



Assessment of the maturity of the minor in the health field: the perspective of parents and pediatricians

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Abstract

Introduction: rickets is a global health problem. Vitamin D deficiency has become a pandemic, its interest has increased due to its implication in multiple extraskeletal actions.

Material and methods: a survey was conducted by e-mail among spanish paediatricians to study their attitude regarding prophylactic vitamin D supplementation.

Results: 83% of pediatricians have vitamin D prophylaxis policies in their area. 61.6% start prophylaxis in the first two weeks, 81.5% maintain it the first year. 57.2% search for vitamin D deficiency, especially if they work in a hospital.

Conclusions: vitamin D prophylaxis policies are uniform. More than a half of Spanish pediatricians conduct a systematic search for vitamin D deficiency in their patients with risk factors during childhood and adolescence.

Key words:

- Rickets prophylaxis
- Spanish pediatricians
- Survey
- Vitamin D deficiency

Variaciones y diferentes percepciones en la suplementación con vitamina D en la edad pediátrica en España

Resumen

Introducción: el raquitismo es un problema de salud a nivel global. La deficiencia de vitamina D se ha convertido en una pandemia, su interés ha aumentado por la implicación de la misma en múltiples acciones extraesqueléticas.

Material y métodos: se realizó una encuesta a través de correo electrónico entre pediatras españoles para estudiar su actitud en relación con la suplementación profiláctica de vitamina D.

Resultados: un 83% de los pediatras tienen políticas de profilaxis de vitamina D en su área. Un 61,6% inicia la profilaxis en las dos primeras semanas y un 81,5% la mantiene el primer año. Un 57,2% realiza una búsqueda de deficiencia de vitamina D, sobre todo si trabajan en medio hospitalario.

Conclusiones: las políticas de profilaxis con vitamina D son bastantes uniformes. Más de la mitad de los pediatras españoles realizan una búsqueda sistemática mediante analítica de deficiencia de vitamina D en sus pacientes con factores de riesgo durante la infancia y adolescencia.

Palabras clave:

- Deficiencia de vitamina D
- Encuesta
- Pediatras españoles
- Profilaxis raquitismo

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INTRODUCTION

Vitamin D plays a key role in calcium-phosphorus metabolism and bone mass accrual.¹ The main source of vitamin D is its synthesis in the skin through sunlight exposure. The definition of vitamin D deficiency is based on the measurement of the plasma levels of 25-hydroxyvitamin D (calcifediol). The active metabolite, calcitriol (1-25(OH) D3), has a very short half-life, so its plasma levels are very low and change late in the development of deficiency, which poses a barrier to its use as an indicator of vitamin D levels.¹⁻⁵

In recent years, a growing body of evidence supports the importance of vitamin D in extraskeletal functions. Vitamin/hormone D is involved in the direct or indirect regulation of approximately 2000 genes and in the pathogenesis of infectious diseases, allergies, autoimmune diseases, cardiovascular disease, mental disorders, diabetes and tumours^{1,3}; observational studies have also found an association between higher vitamin D concentrations and an improved course in several chronic diseases.¹ The prevalence of vitamin D deficiency is increasing in populations of all ethnicities and geographical regions, and some authors have referred to it as an important global health problem.^{3,4}

Rickets continues to be a health problem in developing countries² and is experiencing a resurgence in Spain in relation to immigration.^{6,7}

When it comes to the cut-off levels used to define vitamin D deficiency,¹⁻⁷ there is sufficient evidence to support threshold levels in adults, some evidence to support its diagnosis in adolescents and much scarcer data for children.^{8,9} Thus, when it comes to the paediatric population, there is no evidence to support the establishment of calcium absorption thresholds in relation to vitamin D levels¹⁰; there are even few studies on the subject of bone health.^{11,12}

In recent years, different scientific and professional societies have issued recommendations concerning the circumstances under which it is indicated to measure vitamin D levels and the thresholds to

be applied to define deficiency, more recently addressing aspects related to its extraskeletal actions. In the consensus document for the Italian population, Saggese *et al.* made a thorough review of the literature,⁵ and reported that the most frequently published threshold used to define vitamin D deficiency was 20 ng/ml (50 nmol/L), including some articles that defined an intermediate status of insufficiency as a range between 20 and 30 ng/ml; the Global Consensus on nutritional rickets proposed a lower threshold.² The Spanish Association of Pediatrics (AEP) has proposed a threshold of 20 ng/ml.¹³

Spain is also consistent with the global trend by which a large percentage of the population has vitamin D deficiency; it has also been described in the paediatric population in several regions, although not uniformly, in newborns, infants, children and adolescents, even in areas of the Mediterranean coast and the south with sufficient UV radiation.¹⁴⁻²⁰

There is an adequate consensus regarding the indications of treatment for rickets, although there may be differences in the recommended treatment²; however, there is no consensus on the indications for prophylaxis and treatment in asymptomatic individuals with low vitamin D levels.

Given the greater growth rate in the first year of life, recommendations also tend to focus on the prevention of rickets in this stage, and, in addition to general recommendations about lifestyle, the main international organizations started to recommend vitamin D prophylaxis (Institute of Medicine,²¹ Endocrine Society³, Global Consensus², American Academy of Pediatrics²²); with small variations, the most frequent recommendation is oral vitamin D supplementation at a dose of 400 IU/day for all infants, independently of the feeding modality, in the first year of life.

Since maternal vitamin D deficiency always has an impact on the newborn² and the half-life of 25 OH vitamin D is of only 2 weeks, prophylaxis should also include pregnant women and be initiated in the newborn at birth.

In Spain, the AEP has also issued similar recommendations,¹³ specifically, supplementation with 400 IU of vitamin D a day in infants up to age 1 year. The working group on prevention in childhood and adolescence (PrevInfad) of the Spanish Association of Primary Care Paediatrics (AEPap)²³ has also made recommendations on the subject, although they are not universal and have not been updated in recent years.

Few studies have focused on the level of knowledge of health care professionals regarding health care interventions, the associated adherence and the factors that may affect their implementation. A recent survey conducted in Spain on the use and knowledge of pseudosciences in paediatric providers evinced that a considerable number of Spanish paediatricians recommended to parents the use of treatments not supported by evidence in their children.²⁴

This situation motivated us to carry out an online survey of paediatricians nationwide to analyse aspects related to vitamin D. The primary objective was to assess the degree of adherence to the guidelines for vitamin D prophylaxis in Spain. The secondary objectives included analysing the awareness and particularities of the implementation of this intervention among paediatric providers and assessing the association between the characteristics of health care professionals and the adherence to different aspects of the current recommendations.

MATERIAL AND METHODS

We conducted a descriptive study through a nationwide online survey by means of the Google Docs platform of the practices and perceptions regarding vitamin D supplementation in the paediatric age group. We distributed the questionnaire through the mailing list of the AEP between 13/10/21 and 30/11/21, sending an initial email followed by a reminder. Inclusion required answering every item of the questionnaire with the exception of one which was optional.

Participation in the survey was anonymous and voluntary, guaranteeing the protection of the data,

and the questionnaire was distributed to the paediatricians included in the mailing list of the AEP, requesting that they forward it to family physicians and general practitioners working with the paediatric population, as they are not included in this mailing list. We calculated that given the total number of members of the AEP, which we estimated at 12 219, we would need 983 to respond to obtain results representative of the population with a precision of 3%, a level of confidence of 95% and using the most conservative estimate for the expected proportion ($p = 1-p$).

The questionnaire (Figure 1) was structured in 3 sections following an initial item requesting consent:

1. Characteristics of the participants (8 items: sex, age, professional profile, years of professional experience, clinical practice setting, employment in public/private/mixed care system, paediatric subspeciality or specific area, autonomous region/city of residence).
2. Knowledge and attitudes regarding vitamin D prophylaxis in newborns and infants (11 items: existence or absence of healthcare policy regarding vitamin D prophylaxis and knowledge of it, perceived degree of adherence, timing of initiation, duration and monitoring of prophylaxis, target population, dosage form).
3. Knowledge and attitudes on vitamin D deficiency diagnosis, prophylaxis and treatment in children and adolescents (6 items: diagnosis of rickets cases, routine assessment of vitamin D deficiency and in which cases, vitamin D dose used for prophylaxis in children and adolescents).

The degree of adherence to vitamin D prophylaxis in infants in the catchment area of each provider was categorised based on the provider's estimations as follows: good adherence, $\geq 80\%$ of cases; moderate adherence, 50-80% of cases and poor adherence, $< 50\%$.

We conducted a descriptive univariate analysis of the categorical data (absolute frequency and percentage distributions) and a bivariate analysis by means of the chi-square test. We considered

Figure 1. Survey on the differences in vitamin D supplementation in the paediatric population in Spain and associated perceptions

Dear colleague:

We request your collaboration with the study "Variaciones y diferentes percepciones en la suplementación con vitamin D en la edad pediátrica en España", which would consist in the completion of a brief questionnaire that would take no longer than 10-15 minutes of your time.

The aim of the study is to establish the patterns of prescribing of vitamin D prophylaxis among paediatric providers in Spain and the potential determinants of this practice.

Participation in the survey is voluntary. The responses are anonymous and the study will adhere to legislation on data protection at all times, and participation involves consent to the entry of the responses to a database for subsequent analysis and publication, with the access and use of the data for researchers restricted exclusively to the aforementioned purposes.

This survey is part of a homonymous research project, which has been approved by the Research Ethics Committee of the Balearic Islands, in adherence with current legislation and the principles and regulations applicable to this type of study.

If you have already received an invitation to participate in this study from a different source, we apologize and request that you do not submit an additional response.

Should you deem it pertinent, we would be thankful if you helped us distribute this questionnaire by forwarding this email to other practitioners in the field of paediatrics.

Thank you very much for your cooperation.

Consent to participation: Yes/No

Section 1. Demographic and professional characteristics:

1. Sex: Female/Male/Other
2. Age range: <30 years/30-40 years/40-50 years/50-60 years/>60 years
3. Professional category: Paediatrician/Family physician/General practitioner/Other
4. Work experience: <5 years/5-10 years/10-20 years/20-30 years/>30 years
5. Care setting: Primary care or outpatient clinic /Hospital
6. Care system: Public/Private/Mixed
7. Subspecialisation or specific area of paediatrics
8. Autonomous community or city in Spain

Section 2. Vitamin D prophylaxis in the first year of life:

1. Does your health care area have established protocols for the prescription of vitamin D?: Yes/No/I don't know
2. Do you know them in detail?: Yes/No
3. At what time do you initiate prophylaxis with vitamin D in infants?: Birth/First 2 weeks post birth /First month post birth /I don't prescribe it
4. How would you rate the overall degree of adherence to vitamin D supplementation in your health care area?: Good (>80% of infants receive vitamin D supplementation)/Moderate (50-80% of infants receive supplementation)/Poor (fewer than 50% of infants receive supplementation)
5. What does of vitamin D do you recommend for prophylaxis?: 0-200 IU/400 IU/600 IU/800 IU/1000 IU
6. For how long do you recommend maintenance of vitamin D prophylaxis during infancy?: < 1 month/1-3 months/3-6 months/1st year of life/18 months/None of the above
7. Do you ask about the adherence to vitamin D prophylaxis during routine child health visits? Never/Rarely/Sometimes/Often/Always
8. For whom do you recommend vitamin D prophylaxis? I don't recommend it/Only for breastfed patients/For all patients
9. Do you ask mothers who are breastfeeding whether they are taking vitamin D supplements?: Never/Sometimes/Often/Always
10. What type of preparation do you prescribe? None/Preparations containing only vitamin D /Preparations containing vitamin D and other compounds (other vitamins or supplements)
11. Do you know the price of the preparation you prescribe?: Yes/No

Section 3. Diagnosis and treatment of vitamin D deficiency in children and adolescents:

1. In the past year, how many of the patients you have managed directly had received a diagnosis of rickets secondary to deficiency?: None/<5/5-10/10-20/>20
2. Do you order blood tests to screen for vitamin D deficiency in your patients?: Yes/No
3. In which groups do you order screening/treatment for vitamin D deficiency? You can choose more than one option: None/ African descent/Arabian descent/Obesity/Short stature/Autoimmune disease /Neuromuscular disease/Steroid therapy/ Antiepileptic medication/Frequent infection/Adolescents/Reduced sunlight exposure/Special diets (vegan/vegetarian)/Chronic renal disease /Malabsorption syndrome/Liver failure or cholestasis
4. In which other circumstances not mentioned in the previous question do you order tests for assessment of vitamin D deficiency in your patients? (free text)
5. Which dose of vitamin D do you recommend for prophylaxis in children?: I do not recommend it/200 IU/400 IU/600 IU/800 IU/1000 IU
6. Which dose of vitamin D do you recommend for prophylaxis in adolescents?: I do not recommend it/200 IU/400 IU/600 IU/800 IU/1000 IU

p values of less than 0,05 statistically significant. The statistical analysis was performed with the software SPSS version 23.

RESULTS

We received a total of 1298 responses (1 refusal to participate), amounting to 11% of the mailing list and 20.9% of the opened emails. **Table 1** presents the questionnaire results regarding the characteristics of the professionals. Eighty percent were female (1039), the age group distribution was uniform save for the group aged less than 30 years, which was the least represented (4.9%). The distribution by years of experience was also relatively uniform. Paediatricians accounted for 99.2% of respondents, most were employed in the public health care system (79.5%), and more than half worked in primary care or outpatient clinic settings (59.6%); the autonomous communities with the highest representation were Madrid, Valencia, Catalonia and Andalusia.

As regards knowledge and perceptions regarding vitamin D prophylaxis in the first year of life (**Table 2**), most respondents reported that there was an established health care policy in their catchment area (83%) and 76.3% knew it in detail. Female respondents were aware of it more frequently than male respondents (77.96% vs. 69.5%, $p < 0.01^*$). Also, 77.9% of respondents considered that adherence to prophylaxis in their catchment area was good.

Prophylaxis was initiated in the first 2 weeks post birth by 61.6% of respondents, and in the maternity ward by only 1.8%. Most respondents (86.5%) recommended prophylaxis for a full year after birth (in Asturias, 63.4% recommended it until 18 months post birth) and in all infants (91.5%), independently of the feeding modality (breastfeeding, formula, mixed) with a supplement containing only vitamin D in nearly all cases (97.7%) and knew its exact or approximate price (74.2%). Confirmation of adherence to prophylaxis was the norm (35.1% asked always and 41.7% nearly always).

In relation to the approach in children and adolescents (**Table 3**), we ought to highlight that rickets is infrequent in Spain (83.7% of respondents had no cases of rickets in their caseloads). We found that 57.2% of respondents routinely ordered blood tests to screen for vitamin D deficiency in specific groups of patients. These patients mainly consisted of those with special diets, reduced sunlight exposure or with specific diseases, such as chronic kidney failure, short stature or malabsorption syndromes (**Table 4**). The proportion of clinicians who ordered blood tests for detection of vitamin D deficiency was greater in the hospital setting compared to the primary care setting (67.6% vs. 50.2%, $p < 0.01$), in the group with 10-20 years of professional experience (67.2%, compared to approximately half in the rest of groups) and in the group aged 30 to 40 years, and varied widely between autonomous communities in Spain (**Figure 2**), although the response rate in some regions was substantially lower. As concerns the different paediatric subspecialties, rheumatologists, nephrologists, endocrinologists, gastroenterologists, haematologists/oncologists and neurologists were the specialists that ordered these tests most frequently (**Table 5**).

The majority of respondents recommended a dose of 400 IU of cholecalciferol for vitamin D prophylaxis (87.4%), but did not recommend prophylaxis during adolescence.

DISCUSSION

The profile of the participants was very similar to the profile of the members included in the mailing list of the AEP (12 219 members, 8144 female), with the exception that there was a higher proportion of female respondents (80% in our survey vs. 66.7% in the mailing list) and a low participation by the youngest age group (4.9% of respondents compared to 15.9% of the mailing list). Most of the female respondents were employed in the primary care system, and the most populous autonomous communities in Spain were the most heavily represented.

Table 1. Personal and professional characteristics of respondents based on survey results (n = 1298 responses), expressed as absolute frequencies and percentages

Sex:	
<ul style="list-style-type: none"> • Female: 1039 (80%) • Male: 258 (19.9%) • Other: 1 (0.1%) 	
Age range:	
<ul style="list-style-type: none"> • <30 years: 64 (4.9%) • 30-40 years: 438 (33.7%) • 40-50 years: 284 (21.9%) • 50-60 years: 290 (22.3%) • >60 years: 222 (17.1%) 	
Professional experience:	
<ul style="list-style-type: none"> • <5 years: 103 (7.9%) • 5-10 years: 277 (21.3%) • 10-20 years: 348 (26.8%) • 20-30 years: 296 (22.8%) • >30 years: 274 (21.1%) 	
Speciality:	
<ul style="list-style-type: none"> • Paediatrician: 1290 (99.2%) • Family physician: 5 (0.4%) • General practitioner: 3 (0.2%) 	
Health care system:	
<ul style="list-style-type: none"> • Public: 1032 (79.5%) • Private: 113 (8.7%) • Mixed: 153 (11.8%) 	
Care setting:	
<ul style="list-style-type: none"> • Primary care: 773 (59.6%) • Hospital: 525 (40.4%) 	
Autonomous community/city in Spain:	
<ul style="list-style-type: none"> • Madrid: 202 (15.56%) • Valencian Community: 200 (15.41%) • Catalonia 194: (14.95%) • Andalusia 142: (10.94%) • Galicia: 72 (5.55%) • Basque Country: 69 (5.32%) • Canary Islands: 66 (5.1%) • Castilla y León: 63 (4.86%) • Aragon: 55 (4.24%) • Murcia: 44 (3.39%) 	<ul style="list-style-type: none"> • Asturias: 41 (3.16%) • Balearic Islands: 40 (3.1%) • Navarre: 34 (2.62%) • Castilla-La Mancha: 31 (2.39%) • Extremadura: 22 (1.69%) • Cantabria: 11 (0.85%) • La Rioja: 9 (0.69%) • Melilla: 2 (0.15%) • Ceuta: 1 (0.08%)
Paediatric subspecialty or field:	
<ul style="list-style-type: none"> • Primary care: 653 (50.24%) • Neonatology: 112 (8.63%) • Gastroenterology, Hepatology and Nutrition: 87 (6.7%) • Endocrinology: 77 (5.9%) • Paediatric general inpatient care: 62 (4.78%) • Emergency care: 51 (3.93%) • Nephrology: 44 (3.39%) • Intensive care: 23 (1.77%) • Cardiology: 23 (1.77%) • Infectious diseases: 22 (1.69%) • Neurology: 22 (1.69%) 	<ul style="list-style-type: none"> • Haematology, Oncology: 21 (1.62%) • Pulmonology: 21 (1.62%) • Immunology, allergy: 21 (1.62%) • Medical resident/intern: 13 (1%) • Rheumatology: 10 (0.77%) • Adolescent medicine: 4 (0.31%) • Social paediatrics: 3 (0.23%) • Palliative care: 3 (0.23%) • Metabolic disease: 2 (0.15%) • Other: 3 (0.23%)

Table 2. Knowledge and opinions about vitamin D prophylaxis in the first year of life

Existence of protocols for prevention of rickets through vitamin D prophylaxis: <ul style="list-style-type: none"> • Yes: 1082 (83.4%) • No: 113 (8.7%) • I don't know: 103 (7.9%)
Knowledge of health care policy regarding prophylaxis: <ul style="list-style-type: none"> • Yes: 990 (76.3%) • No: 308 (23.7%)
Degree of adherence to prophylaxis estimated by respondents: <ul style="list-style-type: none"> • Good (>80% of infants receive vitamin D supplementation): 1011 (77.9%) • Moderate (50 to 80% of infants receive vitamin D supplementation): 206 (15.1%) • Poor (less than 50% of infants receive vitamin D supplementation): 17 (1.3%) • I don't know: 64 (4.9%)
Time of initiation of vitamin D prophylaxis in infants: <ul style="list-style-type: none"> • At birth: 100 (7.7%) • In the first 2 weeks post birth: 799 (61.6%) • 2-4 weeks post birth: 360 (27.7%) • 1 month post birth: 24 (1.8%) • I don't prescribe it/I don't know: 14 (1.1%)
Duration of vitamin D prophylaxis: <ul style="list-style-type: none"> • I do not recommend it: 7 (0.5%) • Up to 6 months post birth: 76 (5.9%) • The entire first year of life: 1123 (86.5%) • Past 1 year, until 18 months post birth: 87 (6.7%)
Recommended vitamin D dose: <ul style="list-style-type: none"> • I do not recommend it: 48 (3.7%) • 0-200 IU: 14 (1.1%) • 400 IU: 1135 (84.7%) • 600 IU: 84 (6.5%) • 800 IU: 10 (0.8%) • 1000 IU: 7 (0.5%)
Assessment of adherence: <ul style="list-style-type: none"> • Never: 47 (3.6%) • Rarely: 138 (10.6%) • Sometimes: 117 (9%) • Often: 541 (41.7%) • Always: 455 (35.1%)
Target population for vitamin D prophylaxis: <ul style="list-style-type: none"> • All patients: 1188 (91.5%) • Only breastfed patients: 100 (7.7%) • I do not recommend it: 10 (0.8%)
Adherence to maternal vitamin D supplementation: <ul style="list-style-type: none"> • Never: 656 (50.5%) • Sometimes: 454 (35%) • Often: 109 (8.4%) • Always: 79 (6.1%)
Type of preparation: <ul style="list-style-type: none"> • None: 11 (0.8%) • Exclusively vitamin D: 1268 (97.7%) • Vitamin D and other compounds: 19 (1.5%)
Knows price of recommended preparation: <ul style="list-style-type: none"> • Yes: 557 (42.9%) • Approximately: 406 (31.3%) • No: 335 (25.8%)

Table 3. Knowledge and opinions about vitamin D prophylaxis in children and adolescents

In the past year, how many of the patients you have managed directly had received a diagnosis of rickets secondary to deficiency?

- None: 1086 (83.7%)
- < 5 cases: 174 (13.4%)
- 5-10 cases: 20 (1.5%)
- 10-20 cases: 7 (0.5%)
- >20 cases: 11 (0.8%)

Do you order blood tests to screen for vitamin D deficiency in your patients?

- Yes: 743 (57.2%)
- No: 555 (42.8%)

What vitamin D dose do you recommend for prophylaxis in adolescents?

- I do not recommend it: 726 (55.9%)
- 400 IU: 176 (13.6%)
- 600 IU: 248 (19.1%)
- 800 IU: 110 (8.5%)
- 1000 IU: 33 (2.5%)

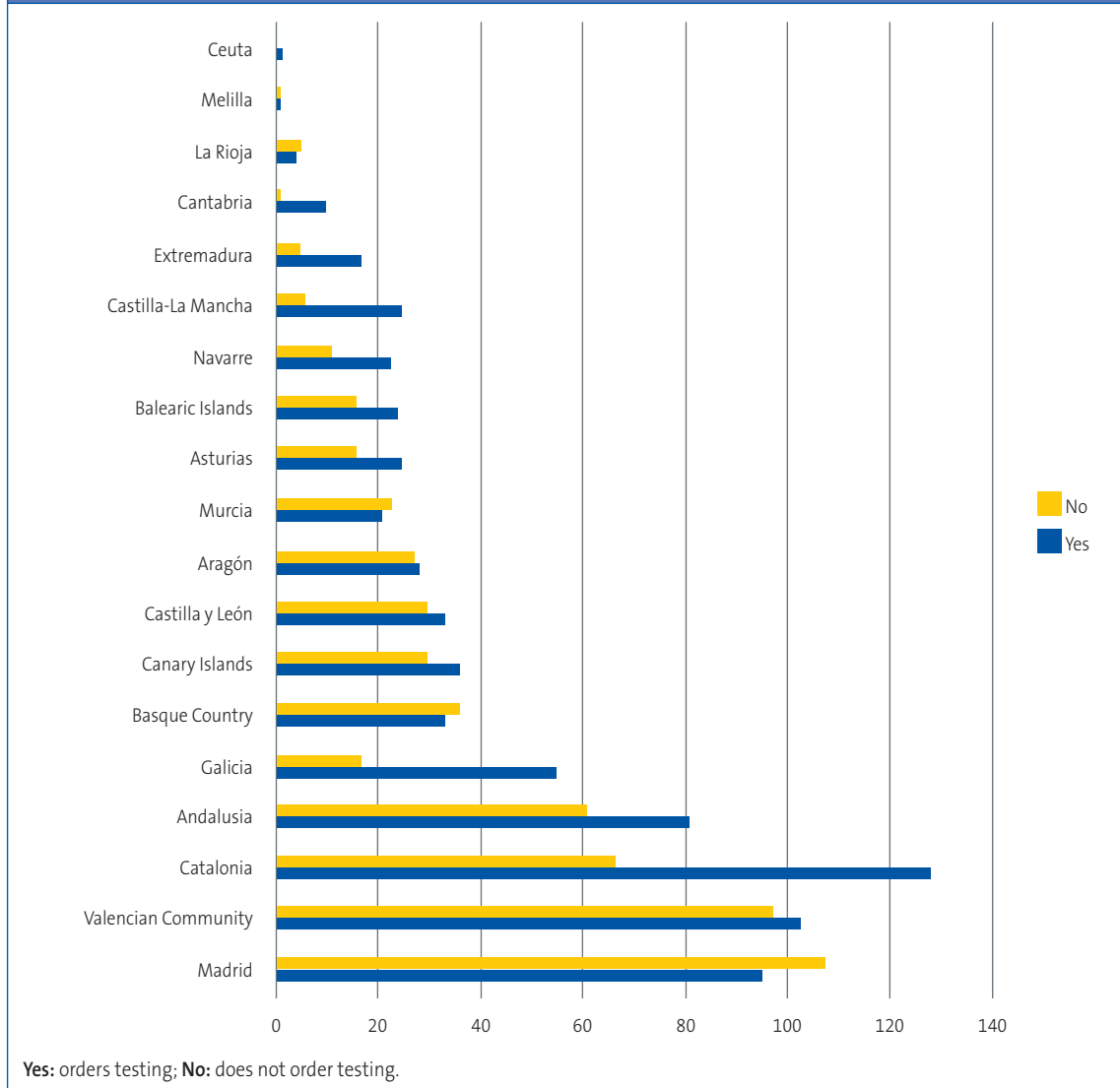
In practically the entire territory of Spain, the administration of cholecalciferol for prevention of rickets and vitamin D deficiency is an established public health policy, and approximately 3 out of 4 respondents reported knowing the policy in detail. Given the lack of uniform and reliable records for the purpose of assessing adherence, we decided to assess the degree of adherence based on the perceptions of health care professionals, as was done in a European survey of experts on the subject.²⁵ In our survey, 77.9% of respondents considered adherence good (that is, that more than 80% of parents adhered to the recommendation).

As for the timing of initiation of prophylaxis, 61.6% of providers reported they started it within 2 weeks of birth. In newborns, vitamin D levels are

equivalent to maternal levels at the end of pregnancy, and the half-life of 25-hydroxycalciferol is 2 weeks, so, as a general rule, prophylaxis should be started in these first 2 weeks post birth.^{2,25} Only 1.8% reported initiation of prophylaxis in the maternity ward, which was found to be associated with greater adherence to the recommendation in the European survey. Most respondents recommended vitamin D supplementation for the entire first year of life, as is generally recommended (in Asturias, vitamin D prophylaxis is indicated for the first 18 months of life). In addition, routine prophylaxis was recommended for all infants, independently of feeding modality, which has also been found to be associated with improved adherence.²⁵ Most providers prescribed preparations

Table 4. Reasons reported by Spanish paediatric providers for ordering measurement of vitamin D serum levels (respondents could choose more than one answer)

- Malabsorption syndromes: 791 (60.9%)
- Special diets: 790 (60.8%)
- Low sunlight exposure: 701 (54%)
- Chronic kidney disease: 648 (49.9%)
- Prolonged steroid therapy: 608 (46.8%)
- Short stature: 586 (45.1%)
- Liver failure/cholestasis: 403 (31%)
- Obesity: 399 (30.7%)
- Autoimmune disease: 397 (30.6%)
- Black skin: 389 (29.97%)
- Antiepileptic medication: 286 (22%)
- Arabian descent: 268 (20.6%)
- Adolescents: 268 (20.6%)
- Frequent respiratory infections: 257 (19.8%)
- None: 165 (12.7%)

Figure 2. Ordering of blood test for assessment of vitamin D deficiency by autonomous community or city in Spain

containing only vitamin D, which was a positive finding, as they are much cheaper.

Adherence is influenced by both patient-related and provider-related factors. In the survey on the factors influencing adherence to vitamin D prophylaxis sponsored by the Bone and Growth Plate Working Group of the European Society for Paediatric Endocrinology (ESPE),²⁵ adherence improved when parents were informed at birth before discharge from the neonatal unit, all babies received supplementation, there was a policy to provide fi-

nancial support to families to acquire vitamin D supplements and adherence monitoring was incorporated into child health check-up visits.

As regards the approach implemented during childhood and adolescence, we ought to underscore that rickets is an infrequent diagnosis in Spain (83.7% of respondents did not have any patients with rickets). We found that 57.2% of providers ordered blood tests routinely to screen for vitamin D deficiency in specific groups of patients. Chief among these groups were patients with spe-

Table 5. Frequency of testing for vitamin D deficiency by paediatric subspecialty

Paediatric subspecialty	Yes	No	Total	%
Primary care	329	323	652	50.4
Neonatology	58	54	112	57.8
Gastroenterology, hepatology and nutrition	73	14	87	83.9
Endocrinology	59	18	77	76.6
Paediatric general inpatient care	41	21	62	66.1
Emergency care	19	32	51	37.3
Nephrology	35	9	44	79.5
Paediatric palliative care	10	13	23	43.5
Cardiology	11	12	23	47.8
Infectious diseases	15	7	22	68
Neurology	17	5	22	77.2
Haematology/oncology	17	4	21	81
Pulmonology	12	9	21	57.1
Immunology, allergy	12	9	21	57.1
Rheumatology	10	0	10	100
Other	26	24	50	52
Total	743	555	1298	57.2

Yes: orders blood test; **No:** does not order blood test; **%:** percent of physicians who order testing.

cial diets, with low sunlight exposure or with diseases such as chronic kidney failure, short stature or malabsorption syndromes (Table 5).

Most respondents recommended a dose of cholecalciferol of 400 IU for vitamin D prophylaxis during childhood, and did not recommend prophylaxis during adolescence.

Some of the risk factors for vitamin D deficiency are dark/black skin, reduced sunlight exposure, low dietary intake, being born to a mother with risk factors for vitamin D deficiency, breastfeeding, chronic diseases such as chronic kidney failure, liver failure and/or cholestasis or malabsorption syndrome, prolonged use of medication such as antiepileptic drugs, steroids or antifungals and obesity.^{1,5-9}

In agreement with the international literature, studies in Spain have studied vitamin D deficiency in these groups, evincing an association with factors such as breastfeeding,²⁶ obesity,²⁷⁻³¹ allergy,³² infectious disease,^{33,34} atopy,³⁵ blood disorders³⁶ and antiepileptic medication,³⁷ among others.

We ought to keep in mind that while experts recommend vitamin D supplementation in many of

these risk groups, the current evidence is insufficient to support routine blood testing for screening of vitamin D deficiency in these patients and, needless to say, there is no evidence supporting routine testing in the healthy population.^{38,39} It is important to be aware of what is supported by evidence and what aspects require further research, as reflected by the recent review by a French consensus group.⁴⁰

As health care professionals, we do not always implement recommendations that we know to be sufficiently supported by evidence and, on the other hand, sometimes implement practices that are not based on evidence.

There are several significant limitations to our study, chief of which are the following: the response rate tends to be small in surveys, and respondents tend to be more motivated and interested in the subject of the survey compared to nonrespondents. We also used a subjective parameter, the perception of providers, to estimate the degree of parental adherence to vitamin D supplementation in their children for prophylaxis. We ought to mention the disparity in the results concerning the number of paediatricians who do not

recommend vitamin D prophylaxis in the 2 items that address this aspect (7 versus 48 paediatricians), which could be due to factors related to the design of the questionnaire or with respondent fatigue or lack of concentration.

To conclude, the highlights of our survey are that health policies regarding prophylactic supplementation with vitamin D in the first year of life are fairly homogeneous throughout Spain, that are well known and that adherence to these recommendations is considered good. On the other hand, up to 57.2% of paediatricians in Spain actively screen for vitamin D deficiency by performing blood tests in some of their patients, despite the lack of evidence in support of this practice.

CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare in relation to the preparation and publication of this article. Partial, very summarised results of the study were presented as an oral communication at the Congress of the Sociedad Española de Endocrinología Pediátrica held in May 2022 in Oviedo, Spain.

AUTHORSHIP

Author contributions: study protocol design, research and manuscript writing (DSE), development of study protocol and original article for publication (rest of authors).

The study was approved by the Research Ethics Committee of the Balearic Islands (file: CEI IB 4510/21PI). It was conducted in adherence with data protection laws, and the researchers had exclusive access to the data, which were only used for the purposes of the study.

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