The association between psoriasis, diabetes mellitus, and atherosclerosis in Israel: A case-control study

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Background: Previous reports demonstrated an association between psoriasis and other diseases including heart failure and diabetes mellitus.

Objectives: Our aim was to describe the association between psoriasis, diabetes mellitus, and atherosclerosis in Israel.

Methods: A cross-sectional study was performed utilizing the database of Maccabi Healthcare Services (MHS), a large health provider organization in Israel. Case patients were defined as subjects who were diagnosed with psoriasis. Patients with diabetes and atherosclerosis were identified by using the MHS diabetes and cardiovascular registries, respectively. The control group included MHS enrollees without psoriasis. The proportion of diabetes and atherosclerosis among case and control groups was compared. Chi-square tests were used to compare categorical parameters. Logistic regression models were used for multivariate analyses.

Results: The study included 46,095 patients with psoriasis (case patients) and 1,579,037 subjects without psoriasis (control patients). The age-adjusted proportion of diabetes was significantly higher in psoriasis patients as compared with the control group (odds ratio [OR] 1.27, 95% confidence interval [CI] 1.1-1.48). The age-adjusted proportion of atherosclerosis was significantly higher in psoriasis patients as compared with the control group (OR 1.28, 95% CI 1.04-1.59). In patients with psoriasis, a multivariate logistic regression model demonstrated an association between diabetes and the multiple use of very potent topical steroids ($P < .05$) or use of systemic medication for psoriasis (methotrexate, cyclosporine or acitretin) ($P < .001$). A similar model demonstrated an association between atherosclerosis and the use of phototherapy ($P < .001$).

Limitations: Our study was based on a computerized database. The diagnosis of psoriasis was based on digitally transmitted data. Therefore overestimation (false-positive cases) and underestimation (false-negative cases) of psoriasis patients may exist, thereby being a source for information bias. A second limitation is selection bias that may occur due to the possibility that reporting of both psoriasis and associated illnesses is higher in individuals who are seeking medical care. A third limitation concerns the causal effect between occurrence of psoriasis and atherosclerosis or diabetes. The dataset of MHS records diagnoses only from 1997 and does not record the date of disease onset.

Conclusions: Our study supports previous reports for an association between psoriasis and atherosclerosis and psoriasis and diabetes. Further study is needed to support this observation. (J Am Acad Dermatol 2007;56:629-34.)

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Psoriasis is a chronic disease affecting 2% to 4% of the population. Several reports have demonstrated an association between psoriasis and diabetes mellitus, cardiovascular disease (including hypertension, myocardial infarction, and heart failure), obesity, and smoking.[1-13]

The largest cohort of psoriasis patients was introduced in a study published by Henseler and Christophers,[14] which included 2941 psoriasis patients. This study showed an association among psoriasis, diabetes, obesity, heart failure, and hypertension. In contrast, a recent published study[15] based on questionnaires sent to psoriasis patients failed to repeat this observation. These reports did not account for the age and gender distribution of patients with psoriasis and did not assess psoriasis severity.

The purpose of the current study was to assess the association among psoriasis, diabetes, and atherosclerosis by using data mining techniques utilizing the large medical dataset of Maccabi Healthcare Services (MHS).

METHODS

The study was designed as a retrospective case-control study using data mining techniques utilizing the MHS database. MHS is the second largest organization for managed care in Israel. MHS covers a population of more than 1,600,000 enrollees. MHS has a comprehensive computerized database that has continuous real-time input from pharmaceutical, medical, and administrative computerized operating systems. Most psoriasis patients are treated by MHS dermatologists. Some are treated by primary physicians. Severe psoriasis patients requiring phototherapy are treated in outpatient clinics in hospitals after being referred there by the dermatologist. All psoriasis patients who are members of MHS have been registered in the MHS database before treatment in the hospital outpatient clinics. A reduced fee (copayment) is collected from the patients while purchasing topical or systemic medication only if prescribed by an MHS physician. For this reason, psoriasis patients return to their MHS dermatologist or primary care physician to receive an MHS prescription, which is documented on the MHS database.

Case patients were defined as having psoriasis, when there was at least one documented diagnosis of psoriasis in the medical records between the years 1997 and 2004, registered by an MHS physician. The control group consisted of all MHS members without a diagnosis of psoriasis. Patients who died between the years 1997 and 2004 were excluded from the study.

Diabetes was defined using the MHS diabetes registry. The inclusion criteria for enrollment in the MHS diabetes registry include at least one of the following criteria: glycosylated hemoglobin > 7.25%, fasting glucose > 200 mg/dL, one purchase of insulin, two purchases of an oral hypoglycemic drug or diagnosis of diabetes with one of the following: glycosylated hemoglobin > 6.25% or fasting glucose >125 mg/dL. Unfortunately, it is not possible to differentiate between types 1 and 2 diabetes according to these data.

Abbreviations used:

CI: confidence interval
CVD: cardiac vascular disease
IHD: ischemic heart disease
MHS: Maccabi Healthcare Services
OR: odds ratio
PVD: peripheral vascular disease

Atherosclerosis was defined using the MHS cardiovascular registry. The inclusion criteria include any of the diagnoses within the spectrum of peripheral vascular disease (PVD), cerebrovascular disease (CVD), and ischemic heart disease (IHD).

The proportion of patients with diabetes and atherosclerosis was compared between case and control patients stratified by age. Psoriasis severity was evaluated by using surrogate markers such as long-term use of very potent topical corticosteroids, purchase of systemic medications for psoriasis (methotrexate, cyclosporine, or acitretin), or phototherapy.

Chi-square tests were used to compare categorical parameters. The *t* test was used to compare continuous parameters. Logistic regression models were used to measure the association among psoriasis severity markers, demographic data, and diabetes or atherosclerosis. Statistical analysis was performed by means of the Statistical Package for the Social Sciences software.

RESULTS

The study included 46,095 patients with psoriasis and a control group of 1,579,037 MHS enrollees. The patients' characteristics appear in Table I. Age and gender distribution of patients with psoriasis is presented in Fig 1.

The Diabetes Registry includes 61,696 patients. The proportions of diabetes in patients with psoriasis and the control group are presented in Table II. The proportion of diabetes in the control group corresponds to the proportion of diabetes in Israel[16] as well as to the same age groups in the United States.[17]

There are 57,530 patients who suffer from atherosclerosis, of whom 43,296 (75.26%) suffer from IHD, 5388 (9.37%) suffer from PVD, and 10,340 (18%) suffer from CVD. From patients suffering