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Metabolic Syndrome and Vitiligo: The Relationship

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Abstract

Background: Vitiligo is an immunologically-mediated skin disorder presents as pointedly well demarcated pigmented macules or patches, which may appear anywhere in the body. Metabolic syndrome (MS) is a group of disorders involving central obesity, impaired glucose tolerance, hypertension and dyslipidemia. Autoimmunity and oxidative stress in Vitiligo could initiate several inflammatory and immunological cascades responsible for the systemic manifestations and skin involvement.

Objective: To determine the association between MS and Vitiligo.

Subjects and Methods: A cross sectional study included 73 patients with Vitiligo, 44 males and 29 females, 11 – 72 years of age and 84 non-Vitiligo subjects, 46 males and 38 females, 12-75 years age as a control group. Physiological measurements include weight, height, waist circumference (WC), and blood pressure (BP). Biochemical measurements include fasting plasma glucose (FPG), triglycerides (TG) and high density lipoprotein-cholesterol (HDL-C).

Results: The frequency of MS among male patients with Vitiligo was 59% compared to 48% among male controls. In females, the frequency of MS among female patients was 38% in comparison to 24% among female controls. The differences were statistically significant ($P < 0.02$). The frequencies of all MS criteria were significantly higher among male patient with Vitiligo having MS as compared to those without MS, ($P < 0.05$ for BP and FBS, $P < 0.01$ for WC, TG and HDL-C). Female patients with MS showed significantly higher frequencies of MS components, WC, BP, FBS ($P < 0.05$), and TG ($p < 0.01$) in comparison to female patients without MS. On the other hand, there were no significant differences between female patient with and without MS regarding HDL-C ($P > 0.05$).

Conclusion: The frequency of MS was significantly higher among both male and female patients with Vitiligo as compared with non-Vitiligo subjects. This implies that these patients are at a high risk of type 2 diabetes and atherosclerotic cardiovascular disease and thereby at a considerable risk of cardiovascular events.

Key words: Vitiligo, metabolic syndrome, type 2 diabetes, cardiovascular disease.

Introduction

Vitiligo is an immunologically-mediated skin disorder with a prevalence of 0.5 to 2 percent worldwide.[1-3] It is due to loss of melanocytes leading to dilution of melanin pigment in the affected areas. Clinically, skin lesions appear as milky white coloured, non-scaly patches with discrete margins.[4]

The depletion of functional melanocytes is characteristic of Vitiligo.[5-7] Multiple mechanisms, including metabolic disorders, oxidative stress, inflammatory mediator generation, cell detachment and autoimmune responses, could contribute to this loss. A primary defect in melanocytes could be the first event, and oxidative damage occurs in the melanocytes contributes to the consequent inflammatory reaction and the enhancement of the immune system especially the innate one.[8]

Metabolic syndrome (MS) is a cluster of disorders that involve central obesity, insulin resistance (IR) impaired glucose metabolism, hypertension and dyslipidemia.[9] Not only because of the high prevalence of its components, but also because of its association with cardiovascular disease (CVD) risk and type 2 diabetes (T2D), MS has acquired greater importance.[10,11]

MS results from the dynamic interplay between genetic and environmental factors. It is a disease of chronic low-grade inflammation associated with IR and visceral adiposity. The multiple factors that constitute the syndrome are atherogenic dyslipidemia, endothelial dysfunction, genetic vulnerability, elevated blood pressure, hypercoagulable state, and chronic stress.[12]

In Vitiligo, a lower number of melanocytes and defective melanogenesis in the adipose tissue may diminish the anti-inflammatory activities of melanocytes, resulting in overproduction and accumulation of oxygen-free radicals, which can be harmful to melanocytes, with subsequent MS.[13] However, studies investigating the relatioship between Vitiligo and MS are scarce.

The aims of this study were to assess the association between MS and Vitiligo and to determine the major components of MS most commonly encountered among patients with Vitiligo.

Subjects and Methods

This is a cross –sectional study conducted from the 1st of November, 2020 throughout 31st of March of 2021 and included 73 patients with Vitiligo, 44 males and 29 females, 11 – 72 years of age. They were diagnosed by Consultant Dermatologists at the Dermatology Clinic at Al-Sadr Teaching Hospital and a private Clinic in Basrah, Iraq. The study also included 84 non-Vitiligo subjects as a control group, 46 males and 38 females, 12-75 years of age.

Height, weight, and waist circumference (WC), systolic blood pressure (SBP) and diastolic blood pressure (DBP) were measured in all subjects.

The updated US National Cholesterol Education Program Adult Treatment Panel III (updated NCEP ATP III) definition was used for the diagnosis of the MS in this study. The

diagnosis of MS require the presence of at least three of the following:[14,15]

1. Increased WC: Men ≥ 102 cm.
   Women ≥ 88 cm.
2. Elevated TG: ≥ 150 mg/dl
3. Decreased HDL-C: Men < 40 mg/dl.
   Women < 50 mg/dl.
4. Elevated BP: ≥ 130/85 mm Hg or the use of medication for hypertension.
5. Elevated FBG: ≥ 100 mg/dl or the use of medication for hyperglycemia.

Blood specimens were collected in a fasting state and used for the determination of fasting plasma glucose (FPG) level, triglycerides (TG) and high density lipoprotein- cholesterol (HDL-C). FPG[16,17] , TG[18] and HDL-C[19,20] were determined enzymaticaally using fully automated from COBAS INTEGRA system.

Statistical analysis was carried out using SPSS program (version 23). P-value < 0.5 was considered statistically significant.

Results

Table 1 presents the characteristics of the studied subjects. In both males and females, BMI was significantly higher among patients with Vitiligo as compared with control subjects (P < 0.01). No significant differences noted with regard to age, SBP and DBP between patients and controls. (P > 0.05).

The frequency of MS among patients with Vitiligo and control subjects is presented in Table 2, where 59% of male patients with vitiligo fulfill the criteria of MS compared with 48% of male controls. In addition, the frequency of MS among female patients was 38% in comparison to a frequency of 24% among female controls. The differences were statistically significant (P < 0.02).

Table 3 presents the frequencies of MS criteria among the studied male patients and controls. Among patients with Vitiligo, the frequencies of all MS criteria were significantly higher among those with MS as compared to those without MS, (P < 0.05 for BP and FPG, P < 0.01 for WC, TG and HDL-C). In the control group, the frequencies of TG (P < 0.01), BP and FPG (P < 0.05) were significantly higher among males having MS in comparison to those with no MS. On the other hand, no significant differences observed concerning WC and HDL-C (P > 0.05).

As shown in Table 4, female patients with MS showed significantly higher frequencies of MS components, WC, BP, FPG (P < 0.05), and TG (p < 0.01) in comparison to female patients without MS. On the other hand, there were no significant differences between female patients with or without MS regarding HDL-C (P > 0.05). Control females showed significantly higher frequencies of MS criteria, WC, TG, HDL-C, FPG (P < 0.01), and BP (p < 0.05) compared to females without MS.

Discussion

Metabolic syndrome represents the co-existence of CVD and T2D metabolic risk factors.[12] The Adult Treatment Panel III of the National Cholesterol Education Program (NCEP) provided the most widely accepted definition (ATP III).[15,21] The prevalence varies by country, depending on the diagnostic

criteria used and regional considerations, although it can reach up to 50% of the over-60 population in the United States.[22]

Vitiligo is a skin pigmentation disorder condition characterized by the loss of the functioning melanocytes. The skin is marked by white patches. The disease affects 0.1-2 percent of the world's population, regardless of ethnicity or gender. The disorder has been reported to have a high incidence in the second and third decade of life.[23] Various variables, including oxidative stress, have a role in the etiopathogenesis of Vitiligo.[24] Autoimmune destruction of melanocytes, neural hypothesis based on the accumulation of a neurochemical substance that reduces melanin formation, and sympathetic nervous system activity based on direct cytotoxicity and indirect creation of free radicals.[24-26]

Thyroid illness, Addison's disease, systemic lupus erythematosus, rheumatoid arthritis, diabetes, and MS are among the systemic diseases that some patients are at an elevated risk to be affected with.[27] Vitiligo is a systemic disorder that affects more than just the skin.[28] Therefore, several metabolic abnormalities may occur in cases with Vitiligo. It is more common in people with diabetes.[29] However, few studies evaluated the relationship between Vitiligo and MS.

The present study revealed that the frequency of MS was high in both male and female patients with Vitiligo in comparison to their respective controls. This is in agreement with other reports.[23,24,30] The higher frequency of MS among patients with Vitiligo implies that these patients at a high risk of T2D and atherosclerotic CVD and hence at a considerable risk of CV events. It has been proposed that Vitiligo patients are at higher risk for atherosclerotic CVD than normal population.[31]

In this study, patients with Vitiligo in the presence of MS showed significantly elevated WC in comparison to individuals having no MS in both males and females. This finding is in disagreement with other studies, whether the lack significant differences in WC between patients and controls,[32,33] or the presence of a significantly lower WC among patients with Vitiligo in comparison to controls.[34]

With regard to dyslipidaemia, low HDL-C is also found in this study to be significant indicator of MS among male patients with MS having MS and also among female controls with MS. In addition, higher TG concentrations were also found to be a significant risk factor for MS both among patients with Vitiligo and control individuals. Several studies reported lower HDL-C[30,35] and higher TG[30,35,36] levels in association with Vitiligo.

We also found that FPG was a significant risk factors for MS regardless gender among both patients with Vitiligo and control subjects. This observation is in agreement with other studies.[26] Another study whom demonstrated a significant association of diabetes with Vitiligo.[27]

The hypertensive component of MS has been attributed to the lack of the vasodilatory effect of insulin. However, IR

also affects vasodilation. In addition, renal sodium absorption via the kidneys is stimulated by insulin, whereas free fatty acids exert vasoconstrictive effects. Therefore, hyperinsulinaemia causes an increased sympathetic activity and, ultimately, these perturbations result in the development of hypertension.[37] The present study reported a significant association of BP with MS among both patients with Vitiligo and controls irrespective of gender. This finding is in agreement with the observations of other studies.[24,30]

In conclusion, the frequency of MS was significantly higher among both male and female patients with Vitiligo as compared with non-Vitiligo subjects. This indicates that these patients are a high risk of T2D and atherosclerotic CVD and thereby at a considerable risk of CV events.

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Table 1. Subject characteristics in patients with Vitiligo and controls

	Males		Females	
	Patients (N= 44)	Controls (N= 46)	Patients (N= 29)	Controls (N= 38)
Age (year)	39.3±10.6	36.11+12.43	34.8±12.35	29.1 ± 12.31
BMI (kg/m^2)	39.5±21.5**	25.1+4.21	34.9±2.8••	25.9 ± 4.4
SBP (mm.Hg)	133.3±11.8	133.0+15.5	129.4±10.3	124.9+15.2
DBP (mm.Hg)	87.6±9.3	88.6+9.8	85.2±10.6	80.8 +9.96

Values are expesssed as mean ± SD
****: P < 0.01 (Male patients Vs controls)**
••: P < 0.01 (Male controls with MS Vs those without MS)

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Table 2. Frequency of MS among patients with Vitiligo and controls

MS	Males				Females			
	Patients (N= 44)		Controls (N= 46)		Patients (N= 29)		Controls (N= 38)	
Present	26*	59%	22	48%	11*	38%	9	24%
Absent	18	41%	24	52%	18	62%	29	76%
Total	44	100%	46	100%	29	100%	38	100%

*: P < 0.02

Table 3. MS Criteria in males

MS Criteria	Patients with Vitiligo				Controls			
	With MS (N= 26)		Without MS (N= 18)		With MS (N= 22)		Without MS (N= 24)	
WC ≥ 102 cm	15**	58%	2	11%	22	100%	18	75%
TG ≥ 150 mg/dL	26**	100%	5	28%	19••	86%	8	33%
HDL-C < 40 mg/dL	22**	85%	8	44%	20	91%	20	83%
BP ≥ 130/85 mmHg	17*	65%	5	28%	19•	86%	22	92%
FPG ≥ 100 mg/dL	19*	73%	13	72%	22•	100%	11	46%

***: P < 0.05, **: P < 0.01 (Patients with MS Vs those without MS)**
•: P < 0.05, ••: P < 0.01 (Controls with MS Vs those without MS)

Table 4. MS Criteria in females

MS Criteria	Patients with Vitiligo				Controls			
	With MS (N= 11)		Without MS (N= 18)		With MS (N= 9)		Without MS (N= 29)	
WC ≥ 88cm	11*	100%	7	39%	12••	41%	3	33%
TG ≥ 150 mg/dL	10**	91%	2	11%	12••	41%	0	0%
HDL-C < 50 mg/dL	10	91%	12	67%	26••	90%	5	56%
BP ≥ 130/85 mm.Hg	4*	36%	0	0%	7•	24%	0	0%
FPG ≥100 mg/dL	9*	82%	12	67%	19••	66%	4	44%

***: P < 0.05, **: P < 0.01 (Patients with MS Vs those without MS)**
•: P < 0.05, ••: P < 0.01 (Controls with MS Vs those without MS)

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المتلازمة الأيضية والبهاق: العلاقة

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الخلاصة

خلفية الدراسة: البهاق هو اضطراب جلدي مناعي المنشأ يظهر على شكل بقع جلدية مصطبغة حادة الحواف والتي قد تظهر في أي مكان في الجسم. المتلازمة الايضية هي مجموعة من الاضطرابات تشمل

السمنة المركزية، ضعف تحمل الجلوكوز، ارتفاع ضغط الدم واضطراب دهون الدم. في حالة البهاق، يمكن أن تؤدي المناعة الذاتية والإجهاد التأكسدي إلى حدوث عدة استجابات التهابية ومناعية مسؤولة عن المظاهر الجهازية وتأثر الجلد بذلك.

الأهداف: تحديد العلاقة بين المتلازمة الايضية والبهاق.

الاشخاص وطرق العمل: شملت الدراسة 73 مريضا يعانون من البهاق ، 44 من الذكور و 29 من الإناث ، تتراوح أعمارهم بين 11 و 72 سنة و 84 من الاشخاص غير المصابين بالبهاق ، 46 من الذكور و 38 من الإناث ، تتراوح أعمارهم بين 12-75 سنة كمجموعة ضابطة. شملت القياسات الفسيولوجية الوزن والطول ومحيط الخصر وضغط الدم ، وشملت القياسات البايوكيميائية الحيوية سكر الدم الصائم ، الدهون الثلاثية ، وكوليسترول البروتين الدهني عالي الكثافة .

النتائج: كان معدل تكرار الإصابة بالمتلازمة الايضية هو 59٪ بين المرضى الذكور المصابين بالبهاق مقارنة بـ 48٪ بين الذكور في المجموعة الضابطة. عند الإناث، كان معدل الإصابة بالمتلازمة الايضية بين مرضى البهاق هو 38٪ مقارنة ب 24٪ بين الإناث في المجموعة الضابطة. كانت الفروق ذات دلالة إحصائية (P <0.02). كانت ترددات جميع معايير المتلازمة الايضية أعلى بشكل معنوي بين مرضى البهاق من الذكور المصابين بالمتلازمة الايضية مقارنة بالمرضى غير المصابين بالمتلازمة الايضية (P <0.05) لكل من ضغط الدم و سكر الدم الصائم ،و(P <0.01) لكل من محيط الخصر و الدهون الثلاثية و كوليسترول البروتين الدهني عالي الكثافة . أظهرت النساء المصابات بالمتلازمة الايضية ترددات معنوية عالية لمكونات المتلازمة الايضية : محيط الخصر ، ضغط الدم ، سكر الدم الصائم (P<0.05) ، و (P TG <0.01) مقارنة بالمرضى الإناث غير المصابات بالمتلازمة الايضية. من ناحية أخرى ، لم تكن هناك فروق ذات دلالة إحصائية بين النساء المصابات وغير المصابات بالمتلازمة الايضية فيما يتعلق بكوليسترول البروتين الدهني عالي الكثافة (P> 0.05).

الاستنتاج: كان تكرار الإصابة بالمتلازمة الايضية أعلى بشكل ملحوظ بين كل من المرضى الذكور والإناث المصابين بالبهاق مقارنة مع غير المصابين بالبهاق. يشير هذا إلى أن هؤلاء المرضى معرضون لخطر كبير للإصابة بأمراض القلب والأوعية الدموية وتصلب الشرايين وبالتالي معرضون لخطر كبير للحوادث القلبية الوعائية.

مفاتيح الكلمات: البهاق، المتلازمة الايضية ،مرض السكري (النوع الثاني)، أمراض القلب والأوعية الدموية