



## ORIGINAL ARTICLE

# A cross-sectional survey among patients and prescribers on insulin dosing irregularities and impact of mild (self-treated) hypoglycemia episodes in Spanish patients with type 2 diabetes as compared to other European patients



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### KEYWORDS

Type 2 diabetes;  
Hypoglycemia;  
Insulin;  
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GAPP 2 survey

### Abstract

**Background and objective:** In Spain, data suggest that 13.8% of adults have diabetes. Two important aspects in diabetes management are mild hypoglycemic episodes and poor treatment adherence. This study assesses the impact of missed insulin doses and prevalence of mistimed and reduced insulin doses and mild hypoglycemia in patients with type 2 diabetes treated with basal insulin analogues in Spain, and compares the data collected to pooled data from 8 other European countries (OECs).

**Materials and methods:** GAPP2 was an international, online, cross-sectional study of diabetic patients aged  $\geq 40$  years treated with long-acting insulin analogues and their healthcare professionals. Patients and healthcare professionals were recruited from online research panels. Data reported in Spain are compared to pooled data from 8 OECs.

**Results:** In Spain, 1–3% of patients reported they had reduced, missed, or mistimed at least one insulin dose in the previous month. Significantly more OEC patients reported dosing irregularities (15–23%; all  $P < 0.01$ ). In Spain, 77% of patients were worried and 59% felt guilty for missing a dose of basal insulin, while 24% reported that they were very worried about nocturnal hypoglycemia. Significantly fewer OEC patients reported worrying (47%;  $P < 0.01$ ) and feeling guilty (37%;  $P < 0.01$ ) about missing an insulin dose, or worry about nocturnal hypoglycemia (12%;  $P < 0.01$ ).

**Conclusions:** In Spain, patients with type 2 diabetes report fewer dosing irregularities and hypoglycemic episodes as compared to patients from OECs. However, Spanish patients appear to have

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**PALABRAS CLAVE**

Diabetes tipo 2;  
Hipoglucemia;  
Insulina;  
Irregularidades en  
dosificación;  
Encuesta GAPP2

a reduced quality of life related to hypoglycemia as well as worry and guilt related to insulin dosing irregularities.

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### Estudio transversal mediante encuesta entre pacientes y médicos prescriptores sobre irregularidades en dosificación de la insulina e impacto de los episodios de hipoglucemia leve (auto-tratadas) en pacientes con diabetes tipo 2 en España en comparación con otros países europeos

**Resumen**

**Antecedentes y objetivo:** En España, los datos indican que el 13,8% de los adultos tienen diabetes. Dos aspectos importantes del tratamiento de la diabetes son las hipoglucemias leves y la baja adherencia al tratamiento. En este trabajo se evalúa el impacto de las irregularidades de dosificación de insulina (dosis omitidas, administradas fuera de tiempo, y anormalmente reducidas) y de las hipoglucemias leves en los pacientes con diabetes tipo 2 tratados con análogos de la insulina basal en España, en comparación con los datos agrupados de otros 8 países europeos (OEC).

**Materiales y métodos:** GAPP2 fue diseñado como un estudio transversal, internacional, online, para pacientes con diabetes tipo 2 y edad  $\geq 40$  años, en tratamiento con análogos de insulina de acción prolongada, y sus profesionales de la salud. Pacientes y profesionales de la salud fueron reclutados a partir de diversos paneles de investigación online. Los datos reportados en España se comparan con los datos agrupados de otros 8 OEC.

**Resultados:** En España, el 1–3% de los pacientes informaron que redujeron, olvidaron o se administraron fuera de tiempo al menos una dosis de la insulina en el mes anterior. En comparación, más pacientes OEC denunciaron significativamente irregularidades de dosificación (15–23%). En España, el 77% de los pacientes manifestaron su preocupación y el 59% se sintieron culpables por olvidar una dosis de insulina basal, mientras que el 24% manifestó estar muy preocupado por las hipoglucemias nocturnas. En relación con los pacientes OEC, menos pacientes manifestaron significativamente preocupación (47%) y sentimiento de culpabilidad (37%) sobre la omisión de una dosis de insulina, o inquietud por las hipoglucemias nocturnas (12%).

**Conclusiones:** En España, los pacientes con diabetes tipo 2 reportan menos irregularidades de dosificación e hipoglucemias en comparación con los pacientes de la OEC. Sin embargo, los pacientes españoles parecen sufrir una reducción de la calidad de vida relacionada con la hipoglucemia, así como preocupación y culpa en relación con las irregularidades en la dosificación de insulina.

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**Introduction**

European data from 2011 showed that 35 million adults had type 1 or type 2 diabetes and €89 billion were spent in treating and managing diabetes and its complications. This is projected to increase by approximately 23%, to €43 billion by 2030.<sup>1</sup> In Spain, data suggest that 13.8% of the adult population has diabetes.<sup>2</sup> Diabetes, particularly type 2 diabetes, is an increasingly important public health problem,<sup>3</sup> from which the estimated costs per patient per year are approximately €1708.<sup>4</sup>

Type 2 diabetes can cause significant impairment in health-related quality of life.<sup>5</sup> Disease complications (e.g. hypoglycaemia, stroke) have been shown to decrease quality of life in patients with type 2 diabetes.<sup>6</sup> Finally, there is a strong link between diabetes and depression which is

associated with significant morbidity, mortality, and increased healthcare costs.<sup>7</sup>

Self-treated hypoglycaemia, often referred to as mild hypoglycaemia, remains a key aspect of diabetes management.<sup>8,9</sup> Mild hypoglycaemia is common, affecting approximately a third of patients using insulin analogues. They are associated with a reduction in patient well-being and functioning<sup>10</sup> and have substantial economic consequences, with lost productivity estimated to cost from \$15.26 to \$93.47 per episode.<sup>10</sup> Mild hypoglycaemic episodes may precede or predispose to severe episodes where patients cannot treat themselves.<sup>11,12</sup>

There is also growing evidence poor adherence to insulin in type 2 diabetes patients results in inadequate glucose control<sup>13,14</sup> and increased mortality.<sup>15</sup> Dosing irregularities (including missed, mistimed by >2 h and reduced doses)

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