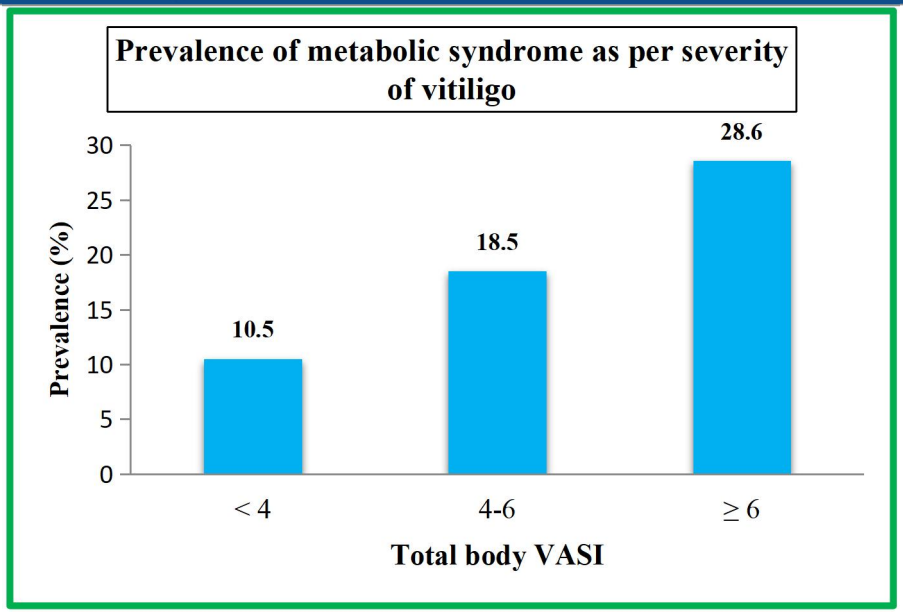

FIGURE 11: Prevalence of Metabolic Syndrome as per severity of vitiligo

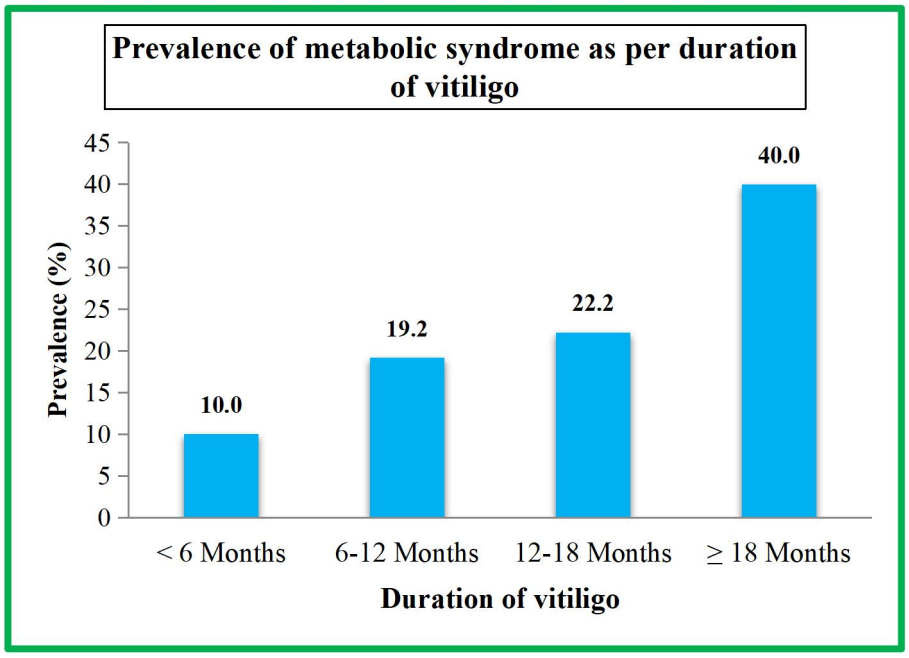

Figure 12 Prevalence of metabolic syndrome as per duration of vitiligo

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