

Original article

Delayed Diagnosis of Hypertension in Diabetic Patients Monitored in Primary Care

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ABSTRACT

Introduction and objectives: Delayed diagnosis of hypertension may result in inadequate blood pressure control and increased cardiovascular risk. The aim of this study was to estimate the delay in hypertension diagnosis in patients with type 2 diabetes and the likelihood of a diagnosis within a suitable period (first 6 months), and to analyze the patient and physician characteristics associated with delayed diagnosis.

Methods: Retrospective dynamic cohort study, with a 7-year follow-up in primary care, of 8074 adult patients with diabetes who met the diagnostic criteria for hypertension. Two thresholds were considered: 140/90 mmHg and 130/80 mmHg. The time elapsed between meeting these criteria and recording the diagnosis was estimated; the time course of the likelihood of a missed diagnosis and the variables associated with correct diagnosis were assessed by Kaplan-Meier survival analysis and logistic regression analysis, respectively.

Results: The mean diagnostic delay was 8.9 (15.4) months in patients with blood pressure \geq 140/90 mmHg compared to 15.2 (19.6) months for those with $<$ 140/90 mmHg ($P < .001$). The main variables associated with correct diagnosis were baseline blood pressure \geq 140/90 mmHg (odds ratio=2.77; 95% confidence interval, 2.44-3.15), no history of acute myocardial infarction (odds ratio=2.23; 95% confidence interval, 1.67-2.99), obesity (odds ratio=1.70; 95% confidence interval, 1.44-1.99), absence of depression (odds ratio=1.63; 95% confidence interval, 1.27-2.08), female sex (odds ratio=1.29; 95% confidence interval, 1.14-1.46), older age, and taking more intensive antidiabetic therapy. There was an inverse relationship with the age of physicians and a direct relationship with their professional stability.

Conclusions: The mean diagnostic delay in hypertension among diabetic patients was greater than 6 months and varied according to the diagnostic threshold used. Patients with baseline blood pressure \geq 140/90 mmHg were more likely to receive a timely diagnosis.

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Retraso diagnóstico de la hipertensión arterial en pacientes diabéticos atendidos en atención primaria

RESUMEN

Introducción y objetivos: El retraso diagnóstico de la hipertensión arterial puede favorecer un control deficiente y el incremento del riesgo cardiovascular. El objetivo es estimar el retraso diagnóstico de la hipertensión en los diabéticos tipo 2 y la probabilidad de que se los diagnostique en un plazo adecuado (primeros 6 meses) y analizar las características de pacientes y médicos asociadas al retraso diagnóstico.

Métodos: Cohorte dinámica retrospectiva, con 7 años de seguimiento en atención primaria, de 8.074 adultos diabéticos a los que se incluyó en el momento de cumplir criterios diagnósticos de hipertensión arterial considerando dos umbrales: 140/90 y 130/80 mmHg. Se estimó el tiempo transcurrido desde el cumplimiento de dichos criterios hasta el registro del diagnóstico la evolución temporal de la probabilidad de que no se diagnosticara mediante análisis de supervivencia de Kaplan-Meier y las variables asociadas al diagnóstico adecuado mediante regresión logística.

Resultados: El retraso diagnóstico medio fue $8,9 \pm 15,4$ meses para pacientes que acudieron con presión arterial \geq 140/90 mmHg frente a los $15,2 \pm 19,6$ meses de aquellos con presión $<$ 140/90 mmHg ($p < 0,001$). Las principales variables asociadas al diagnóstico adecuado fueron presión arterial inicial \geq 140/90 mmHg (odds ratio = 2,77; intervalo de confianza del 95%, 2,44-3,15), no tener infarto agudo de miocardio previo (odds ratio = 2,23; intervalo de confianza del 95%, 1,67-2,99), obesidad (odds ratio = 1,70; intervalo de confianza del 95%, 1,44-1,99), no sufrir depresión (odds ratio = 1,63; intervalo de confianza del 95%, 1,27-2,08), ser mujer

Palabras clave:

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(odds ratio = 1,29; intervalo de confianza del 95%, 1,14-1,46), tener más edad o tratamiento antidiabético más intensivo. La edad del médico mostró relación inversa y su estabilidad laboral, relación directa.

Conclusiones: El retraso diagnóstico medio de la hipertensión en diabéticos fue > 6 meses y varió según el umbral diagnóstico utilizado. Los pacientes con presión arterial inicial $\geq 140/90$ mmHg presentaron mayor probabilidad de diagnóstico adecuado.

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Abbreviations

BP: blood pressure
DM2: type 2 diabetes mellitus
EMR: electronic medical record
HT: hypertension
PC: primary care

INTRODUCTION

Hypertension (HT) is a cardiovascular risk factor that affects 35% of the Spanish adult population.¹

The prevalence of HT is between 1.5 and 2.3 times higher in patients with type 2 diabetes mellitus (DM2) than in nondiabetic subjects.^{2,3} When present it hastens the course of microvascular and macrovascular complications of DM2^{4,5} and increases mortality, to the extent that 75% of deaths of cardiovascular origin in diabetic patients are attributable to HT.^{2,6}

Monitoring HT in diabetics reduces mortality and prevents or delays the incidence of vascular complications.^{7,8} However, despite the availability of effective drug therapies, blood pressure (BP) control in these patients is poor, which may be partly due to underdiagnosis and delayed diagnosis. To date no reports have estimated the typical delay in diagnosing HT. Knowledge of these factors may enable implementation of procedures that will improve the management of these patients and reduce their cardiovascular risk.

The aims of this study were to estimate the delay in diagnosing HT in adults with DM2 in primary care (PC) according to the diagnostic threshold considered and the probability of these patients receiving a diagnosis with the first 6 months of the onset of HT, as well as to analyze the association between patient and physician characteristics and the likelihood of a delayed diagnosis.

METHODS

This retrospective, analytical, observational, dynamic cohort study was performed in 21 health centers in northeast Madrid. The study population comprised all patients diagnosed with DM2 in their electronic medical record (EMR) who attended at least 2 annual check-up visits in their PC centers. Patients older than 18 years who met the diagnostic criteria for HT between January 1, 2003 and June 30, 2009 and had at least 2 BP readings recorded in the EMR during the study year were included. Patients with a HT diagnosis at the start of the study and those with a follow-up lasting less than 6 months were excluded.

Patient inclusion and follow-up began on January 1, 2003; inclusion ended on June 30, 2009, and follow-up was completed on December 31, 2009.

Data were obtained from personalized secondary data in the patients' EMR. Diagnoses of HT and DM2 recorded in the EMRs were validated in the same setting where the study was

conducted,⁹ and a positive predictive value for DM of 91.23% and a negative predictive value of 99.98% were obtained. For the HT diagnostic threshold of 140/90 mmHg, the positive and negative predictive values were 82.52% and 97.94%, and for the diagnostic threshold of 130/80 mmHg, 98.68% and 53.92%, respectively.

A patient was considered diabetic when the EMR contained a diagnosis of DM2 (International Primary Care Classification codes K86 or K87).

The patient was considered hypertensive when the measurement of 2 or more systolic blood pressure (SBP) measurements taken on at least 2 consecutive visits was ≥ 130 mmHg or the mean diastolic blood pressure (DBP), ≥ 80 mmHg, according to seventh report of Joint National Committee guidelines.¹⁰

Given the lack of agreement among scientific societies on the diagnostic thresholds for HT in patients with DM2, this study considered a second HT threshold when the mean of 2 or more SBP measurements on at least 2 consecutive visits was ≥ 140 mmHg or the mean DBP was ≥ 90 mmHg, according to the NICE (National Institute for Clinical Excellence) standard.¹¹

HT was considered diagnosed when recorded in the EMR, and as undiagnosed when the diagnostic criteria were met but no HT diagnosis was recorded in the EMR. The use of medication with a hypotensive effect but prescribed for indications other than HT was not considered.

We measured the time elapsed between the visit when the patient met the diagnostic criteria and the date when the diagnosis was recorded.

A diagnosis was defined as "correct" when it was recorded in the EMR during the first 6 months after the patient met the diagnostic criteria and as "incorrect" when it was not recorded until more than 6 months later or not at all. Patient-related variables (sociodemographic, comorbidity, anthropometric, biochemical parameters), use of health resources (consultation and treatments) and PC physician-related variables (sex, age, professional stability, work schedule and professional seniority) were analyzed.

Statistical Analysis

A descriptive analysis was prepared of the study population, overall and stratified by the BP measurement when diagnostic criteria were met. The time elapsed between meeting these criteria and recording of the diagnosis, along with the variation over time of the probability of remaining diagnosis-free, was estimated by Kaplan-Meier survival analysis. Log-rank test was used to study differences related to the degree of initial HT.

A univariate analysis was carried out of the factors associated with a correct diagnosis (ie, diagnosis of HT in the EMR during the first 6 months after the diagnostic criteria were met). The chi-square was used for qualitative variables and Student *t* test for quantitative variables. Variables with a significance < 0.25 were included in the logistic regression analysis.

All estimates were calculated with their 95% confidence intervals (95%CI). A *P* value $< .05$ was considered statistically significant. Data were analyzed using SPSS 19.0 statistical software package (SPSS Inc.; Chicago, Illinois, United States).

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