



## Does ambulatory blood pressure monitoring contribute anything to clinic blood pressure in paediatric patients with type 1 diabetes?<sup>☆</sup>

### ¿Aporta la realización de monitorización ambulatoria de la presión arterial frente a la toma aislada en los pacientes pediátricos con diabetes tipo 1?

Dear Editor,

Hypertension (HTN) is an important cardiovascular risk factor in patients with type 1 diabetes (T1D), who are at increased risk the greater the duration and severity of HTN.<sup>1,2</sup> For this reason, patients with T1D used to be screened for HTN by means of office blood pressure (BP) measurement, with use of ambulatory blood pressure monitoring (ABPM) to confirm the diagnosis. The most recent European Society of Hypertension guidelines for the management of high blood pressure in children and adolescents recommend ABPM in patients with a T1D diagnosis,<sup>3</sup> although due to its lower availability it is not used routinely.

The aim of our study was to describe the different BP phenotypes based on the isolated office BP measurements (clinic BP) and ABPM in children and adolescents with T1D and analyse the presence of differences in epidemiological, clinical

or laboratory characteristics associated with high ambulatory BP values. We conducted a cross-sectional study in a cohort of children and adolescents with T1D followed up in the childhood diabetes unit of a tertiary care hospital. We included patients aged 5 to 18 years with T1D of more than 6 months' duration without a prior history of HTN. The primary variables were the clinic BP and the 24-h ambulatory BP. We collected data on previous capillary glycated haemoglobin and lipid profile values as well as the body mass index (BMI) z-score relative to the reference population of the same age and sex.

We categorised clinic BP measurements as normal BP (systolic BP [SBP] and diastolic BP [DBP] < 90th percentile [P90]), high BP (SBP or DBP ≥ P90 and <95th percentile [P95]) or HTN (SBP or DBP ≥ P95 and <P95 + 12 mmHg or SBP or DBP ≥ P95 + 12 mmHg).<sup>4</sup> At the office, BP was measured with a properly calibrated oscillometer. In patients with SBP and DBP values repeatedly above the P90, BP was measured manually with a sphygmomanometer and stethoscope.

Ambulatory blood pressure monitoring was performed with the Spacelabs 90207 monitor (Spacelabs Healthcare). All recordings contained at least 75% of valid readings. We defined HTN as a mean daytime, night-time and 24 h SBP or DBP above the 95th percentile (*Ambulatory blood pressure monitoring in children and adolescents*. Hypertension, 2008). We analysed the mean of the variables under study based on whether the ABPM was normal or pathological.

Seventy patients met the inclusion criteria (51.40% female). All agreed to participate in the study, and we

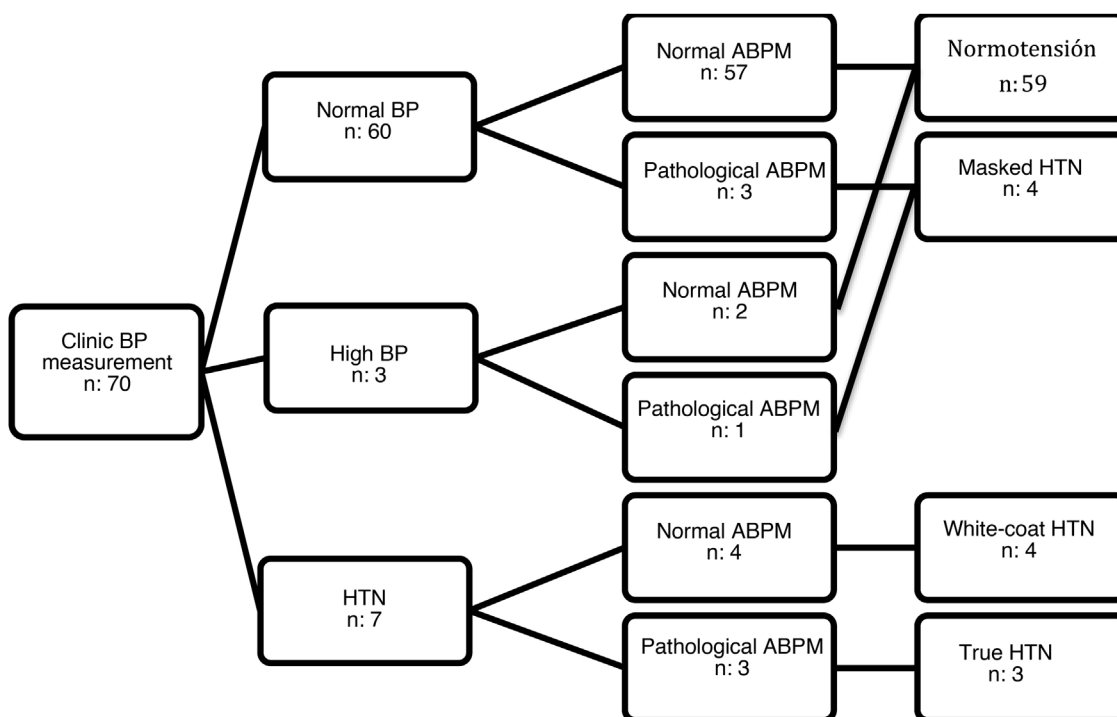


Figure 1 Distribution of hypertension phenotypes in the sample based on clinic and ambulatory blood pressure values.

<sup>☆</sup> Please cite this article as: Blázquez Gómez CJ, Alonso Rubio P, Megido Armada A, Huidobro Fernández B, Riaño Galán I. ¿Aporta la realización de monitorización ambulatoria de la presión arterial frente a la toma aislada en los pacientes pediátricos con diabetes tipo 1? An Pediatr (Barc). 2021;95:269–271.

**Table 1** Mean age, time from onset, SBP z-score, DBP z-score, BMI z-score, HbA1c and lipid profile values in patients with normal and high ambulatory blood pressure values.

	Overall	Normal ABPM (normotension + white-coat HTN)	Pathological ABPM (masked HTN + true HTN)	<i>P</i>
	<i>n</i> = 70 Mean (SD)	<i>n</i> = 63 Mean (SD)	<i>n</i> = 7 Mean (SD)	(Significance: <i>P</i> < 0.05)
Current age (years)	11.26 (2.67)	11.17 (2.68)	12.03 (2.64)	0.43
Duration of T1D (years)	3.96 (3.07)	4.05 (3.15)	3.17 (2.13)	0.48
SBP z (mmHg)	0.30 (0.92)	0.16 (0.84)	1.54 (0.73)	0.00
DBP z (mmHg)	0.55 (0.52)	0.49 (0.41)	1.08 (0.98)	0.16
BMI z (kg/m <sup>2</sup> )	0.09 (0.94)	0.13 (0.96)	-0.18 (0.79)	0.42
HbA1c <sup>a</sup> (%)	7.51 (0.97)	7.42 (0.91)	8.28 (1.14)	0.03
Triglycerides (mg/dL)	67.90 (31.88)	66.68 (31.15)	79.33 (39.36)	0.36
Total cholesterol (mg/dL)	160.55 (29.08)	160.73 (29.39)	158.83 (28.45)	0.88
LDL cholesterol (mg/dL)	86.89 (27.38)	86.46 (28.40)	90.83 (15.97)	0.71
HDL cholesterol (mg/dL)	61.34 (15.02)	62.32 (14.71)	52.17 (16.08)	0.12

ABPM, ambulatory blood pressure monitoring; BMI, body mass index; HbA1c, glycated haemoglobin; DBP, diastolic blood pressure; SBP, systolic blood pressure; SD, standard deviation; T1D, type 1 diabetes.

<sup>a</sup> Mean of the last 4 trimestral capillary HbA1c measurements.

obtained signed informed consent to participation. The mean age was 11.26 years (standard deviation, 2.67) and the median duration of T1D was 3.46 years (interquartile range, 4.10). The clinic BP was in the normal range in 60 patients, high in 3 and in the HTN range in 7. In the group of patients with normal/high BP, ABPM detected masked HTN in 4 patients. Of the 7 patients with clinic BP measurements in the HTN range, ABPM confirmed it in 3 (true HTN) and ruled it out in 4 (white-coat HTN) (Fig. 1). None of the patients with high ambulatory BP values had obesity (BMI z-score >2). Only 3 patients had a family history of HTN, without significant differences in family history between patients with HTN and patients with normal BP. Table 1 summarizes the characteristics of both groups.

Ambulatory blood pressure monitoring is the gold standard for diagnosis of HTN in children with T1D.<sup>5,6</sup> In the sample under study, ABPM proved very useful, for while the SBP z-score was significantly associated with high ambulatory BP, without ABPM cases of white-coat HTN would have not been identified and, more importantly, the diagnosis of 4 cases of masked HTN would have been missed. The accurate identification of HTN by ABPM has significant repercussions for treatment, as the current recommendation is that these patients initiate treatment with a combination of pharmacological and dietary measures.<sup>3</sup> On the other hand, ABPM allows identification of abnormal BP patterns at night, which has been found to be associated with future development of albuminuria.<sup>7</sup> When it came to the differences between the 2 groups, although excess weight is a risk factor for HTN, we did not observe differences in BMI between the groups. Patients with ambulatory HTN exhibited poorer glycaemic control, an association that has been described in the past.<sup>8</sup>

Although the sample size was small, our findings support the routine use of ABPM, especially in patients with poor glycaemic control. In all likelihood, once ABPM becomes more widely available, it will be used routinely following diagnosis of T1D.

## References

1. Miller RG, Mahajan HD, Costacou T, Sekikawa A, Anderson SJ, Orchard TJ. A contemporary estimate of total mortality and cardiovascular disease risk in young adults with type 1 diabetes: the Pittsburgh epidemiology of diabetes complications study. *Diabetes Care*. 2016;39:2296–303.
2. Guo J, Brooks MM, Muldoon MF, Naimi AI, Orchard TJ, Costacou T. Optimal blood pressure thresholds for minimal coronary artery disease risk in type 1 diabetes. *Diabetes Care*. 2019;42:1692–9.
3. Lurbe E, Agabiti-Rosei E, Cruickshank JK, Dominiczak A, Erdine S, Hirth A, et al. 2016 European Society of Hypertension guidelines for the management of high blood pressure in children and adolescents. *J Hypertens*. 2016;34:1887–920.
4. Flynn JT, Kaelber DC, Baker-Smith CM, Blowey D, Carroll AE, Daniels SR, et al. Clinical practice guideline for screening and management of high blood pressure in children and adolescents. *Pediatrics*. 2017;140:e20171904.
5. Downie ML, Ulrich EH, Noone DG. An update on hypertension in children with type 1 diabetes. *Can J Diabetes*. 2018;42:199–204.
6. Flynn JT, Daniels SR, Hayman LL, Maahs DM, McCrindle BW, Mitsnefes M, et al. Update: ambulatory blood pressure monitoring in children and adolescents: a scientific statement from the American Heart Association. *Hypertension*. 2014;63:1116–35.
7. Lurbe E, Redon J, Kesani A, Pascual JM, Taconis J, Álvarez V, et al. Increase in nocturnal blood pressure and progression to microalbuminuria in type 1 diabetes. *N Engl J Med*. 2002;347:797–805.
8. Dost A, Klinkert C, Kapellen T, Lemmer A, Naeke A, Grabert M, et al. Arterial hypertension determined by ambulatory blood pressure profiles: contribution to microalbuminuria risk in a multicenter investigation in 2,105 children and adolescents with type 1 diabetes. *Diabetes Care*. 2008;31:720–5.

Cristina Julia Blázquez Gómez<sup>a,\*</sup>, Pablo Alonso Rubio<sup>b</sup>, Alba Megido Armada<sup>c</sup>, Belén Huidobro Fernández<sup>d</sup>, Isolina Riaño Galán<sup>c,e</sup>

<sup>a</sup> Servicio de Pediatría, Hospital Universitario Príncipe de Asturias, Alcalá de Henares, Madrid, Spain

<sup>b</sup> Servicio de Pediatría, Hospital Universitario Marqués de Valdecilla, Santander, Cantabria, Spain

<sup>c</sup> AGC de Pediatría, Hospital Universitario Central de Asturias, Oviedo, Asturias, Spain

<sup>d</sup> Servicio de Pediatría, Hospital Universitario de Cabueñes, Gijón, Asturias, Spain

<sup>e</sup> IUOPA-Departamento de Medicina-ISPA, Universidad de Oviedo, CIBERESP, Oviedad, Asturias, Spain

\* Corresponding author.

E-mail address: [blazquezg1@gmail.com](mailto:blazquezg1@gmail.com)

(C.J. Blázquez Gómez).

<https://doi.org/10.1016/j.anpede.2020.12.013>

2341-2879/ © 2021 Asociación Española de Pediatría. Published by Elsevier España, S.L.U. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## Influenza A (H1N1)pdm09 viral clearance kinetics in hospitalized children ☆☆☆



### Cinética del aclaramiento del virus de la gripe A (H1N1) en niños hospitalizados

Dear Editor:

Children are the main source of transmission and reservoir of influenza virus. It is believed that control of the virus is poorer in the paediatric population, and that therefore children have longer shedding periods compared to other age groups.<sup>1</sup> The aim of this study was to analyse the influenza A (H1N1)pdm09 virus kinetics and clearance in hospitalized children and to establish their association with different clinical variables.

We conducted a prospective and observational study in the Departments of Paediatrics and Microbiology of 2 hospitals in Valladolid, Spain, and the National Influenza Centre of Valladolid. The study period ranged from week 40 of 2015 to week 20 of 2016, corresponding to the 2015–2016 flu season. We included inpatients aged less than 14 years with laboratory-confirmed influenza A (H1N1)pdm09 virus infection. For the purpose of testing, we collected throat swab samples in patients aged more than 2 years and samples of nasopharyngeal lavage in younger children. The latter allows a more representative sample to be obtained and could overestimate the viral RNA load (VRL) in this group of patients. To analyse the VRL, we collected samples on the day of admission and days 4, 8 and 12 or until negative, if this occurred before day 12. The variables under study included the duration of symptoms from onset, number of long-term excretors (LTE, defined as patients with periods of viral shedding [VS] greater than 8 days from onset), and number of short-term excretors (STE, defined as patients with VS < 8 days). We obtained written informed consent from the legal guardians of every participant.

Influenza A(H1N1)pdm09 virus infection was confirmed by reverse-transcription polymerase chain reaction (RT-PCR) using MAGPIX and NxTAG-RPP reagents (Luminex; Austin, TX, USA). The VRL was measured by quantitative RT-PCR in the influenza-positive samples using a 7500-Fast Real-Time PCR System (Applied Biosystems; Foster City, CA, USA) and LightMix-Kit Influenza A Virus M2 reagents (Roche; Basel, Switzerland). We used the Allplex Respiratory Full Panel (Seegene) reagent kit in every patient, which can detect 19 viral and 7 bacterial targets, including the M2 and H genes of the main endemic strains circulating in Spain. The statistical analysis focused on the comparison of different clinical variables and their relationship with the duration of VS. We used the software SPSS version 20.0 to perform the statistical tests.

We recruited 24 patients (54% male; median age, 17.5 months; age range: 0–120 months) during the study period. Severe asthma and cystic fibrosis were the only comorbidities, detected in two patients (8%), and these were the only patients that received the influenza vaccine. We found the highest VRL in the first sample taken on the day of admission in 87.5% of patients (mean CV<sub>1</sub>, 7032.9 copies/mL; 95% confidence interval [CI], 1131.2–16 418.5), with a decrease in the second sample (mean CV<sub>2</sub>, 239.5 copies/mL; 95% CI, 51.4–547.9). All patients tested negative in the third timepoint. Fifty percent of patients (12/24) were LTEs. The mean length of stay was 7.4 days (95% CI, 5.1–9.9) in the LTE group, compared to 5.6 days (95% CI, 3.4–8.0) in the STE group, a difference that was not statistically significant (Student *t* test *P* = 0.294) (Table 1).

The VRL became undetectable after 9–12 days from onset in 67% (8/12) of LTEs, between 13 and 16 days in 25% (3/12) and after 12 days in 8% (1/12) (Fig. 1). We found viral or bacterial coinfections with influenza in 58.3% (7/12) of LTEs (5 bacterial and 2 viral). Six patients required admission to the paediatric intensive care unit (PICU), 4 of them were LTEs. The 4 LTEs required respiratory support with non-invasive ventilation (NIV), and none required vasoactive drugs. We detected viral or bacterial coinfection in 45.8% of patients (11/24), bacterial in 54.5% (6/11) (involving *Moraxella catarrhalis*, *Streptococcus pneumoniae*, *Staphylococcus aureus* and *Haemophilus influenzae*), and viral in 45.5% (5/11) (involving bocavirus, respiratory syncytial virus and adenovirus). We did not find significant differences in the VRL detected in the first (Student *t* test *P* = 0.180) or in the second (Student *t* test *P* = 0.059) between the LTE and STE groups. The approach to treatment was similar in both groups: 100% received symptomatic management,

☆ Please cite this article as: Sánchez N, Matías V, Alcalde C, Rojo S, Sanz I. Influenza A (H1N1)pdm09 viral clearance kinetics in hospitalized children. *An Pediatr (Barc)*. 2021;95:271–274.

☆☆ Previous presentation: this study was presented as an oral communication at the 67th Congress of the Asociación Española de Pediatría, June 6–8, 2019, Burgos, Spain.