Carotid Intima-Media Thickness as a cardiovascular risk in Psoriatic Iranians; a case-control study

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Abstract

Psoriasis is an inflammatory condition that increases the risk of cardiovascular events. One of the factors that are related to cardiovascular events is Carotid intima-media thickness (CIMT). This study aimed to identify CVD in psoriatic patients based on CIMT and survey association of CIMT and psoriasis. This case-control study was conducted for one year in Besat Hospital, Tehran, Iran. Case and control were matched in terms of age and gender. Our cases were patients with confirmed psoriasis and the control group were individuals that had no previous history of any chronic disease.
Most of our patients were male (65%) with a mean age of 40.63 ±18.03 years old which was matched with the control(60 controls). CIMT was higher in patients compared to controls. CIMT was more strongly related to BMI than age. We showed that CIMT is significantly higher in psoriasis patients and there is a strong correlation between CIMT and BMI and age, which can be interpreted that the risk of cardiovascular events in the Iranian population with psoriasis is higher than in healthy people, and this risk will change significantly according to age and BMI.

Keywords: *Psoriasis, carotid intima-media thickness, cardiovascular disease, atherosclerosis*

Introduction

Psoriasis is a chronic inflammatory disease with a prevalence that varies based on population(1, 2). The prevalence rate had been reported from no cases in African countries to 1-3% in Poland. (800000 to 1000000 cases in population)(3-6). Underlying passages lead to psoriasis and clinical signs are unclear, but until now, we know that this condition is a T-cell incompetency. Abnormal and rapid keratocyte maturation cycle and increasing cell divisions are mechanisms involved in psoriasis (7, 8). In psoriasis, the skin, nails, genitalia, and extensor surfaces are mainly involved (9). Recently more chronic diseases have been reported to be associated with psoriasis-like obesity, diabetes mellitus, depression or addiction, cancer, chronic inflammatory bowel disease, arthritis, and cardiovascular diseases (CVD) (6, 10-12).

Moreover, the same pathway and risk factors including smoking and alcohol use in psoriasis (13) have turned attention to the survey of CVD and their potential risk factors in psoriasis(14, 15). It has been shown that cardiovascular disease is higher in juvenile patients than in older ones and patients with severe psoriasis(11). Until now the relationship between psoriasis and CVD has not been well established in previous studies. In some studies, the risk of CVD has been reported to be higher in patients with psoriasis(9, 12, 16, 17). However, in others, it is reported that the risk of CVD, transient ischemic attacks, or cerebrovascular accidents is unchanged between psoriatic patients and controls(18). In addition, a Korean study has shown that there is no relationship between metabolic syndrome and psoriasis (19, 20). In another Dutch cohort study, there was no statistically significant difference

in ischemic heart disease risk between psoriatic patients and controls in a large population (21).

In a previous study, Carotid intima-media thickness (CIMT) was a good predictor of cardiovascular disease (22-24). Relation between CIMT and psoriasis had not been surveyed among the Iranian population.

Method:

This is a case-control study conducted from April 2021 to April 2022 in Besat Hospital, Tehran, Iran on patients with psoriasis. Patients with psoriasis confirmed by a dermatologist who referred to Besat Hospital were enrolled in the study, while patients with diabetes mellitus, cardiovascular disease, hypertension, chronic renal failure, and patients who have been taking lipid-reducing, antihypertensive or antiplatelet drugs, nitrates, or systemic steroids for a long time, as well as those who have had problems measuring their Carotid intima-media thickness due to neck surgery, and severe vascular tortuosity and vascular stents were also excluded from the study. The control group, after age, gender, and race matching, was selected from people without any previous history of chronic disease. After explaining the research steps and receiving informed consent, the study started.

The Psoriasis Area and Severity Index (PASI) is a quantitative rating score for measuring the severity of psoriatic lesions based on area coverage and plaque appearance. Additionally, the presence of atherosclerotic plaque in the carotid artery is considered as a specific protruding part into the lumen of the vessel that is at least 50% thicker than the surrounding areas. For each section, the degree of plaque is classified between (0 without plaque observation) and (3 plaques that cover more than 50% of the vascular diameter).

Scores from 10 vascular segments (combination of left and right carotid arteries) and plaque index (possible range) are aggregated from 0-30.

In terms of the duration of the disease, patients are divided into groups of less than five years, five to ten years, and more than ten years. Finally, volunteers are compared in two groups of patients and healthy individuals. In addition, based on the severity of the disease, patients were divided into three groups with grades 1 to 3 (mild, moderate, then severe) by a dermatologist and arterial thickness was compared between them.

CIMT:

The thickness of the carotid intima at the site of the carotid bulb was measured and the average sizes of both sides were calculated. CIMT data were obtained using standard ultrasound equipment with a 12-MHz linear array vascular ultrasound probe (Samsung Imaging Systems, WSA80). All sonographic measurements were done by a single radiologist.

Data analysis:

The results were expressed as mean and standard deviation (SD) for quantitative variables and as a percentage for stratified qualitative variables. We used T-test ، Mann-Whitney and Chi-square test for comparisons between quantitative and qualitative variables. SPSS software version 23 was used for statistical analysis of data. The significance level was considered less than 0.05.

Ethical Consideration:

The Ethics Committee of the Army University of Medical Sciences approved this study (IR.AJAUMS.REC.1400.218). Informed written consent was obtained from all participants.

Result:

In one year of study, 60 psoriatic patients and 60 healthy people were surveyed. In both case and control groups, most of them were male (65% in the control and 68.33% in the case group). The mean age of the control group was 38.63± 15.38 years old and 40.63 ±18.03 years old in the case group. Demographic characteristics are shown in Table 1.

Table 1. Demographic characteristics and CIMT

		control	psoriasis
		N (%)	N (%)
Age (y)	<30y	21(35%)	18(30%)
	31-40y	14(23.33%)	17(28.33%)
	>40y	25(41.67%)	25(41.67%)
Gender	male	36(65%)	41(68.33%)
	female	24(35%)	19(31.67%)
BMI[1]	<20	6(10%)	1(1.67%)
	21-25	18(30%)	13(21.67%)
	26-30	26(43.33%)	31(51.67%)
	>30	10(16.67%)	15(25%)

[1] Body mass index

Disease duration	<5y		14(23.33%)
	5-10y		30(50%)
	>10y		16(26.67%)
CIMT[2](mm)			
	<0.8mm	52(86.67%)	32(53.33%)
	>0.8mm	8(13.33%)	28(46.67%)
PASI [3]	mild		18(30%)
	moderate		31(51.67%)
	severe		11(18.33%)
Atherosclerotic plaque	positive	12(20%)	8(13.33%)
	negative	48(80%)	52(77.7%)

In this study, PASI was used to evaluate psoriasis and surveyed based on CIMT. It showed that 43.75% of patients with CIMT <0.8 mm had moderate psoriatic symptoms. Details were shown in Table 2.

Table 2. Comparison OF CIMT and severity of psoriasis and plaque using chi-square test.

		CIMT	
		<0.8	>0.8
PASI	Mild	11(34.38%)	7(25%)
	Moderate	14(43.75%)	16(57.14%)
	Severe	7(21.88%)	5(17.86%)
Atherosclerotic plaque	Positive	0	7(25%)
	Negative	32(100%)	21(75%)

The mean CIMT in the control group was .6233 ± .12159 mm and .7411 ± .14409 mm in the case group. Mean CIMT was higher in psoriatic patients and there were significant differences between the two groups(p=.000). Other variables had no significant differences between the two groups (Table 3).

Table 3. Comparison of variables in case and control groups using independent T-test

		Control	Psoriasis	p-value
CIMT	Mean ±SD	.6233± .12159	.7411 ±.14409	0.00
Age		38.63± 15.38	40.63 ±18.03	0.51
Gender	Male	36	41	0.44
	Female	24	19	
BMI	Mean± SD	26.83 ±4.819	27.70 ±3.628	0.26
Atherosclerotic plaque	Positive	12	8	0.21
	Negative	48	52	

Regarding the correlation between BMI and CIMT, it should be noted that the correlation coefficient is equal to 0.46, and considering that the correlation coefficient is close to 0.50 or more, there is a statistically significant correlation between BMI and CIMT in our study, but this correlation is lower compared to the correlation between age and IMT (0.46 versus 0.68); In other words, in this study, increasing age has a higher correlation with increasing CIMT, although increasing BMI has a lower correlation with this comparison (table 4).

Table4. Correlation between CIMT and demographic variables

CIMT

[2] Carotid intima-media thickness

[3] psoriasis area and severity index

	Pearson Correlation	p-value
Age	0.683	.000
BMI	0.464	.000

Discussion:

Psoriasis and other disorders that are inflammatory diseases are associated with higher cardiovascular mortality and morbidity (25-27). The chronic systemic inflammatory state per se has been linked to an acceleration of the atherosclerotic process. Proinflammatory cytokines, such as TNF-α and interferon are important participants in plaque formation as well as endothelial dysfunction (28). Recently, had been shown that myocardial infarction (MI), was higher in psoriasis patients even after control of the known risk factors(29)

To our knowledge, this is the first study that surveyed CIMT in psoriatic patients in Iranian people. We showed that psoriatic patients had significantly higher CIMT than the control group and the relationship of BMI with CIMT is stronger than age and CIMT. Also, we showed that there was no significant relationship between the case and control groups in atherosclerotic plaque. Most of the patients with CIMT<0.8mm had moderate psoriasis and this ratio was higher in patients with CIMT>0.8 mm.

A study conducted in 2008 on 43 psoriasis patients and 43 healthy people showed that CIMT in psoriasis patients was significantly higher in comparison to the control group (30). Another cross-sectional study in Germany in 2012 on 1955 healthy people and 72 psoriasis patients surveyed CIMT and its relation to plaque. The prevalence showed that there was no significant relation between psoriasis and plaque, while psoriasis had an association with higher CIMT (31). A study in Egypt in 2011 on 43 psoriasis patients and 10 control individuals showed that CIMT in psoriasis patients is significantly higher than in the control group. Also it showed that between PASI and BMI was a strong correlation that was not surveyed in our study(32). A cross-sectional study on 40 patients and 40 control individuals demonstrated similar results as our study. It showed that CIMT is significantly higher in psoriasis patients compared to the control group, while there was no significant relationship between CIMT and BMI. This study showed that PASI had an association with LDL cholesterol that wasn't surveyed in our study (33).

A meta-analysis of 16 cross-sectional studies surveyed cardiovascular risk factors and predictors in psoriasis patients showed that psoriasis patients had higher CIMT than control groups similar to our study. Moreover, it showed psoriasis patients had more frequent plaques(34) in contrast with our results. Maybe the differences were related to the number of patients which was one of our limitations. We recommend more studies with higher sample sizes. In a Korean 2015 study with 54 psoriasis patients and 60 control, it was demonstrated that CIMT was higher in psoriasis patients but this was not statistically significant in comparison to the control group, different from our results. It seems that race difference is a confounding variable that needs more studies to evaluate the effect of race on CIMT in psoriasis patients. This study showed that psoriasis was independently relevant to arterial stiffness (35).

Conclusion:

Psoriasis is a chronic disease that in previous studies was shown to increase cardiovascular risks. In this study, we surveyed CIMT and its relationship with age and BMI, PASI, and some other factors. We showed that CIMT is significantly higher in psoriasis patients and there is a strong correlation between CIMT and BMI and age, which can be interpreted that the risk of cardiovascular events in the Iranian population with psoriasis is higher than in healthy people, and this risk will change significantly according to age and BMI.

*** All the authors of this article are researchers and educators and are not employed by a government agency that has a primary function of research or education.**

Data statement: The authors declare that they had full access to all of the data in this study and the authors take complete responsibility for the integrity of the data and the accuracy of the data analysis

Ethics consideration:

- **The Ethics Committee of the Army University of Medical Sciences approved this study (IR.AJAUMS.REC.1400.218) on 12 June 2020**

Consent for publication

Not applicable

- **Availability of data and material**

Not applicable

- **conflict of interest:**

"The authors declare that they have no competing interests"

- **financial consideration:**

Not applicable

- **Authors' contributions**

Dr. M.Z. performed a sonographic study on all patients and recorded data related to ultrasound information. Dr. A.S., S.H., and H.Z. extracted all non-sonographic information from patients by interview. Dr. S.M. and Dr.

J.K. analyzed and interpreted the patient data. All authors read and approved the final manuscript.

- **Acknowledgements**

Not applicable

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