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INFORMAÇÕES ESSENCIAIS COMPATÍVEIS COM O RESUMO DAS CARACTERÍSTICAS DO MEDICAMENTO. DENOMINAÇÃO DO MEDICAMENTO: Dioralyte, pó para solução oral. **COMPOSIÇÃO QUALITATIVA E QUANTITATIVA: Substâncias activas** g/saqueta: Glicose 3,56; Cloreto de sódio 0,47; Cloreto de potássio 0,30; Citrato dissódico 0,53. **INDICAÇÕES TERAPÊUTICAS:** Correcção da perda de líquidos e electrólitos nos lactentes, crianças e adultos. Tratamento da diarreia aquosa de várias etiologias, incluindo as gastrenterites, em todos os grupos etários. **POSOLOGIA E MODO DE ADMINISTRAÇÃO:** Cada saqueta deve ser sempre dissolvida em 200 ml de água. O volume de Dioralyte reconstituído a tomar deve ser decidido pelo médico assistente, tendo em consideração o peso do doente e o estado e gravidade da situação. Um princípio básico no tratamento da diarreia é a substituição da perda de líquidos e a manutenção de uma ingestão de líquidos suficiente para repor a sua perda nas fezes. A ingestão diária deve ser baseada num volume de 150 ml/Kg de peso nos lactentes e 20–40 ml/Kg de peso nos adultos e crianças. Uma aproximação razoável é a seguinte: -lactentes – 1 a 1,5 vezes o volume alimentar habitual; - crianças – 1 saqueta após cada dejecção diarreica; - adultos – 1 ou 2 saquetas após cada dejecção diarreica. Inicialmente, podem ser necessárias maiores quantidades de Dioralyte para assegurar uma reposição precoce do equilíbrio hidro-electrolítico. Nos estadios iniciais do tratamento da diarreia, todos os alimentos, incluindo o leite de vaca e o leite artificial, devem ser interrompidos. Não se deve no entanto interromper o aleitamento materno. Nas crianças amamentadas sugere-se que se dê à criança o mesmo volume de Dioralyte do que o da alimentação normal, seguindo-se o aleitamento. Pode ser necessário, durante este período, a expressão do leite residual da mama. Após 24-48 horas, quando os sintomas desaparecerem, a dieta normal deve ser retomada gradualmente para evitar o agravamento da situação. O regime sugerido para o tratamento da diarreia infantil grave baseado no peso corporal em Kg é apresentado no quadro anterior. Quando a diarreia é acompanhada de vómitos, sugere-se ingestão frequente de pequenas quantidades de Dioralyte. No entanto, é importante que seja tomado o volume total necessário de Dioralyte. Quando o funcionamento dos rins é normal torna-se difícil superhidratar por via oral e quando existem dúvidas acerca da dosagem correcta, mais vale tomar a mais do que a menos. **CONTRA-INDICAÇÕES:** Não se conhecem contra-indicações ao Dioralyte. No entanto, existem algumas situações em que o tratamento com Dioralyte é inapropriado, tais como por exemplo, situações de oclusão intestinal requerendo intervenção cirúrgica, ou em caso de vómitos persistentes e desidratação grave ou diarreia infantil grave em que será necessária uma terapêutica por via intravenosa. **ADVERTÊNCIAS E PRECAUÇÕES ESPECIAIS DE UTILIZAÇÃO:** O Dioralyte só deve ser reconstituído com água. Cada saqueta deve ser sempre reconstituída em 200 ml de água. Uma solução mais fraca do que a recomendada não contém a concentração óptima de glicose e electrólitos e uma solução mais forte do que a recomendada pode provocar desequilíbrio electrolítico. Se a diarreia não melhorar rapidamente, os doentes deverão ser reavaliados. Nos idosos, a administração de soluções contendo glucose e electrólitos deve ser cuidadosa em caso de alterações renais ou hepáticas graves ou em outras situações em que o balanço electrolítico normal se encontre alterado. Nos lactentes, deve interromper-se durante 24 horas a alimentação com leite de vaca ou leite artificial, que deverão ser reintroduzidos gradualmente quando a diarreia tiver diminuído. Não se deve interromper o aleitamento materno. **EFEITOS INDESEJÁVEIS:** Podem ocorrer náuseas ou vómitos após a administração da solução, em particular quando esta é ingerida com demasiada rapidez. Estão também descritos casos isolados de desconforto abdominal e de obstipação.Data da revisão do texto: Janeiro de 2004.**TITULAR DA AUTORIZAÇÃO DE INTRODUÇÃO NO MERCADO: KORANGI - Produtos Farmacêuticos, Lda. Medicamento não sujeito a receita médica. Para mais informações contactar o Titular da Autorização de Introdução no Mercado**

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COMBINAÇÃO ÚNICA DE POSBIÓTICOS[10]

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NOTA IMPORTANTE: O leite materno é a nutrição ideal para o lactente, com todos benefícios para o melhor início de vida. É importante que na gravidez e durante o aleitamento materno, o/a Profissional de Saúde recomende que a alimentação da Mãe se baseie numa dieta sã e equilibrada. A Mãe deve ser informada e aconselhada sobre o facto de a combinação do leite materno com a alimentação por biberão, durante as primeiras semanas de vida, poder reduzir a produção do leite materno e sobre a dificuldade de voltar atrás na decisão de não amamentar. As implicações financeiras e sociais de utilizar um leite para lactentes devem sempre ser consideradas. No caso da impossibilidade do aleitamento materno e no caso de serem utilizadas fórmulas para lactentes, mediante recomendação do Profissional de Saúde, devem ser seguidas as instruções de utilização dadas pelo fabricante, pois a sua incorreta utilização pode colocar em risco a saúde do lactente.

#Aptamil® Profutura® 1 é a fórmula mais próxima do leite materno da gama Aptamil® leites para lactentes. Aptamil® Profutura® 2 é a fórmula mais próxima do leite materno da gama Aptamil® leites de transição. Aptamil® Profutura® 1 é um leite para lactentes destinado a fins nutricionais específicos de lactentes desde o nascimento até aos 6 meses, como substituto do leite materno, quando não amamentados. **Aptamil® Profutura® 2** é um leite de transição, indicado para bebés a partir dos 6 meses de vida até ao final da lactância, como parte de uma dieta diversificada. É adequado para bebés com mais de 6 meses: não deve ser usado como substituto do leite materno até então.

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HIDRATANTE, APAZIGUANTE, ANTIPRURIDO, ANTIRRECIDIVA

SUAVIZA O PRURIDO[1]
-73% EM BEBÉS E CRIANÇAS

REDUZ A SENSAÇÃO DE DOR[1]
-69% EM BEBÉS E CRIANÇAS

REDUZ O IMPACTO NA QUALIDADE DE VIDA[1]
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+ ÁGUA TERMAL LA ROCHE-POSAY

1. Estudo observacional em 1161 bebés e crianças após 1 mês de utilização.

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EDITORIAL

Progress in growth monitoring for infants born at term and preterm gestations: are we there yet?

Progresso na monitorização do crescimento de bebés nascidos a termo e em gestações prematuras: já lá chegámos?

Joaquim M. B. Pinheiro

Albany Medical Center, Albany, New York, United States of America

The first graphic display of pediatric growth was created by Count Philibert de Montbeillard (1720-1785), illustrating his own son's height progression[1]. With the accumulation of knowledge on population anthropometrics in the late 19th and early 20th centuries, growth charts have become essential reference tools for pediatricians in monitoring the development of growth parameters in their patients[1]. Anthropometric classification, a predicted growth trajectory for individual children, and the identification of deviations from said predictions are useful indicators of possible pathological conditions. To serve the individual child, growth standards must account for normal variation within a population, while enabling the early detection of changes that signal abnormal auxological trajectories in a particular child, e.g., when there is an unexpected crossing of percentile lines.

The tension between generalization and personalization is intrinsic to the construction of growth charts. For example, applying the World Health Organization's growth standards universally results in significant rates of misclassification or misdiagnosis among certain populations, particularly with respect to microcephaly[2]. Even more problematic is the prospect of representing growth across life stages, from fetus to newborn, to infant, to child, to adolescent, to fully grown adult. This difficulty is greatly exacerbated by preterm birth, when the newborn undergoes acute physiological water (and weight) loss, along with a phase of suboptimal nutrition. The variation in predominant determinants of growth trajectories in each life stage makes it impossible to utilize a single chart to track the entirety of an infant's growth. Instead, growth charts are restricted to specific age ranges, e.g., preterm neonates vs. infants vs. children. Because charts that encompass different age ranges are derived from different cohorts, merging charts through smoothing at the age transitions is statistically complex[3]. Moreover, rapid changes in the social environment and improvements in healthcare practices can affect anthropometric parameters even within two decades, requiring growth chart standards to be revised, as exemplified by children with Down syndrome[4,5] and neonates born preterm[3,6]. These issues have led to expressions of concern about the accuracy and usefulness of growth charts in both medical and lay publications[7].

The accuracy of auxological assessments can be improved by using specialized charts for specific target populations, whether these are based on diagnosis[5] or developmental stage, such as prematurity[3]. Understanding and using the panoply of infant growth charts available for various clinical purposes in the inpatient and outpatient realms presents a challenge to neonatal and pediatric clinicians.

To help practitioners negotiate this issue, the Portuguese Neonatal Society published updated guidelines for the use of infant growth charts in this issue of this Journal[8]. This is second time that these

Correspondence:
Joaquim M. B. Pinheiro
E-mail: pinheij@amc.edu

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recommendations have been updated within a decade, and the new information should help clarify the purposes, advantages and limitations of each chart, while promoting consistency in the use of these rapidly evolving tools. Besides growth, there are now charts for neonates born at term, as well as those born preterm, which make it possible to assess whether postnatal weight loss is physiological or potentially pathological. The accessibility of these charts is facilitated by links, provided in the guidelines, to online versions of some charts, enabling clinicians to accurately assess any deviations in growth parameters, including z-scores, as well as print out individualized charts. Some of the chart-generating applications are open-access and downloadable. However, the ability to plot multiple points, or to save the data, is often limited. These shortcomings hinder the usability of these charts for serial assessments, deterring clinicians from adopting them into their routine workflow. Furthermore, the need to simultaneously use charts from different sources (e.g., the 2013 Fenton charts to monitor length and head growth in preterm newborns, while weight changes are tracked by a separate growth calculator) is another barrier to clinical efficiency. Integrating these tools into electronic medical records would facilitate their automated use, but this is largely restricted by legal and security considerations related to proprietary software. Clinicians must therefore choose the recommended charts for the purpose(s) currently intended and share the growth assessments when transitioning from one care provider to another in order to provide effective continuity in growth monitoring by subsequent caregivers[9]. This must be done on paper, unless clinicians in both settings can share raw growth data as part of a common healthcare system. Despite the progress in creating new charts, it remains unclear whether they are being used more broadly and effectively now than when the previous guidelines were published[10]. Applications within PediTools have been implemented successfully in some NICUs[11], but there is no published information on compliance with the routine use of these calculators in most hospitals.

Even though we have not yet achieved the consistent, widespread implementation of infant growth charts across the hospital and post-discharge stages of care, we are witnessing an accrual of knowledge that may eventually assist us in developing highly individualized charts. For term and late preterm neonates, combining weights from birth and postnatal day three with gestational age, sex, mode of delivery, type of feeding, maternal age, and parity yields a highly accurate prediction of weight change during the first week[12]. This is useful for both clinicians and parents to monitor the adequacy of breast feeding during the transition to home, but it may also enable clinicians to implement personalized milk fortification, including protein, early in order to optimize growth[13]. Ultimately, a holistic approach to nutritional management in infants will be needed, taking multiple factors into consideration in interpreting growth patterns[14].

It is soon likely that average parents who share Count de Montbeillard's interest in the growth of their child may simply access the child's growth data on their mobile device, input factors relevant to growth, and generate useful graphs that they can share with their pediatric care providers. This is already available in some mobile applications (e.g., www.mychart.org/Features/) and it allows parents to bridge some of the logistical communication gaps across care transitions. It seems likely that the Portuguese Neonatal Society will need to continue working on evaluating new versions of growth charts, recommending virtual dashboards for growth monitoring, guiding the implementation of these, and advocating for national policies that encourage the development of application programming interfaces to make growth data easily usable by all pediatric caregivers.

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ORIGINAL ARTICLE

Assessment of 'per capita' lunchtime food intake among 6- to 35-month-old children: a study on compliance with national and international standards in the "Creche com Sabor e Saúde" (C2S) project

Lúcia Nova[1], Beatriz Teixeira[1,2], Beatriz Cidade Coelho[1], Inês Dias[4], Mariana Conceição[4], Olívia Pita[1], Liliana Ferreira[2,3,5], Ana Jorge[5], Maria do Céu Monteiro[1,6], Maria Cristina Teixeira Santos[1,7,8], Sara Rodrigues[1,2], Ada Rocha[1,9], Ana Gonçalves[4], and Cláudia Afonso[1,2]*

[1]Faculdade de Ciências da Nutrição e Alimentação, Universidade do Porto, Porto; [2]EPIUnit-Instituto de Saúde Pública, Universidade do Porto, Porto; [3]Laboratório para a Investigação Integrativa e Translacional em Saúde Populacional, Universidade do Porto, Porto; [4]Associação Cultural e Recreativa de Cabreiros, Braga; [5]Cáritas Diocesana de Coimbra, Coimbra; [6]TOXRUN – Toxicology Research Unit, Instituto Universitário de Ciências da Saúde-CESPU, Gandra; [7]ProNutri Group – CINTESIS@RISE-Centro de Investigação em Tecnologias e Serviços de Saúde, Universidade do Porto, Porto; [8]Laboratório Associado RISE, Rede de Investigação em Saúde, Lisbon; [9]GreenUPorto, Sustainable Agrifood Production Research Centre/Inov4Agro, Porto. Portugal

Abstract

Introduction and objectives: To evaluate compliance with *per capita* food supply at lunch in daycare centers. **Methods:** Visits were made on five consecutive days at lunchtime to six daycare centers enrolled in the "Creche com Sabor e Saúde" project (C2S), meaning "Daycare Centers with Taste and Health". To quantify food portions for different age groups (6-8 months, 9-11 months, 12-23 months, and 24-35 months), each meal component (carbohydrate sources, protein sources, and vegetables) and dessert (fruit) underwent random selection and was weighed three times. The averages obtained were compared to C2S project guidelines for *per capita* food supply, in line with national and international recommendations. **Results:** One hundred and forty-five dishes and 244 desserts were analyzed. No dishes were served to infants under nine months. *Per capita* amounts for protein-supplying foods were fulfilled (9-11 months: 14.2 g; 12-23 months: 20.3 g; 24-35 months: 23.9 g). Carbohydrate-rich foods were provided in quantities exceeding the recommendations, particularly for the 12-23 month age group (62.2 g vs. 40 g). For infants under 12 months, no vegetables were offered, and above this age, the average amount provided fell below the minimum guideline of 20 g (12-23 months: 9.4 g; 24-35 months: 10.8 g). The quantity of fruit offered exceeded the recommendations for the 6-8 month (84.6 g > 30-50 g) and 9-11 month (133.3 g > 40-70 g) age groups, aligning with guidelines for the 12-35 months. **Discussion:** Daycare centers inconsistently followed *per capita* food supply guidelines for lunch, with deficits in vegetable intake and excesses in carbohydrate-rich foods and fruit that surpassed the recommended quantities.

Keywords: Food supply. Per capita. Daycare center. Lunch.

***Correspondence:**
Beatriz Teixeira
E-mail: beatrizteixeira.nutricao@gmail.com

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Análise da oferta alimentar per capita ao almoço para crianças dos 6 aos 35 meses de idade: um estudo sobre o cumprimento das orientações nacionais e internacionais do projeto "Creche com Sabor e Saúde" (C2S)

Resumo

Introdução e objetivos: Avaliar o cumprimento das orientações *per capita* de oferta alimentar para almoço em creches. **Métodos:** Realizaram-se visitas, em cinco dias consecutivos, durante o almoço, a seis instituições envolvidas no projeto "Creche com Sabor e Saúde" (C2S). Para quantificar as porções alimentares dos diferentes grupos etários (6-8 meses, 9-11 meses, 12-23 meses, 24-35 meses), cada componente do prato (hortícolas, alimentos fornecedores de hidratos de carbono e de proteína) e da sobremesa (fruta) foi aleatoriamente pesado três vezes. As quantidades médias obtidas foram comparadas com as orientações *per capita* obtidas no projeto C2S, alinhadas com as recomendações nacionais e internacionais. **Resultados:** Analisaram-se 145 pratos e 244 sobremesas. Não foi oferecido prato abaixo dos nove meses. As capitações para os alimentos fornecedores de proteína foram cumpridas (9-11 meses: 14,2 g; 12-23 meses: 20,3 g; 24-36 meses: 23,9 g). Os alimentos fornecedores de hidratos de carbono foram oferecidos em quantidades superiores às orientações, especialmente entre 12-23 meses (62,2 g vs. 30 g). Não foram oferecidos hortícolas abaixo dos 12 meses e, acima desta idade, a capitação foi inferior à orientação mínima de 20g (12-23 meses: 9,4 g; 24-36 meses: 10,8 g). A quantidade de fruta apresentada estava acima das recomendações dos 6-8 meses (84,6 g > 28-50 g) e dos 9-11 meses (133,3 g > 40-70 g), encontrando-se segundo as orientações na faixa etária dos 12-35 meses. **Discussão**: As capitações de alimentos oferecidas ao almoço não se apresentaram de acordo com as orientações em todas as faixas etárias, principalmente para os hortícolas (por defeito) e para os fornecedores de hidratos de carbono (por excesso).

Palavras-chave: Oferta alimentar. Capitações. Creche. Almoço.

Keypoints

What is known
- An appropriate dietary intake is crucial for proper child growth and development.
- Daycare centers are places where children spend a significant part of their day.
- Daycare centers are an important setting for promoting healthy eating habits.

What is added
- This study is the first analysis of lunch quantities provided in daycare settings, aligning with national and international guidelines.
- *Per capita* food supply guidelines at lunch were inconsistently followed in daycare centers.
- In general, vegetables are offered minimally by default, while carbohydrate-rich foods and fruit are provided in excess.

Introduction

As an essential element of health and well-being, food is a fundamental right enshrined in the Universal Declaration of Human Rights of 1948 and in the International Covenant on Economic, Social, and Cultural Rights of 1966[1,2]. This right is also envisaged in the United Nations (UN) 2030 Agenda in five of the Sustainable Development Goals (SDGs 2, 3, 12, 14, and 15). More specifically, it is directly related to combating hunger (SDGs 2) and improving the quality of food and the sustainability of food systems (SDGs 12)[3].

A healthy diet stands as a key determinant of population health and in childhood, it plays a pivotal role in growth and development, underscoring the importance of providing sufficient energy, macronutrients, and micronutrients[4,5].

Developing healthy eating habits[5] and consuming appropriate portions from each food group are crucial for meeting individual needs across all age groups[6], particularly in the early years of life. These factors are pivotal in preventing the early onset of chronic diseases, including type II diabetes, obesity, hypertension, and cardiovascular diseases, among others[7,8]. In recent years, daycare centers have gained recognition as essential social institutions[9] and can play a significant role in promoting healthy food environments[10,11].

Quantifying food consumption involves measuring the quantity of each food or ingredient *per capita* (originating from Latin, meaning per person) in collective feeding to create a specific meal. These measurements can be expressed in grams, kilograms, or liters per person and are essential components of the technical sheets used in meal preparation across various food units[6,12].

Children in daycare centers spend a significant portion of their day in this environment, which also serves as the primary setting for their daily meals. Consequently, establishing *per capita* food supply standards and ensuring meal compliance within these institutions are critical for optimizing child development[13]. Moreover, intervening in meal provision contributes to the effective management of the food service[14,15].

In order to assess children's eating habits in daycare centers, a characterization of the food offerings in these institutions was carried out[16]. Out of all the meals served, lunch inherently stands out as a primary daily meal. Out of all the meals served in daycare centers, lunch naturally represents one of the main meals of the day. However, in the Portuguese daycare context, most centers lack a defined *per capita* food offering. To address this, the "Creche com Sabor e Saúde" project (C2S), meaning "Daycare Centers with Taste and Health", introduced *per capita* food supply guidelines based on reputable entities such as the European Food Safety Authority (EFSA) and the European Society for Paediatric Gastroenterology, Hepatology, and Nutrition (ESPGHAN)[17]. In alignment with the Institute of Medicine (2010), lunch is recommended to contribute approximately 30-35% of the total energy value (TEV) and include a variety of foods from different groups in appropriate quantities[18].

By prioritizing the health and optimal development of the child, it is crucial to scrutinize the quantities of various foods provided at lunch at daycare centers.

Aim

To assess the adherence to *per capita* food supply guidelines at lunch in daycare centers.

Methods

This study was carried out in the "Creche com Sabor e Saúde" (C2S) project, that took place between February 2022 and February 2023, involving 18 Private Social Solidarity Institutions with daycare services for over 800 children aged six to 36 months, located in the northern and central regions of Portugal. C2S was co-financed by the Directorate-General of Health (DGS) and the "Associação Cultural e Recreativa de Cabreiros". The project's team included nutritionists, interns, researchers, and professors from the Faculty of Nutrition and Food Sciences (University of Porto) and the main goal of this project was to improve the eating habits of children up to the age of three in a daycare center[16].

Out of the 18 institutions participating in the C2S project, six daycare centers were selected for this study by order of convenience (according to the availability of the research team and the geographic location of the institutions). The C2S Project was approved by the Faculty of Nutrition and Food Sciences of the University of Porto Ethics Commission (Parecer nº 77/2022/CEFCNAUP/2022).

The data collection of this cross-sectional study took place during lunchtime in the cafeteria over five days in each institution, spanning from October 2022 to January 2023, during the intervention period, in a total of 30 lunches. The lunch comprised soup, the main dish, and dessert. The analysis focused on the components of the main dishes (carbohydrate sources, protein sources, and vegetables) and desserts (fruit). Soup was excluded due to the impracticality of analyzing its various ingredients separately. In terms of vegetables on the plate, 25% of the recommended total vegetable portion for lunch was considered, with the remaining 75% allocated to soup. Exclusion criteria included weeks with holiday celebrations and composite main dishes. Data analysis was conducted separately for age groups (6-8 months, 9-11 months, 12-23 months, and 24-35 months).

1st phase – Data collection

Taking into account the potential bias stemming from fluctuations in the quantity of food served to individual children across different meal distribution phases, each component underwent three separate weighings on each day for every age group[19]. Considering the goal of obtaining three weight measurements for each food component over the course of five days in six different institutions, a total of 90 weight measurements were expected for each component for each age group. These measurements were taken using a Selecline® digital scale, boasting a maximum capacity of 3,000 g and a precision of 1.0 g.

To evaluate the quantity served for each component in the main dish (carbohydrate-supplying food, protein-supplying food, and vegetables), as well as the dessert offered, the following procedures were implemented:

- Record the weight of three empty dishes or bowls employed for serving meals and calculating the mean weight for each set of three;
- Weigh the dishes or bowls, during the standard plating procedure, with each food component of the main dish or dessert offered, and documenting the weights of each component individually;
- Deduct the average weight of an empty dish or bowl from each weighing subsequent to plating.

Table 1. Portions, in grams, defined in the "Creche com Sabor e Saúde" project (C2S) for children's lunch, presented by age group

Food groups	Age (months)			
	(6;8)	(9;11)	(12;23)	(24;35)
Meat, fish and eggs	15 g raw meat OR 12 g cooked meat OR 17 g raw fish OR 15 g cooked fish OR 25 g egg whites OR 20 g egg yolks OR 22 g whole eggs	15g raw meat OR 12 g cooked meat OR 17 g raw fish OR 15 g cooked fish OR 25 g egg whites OR 20 g egg yolks OR 22 g whole eggs	17 g raw meat OR 15 g cooked meat OR 20 g raw fish OR 17 g cooked fish OR 30 g egg whites OR 25 g egg yolks OR 25 g whole eggs	25 g raw meat OR 20 g cooked meat OR 25 g raw fish OR 25 g cooked fish OR 40 g egg whites OR 30 g egg yolks OR 35 g whole eggs
Pulses	7 g raw dried pulses OR 20 g cooked dried pulses OR 25 g raw/cooked fresh pulses OR 10 g lupin beans	7 g raw dried pulses OR 20 g cooked dried pulses OR 25 g raw/cooked fresh pulses OR 10 g lupin beans	10 g raw dried pulses OR 25 g cooked dried pulses OR 30 g raw/cooked fresh pulses OR 15 g lupin beans	10 g raw dried pulses OR 30 g cooked dried pulses OR 40 g raw/cooked fresh pulses OR 15 g lupin beans
Cereals and derivatives and tubers	20 g cooked rice and pasta OR 10 g rice, pasta and other raw grains OR 25 g potatoes and other tubers OR 10 g flours, flakes and semolina OR 15 g starchy fruits OR 30 g grains OR 10 g bread OR 10 g pseudocereals OR 10 g toasts OR 10 g non-dairy porridge OR 7 g dairy porridge	35 g cooked rice and pasta OR 10 g of rice, pasta and other raw grains OR 35 g potatoes and other tubers OR 10 g flours, flakes and semolina OR 25 g starchy fruits OR 45 g grains OR 20 g bread OR 15 g pseudocereals OR 15 g toast OR 10 g non-dairy porridge OR 10 g dairy porridge	35 g cooked rice and pasta OR 15 g rice, pasta and other raw grains OR 40 g potatoes and other tubers OR 15 g flours, flakes and semolina OR 25 g starchy fruits OR 50 g grains OR 20 g bread OR 15 g pseudocereals OR 15 g toasts OR 15 g non-dairy porridge OR 10 g milk porridge	55 g cooked rice and pasta OR 20 g rice, pasta and other raw grains OR 60 g potatoes and other tubers OR 20 g flours, flakes and semolina or 40 g starchy fruits OR 75 g grains OR 30 g bread OR 25 g pseudocereals OR 25 g toasts OR 20 g non-dairy porridge OR 20 g dairy porridge
Vegetables	60 g B vegetables OR 15 g A vegetables OR 40 g B vegetables OR 60 g C vegetables OR 90 g D vegetables	110 g B vegetables OR 30 g A vegetables OR 70 g B vegetables OR 105 g C vegetables OR 160 g D vegetables	125 g B vegetables OR 35 g A vegetables OR 80 g B vegetables OR 120 g C vegetables OR 180 g D vegetables	150 g B vegetables OR 45 g A vegetables OR 100 g B vegetables OR 145 g C vegetables OR 220 g D vegetables
Oil and fat	45 g avocado OR 5 g of olive oil OR 7 g vegetable cream, butters and spreads OR 8 g oleaginous fruits OR 10 g oilseeds	45 g avocado OR 5 g olive oil OR 7 g vegetable cream, butters and spreads OR 8 g oleaginous fruits OR 10 g oilseeds	45 g avocado OR 5 g olive oil OR 7 g vegetable cream, butters and spreads OR 8 g oleaginous fruits OR 10 g oilseeds	55 g avocado OR 6 g olive oil OR 10 g vegetable cream, butters and spreads OR 10 g oleaginous fruits OR 12 g oilseeds
Fruit	30 g A fruit OR 50 g B fruit OR 90 g C fruit OR 122 g D fruit OR 45 ml 100% juices	40 g A fruit OR 70 g B fruit OR 130 g C fruit OR 175 g D fruit OR 60 ml 100% juices	40 g A fruit OR 70 g B fruit OR 130 g C fruit OR 175 g D fruit OR 60 ml 100% juices	45 g A fruit OR 80 g B fruit OR 150 g C fruit OR 205 g D fruit OR 70 ml 100% juices

g: grams.

2nd phase – Data analysis and comparison

The amounts of food served during lunch meals were juxtaposed with the *per capita* food supply benchmarks established by the C2S Project for age groups ranging from six to 35 months (Table 1).

Statistical analysis

To construct the database and conduct statistical analyses, Microsoft Excel Software® version 2003 was employed. A descriptive analysis was undertaken, commencing with the calculation of absolute and relative frequencies for the provision of each food component across different age groups. Subsequently, the mean and standard deviation of the quantity served for each analyzed food component during lunch were calculated in grams, stratified by age groups. To facilitate the comparison of average *per capita* food quantities served against previously established guidelines, line graphs were generated.

Table 2. Average weight, in grams, obtained for each component of the lunch, by age group - "Creche com Sabor e Saúde" project (C2S)

	6-8 months		9-11 months		12-23 months		24-35 months	
Target number of weighings for each component (n)	90		90		90		90	
Meal components (dish and dessert)	**n (%)**	**Average quantity served (g)**	**n (%)**	**Average quantity served (g)**	**n (%)**	**Average quantity served (g)**	**n (%)**	**Average quantity served (g)**
Carbohydrate-supplying foods (dish)	0 (0)	-	7 (7.78)	49,57	66 (73.3)	62.17	72 (80)	67.15
Protein-supplying foods (dish)	0 (0)	-	6 (6.67)	14,17	60 (66.67)	20.28	60 (66.67)	23.88
Vegetables (dish)	0 (0)	-	0 (0)	-	39 (43.33)	9.44	48 (53.33)	10.85
Fruit (dessert)	49 (54.44)	84,63	39 (43.33)	133,31	69 (76.67)	53.13	87 (96.67)	46.64

g: grams.

Results

The institutions included in this study had an average (standard deviation) of 10 (six) children aged six to 11 months, 12 (two) children aged 12 to 23 months and 17 (one) children aged 24 to 36 months.

In the 6-8 month age range, no main courses were provided, and 49 desserts were weighed. The recorded weights for the remaining age groups were as follows: for 9-11 months, seven main dishes and 39 desserts; for 12-23 months, 66 main dishes and 69 desserts; and for 24-35 months, 72 main dishes and 87 desserts. A comprehensive analysis was subsequently conducted on a total of 145 main dishes and 244 desserts.

Table 2 delineates the mean weights recorded for each component within the main dish and each dessert served during lunch, categorized by age group. Regarding dessert, fruit was the only food served across all age groups. Among the entire set of main dishes analyzed (n = 145), all included carbohydrate-supplying foods, 126 (86.9%) featured protein-supplying foods, while 87 (60.0%) incorporated vegetables. It is noteworthy that for the 9-11 month age group, none of the dishes within this category included vegetables. Figure 1 visually depicts the *per capita* averages, measured in grams, alongside the corresponding recommended guidelines for the supply of each food component (carbohydrate-supplying foods, protein-supplying foods, vegetables, and fruit) for each age group examined. It is also important to highlight that between six and eight months, no main dishes were served on any given day.

- Carbohydrate-supplying foods (main dish): the average *per capita* obtained (49.6 g from 9-11 m, 62.2 g from 12-23 m, and 67.2 g from 24-35 m) was always above the proposed guidelines considered (Fig. 1 A).
- Protein-supplying foods (main dish): From 9-36 m, the average *per capita* obtained (14.2 g from 9-11 m, 20.3 g from 12-23 m, and 23.9 g from 24-35 m) was in line with the proposed guidelines considered for all age groups (Fig. 1 B).
- Vegetables (main dish): when offered, the average *per capita* obtained (9.4 g from 12-23 m, and 10.9 g from 24-35 m) was below the suggested limits and did not even reach half of the lower limits of the proposed guidelines considered (Fig. 1 C).
- Fruit (dessert): from 6-11 m, the average *per capita* obtained (84.6 g from 6-8 m and 133.3 g from 9-11 m) was above the proposed guidelines considered. Between 12-35 m, the average *per capita* obtained (53.1 g from 12-23 m, and 46.6 g from 24-35 m) was in line with the proposed guidelines considered (Fig. 1 D).

Discussion

In this study, it was observed that there was an excess of carbohydrate-supplying foods and a deficiency in the availability of vegetables on the plate. Regarding dessert, an excess of fruit was served to infants between six and 11 months of age. Although this remains a relatively understudied area in this age

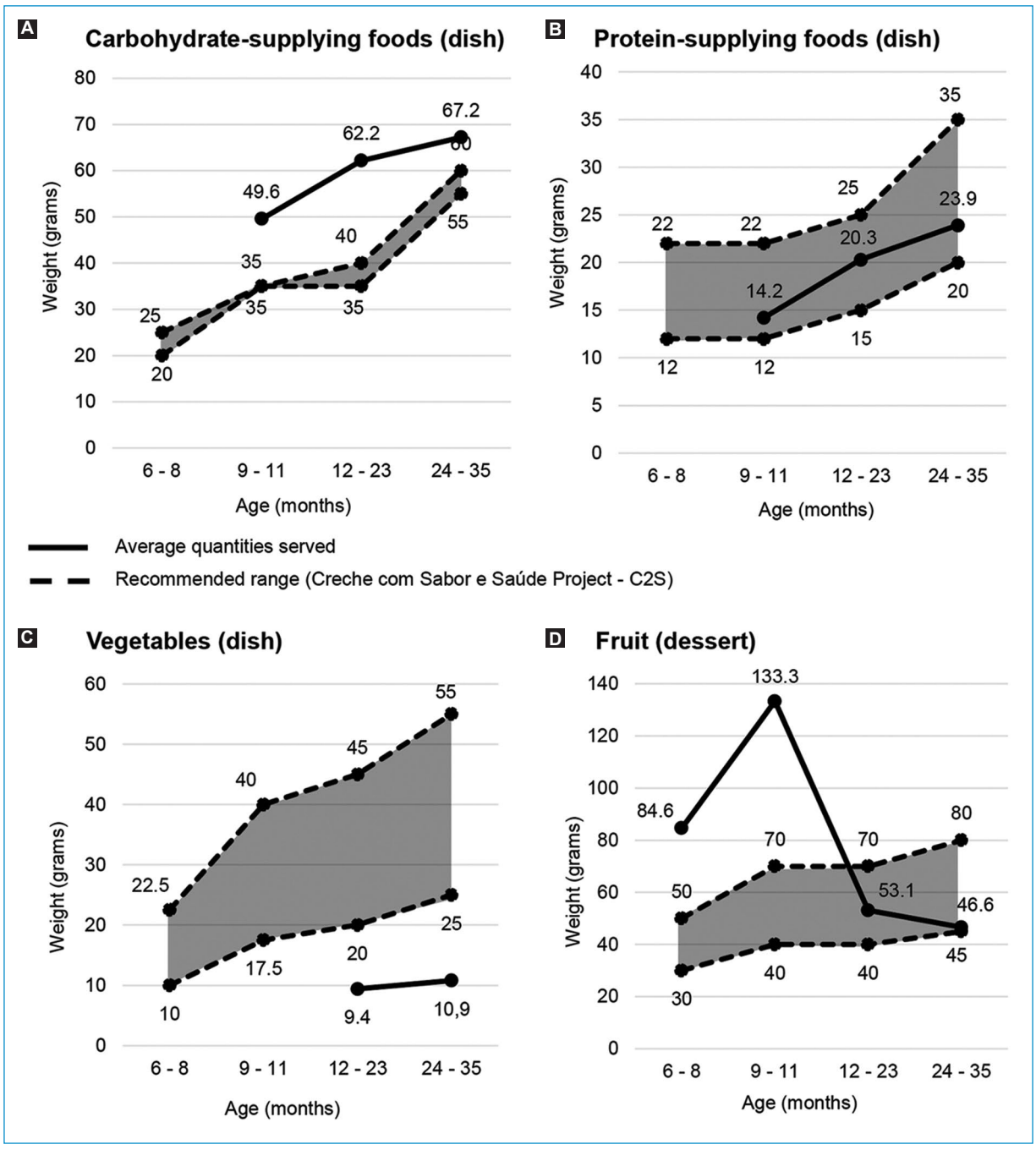

Figure 1. Comparison of the average quantities served at lunch (in grams) with the recommendations defined in the "Creche com Sabor e Saúde" project (C2S), by age group.

group, findings from two studies conducted in daycare centers in New York indicate that fewer than 50% of children adhered to national recommendations for intake across key food groups, which include fruit (excluding juices), vegetables, grains, dairy products, and meat, fish, and eggs, particularly noteworthy as regards vegetables and whole grains[20,21].

Furthermore, according to a systematic review published in 2022 by Elford et al.[22], where the incorporated studies used menus as a tool to characterize and quantify food provision, a significant disparity emerges between the content presented on daycare menus and the actual offerings. This incongruence is particularly pronounced in studies with extended analysis

periods, exemplified by two investigations, one conducted in 2006 by Fleischhacker et al., in the United States and the other in 2015 by Alves et al., in Brazil[23,24]. These findings align with the observations in this study, as vegetables were not consistently served on the plate, despite being listed on all menus under evaluation.

In terms of the supply of carbohydrate-supplying foods, only those visibly present on the plate were taken into account. It was noted that these foods were additionally incorporated into soups within institutions, suggesting that the actual consumption might surpass the average quantities obtained. The high intake of carbohydrates in this age group has the potential to lead to a daily energy intake surpassing the recommended needs, thereby contributing to the rise in the prevalence of childhood overweight, as highlighted in prior research[25]. Furthermore, there is supporting evidence indicating that excessive consumption of this food group during adulthood is associated with an increased likelihood of developing cardiovascular diseases[26].

As regards protein-supplying foods, even though the quantity offered on the plate aligns with the considered guidelines, it is crucial to note that these foods are also incorporated into soups until the first year of age[16]. It is therefore anticipated that the values of protein-supplying foods presented in this study may be underestimated and, in reality, there could be an overconsumption of these foods. Findings from the most recent national food survey (IAN-AF 2015/16) indicate that approximately 80% of Portuguese children up to the age of 10 exceed the recommended intake levels for this food group[27]. Excessive protein intake during childhood is linked to adverse health outcomes throughout life[28,29].

Concerning the observed non-compliance in the provision of vegetables (60% of the dishes included them), one potential justification was informally disclosed by professionals during visits to daycare centers. It was mentioned that, to reduce food waste, only an amount known to be consumed by the child was placed on the plate. This finding aligns with the outcomes of a study conducted in a daycare center in Brazil, involving children aged seven to 12 months[23]. While effective food waste management is paramount in collective feeding contexts[15], it is equally essential to consistently provide this category of food to cultivate taste and palate[30-32]. An emphasis should be placed on raising awareness among daycare professionals to develop strategies that enhance the acceptance of vegetables, given the significance of this food group in promoting pediatric health[7,8]. A systematic review incorporating 80 randomized trials demonstrated that multidisciplinary interventions, incorporating schools and families, facilitated an increase in vegetable consumption among children under five years of age[33]. Moreover, as indicated by a 2017 systematic review by Hendrie et al., strategies such as exposure to vegetables, bolstering professional training, and social planning (involving collaboration between families/guardians, professionals, and institutions to convey a consistent message promoting healthy eating and vegetable consumption) appear to be effective in child-targeted interventions[34].

In the current investigation, an excess of fruit was observed in infants between six and 11 months of age. In this age group, in contrast to the usual practice from 12 months onward, the dessert comprised a blend of various crushed or cooked fruits (such as banana, apple, and pear puree). Given the recognized significance of introducing foods individually during the complementary feeding period, the provision should consist of only a single fruit item per meal to train the child's palate[5]. Furthermore, when fruit was presented in puree form, the quantity served exceeded the recommended amount.

The primary limitation of this study lies in the relatively small number of daycare centers assessed, compounded by the fact that they were selected for convenience. Moreover, it was not always possible to measure each component three times due to logistical issues, such as the number of children in a specific age group present in each day and the pace of the meal distribution. Furthermore, the lunch assessment exclusively involved measuring the food within the main dish and dessert, as quantifying the ingredients used in the soup proved unfeasible. This limitation is even more significant when considering the nine to 11-month-old range since children are in the stage of food diversification, which may involve exploring new flavors/textures without necessarily aiming to fulfill nutritional needs. Thus, the exclusion of soup from these calculations is even more relevant to consider in this age group. However, logistically, it was not possible to weigh its ingredients. For future works, this assessment should be done by weighing each food item used in the preparation of the soups before the cooking process. Another weakness of this study is the exclusion of composite dishes. Finally, it should be noted that although the portions offered were quantified during the C2S project intervention period, this is not considered to have influenced the results, since the overall project was aimed at improving the quality of the menus and not so much at intervening in the quantity offered.

A noteworthy strength of this study is its pioneering nature, being the first conducted in Portugal to quantify

the amount of food provided during lunch in a daycare setting, focusing on the main dish and dessert. Consequently, the results obtained enable analysis and reflection, contributing to the formulation of food policies that foster healthy eating habits in daycare centers.

In conclusion, it is imperative for daycare centers to adopt guidelines that establish standardized processes and procedures regarding portions, technical specifications for products/recipes, menus, and plating. This priority is crucial for promoting health within these environments. Additionally, there is a fundamental need to invest in the training of daycare center staff, addressing the identified needs. Any strategies aimed at promoting well-being and health will remain incomplete without the active participation and awareness of families and the broader community.

Conclusion

The quantity of food provided at lunch did not consistently adhere to the established guidelines, particularly falling short for vegetables and surpassing recommendations for carbohydrate-supplying foods and fruit.

In order to foster healthy growth and development in children, it is imperative to implement standardized procedures and provide training for all professionals engaged in daycare centers. This cohesive approach ensures effective communication with families as well.

Previous presentation

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Authors' contribution

Lucía Nova: Acquisition of data either from patients, research studies, or literature; Analysis or interpretation of data from patients, research results, or literature search; Drafting the article; Final approval of the version to be published (mandatory for all authors); Agreement to be accountable for the accuracy or integrity of the work (mandatory for all authors). Beatriz Teixeira: Conception and design of the study, report, review, or another type of work; Acquisition of data either from patients, research studies, or literature; Analysis or interpretation of data from patients, research results, or literature search; Critical review of the manuscript for important intellectual content; Final approval of the version to be published (mandatory for all authors); Agreement to be accountable for the accuracy or integrity of the work (mandatory for all authors). Beatriz Cidade Coelho: Acquisition of data either from patients, research studies, or literature; Drafting the article; Final approval of the version to be published (mandatory for all authors); Agreement to be accountable for the accuracy or integrity of the work (mandatory for all authors). Inês Dias and Ana Gonçalves: Conception and design of the study, report, review, or another type of work; Acquisition of data either from patients, research studies, or literature; Critical review of the manuscript for important intellectual content; Final approval of the version to be published (mandatory for all authors); Agreement to be accountable for the accuracy or integrity of the work (mandatory for all authors). Mariana Conceição, Maria Cristina Teixeira Santos, Sara Rodrigues, Ada Rocha, and Cláudia Afonso: Conception and design of the study, report, review, or another type of work; Critical review of the manuscript for important intellectual content; Final approval of the version to be published (mandatory for all authors); Agreement to be accountable for the accuracy or integrity of the work (mandatory for all authors). Olívia Pita: Analysis or interpretation of data from patients, research results, or literature search; Drafting the article; Critical review of the manuscript for important intellectual content; Final approval of the version to be published (mandatory for all authors); Agreement to be accountable for the accuracy or integrity of the work (mandatory for all authors). Liliana Ferreira, Ana Jorge, Maria do Céu Monteiro: Critical review of the manuscript for important intellectual content; Final approval of the version to be published (mandatory for all authors); Agreement to be accountable for the accuracy or integrity of the work (mandatory for all authors).

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Conflicts of interest

None.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that no patient data appear in this article. Furthermore, they have acknowledged and followed the recommendations as per the SAGER guidelines depending on the type and nature of the study.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

Use of artificial intelligence for generating text. The authors declare that they have not used any type of

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ORIGINAL ARTICLE

Deliberate self-poisoning in a tertiary pediatric hospital

Vitória Cadete[1], Ema Freitas[1], Inês Fontes[1], Manuel Almeida[2], Fátima Rato[3], António Marques[1], Sandra Pires[2], and Rita Machado[1]*

[1]Pediatric Department, Hospital de Dona Estefânia, Unidade Local de Saúde São José, Lisbon; [2]Child and Adolescent Psychiatry, Hospital de Dona Estefânia, Unidade Local de Saúde São José, Lisbon; [3]Centro de Informação Anti-venenos. Portugal

Abstract

Introduction and objectives: Deliberate self-poisoning (DSP) is a frequent cause of admission at the emergency department during adolescence. Since the beginning of the COVID-19 pandemic, a higher number of cases was reported. This retrospective study aimed to determine DSP prevalence, between 2018 and 2022, as well as the medication used and the method for obtaining it, within the catchment area of a Tertiary Pediatric Hospital Emergency Department (ED) in Portugal. **Methods:** Retrospective study, including patients aged 10 to 17 that lived in the catchment area of the ED and were admitted for DSP less than 7 days prior. By searching with the keywords "DSP" and "deliberate self-poisoning", 2975 records were found, of which 1403 cases were included. Statistical analysis was performed in SPSS with a significance level of 0.01. **Results:** Out of 1403 cases, 87.9% were female, mostly in mid-adolescence and with a previous follow-up appointment with a child and adolescent psychiatrist. The patient's own psychotropic medication were the most used drugs. Episodes with no suicidal intention were more frequent. After the ED, most cases were discharged with a referral for psychiatric follow-up. There was a higher number of DSP in 2021 ($p < 0.01$), with a prevalence of 123.8/100,000. **Discussion:** DSP is growing among adolescents. Cases increased significantly in 2021. We highlight the need for prevention campaigns and vigilance systems to monitor and modify this trend.

Keywords: Deliberate self-poisoning. Deliberate self-harm. COVID-19. Adolescence. Mental health. Attempted suicide.

Ingestão medicamentosa voluntária num hospital pediátrico terciário

Resumo

Introdução e objetivos: Na adolescência, as ingestões medicamentosas voluntárias (IMV) constituem uma causa frequente de admissão na urgência e desde o início da pandemia COVID-19 verificou-se um aumento do número de casos. O estudo teve como objetivo determinar a prevalência de IMV na área abrangida por um Serviço de Urgência Pediátrica Polivalente, entre 2018-2022, bem como caracterizar os fármacos utilizados e o acesso aos mesmos. **Métodos:** Estudo retrospetivo, que incluiu doentes dos 10 até aos 17 anos e 364 dias, residentes na área abrangida, com admissão na urgência por ingestão medicamentosa voluntária há menos de 7 dias. Através de pesquisa de palavras-chave "IMV" e "ingestão medicamentosa voluntária" nos processos, foram encontrados 2975 episódios, dos quais 1403 foram incluídos. Foi realizada análise estatística no SPSS, com significância para $p < 0,01$. **Resultados:** Dos 1403 episódios de IMV, 87,9% eram do sexo feminino, com idade mediana de 15 anos, sendo mais frequente na adolescência média (15-17 anos + 364 dias) e com seguimento prévio em

***Correspondence:**
Vitória Cadete
E-mail: vitoria.cadete@gmail.com

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pedopsiquiatria. Os psicofármacos da medicação habitual foram os fármacos mais utilizados. O destino mais frequente foi alta para consulta. Houve um maior número de ingestões medicamentosas em 2021 (p < 0,01), com uma prevalência de 123,8/100,000. **Discussão:** As IMV são causa crescente e preocupante de vinda ao SU nos jovens, verificando-se um aumento do número de casos em 2021. Realça-se a necessidade de investimento nesta temática, para promoção de iniciativas de apoio, prevenção e seguimento destes jovens, para reverter esta realidade.

Palavras-chave: Ingestão medicamentosa voluntária. COVID-19. Adolescência. Saúde mental. Tentativa de suicídio.

Keypoints

What is known
- Deliberate self-poisoning in adolescence is a common cause of emergency department admissions.

What is added
- There was a notable increase of deliberate self-poisoning in adolescence reported in 2021.
- In most cases, adolescents ingested prescribed psychotropic medication, suggesting inadequate supervision in access to these drugs.

Introduction

Deliberate self-poisoning (DSP) has been defined by the World Health Organization as the deliberate ingestion of a medication beyond the prescribed dose or recognized therapeutic dosage[1].

In children and adolescents, attempted suicide may represent a plead for help, exposing emotional vulnerability and restlessness. The younger the child, the more complex it becomes to assess the intent behind their actions. Suicidal intent is characterized by the presence of thoughts and/or the desire to die or to inflict one's own death. A suicide attempt comprises any non-fatal, self-inflicted, and self-destructive act with a clear intent to die. Notably, DSP stands out as the most common method employed by adolescents who have been hospitalized due to suicide attempts[2-5].

Adolescence is a period marked by change, transformation, and growth, when acquiring social and emotional skills for adult life is vital[6,7]. While some adolescents experience discovery and happiness, others face significant distress, apprehension, and anxiety. DSP has become a frequent cause of admission to the emergency department (ED) in adolescence, with an apparent increase since the beginning of the COVID-19 pandemic[8-12].

In fact, children and adolescents' mental health was deeply affected by the COVID-19 pandemic. This is a critical time in their lives, especially considering that this is when half of the psychopathology begins to manifest[13-14]. Due to the closure of schools and extracurricular activities, children became isolated for long periods of time, affecting their routine, which is crucial, especially for those who already had mental health problems[13].

Thus, this study aimed to determine the number of DSP cases and their prevalence in a Pediatric and Child and Adolescent ED between 2018 and 2022. It also sought to characterize the medications used, the methods of obtaining said medication, and the destination after the ED visit.

Methods

The study followed a retrospective design, analyzing cases of DSP admitted to the ED of a Portuguese Tertiary Pediatric Hospital that includes a Child and Adolescent Psychiatry ED between January 2018 and December 2022.

The inclusion criteria were adolescents aged between 10 and 17 years old, a DSP episode less than seven days prior to admission, and residence in the catchment area of the ED. Cases that did not meet these criteria were excluded.

By searching for the keywords "DSP" and "deliberate self-poisoning" in the records, cases were found and then reviewed by a pediatrician and/or child and adolescent psychiatrist (CAP).

The following parameters were analyzed: age, gender, date of admission, season of the year, area of residence, psychiatric family history, previous episode of DSP, previous follow-up by CAP, medications used, acquisition method, suicidal intent, and destination after the ED.

Regarding the patient's age, cases were divided into early and mid-adolescence (11-14 years old and 15-17 years plus 364 days old, respectively).

In terms of the seasons, winter was considered as running from January to March, spring from April to

June, summer from July to September, and autumn from October to December.

The categories for medications used in DSP and the methods of acquisition were established based on the expert opinions of pediatricians and CAP.

The medications used in DSP were divided into seven categories: psychotropic medications, paracetamol, psychotropic medications and paracetamol, psychotropic medications and others (without paracetamol), psychotropic medications and others (including paracetamol); paracetamol and others (without psychotropic medications), medications not including psychotropic medications or paracetamol, and unknown. For the crosstabulation analysis, four categories were created, namely psychotropic medications, paracetamol, a combination of drugs, and unknown.

The acquisition methods were divided into six categories: patient's usual medication, third-party medication, medications acquired with the intention of DSP, patient's usual medication plus third-party medication, usual medication plus others acquired for the purpose of DSP, third-party medication plus others acquired for this purpose, and unknown. For the crosstabulation analysis, five categories were created, namely the patient's usual medication, third-party medication, medications acquired with the intention of DSP, multiple sources, and unknown.

Upon discharge, the following destinations were considered: discharge with or without referral to CAP; hospital admission, or admission to the Pediatric Intensive Care Unit (PICU).

Descriptive statistical analysis and statistical tests, namely Chi-squared tests, were performed using the Statistical Package for the Social Sciences (SPSS). The significance level (Sig) was set at 1%, with a confidence level of 99%.

Estimates of the resident population in the catchment area, aged between 10 and 17 years plus 364 days old, were used to calculate prevalence. The National Institute of Statistics estimated the resident population between 2018 and 2020, based on the 2011 Census, whereas 2021 and 2022 were based on the 2021 Census. Therefore, is not possible to directly compare the estimates of the 2021 and 2022 ad hoc resident population with the estimates of the resident population between 2011 and 2020.

Results

In total, 2975 episodes were identified. 1572 were excluded, 8 for not belonging to the ED catchment area and 1564 for not corresponding to active DSP episodes. Overall, 1403 episodes were included.

Of these 1403 cases, 87.9% (with a confidence interval (CI) of 85.5%-90.0%, n = 1233) were female adolescents. The median age was 15 years old. Upon subgroup analysis for early and mid-adolescence, it was more frequent in mid-adolescence (64.6%, with a CI of 61.2%-67.8%, n = 906), as detailed in table 1.

In terms of the area of residence, most children and adolescents who engaged in DSP lived in the Metropolitan Area of Lisbon (73.4%, CI of 70.3% - 76.4%, n = 1030), followed by the Algarve (9.8%, CI of 7.8% - 12.0%, n = 137). The prevalence of DSP per 100,000 children, per year, per geographical area can be found in table 2. In 2018, the highest prevalence was in Alentejo Central (81.5 per 100,000), while in 2019 and 2022, it was in the Metropolitan Area of Lisbon (73.4 per 100,000 and 92.9 per 100,000, respectively). In 2020, it was more frequent in the Algarve (85.1 per 100,000), and finally in 2021, in Alto Alentejo (188.7 per 100,000).

Analyzing table 3, which shows the case frequency per year, 16.1% of cases occurred in 2018 (n = 226), 16.9% in 2019 (n = 237), 13.5% in 2020 (n = 189), 33.1% in 2021 (n = 464), and 20.5% in 2022 (n = 287). This difference was found to be statistically significant, indicating an increase in the number of cases in 2021 ($p < 0.01$).

Regarding the prevalence of DSP per 100,000 children aged between 11 and 17 years plus 364 days old from 2018 to 2022, the lowest identified prevalence was in 2020 at 46.3 per 100,000 children, when compared to 2018 and 2019. The prevalence registered in 2021 was 123.8 per 100,000 children, and in 2022, it was 72.0 per 100,000 children.

Considering the season of the year, DSP was more common in autumn (29.8%, CI of 26.7%-33.0%, n = 418), followed by winter (26.2%, CI of 23.2%-29.3%, n = 367), spring (25.8%, CI of 22.8% -28.9%, n = 362), and finally summer (18.2%, CI of 15.7%-21.0%, n = 256).

In 50.6% (CI of 47.1%-54.1%, n = 710) of the episodes, no previous history of DSP was found, so these were categorized as first episodes. These were more frequent than cases with a prior history of DSP (36.3%, CI of 33.0%-39.7%, n = 509). In 13.1% (CI of 10.9%-15.6%, n = 184) of cases, it was not possible determine whether there were any previous episodes via electronic medical records.

Regarding prior CAP follow-up, most cases were already under follow-up (64.7%, CI of 61.4%-68.0%, n = 908), while 34.8% (CI of 31.5%- 38.1%, n = 488) had no history of follow-up, and in 0.5% (CI of 0.1%-1.2%,

Table 1. Demographic characterization of the sample

Demographic characteristics		Frequency (%)		Confidence interval
Gender	Female	1233 (87.9%)		[85.5%-90.0%]
	Male	170 (12.1%)		[10.0%-14.5%]
Age	10	0 (0.0%)		
	Early adolescence 11 12 13 14	 15 (1.1%) 47 (3.3%) 141 (10.0%) 294 (21.0%)	497 (35.4%)	[32.2%-38.8%]
	Mid-adolescence 15 16 17	 338 (24.1%) 313 (22.3%) 255 (18.2%)	906 (64.6%)	[61.2%-67.8%]
Area of residence	Oeste Médio Tejo Metropolitan Area of Lisbon Lezíria do Tejo Alto Alentejo Alentejo Litoral Alentejo Central Baixo Alentejo Algarve Açores	74 (5.3%) 21 (1.5%) 1030 (73.4%) 66 (4.7%) 23 (1.6%) 11 (0.8%) 26 (1.9%) 13 (0.9%) 137 (9.8%) 2 (0.1%)		[3.9%-7.0%] [0.8%-2.5%] [70.3%-76.4%] [3.4%-6.4%] [0.9%-2.7%] [0.3%-1.6%] [1.1%-3.0%] [0.4%-1.8%] [7.8%-12.0%] [0.07%-0.7%]

n = 7) it was unknown (Table 4). When specifically analyzing first DSP episodes, 50.7% (n = 360 of 710 first episodes) were already being followed by a CAP.

Concerning the family history of psychiatric disease, it was present in approximately 63.8% of cases (CI of 60.4%-67.1%, n = 895). In 16.7% of cases (CI of 14.2%-19.4%, n = 234), it was unknown whether there was a family background of psychiatric disease, as detailed in table 4.

Analyzing table 5, in terms of medications used for DSP, the exclusive use of psychotropic medication was significantly most prevalent (53.0%, CI of 49.5%- 56.4%, n = 743). In 8.0% (CI of 6.2%-10.0%, n = 112) of cases, psychotropic medications were taken with other medications, excluding paracetamol. Additionally, in 4.3% (CI of 3.0%-5.9%, n = 60) of cases, they were taken with other medications, including paracetamol, and in 1.9% (CI of 1.1%-3.1%, n = 27) of cases, they were taken exclusively with paracetamol. The exclusive use of paracetamol occurred in 7.3% (CI of 5.6%-9.2%, n = 102) of cases and was associated with other medications, excluding psychotropic drugs, in 6.3% (CI of 4.7%-8.1%, n = 88) of cases. In 13.6% (CI of 11.3%-16.1%, n = 191) of cases, medications other than paracetamol and psychotropic drugs were used. However, in 5.7% (CI of 4.2%-7.5%, n = 80) of cases, it was not possible to identify the medication used.

As regards the method of obtaining the medication, it was part of the child's usual medication in 43.3% of cases (CI of 39.8%-46.7%, n = 607) and in 20.8% (CI of 18.1%-23.7%, n = 292) it was part of a third-party's medication. It was acquired intentionally for DSP in 3.5% of cases (CI of 2.4%-7.5%, n = 49). The acquisition method was unknown in 25.4% of cases (CI of 22.4%-28.5%, n = 356).

The crosstabulation analysis of the ingested medication and the method of acquisition reveals that psychotropic medication included in the patient's usual medication was the most frequently used (37.5%, n = 526, $p < 0.01$). The method of acquisition could not be determined in most cases of DSP using paracetamol alone.

Concerning suicidal intent (Table 4), during observation, this was not identified in 66.6% of cases (CI of 63.2%-69.8%, n = 934) although it was present in 31.6% (CI of 28.4%-34.9%, n = 443) of cases, and was unknown in 1.8% (CI of 0.11%-0.3%, n = 26) of cases. Focusing on episodes with suicidal intent (Table 6), crosstabulation analysis was conducted, which concluded that there was no statistically significant difference between genders or between the presence/absence of a family history of psychiatric disease. Of the 443 cases with suicidal intent, 195 had a previous history of DSP and 311 had had prior follow-up in psychiatric appointments. Crosstabulation of suicide intent and DSP showed that episodes in which both suicide

Table 2. Prevalence per 100,000 children, categorized by geographical area and year

	2018	2019	2020	2021	2022
Oeste	40.4	47.6	23.8	82.7	57.5
Médio tejo	11.5	35.3	5.9	54.9	18.3
Metropolitan Area of Lisbon	71.5	73.4	50.6	135.9	92.9
Alentejo Litoral	0.0	0.0	46.0	105.0	14.6
Baixo Alentejo	11.5	11.5	57.9	59.0	11.7
Lezíria do Tejo	46.5	57.7	53.2	133.4	57.9
Alto Alentejo	54.9	27.8	14.1	188.7	26.9
Alentejo Central	81.5	0.0	27.9	109.0	18.0
Algarve	40.3	58.8	85.1	117.7	67.5
Açores	0.0	0.0	0.0	4.7	4.7

Table 3. Frequency and prevalence of deliberate self-poisoning episodes per 100,000 children in the ED catchment area, between 2018 and 2022

Year	DSP frequency (%)	Prevalence per 100,000 children	p-value
2018	226 (16.1%)	56.1	p < 0.01
2019	237 (16.9%)	58.6	
2020	189 (13.5%)	46.3	
2021	464 (33.1%)	123.8	
2022	287 (20.5%)	72.0	

ED: emergency department.

Table 4. Characterization of episodes according to personal history (previous DSP or follow-up in child and adolescent psychiatry), family history of psychiatric disease, and suicidal intent

Personal history	Frequency (%)	Confidence interval
Previous DSP		
Present	509 (36.3%)	[33.0%-39.7%]
Absent	710 (50.6%)	[47.1%-54.1%]
Unknown	184 (13.1%)	[10.9%-15.6%]
Previous follow-up in child and adolescent psychiatry		
Present	908 (64.7%)	[61.4%-68.0%]
Absent	488 (34.8%)	[31.5%-38.1%]
Unknown	7 (0.5%)	[0.1%-1.2%]
Family history of psychiatric disease	**Frequency (%)**	**Confidence interval**
Present	895 (63.8%)	[60.4%-67.1%]
Absent	274 (19.5%)	[16.9%-22.4%]
Unknown	234 (16.7%)	[14.2%-19.4%]
Suicidal intent	**Frequency (%)**	**Confidence interval**
Present	443 (21.8%)	[28.4%-34.9%]
Absent	934 (66.6%)	[63.2%-69.8%]
Unknown	26 (1.8%)	[0.11%-0.3%]

DSP: deliberate self-poisoning.

intent and previous DSP were absent were the most frequent (41.5%, n = 499, p < 0.01). Finally, crosstabulation of suicide intent and previous psychiatric follow-up demonstrated that episodes without suicide intent in patients with previous CAP follow-up were the most common (42.4%, n = 581, p < 0.01).

In regard to the destination after the ED, the most prevalent was discharge with referral for CAP follow-up (77.3%, CI of 74.3%-80.1%, n = 1084), followed by hospital admission (17.7%, CI of 15.2%-20.5%, n = 249), discharge with no referral (4.9%, CI of 3.6%-6.6%, n = 69), and lastly, admission to PICU (0.1%, CI of 0.0%-0.5%, n = 1).

Discussion

In recent years, the prevalence of DSP has been increasing, and is the most frequent method of attempted suicide in adolescence[12,15].

In a retrospective Australian study, the frequency of intentional poisoning showed an annual rise of 8.39% between 2006 and 2016, resulting in a total increase of 98% during this period[7]. However, a German longitudinal study revealed an increase in PICU admissions after suicide attempts among adolescents during the second lockdown in 2021, following an initial decline during the first lockdown in 2020[9]. Similar results were observed in our study, which showed a statistically significant increase in 2021 following a decrease in 2020, compared to previous years. In 2022, we observed a reduction of cases compared to 2021, although the frequency remained higher than in the preceding years (2018-2020).

There was a lower prevalence in 2020, compared to 2018 and 2019. In 2021, the prevalence was higher, however, it is not possible to accurately conclude that this represents an increase, since the resident population between 2018 and 2020 was estimated from the 2011 Census, while 2021-2022 data came from the provisional results of the 2021 Census, making it not comparable. This constitutes a significant limitation.

A systematic review of children and adolescents' mental health during the COVID-19 pandemic and other

Table 5. Medication used and respective acquisition method

Medication acquisition method (total % of episodes; CI)							
UM	**3rd PM**	**Acquired medication**	**UM + 3rd PM**	**UM + acquired**	**3rd PM + acquired**	**Unknown**	**Total**
607 (43.3%, CI [39.8%-46.7%])	292 (20.8%, CI [18.1%- 23.7%])	49 (3.5%, CI [2.4%-5.0%])	80 (5.7%, CI [4.2%-7.5%])	16 (1.1%, CI [0.5%-2.1%])	3 (0.2%, CI [0.0%-0.1%])	356 (25.4%, CI [22.4%-28.5%])	1403 (100.0%)

Medication used (total % of episodes; CI)								
Psychotropic medication	**Paracetamol**	**Paracetamol and psychotropic medication**	**Psychotropic and others (without paracetamol)**	**Paracetamol and others (including psychotropic)**	**Paracetamol and others (without psychotropic)**	**Others (without psychotropic or paracetamol)**	**Unknown**	**Total**
743 (53.0%, CI [49.5%-56.4%])	102 (7.3%, CI [5.6%-9.2%])	27 (1.9%, CI [1.1%-3.1%])	112 (8.0%, CI [6.2%-10.0%])	60 (4.3%, CI [3.0%-5.9%])	191 (13.6%, CI [11.3%-16.1%])	88 (6.3%, CI [4.7%-8.1%])	80 (5.7%, CI [4.2%-7.5%])	1403 (100.0%)

Medication used vs. respective acquisition method							
	UM	**3rd PM**	**Acquired medication**	**Several sources**	**Unknown**	**Total**	**p-value**
Psychotropic medication	526 (37.5%)	121 (8.6%)	12 (0.9%)	25 (1.8%)	59 (4.2%)	743 (53.0%)	
Paracetamol	4 (0.3%)	27 (1.9%)	17 (1.2%)	1 (0.1%)	53 (3.8%)	102 (7.3%)	
Combinations of drugs	75 (5.3%)	139 (9.9%)	17 (1.2%)	70 (5.0%)	177 (12.6%)	478 (34.1%)	
Unknown	2 (0.1%)	5 (0.4%)	3 (0.2%)	3 (0.2%)	67 (4.8%)	80 (5.7%)	
Total	607 (43.3%)	292 (20.8%)	49 (3.5%)	99 (7.1%)	356 (25.4%)	1403 (100.0%)	
P-value							$p < 0.01$

UM: usual medication; 3rd PM: third-party medication.

Table 6. Crosstabulation of suicidal intent with gender, family history of psychiatric disease, previous DSP, and previous follow-up by child and adolescent psychiatry

	Suicidal intent		p-value
	Present	Absent	
Gender			p 0.22
Female	382 (27.7%)	827 (60.1%)	
Male	61 (4.4%)	107 (7.8%)	
	Suicidal intent		**p-value**
	Present	**Absent**	
Family history of psychiatric disease			p 0.57
Present	287 (24.9%)	596 (51.8%)	
Absent	92 (8.0%)	176 (15.3%)	
	Suicidal intent		**p-value**
	Present	**Absent**	
Previous DSP			p < 0.01
Present	195 (16.2%)	305 (25.4%)	
Absent	204 (17.0%)	499 (41.5%)	
	Suicidal intent		**p-value**
	Present	**Absent**	
Previous psychiatry follow-up			p < 0.01
Present	311 (22.7%)	581 (42.4%)	
Absent	130 (9.5%)	349 (25.5%)	

DSP: deliberate self-poisoning.

previous pandemics concluded that they cause stress, worry, and an increase in risky behaviors, such as substance abuse and suicide attempts. The review also reported that lifestyle changes during the COVID-19 pandemic, such as school closures, social distancing, isolation, and the fear of being infected, were associated with anxious and depressive symptoms, with the female adolescents' group at greater risk[13]. The decline in cases in 2020 may be attributed to a decrease in emergency care during that period, probably due to the population's heightened fear of infection and subsequent avoidance of hospitals. In 2021, we observed an increase, perhaps linked to the lockdowns and the aftermath of this stressful period. In 2022, a reduction was noted compared to 2021, possibly associated with the return to a normal routine. Nevertheless, it was still higher than the previous years, likely indicating a lingering impact on adolescents' mental health as a repercussion of the pandemic.

As regards the season of the year, in our study, cases of DSP were more frequent in autumn and less frequent in summer. Similarly, an Australian study reported a reduction in the frequency of DSP during the summer season[10].

In this study, most DSP episodes occurred in females and in mid-adolescence, with a median age of 15 years. This data is in line with the literature, in which suicide attempts are more common in females, during mid-adolescence[4,12,15]. In our study, most cases occurred in the Metropolitan Area of Lisbon, an urban area. However, when analyzing demographics, the prevalence was not consistently higher in this region. The literature, however, suggests that most cases occur in urban areas[11,16]. Further studies are needed to characterize the differences in demographic prevalence over the years in Portugal more accurately. It is also important to determine whether it is more common in urban or rural areas, which was not accessed and constitutes a limitation of the study.

There was a family history of psychiatric illness in 63.8% of episodes. A systematic review of parental characteristics and children's mental health concluded that there are genetic and environmental parental factors that are important predictors of mental illness in children. While genetic transmission appears to be the most significant factor in the development of depressive symptoms, educational level and substance abuse seem to have both genetic and environmental influence[17].

First episodes of DSP occurred in 50.6% of cases, potentially indicating a decline in children and adolescents' mental health, possibly associated with the digital era and, more recently, the pandemic. With technological innovation, there has been an increase in screen-related activities, including the wider use of social networks. According to several studies, this surge aligns with an increase in the incidence of depressive disorders and suicide among adolescents[18].

Another concerning factor is the occurrence of previous DSP episodes in 36.3% of cases. A study carried out in Singapore demonstrated that the presence of previous episodes of DSP served as a predictor of pre-existing psychiatric illness. The study also concluded that the combination of previous DSP episodes and psychopathology increased the risk of recurrent DSP[12]. Similarly, an Australian study conducted in Melbourne identified a high incidence of pre-existing mental illness in the study population, with a quarter of patients having a prior history of DSP and 67% receiving a prior diagnosis of psychiatric illness[19].

To reduce DSP episodes, the aforementioned study suggests that during any visit to the ED, children and adolescents should undergo screening for prior mental

illness and receive an assessment for psychiatric follow-up to ensure its regularity[19]. In our study, most DSP episodes occurred in adolescents who had undergone previous psychiatric follow-up. However, it was not possible to assess the frequency and format of the appointments (whether in-person or digital), especially during the COVID-19 pandemic, when sustained and constant follow-up would have been even more critical. Nevertheless, it is possible that the appointments were less frequent and predominantly digital, in line with widespread practice at the time, which was suboptimal during such a vulnerable period for mental health.

The drugs most used in DSP were psychotropic medication, accounting for 53.0% of cases, as observed in table 5. This is in line with a study conducted at Coimbra's University Faculty of Medicine, which concluded that benzodiazepines were the most frequently used medications, comprising 41.8% of cases[20]. Nonetheless, there is no consensus in the literature regarding the most frequently used medications or class of medications. An international study identifies painkillers as the most commonly used, while studies conducted in Israel and Romania specifically point to paracetamol[15,16].

In a more detailed analysis of the episodes in which psychotropic medications were used, it was observed that, in most cases, they were part of the person's regular medication. Consequently, one might infer that these individuals were dealing with mental illness and taking regular medication. An American study also notes that psychiatric comorbidities are present in the majority of DSP cases[21].

Concerning paracetamol, which is highly relevant due to its hepatotoxicity and easy accessibility, this was used in approximately 19.8% of cases, either alone or in combination with other medications. This finding deviated from other studies, in which paracetamol holds primary significance in DSP. For instance, an Australian retrospective study spanning the period from 2006 to 2019, covering a population aged five to 19 years old, revealed that paracetamol (alone or in combination) was used in about 30.7% of DSP cases[4]. Similarly, a Romanian retrospective study that evaluated 219 cases of DSP concluded that paracetamol alone was the most frequently used medication, accounting for approximately 23.1% of cases[22]. Based on these findings, the authors of the aforementioned Australian study propose changes to paracetamol accessibility. They suggest measures such as restricting its purchase in pharmacies or other establishments, following the example of the United Kingdom, which in 1998, limited paracetamol purchases to 16 grams in pharmacies and 8 grams elsewhere. This measure proved effective, leading to a subsequent reduction in overdoses, admissions to liver units, and deaths[23]. A similar initiative could potentially be applied to the packaging of psychopharmaceutical drugs.

In approximately 5.7% of cases, it was not possible to determine the medications used, either because they were not mentioned on medical records or, for example, due to the adolescents' inability to identify them. Similarly, as shown in table 5, the origin of the medications used in 25.4% of cases remained uncertain, possibly due to a lack of data in the records, a lack of cooperation from the adolescent, or even the inability of the patient to recall how they acquired the medication.

Children and adolescents' access to medication is always discussed with parents, whether during a follow-up appointment or at the ED. Parents and caregivers are required to store the medication in an inaccessible place and are responsible for administering it as prescribed. Despite these instructions, it was found that the most frequently used medications in DSP were the patient's regular medication in 43.3% of cases, namely psychotropic medications (37.5%, $p < 0.01$), indicating that the recommendations were not followed. Non-compliance with the recommendations needs to be identified and addressed by providing families with more information. Awareness campaigns, such as Safe Kids Worldwide®, assist families and communities in keeping children safe, particularly by educating them about the prevention of DSP[24].

Adolescent suicide is a growing public health concern and is the second leading cause of death in both male and female adolescents in Europe[15]. It is therefore crucial to identify risk factors. A better understanding of these factors could aid in preventing suicide[25]. One of the strongest predictors of suicide risk is a previous suicide attempt. Following an attempt, the risk of suicide is 30 to 50 times higher. The heightened risk persists for the following 10 years, particularly in the first year[4,26]. Other factors may also predict suicide attempts, such as demographic and social factors (female gender or urban environment), family-related factors (disturbed family structure, the death or absence of a parent, or substance abuse), psychological factors (personality traits or coping mechanisms), and school/work-related issues (poor school performance, absenteeism, or difficulties in relationships with peers)[27].

In our study, 66.6% of DSP cases did not exhibit suicidal intent. DSP in adolescents is frequently linked to impulsivity[16,19,28]. However, these episodes should

not be underestimated, as they increase the risk of further suicide attempts[16,26].

Suicidal intent was, however, present in 31.6% of DSP cases, and nearly half of these cases had a previous DSP. Hence, there is a need for parental supervision regarding access to drugs to prevent new DSP episodes[5]. Moreover, of the 443 cases with suicidal intent, 311 had previously attended appointments with a CAP. As previously mentioned, the COVID-19 pandemic may have impacted the follow-up of these patients. Additionally, 130 of the 443 cases with suicidal intent had no follow up by CAP. DSP may represent the initial externalization of a pre-existing psychiatric illness. Therefore, one potential means of prevention is to inquire about the adolescent's mental health and track risk factors during every medical visit[22].

Additionally, establishing a surveillance system for DSP in Portugal, similar to Ireland's Self-Harm Registry, could prove beneficial. In brief, this system records and reports information related to self-harm cases in hospital emergency departments nationwide, providing current national statistics and trend analyses on self-harm incidents. Such comprehensive data not only facilitates the identification of at-risk groups, but also enhances our understanding of self-harm, providing a solid foundation for the development and assessment of preventive strategies[29].

After medical examination at the ED, 73.3% of patients were discharged for CAP follow-up. This is consistent with the absence of suicidal intent in most cases[19,28]. In 4.9% of cases, patients were discharged without a referral. In these cases, follow-up should be conducted by a General Practitioner or Psychologist. Additionally, 17.7% were hospitalized, and 0.1% were admitted to the PICU. It is essential to note that there are only four hospitals in Portugal with inpatient CAP, offering a total capacity of 42-44 beds, which are nearly always fully occupied[30].

This study has some limitations as a single-center study, which does not fully represent the reality in Portugal. Therefore, a multicenter national study is needed to verify whether there is a nationwide increase in DSP. Another limitation is that, as a retrospective study, data was collected from electronic records, which were sometimes incomplete, compromising, for example, the characterization of the method of obtaining the medication used in the DSP. It was also not possible, in some cases, to determine suicidal intent. Hence, prospective studies are needed to better characterize suicidal intent as well as the therapeutic approach.

Conclusion

DSP prevalence is higher in females during mid-adolescence and has been on the rise in recent years. According to several studies, the increasing incidence of depressive disorders and suicide among adolescents might be related to the wider use of social networks. This was further aggravated during the COVID-19 pandemic, as shown in our study. More DSP admissions were observed in 2021 and 2022 than in the previous years, possibly due to emotional distress during the pandemic. Additional studies and vigilance systems will be needed to monitor this trend.

The study did not explicitly address whether patients lived in urban or rural areas, which is crucial information to target prevention initiatives. Although most cases occurred in the Metropolitan Area of Lisbon, the prevalence of DSP varies across regions. As a result, and despite lacking data on the prevalence in the North and Centre regions of Portugal, we recommend the implementation of a comprehensive national prevention campaign.

For DSP, adolescents used mainly psychotropic drugs from their own regular medication. This suggests that these patients not only may suffer from psychiatric illness, but also that these medications lacked proper supervision. Appropriate medication management by caregivers is a crucial area of intervention to reduce DSP.

Identifying risk factors is essential, especially previous episodes of DSP, which is the most significant risk factor for recurrence. At any appointment or visit to the ED, children and adolescents should undergo screening for prior and current mental illness and receive adequate psychiatric follow-up.

In our study, suicidal intent was not found in the majority of cases of DSP and, accordingly, after examination in the ED, most patients were discharged with a referral for CAP follow-up. Preventive measures for DSP should be strengthened. It is vital to raise awareness about mental health issues and to promote educational strategies and support groups for children and families.

Finally, we highlight the need for multicenter prospective studies and the implementation of a national registry system, which may provide additional information and knowledge in this domain.

Previous awards and presentations

Presented as a Poster at the *22º Congresso Nacional de Pediatria.*

Authors' contribution

Vitoria Cadete, Ema Freitas, Inês Fontes, Manuel Almeida, António Marques, and Rita Machado: Conception and design of the study, report, review or other type of work or paper; Acquisition of data either from patients, research studies, or literature; Analysis or interpretation of data either from patients, research studies, or literature; Drafting the article; Critical review of the article for important intellectual content; Final approval of the version to be published; Agreement to be accountable for the accuracy or integrity of the work. Sandra Pires: Conception and design of the study, report, review or other type of work or paper; Anayisis or interpretation of data either from patients, research studies, or literature; Drafting the article; Critical review of the article for important intellectual content; Final approval of the version to be published; Agreement to be accountable for the accuracy or integrity of the work. Fátima Rato: Critical review of the article for important intellectual content; Final approval of the version to be published; Agreement to be accountable for the accuracy or integrity of the work.

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Conflicts of interest

None.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that no patient data appear in this article. Furthermore, they have acknowledged and followed the recommendations as per the SAGER guidelines depending on the type and nature of the study.

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SYSTEMATIC REVIEW AND META-ANALYSIS

Effect of methylphenidate on substance use disorders in children and adolescents with attention-deficit/hyperactivity disorder: a systematic review

Andreia Coutinho[1], *Maria Bento*[1], *Dídia Cruz*[1], *and José Chen-Xu*[2,3]

[1]USF São Julião, Unidade de Saúde Familiar São Julião, Unidade Local de Saúde do Baixo Mondego, Figueira da Foz; [2]Unidade de Saúde Pública, Unidade Local de Saúde do Baixo Mondego, Figueira da Foz; [3]Comprehensive Health Research Centre, Escola Nacional de Saúde Pública, Universidade NOVA de Lisboa, Lisbon. Portugal

Abstract

Introduction and objectives: Attention-Deficit/Hyperactivity Disorder (ADHD) affects 2.2% of children and adolescents. The risk of substance use disorders (SUD) is twice as high among people with ADHD, requiring targeted approaches. This study aimed to evaluate the effect of methylphenidate on the development of substance use disorders among children and adolescents with ADHD, including alcohol, tobacco, and other drugs. **Methods:** A systematic search was conducted on January 26th, 2023. Characteristics of the study and participants were extracted and the risk of bias evaluated. **Results:** From the 2,854 articles identified and 14 registry entries, seven reports were included in the review, accounting for 860 participants, with 526 from intervention (61.2%) and 334 from control groups (38.8%). Treatment with methylphenidate was consistently protective against drug use. **Discussion:** Methylphenidate treatment may be effective in reducing SUD risk, especially in young drug users. Preventive measures are needed, including health promotion and interventions tackling health determinants, particularly in vulnerable groups. Further high-quality studies are required to strengthen our findings.

Keywords: ADHD. Child. Adolescent. Substance use. Methylphenidate.

Efeito do metilfenidato na perturbação de consumo de substâncias em crianças e adolescentes com perturbação de hiperatividade e défice de atenção: uma revisão sistemática

Resumo

Introdução e objetivos: A Perturbação de Hiperatividade/Défice de Atenção (PHDA) afeta 2,2% das crianças. O risco de Perturbação por uso de Substâncias (PS) é o dobro nesta população, exigindo abordagens direcionadas. Este estudo avaliou o efeito do metilfenidato no desenvolvimento de PS entre crianças e adolescentes com PHDA, incluindo álcool, tabaco e outras drogas. **Métodos:** Pesquisa sistemática realizada em 26/01/2023, com extração das características do estudo e dos participantes e avaliação do risco de viés. **Resultados:** Dos 2854 artigos identificados e 14 registos de ensaios clínicos, foram incluídos sete relatos, contabilizando 860 participantes, com 334 no grupo de controlo e 526 na intervenção (61,2%). O tratamento com metilfenidato foi consistentemente protetor contra o uso de drogas. **Discussão:** O tratamento com metilfenidato

***Corresponding author:**
José Chen-Xu
E-mail: josechenx@gmail.com

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pode ser eficaz na redução do risco de PS, especialmente em jovens consumidores de drogas. São necessárias medidas preventivas, incluindo a promoção da saúde e intervenções nos determinantes da saúde. São necessários mais estudos de alta qualidade para fortalecer estes achados.

Palavras-chave: PHDA. Criança. Adolescente. Uso de substâncias. Metilfenidato.

Keypoints

What is known

– Attention-Deficit/Hyperactivity Disorder (ADHD) is a common neuropsychiatric condition in children and adolescents, characterized by persistent patterns of inattention, hyperactivity, and impulsivity.
– Previous studies have established a strong association between ADHD and substance use disorders (SUD), with a substantially increased risk of developing SUD among individuals with ADHD and have as well explored the potential protective effect of methylphenidate (MPH) treatment against the development of SUD in individuals with ADHD.
– The neurobiological basis of this complex comorbidity remains largely unknown, but evidence suggests an interaction between dopaminergic and reward systems, contributing to impulsivity and reward-seeking behaviors associated with both disorders.
– Pharmacological interventions, such as methylphenidate, have been widely used to treat ADHD symptoms and have demonstrated, in some studies, a potential protective effect against the development of SUD in adolescents with ADHD.

What is added

– This systematic review and meta-analysis provide novel insights by synthesizing evidence from seven studies to comprehensively evaluate the effects of methylphenidate treatment on reducing the risk of substance use disorders (SUD) in children and adolescents with ADHD.
– Our findings consolidate evidence that methylphenidate treatment may have a positive impact on reducing the risk of SUD, particularly in youths already engaged in substance use.
– Additionally, we emphasize the importance of preventive measures, such as health promotion and interventions addressing social determinants of health, to mitigate the risks associated with ADHD and substance use.
– Through meticulous analysis of diverse treatment protocols and outcome measures, we have elucidated the heterogeneous nature of existing research. Therefore, this review underscores the need for further high-quality studies to validate and expand our findings, as well as the importance of adopting a multidisciplinary and personalized approach in managing ADHD and substance use disorders in children and adolescents.

Introduction

Attention-Deficit/Hyperactivity Disorder (ADHD) is a common disorder among children and adolescents, with a mean worldwide prevalence of ADHD of 5.6% to 7.6% in this population[1]. ADHD is now acknowledged to persist into adulthood in ~ 50-65% of individuals[2-5]. According to the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-V), the presence of symptoms by age 12 is defined as the age of onset[6,7], with a recent European study showing an earlier onset between 2.3 years and 7.5 years, with an age of diagnosis between 6.2 and 18.1 years old[8]. ADHD shows high concurrent comorbidity of neurodevelopmental and mental health disorders, such as autism spectrum disorder, communication and intellectual disability, and depressive, anxiety, and bipolar disorders[9]. Earlier and more frequent use of alcohol, tobacco, and other drugs has also been linked with ADHD, with a risk of SUD twice as high among this group, making substance use disorders (SUD) one of the most problematic co-occurring disorders[10]. Individuals with ADHD who have low dopamine levels will experience impulsivity and inability to delay gratification, which represents the main developmental risk factors for early substance use and misuse[11]. On the other hand, substances of abuse increase the release of dopamine, reducing inattentive symptoms and inner restlessness.

Approved pharmacological agents for ADHD include stimulants[12]. Methylphenidate is an effective, safe, and well-tolerated psychostimulant and remains the first option of treatment[9]. The main mechanism of action of methylphenidate is the binding and blocking of dopamine transporters and norepinephrine transporters, leading to increased synaptic levels of these neurotransmitters. Adverse effects are sometimes present, with nervousness and insomnia being the most common[13].

Some studies suggest that stimulant treatment has a protective effect against the development of SUD in adolescence and early adulthood[14-16]. However, conflicting findings have been reported in other studies that did not find such a protective effect, with several adverse effects that led to its withdrawal[17,18]. These mixed results warrant further investigation and a comprehensive evaluation of the evidence.

Therefore, the main purpose of this review is to critically assess the existing studies and evaluate the overall evidence regarding the effect of methylphenidate treatment in children and adolescents with ADHD on the development of substance use disorders, including alcohol, tobacco, and other drugs.

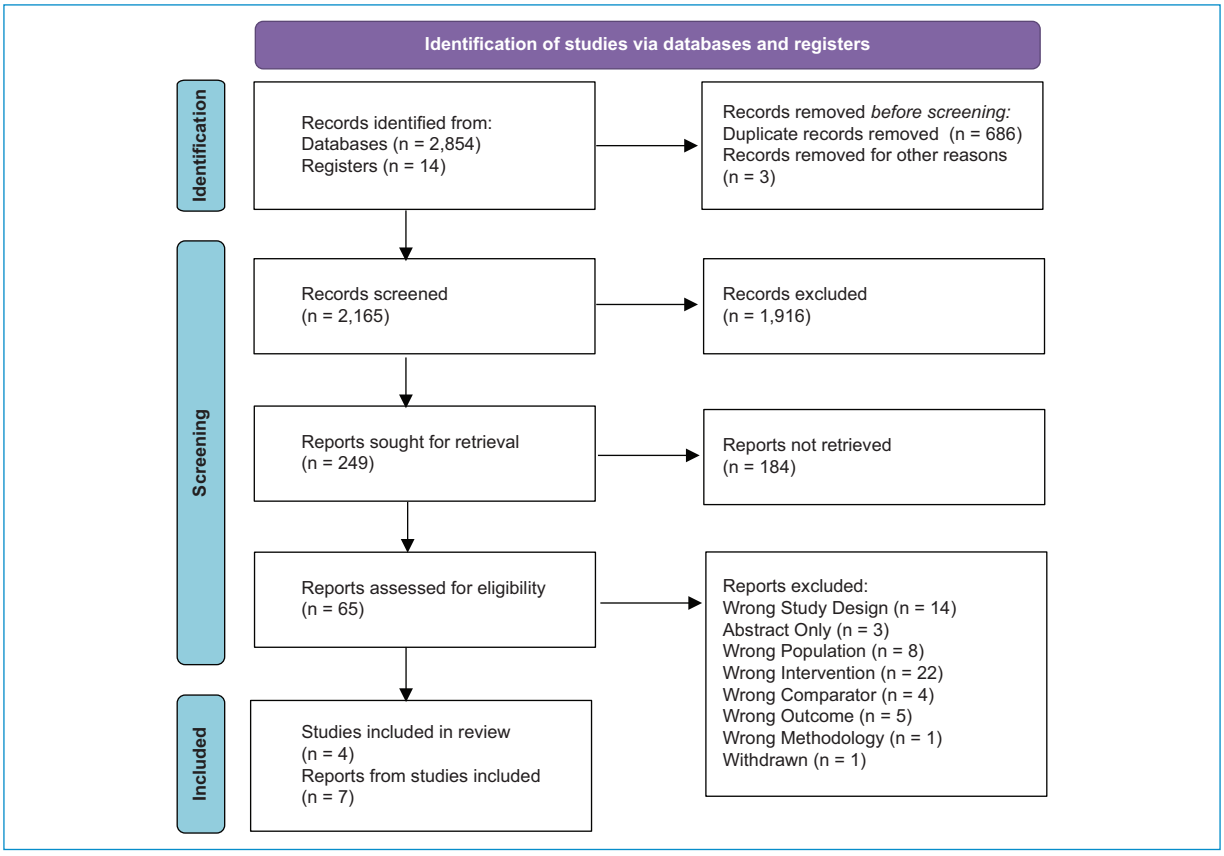

Figure 1. PRISMA flowchart of the studies reviewed in this systematic review.

Methodology

Search strategy

We defined the following patient, intervention, comparison, outcome (PICO) model: P) children and adolescents (< 18 years old) diagnosed with ADHD and with or without reported consumption of alcohol, tobacco, or drugs; I) treatment with methylphenidate; C) without any treatment or placebo; O) substance abuse disorder, including alcohol, tobacco, or other drugs.

We utilized Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) guidelines (Fig. 1) to define the search strategy. Studies were identified through a systematic search of four electronic databases: PubMed, ScienceDirect, Web of Science, and Embase. The search was conducted on January 26, 2023, using the following search query: (ADHD [MeSH Terms] AND (child OR adolescent* or kid*)) AND (methylphenidate [MeSH Terms]) AND (alcohol OR tobacco OR smoking OR drug* OR "drug abuse").

The search was also conducted in registries on January 26, 2023, namely the International Traditional Medicine Clinical Trial Registry and Clinicaltrials.gov. We filtered for the following terms: Population/Age Range: child (birth to 17 years old); Condition: ADHD; Intervention: methylphenidate. For Clinicaltrials.gov, we also applied the following: Outcome: tobacco OR smoking OR alcohol OR drug abuse OR substance use OR substance abuse.

Filters were applied to limit the search to studies involving children and adolescents (< 18 years old) and published between 1994 and 2023, as the consensual classification for ADHD was officially introduced in the Fourth Edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) in 1994[19]. We considered the following types of studies: Clinical trials, Drugs experiments/trials, Randomized controlled trials (RCTs), Cohorts and case-control studies, and other non-randomized studies, as quasi-experimental and natural experiment studies. Studies to be included must have not only the abstract, but also the full text.

We imposed no language or other restrictions on any of the searches.

Articles were screened by title, abstract, and full text, and data was extracted on the study and participants' characteristics, as well as odds ratio (OR) estimates and 95% confidence intervals (CIs).

The protocol of this review was registered in PROSPERO (ID: CRD42023394690).

Selection process

The retrieved articles were analyzed independently in pairs by the four authors (AC, DC, JCX, and MB) in line with pre-defined criteria in PICO to determine eligibility for inclusion. The screening phase comprises the analyses of the articles' titles, abstract, and full text. For the screening phase, possible classifications for the inclusion of the studies are: "Yes", "Unclear", and "No". If the paper is classified as "No" by both researchers, the paper is removed from the database. If it receives an "Unclear" or "Yes", it moves to the next selection phase.

The references of the studies selected which included the same outcome were also analyzed to find other eligible reports. When more than one report referred to the same study or clinical trial, the one presenting the results with more detail or providing data for the largest sample was considered, although any of the reports could be used to obtain information on the study characteristics. When there were disagreements between the reviewers in independent assessments, these were discussed in a specific meeting, and were resolved by consensus or after discussion with another researcher.

The qualitative analysis phase was carried out by 2 people (JC and MB). This step evaluated the existence of the outcome of interest and the completeness of the data, the control group (ADHD children and adolescents not medicated with methylphenidate or with placebo), any possible duplication of participants across studies, and the existence of other drugs utilized for ADHD.

If there was data related to inferential analysis, such as odds ratio or relative risk between the groups defined, these were also considered.

Data extraction and collection

The data was extracted independently by two people (AC and DC) and double-checked by JCX. Data was collected from the articles and entered in a Microsoft Excel spreadsheet, and included the following characteristics, including our defined PICO:

- Study design
- Location
- Population age
- Population gender
- Comparator group
- Duration of the study
- Duration of the follow-up
- Intervention characteristics
- Number of patients in the intervention group
- Number of patients in the control group
- Odds ratio, 95% confidence intervals (95% CI) and respective p values (if available). Due to their variability, these were converted to a logarithmic scale for data analysis purposes.

Risk of bias in individual studies

The Risk of Bias Assessment (RoB) was carried out by MB and JC, using the Cochrane Risk of Bias In Randomized Trials (RoB2), and Risk Of Bias In Non-randomized Studies of Interventions (ROBINS-I). Robvis (National Institute for Health Research) was used for the graphic design of the RoB. The calculation of p values for Egger's test was used to assess publication bias.

The quality of evidence was evaluated using the GRADE approach. For RCTs, the evidence is downgraded from 'high' certainty by one level for serious (or by two levels for very serious) concerns for each study limitation. For non-randomized studies, the level of evidence starts from the lowest level of certainty, and is upgraded. The levels of certainty are defined according to the GRADE checklist[20].

Data synthesis

The qualitative synthesis was performed as a narrative review of the results of the studies, describing the effects of the variables and the main outcomes.

For the quantitative synthesis, we used the inconsistency index I^2 to assess statistical heterogeneity among studies in the meta-analysis. As heterogeneity was high, a subgroup analysis was attempted. OR were reported for each study included and a pooled estimate on forest plots, with a 95% confidence interval (CI), adopting a random-effects model. No treatment or placebo were considered as a reference.

Data synthesis was performed using OpenEpi[21] and IBM SPSS Statistics 28®.

Table 1. Summary of characteristics of the studies analyzed

Study	Type of study	Location	Total n	Mean age	SUD	Intervention	Duration	Dose	n Intervention	n Control	n Interv_ SUD+	n Control_ SUD+	Odds ratio	Confidence interval	p- value
S1	RCT	USA	303	16.5 y (SD = 1.3)	Drugs and alcohol	OROS-MPH	16 weeks	18 mg titrated up to 72 mg during the first two study weeks	151	152			*		
S2													*		
S3					Cigarette and cannabis use						71	82	0.76	0.48-1.19	0.228
S4	Non-randomized	Germany	215	8 y and 9 m	Smoking	Immediate release MPH	2 y and 3 m (SD = 1 y 1 m)	Cumulative total dose was 4.510 mg	106	109	21	29	0.68	0.36-1.30	0.244
S5					Alcohol abuse						15	21	0.69	0.33-1.43	0.323
					Other drugs						14	34	0.34	0.16-0.67	0.002
S6	Non-randomized	USA	141	15.7 (SD = 2.7)	Alcohol	OROS MPH	2 y	Mean of 64.6 ± 25.4 mg/day (1.02 ± 0.33 mg/kg/day)	115	26	12	9	0.22	0.08-0.60	0.003
					Marijuana						3	6	0.09	0.02-0.39	0.001
					Other drugs						2	6	0.06	0.01-0.31	0.001
S7	Non-randomized	USA	201	16.1 (SD = 3.2)	Smoking	OROS MPH	2 y	Daily mean of 61 ± 25 mg (0.97 ± 0.36 mg/kg/day)	154	57	11	11	0.32	0.13-0.79	0.013

*Not possible to calculate due to utilizing different outcome measures.
RCT: randomized controlled trial.

Results

A total of 2,854 articles were identified through searching databases, of which 402 were from PubMed, 487 from ScienceDirect, 1,684 from Web of Science, and 169 from Embase. Searches conducted in the International Traditional Medicine Clinical Trial Registry and Clinicaltrials.gov retrieved three and 11 hits, respectively. After removing duplicates, 2,165 articles remained for screening. Of these, 12 were Cochrane Reviews and 249 were selected for abstract screening. Sixty-five articles were selected for full-text review. Ultimately, seven reports from four studies met the inclusion criteria and were included in the review and meta-analysis.

Specific characteristics of each of these articles are presented in table 1. From the articles selected, three were randomized controlled trials, while the remaining four were non-randomized trials. Two studies were retrospective; these were conducted in Germany. The other studies were prospective and carried out in the United States. Out of the prospective studies, three were conducted for 16 weeks, while the remaining two had an overall intervention duration of two years.

Most of the studies presented a mean age of around 16 years old, except for two, which included children with a mean age of around eight years old. The settings where the studies were conducted varied greatly between referral sources, such as juvenile justice and social services agencies, as well as primary care and mental health clinics, schools, and media advertising.

When accounting for the studies included, there were 862 participants with ADHD, with 526 participants (61.0%) across the intervention groups.

Regarding the intervention, five studies adopted OROS-MPH[22-24;27-28], whereas two others utilized immediate release MPH[25-26].

The dosage also varied among studies. Three studies reported having an initial dose of 18 mg titrated up to 72 mg (or highest dose tolerated) during the first two study weeks[22-24]. Two different studies, conducted by Hammerness et al., employed varying dosage regimens. In the study from 2013, participants received daily doses of OROS MPH that were clinically adjusted during a six-week acute phase, with increments of 9-18 mg/day and a maximum of 1.5 mg/kg/day or 126 mg/day[28]. The mean exposure to OROS-MPH was 10 months, culminating in a mean dose at the endpoint of 61 ± 25 mg. Conversely, in the 2017 study, OROS MPH was prescribed under open-label conditions for up to 24 months, with clinically adjusted doses reaching a maximum of 1.5 mg/kg/day or 126 mg/day. The mean exposure to OROS-MPH in this study was 13 months, with a mean dose at the endpoint recorded as 64.6 ± 25.4 mg/day (1.02 ± 0.33 mg/kg/day)[27].

The remaining two retrospective studies presented a mean cumulative total dose of 4.510 mg MPH per child[25-26].

As for the outcome, three studies defined smoking as the main outcome[24,26,28], one analyzed alcohol dependence[25], and three studies analyzed drug abuse (cannabinoids and other drugs)[22,23,27]. Different studies reported outcomes in various parameters, described below:

- S1: Riggs et al. (2011) defined utilized substance-adolescent reported number of days of use in the past 28 days, while also conducting weekly urine drug screens[22];
- S2: Tamm et al. (2013) utilized reported reduction in substance use days from baseline to week 16[23];
- S3: Gray et al. (2011) analyzed smoking tobacco and cannabis use after a 16-week follow-up period[24];
- S4: Huss et al. (2007) first evaluated self-reported consumption of alcohol and drugs, while also measuring urine sampling[25];
- S5: Huss et al. (2008) analyzed the prevalence of nicotine use disorders, while also recording the ages at first cigarette and at regular smoking (10 cigarettes per day for at least four weeks)[26];
- S6: Hammerness et al. (2017) also utilized urine sample screening, together with self-reported use of alcohol or substances, including marijuana[27];
- S7: Hammerness et al. (2013) evaluated smoking tobacco initiation and persistence, which was self-reported by participants[28].

In the studies analyzed, dependence levels on marijuana and other drugs were as low as 1.7% to 2.6%, whereas cigarette and cannabis dependence combined presented the highest dependence levels, with 47.0%.

Prior to delving into inferential analyses, a risk of bias assessment was conducted using both ROBINS-I and ROB2. The findings unveiled notable concerns across most studies, particularly in the domain of confounding (refer to Fig. 2). Despite these concerns, the overall quality of evidence was deemed moderate according to the GRADE approach. Furthermore, the Egger's test presented a p value of 0.013, denoting publication bias.

A forest plot was conducted (Fig. 3) to understand the various studies and their outcomes. The data was analyzed using a random effects model. However, owing to the substantial heterogeneity observed ($I^2 = 79\%$), we refrained from conducting a meta-analysis on the results.

Figure 2. Risk of bias assessment for the studies analyzed: for S1-S3, ROB2 was applied (top), whereas for S4-S7 ROBINS-I was the indicated framework for evaluation (bottom).

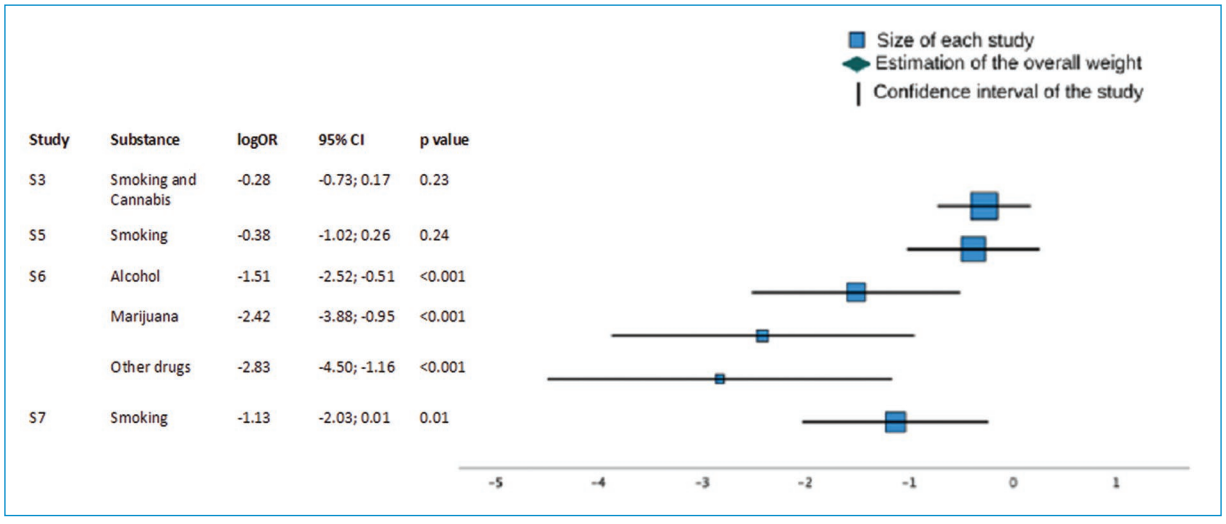

Figure 3. Forest plot with a summary of the papers included.

To comprehend the reasons for this heterogeneity, another forest plot was carried out, taking into account the country of origin, which also separates studies on randomized versus non-randomized.

However, heterogeneity still remained high, with I^2 = 76%. As such, we proceeded with the narrative synthesis of the results reported in the inferential analyses of the selected studies.

Regarding OR values, two of the studies showed diverse significant results, depending on the SUD analyzed, ranging from 0.06 (0.01-0.31; p = 0.001) to 0.32 (0.13-0.79; p = 0.013). Two other studies had non-significant results, mostly related to nicotine dependence.

In reviewing studies that investigated tobacco use, ADHD patients treated with MPH exhibited varying results:

Hammerness, 2013 reported an OR = 0.32 (0.13-0.79; p = 0.013) when compared to non-medicated patients[28], while Huss, 2008 showed a non-significant OR of 0.68 (0.36-1.30; p = 0.244)[26].

The alcohol group also showed benefits on being medicated with MPH, with an OR = 0.22 (0.08-0.60; p = 0.003) in the Hammerness study[27], whereas the study by Huss et al. showed non-significant OR = 0.69 (0.33-1.43; p = 0.323)[25]. The marijuana group had significant results, with an OR = 0.09 (0.02-0.39; p = 0.001), despite its smaller sample[31]. Similarly, other drugs analyzed in the same study by Hammerness also had a small number of individuals with SUD after the intervention, with an OR = 0.059 (0.01-0.31; p = 0.001)[27]. The study by Huss et al. also reported significant outcomes, albeit slightly higher OR = 0.34 (95% CI 0.16-0.67; p = 0.002)[26].

The studies from Riggs, Tamm, Gray et al. reported combined factors - smoking and cannabis, which reported a non-significant OR = 0.76 (0.48-1.19; p = 0.228)[22-24].

Discussion

In this systematic review, we aimed to evaluate the impact of methylphenidate (MPH) treatment on children and adolescents diagnosed with attention-deficit/hyperactivity disorder (ADHD) and co-occurring substance use disorders (SUD). We included a total of seven studies, comprising 862 participants, and provided a comprehensive perspective. Among these, three were randomized controlled trials (RCTs) involving 303 participants, while four were non-randomized trials encompassing 559 participants. The average age of participants was approximately 16 years, except for two studies that focused on younger children with a mean age of about eight years.

These studies employed varied formulations and durations of MPH treatment. The majority utilized OROS-MPH (n = 5), while others utilized immediate-release MPH (n = 2). The treatment duration ranged from a minimum of 16 weeks to a maximum of two years and three months. The outcomes assessed were diverse, with three studies concentrating on smoking, one on alcohol dependence, and three on drug abuse, including marijuana, cannabis, and other substances.

Our findings suggest that the administration of MPH to children and adolescents with comorbid ADHD and SUD demonstrated a discernible impact, particularly in the context of drug use. However, it is important to note that the effect of MPH on smoking outcomes was less evident, potentially indicating nuanced perceptions of smoking compared to other substance use disorders.

In caring for adolescents and young adults facing both SUD and ADHD, it is crucial to address both conditions simultaneously. A thorough assessment of their substance use and ADHD is crucial before initiating treatment. Research underscores the significant benefits derived from a combination of family and individual interventions for adolescents and young adults with SUD[29]. An initial emphasis on addiction control is advised[30,31].

Addressing ADHD, the guidelines from the National Institute for Health and Care Excellence (NICE) advocate for the use of stimulant medications, particularly methylphenidate and other amphetamines, as the primary intervention for both children and adults[32]. These medications have exhibited effectiveness in ameliorating core ADHD symptoms and functional impairments, including in adolescents grappling with ADHD and SUD[33].

For school-aged children and young individuals with mild symptoms of ADHD, NICE recommends behavioral therapy as the initial course of action[32]. However, when medication is warranted, methylphenidate stands as the first-choice medication for those with moderate to severe ADHD symptoms and functional impairment. In children and adolescents with concurrent ADHD and SUD, the timing of pharmacological intervention appears to be a critical consideration[33].

In alignment with NICE, the American Academy of Pediatrics (AAP) also designates stimulant medications as the preferred first-line treatment for elementary school-aged students with ADHD[34]. Stimulants have demonstrated considerable efficacy in mitigating ADHD core symptoms. Selective norepinephrine reuptake inhibitors, such as atomoxetine, and selective α-2 adrenergic agonists, including extended-release guanfacine and extended-release clonidine, are also considered available pharmacological options, although some studies point to the need for further investigations due to safety concerns[35,36].

The European ADHD Guidelines Group (EAGG) aligns with the AAP and NICE, endorsing stimulant medications, such as methylphenidate and amphetamines, as the primary treatment modality for ADHD in children and adolescents. Non-stimulant medications, like atomoxetine, are suggested as a second-line option for those who do not respond well to stimulants or have side effects or contraindications to their use[37].

Cognitive behavioral therapy (CBT) has also demonstrated utility in combination with pharmacotherapy. Several studies have reported a reduction in ADHD scores with combined therapies, underscoring the

augmentative role of CBT in improving ADHD symptomatology[37]. Structured psychotherapies emerge as the preferred treatment approach for addressing both ADHD and SUD[33,38]. Motivational interviewing has also exhibited promise in ameliorating ADHD symptoms, encompassing structured and goal-oriented sessions[39,40].

Given the limited availability of literature specifically addressing psychotherapy for adolescents and young adults with concomitant SUD and ADHD, additional research examining the efficacy of CBT in treating both active disorders and preventing relapse is essential.

Limitations

The mixed results observed in our review and the existing literature emphasize the need for further studies and a comprehensive evaluation of the evidence regarding the use of MPH in ADHD and SUD. Future research should consider larger sample sizes, longer follow-up periods, and standardized outcome measures to provide more robust evidence on the potential benefits and risks of MPH treatment in this specific population.

It is also important to acknowledge the limitations of the studies included. The heterogeneity in study designs, participant characteristics, treatment protocols, and outcome measures across the studies may have contributed to the variability in the observed results. Additionally, the reliance on self-report measures and the potential for selection bias in non-randomized trials should be considered when interpreting the findings.

Furthermore, we presented a publication bias, which can be tackled by investing in the development of high-quality research and thorough literature reviews, which will allow meta-analyses. Additionally, journals should strive to publish legitimate trials regardless of their results, requiring peer reviewers and authors to disclose their conflicts of interest[41].

Conclusion

Overall, these findings suggest that methylphenidate treatment may be effective in reducing the risk of substance use disorders in children and adolescents with ADHD, especially in drug users.

Despite our limited conclusions, further high-quality studies are needed to confirm these results and address potential sources of bias.

Preventive measures for this population are required, by tackling social determinants of health and working closely with vulnerable groups. Health promotion and interventions in the community are needed to decrease the use of substances in this age group.

Authors' contribution

Andreia Coutinho: Conceived and designed the study, report, review, or other type of work or paper; Analyzed or interpreted data from patients, research studies, or literature; Drafted the article; Critically reviewed the article for important intellectual content; Provided final approval of the version to be published; Agreed to be accountable for the accuracy or integrity of the work; Maria Bento: Conceived and designed the study, report, review, or other type of work or paper; Analyzed or interpreted data from patients, research studies, or literature; Drafted the article; Critically reviewed the article for important intellectual content; Provided final approval of the version to be published; Agreed to be accountable for the accuracy or integrity of the work; Dídia Cruz: Conceived and designed the study, report, review, or other type of work or paper; Analyzed or interpreted data from patients, research studies, or literature; Drafted the article; Critically reviewed the article for important intellectual content; Provided final approval of the version to be published; Agreed to be accountable for the accuracy or integrity of the work; José Chen-Xu: Conceived and designed the study, report, review, or other type of work or paper; Acquired data from patients, research studies, or literature; Analyzed or interpreted data from patients, research studies, or literature; Drafted the article; Critically reviewed the article for important intellectual content; Provided final approval of the version to be published; Agreed to be accountable for the accuracy or integrity of the work.

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Conflicts of interest

The authors have no conflicts of interest to declare.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that no patient data appear in this article. Furthermore, they have acknowledged and followed the recommendations as per the SAGER guidelines depending on the type and nature of the study.

Right to privacy and informed consent. The authors declare that no patient data appear in this article.

Use of artificial intelligence for generating text. The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript, nor for the creation of images, graphics, tables, or their corresponding captions.

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REVIEW ARTICLE

The history of adolescent medicine in Portugal

Paula Fonseca[1]* *and Helena Fonseca*[2]

[1]*Serviço de Pediatria do Centro Hospitalar de Médio Ave - Vila Nova de Famalicão;* [2]*Adolescent Medicine Division, Department of Pediatrics, Hospital de Santa Maria, Faculty of Medicine. Lisbon, Portugal*

Abstract

The aim of this paper is to review the early development of adolescent medicine in Portugal.

Keywords: Adolescent medicine. History. Early development. Portugal.

A história da medicina adolescente em Portugal

Resumo

O objetivo deste artigo é rever a evolução da medicina do adolescente em Portugal desde a sua criação.

Palavras-chave: Medicina do adolescente. História. Evolução. Portugal.

Keypoints

What is known

– In the past, adolescent medicine was largely neglected. There is evidence of the importance of investing in adolescent health.

What is added

– Understanding the development of adolescent medicine over the years is crucial to provide the best possible care to adolescents in Portugal.

Introduction

The Portuguese Society for Adolescent Medicine (PSAM) completes its 24th anniversary this year (2024).

To celebrate this date, the authors propose sharing a historical review of adolescent medicine (AM) in Portugal, its first steps and its development.

It has been a long journey, unknown to many, so this report may be a legacy for future generations.

Over the years, memories tend to fade, and generational memory has limits. It would be a shame for younger pediatricians and doctors in general not to be aware of this exciting journey we had the privilege to begin. That is why it is so important to share the process of individualization and empowerment of adolescent health care in Portugal.

Adolescent medicine over the last two centuries

According to the definition of the World Health Organization (WHO), adolescence is the period of life between 10 and 19 years of age.

***Correspondence:**
Paula Fonseca
E-mail: paula.fonseca@chma.min-saude.pt

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AM is the specialty responsible for the clinical care of this age group, one which has a number of characteristics that make it distinct from every other age bracket.

Although it has been recognized for decades all over the world, in Portugal, AM is actually only 24 years old.

For some people, and even among health professionals, AM has been considered a new fashion, conceived with no strong clinical justification and with no need for individuation within pediatrics. This might be considered an inaccuracy, probably grounded on a lack of information[1].

In fact, adolescence has always been recognized both as a source of potential and concern. There are numerous documents about adolescence before Christ, written by Aristotle and Socrates, summarizing the concerns around this specific age, which are not so different from recent reports.

During the 19th century, Stanley Hall (1846-1924), a psychologist working with adolescents in a school setting, became aware of the distinct characteristics and specific needs of adolescents. In 1904, he published the first book on adolescent health entitled "Adolescence – Its Psychology and its relations to physiology, anthropology, sociology, sex, crime, religion, and education"[2].

Some years later, Roswell Gallagher (1903-1995) progressed Hall's view. During his adolescence, Gallagher had to be hospitalized for a considerable length of time due to a tuberculosis infection. Probably as a result of this event, he became quite sensitive to the issues related to adolescent health. When he graduated in medicine, he began working as a school physician[2,3]. He became so interested in adolescents' specific characteristics and needs that he felt the urge to share these concerns with his colleagues. In 1941, he organized the American Academy of Pediatrics' first symposium on AM. Ever since then, this "new" medical specialty has grown and in 1951 he created the first adolescent inpatient unit at Boston Children's Hospital, where he worked until his retirement in 1967. This is why he is considered the "father of Adolescent Medicine"[1].

In 1967, a formal academic program in AM was initiated in the Bronx by the Division of Adolescent Medicine at the Montefiore Medical Centre/Albert Einstein College of Medicine.

In 1968, the Society for Adolescent Medicine (SAM) was created. The stated goals of the SAM were "to improve the quality of health care for adolescents, to encourage the investigation of normal growth and development during adolescence, to study those diseases that affect adolescents, to stimulate the creation of health services for adolescents, to increase communication among health professionals who care for adolescents, and to foster and improve the quality of training of those individuals providing health care to adolescents"[1].

The American Board of Pediatrics administered the first examination for sub-board certification in AM in November 1994. In 1998, the Accreditation Council for Graduate Medical Education, through its Pediatric Residency Review Committee, accredited 16 AM fellowship-training programs[1].

Adolescent medicine in Portugal

In Portugal, by the end of the 20th century (more precisely, in the 1980s), pediatrics was responsible for the surveillance of children and adolescents only up to the age of 12.

Traditionally, adolescents were followed in primary care by general practitioners, but when there was a need for hospital attendance or hospitalization there were neither specific wards nor health professionals with specific training in attending adolescents.

Because of the specific characteristics and health needs of adolescents, many health professionals did not feel comfortable in treating adolescents, and therefore the easiest way to deal with this was to assume that adolescents were a healthy group with no need for a specific approach.

Of course, this cannot be true, otherwise we would be thinking like the old shepherd in *Winter's Tale III (William Shakespeare* 1564-1616): "I wish there were no age between ten and three-and-twenty, or that youth would sleep out the rest, for there is nothing in the between but getting wenches with child, wronging the ancientry, stealing, fighting"[4].

Meanwhile, Maria de Lourdes Levy (1921-2015), a pediatrician and the first female full professor in pediatrics in Portugal, started a lively discussion on the emergence of this "new age group" within pediatrics and in 1993 she wrote a paper entitled "Adolescentes. Nova disciplina em Pediatria?"[5] Her vision facilitated the creation in 1996 of the first Portuguese adolescent outpatient clinic in a pediatric department, at Hospital de Santa Maria, headed by Helena Fonseca. At that time, she was a young pediatrician who decided to obtain specialized training at the University of Minnesota, where she was awarded her master's degree. That same year, the clinic was invited to organize the 4th European Meeting of the International Association for Adolescent Health (IAAH) in Lisbon, under the topic

"O adolescente e a família numa sociedade em mudança". This meeting hosted more than three hundred health professionals who discussed the topic under different angles at the Lisbon Catholic University.

In the same decade, a few other pediatricians with the same concerns and sensitivity began considering adolescence as an integral part of pediatrics.

In 1997, another outpatient clinic was created in Viseu at the pediatric department of Hospital de São Teotónio by pediatrician Carlos Figueiredo, and another in 1999 in Porto at the pediatric department of Hospital Geral de Santo António by Paula Fonseca.

In 1999, Lawrence Neinstein was given the Society for Adolescent Medicine 'Visiting Professor Award' and the recipient was Hospital de Santa Maria, Lisbon. The intention of this award is to provide an educational experience in AM for a group of healthcare providers who may not otherwise have the opportunity to benefit from specialized expertise. The initiative hosted a group of pediatricians coming from across the country and was crucial for consolidating the field at the national level and changing the paradigm.

At that time, there was no official representative of Portugal in the international organizations of AM. However, Helena Fonseca was already internationally recognized as a pediatrician with huge experience in this area and she was regularly invited to participate in various international events to represent Portugal. This situation had to become official and a Portuguese association had to be created. Helena Fonseca joined other colleagues and proposed the creation of a Portuguese Society of Adolescent Medicine (PSAM) to the Portuguese Society of Pediatrics (PPS).

The name and the logo (Fig. 1) of the proposed society were agreed upon by all the pioneer members, and it was consensually accepted that it should be named 'Sociedade de Medicina do Adolescente' instead of 'Sociedade de Medicina da Adolescência", due to the importance we wanted to give to the adolescent as an individual person. Following the same reasoning, the logo represents the individual adolescent at the center of our attention, painted in two colors, representing individual diversity. The circle around aims to represent all significant people (parents, teachers, and health care professionals) who care about adolescents.

On May 6, 2000, Helena Fonseca, Lourdes Levy, Carlos Figueiredo and Paula Fonseca were present at the Portuguese Congress of Pediatrics in the elections for the new proposed societies. The creation of PSAM was voted on and unanimously accepted[6].

The team quickly started to organize educational pre- and post-graduate training sessions. At that time, only the Faculty of Medicine of the University of Lisbon was offering AM as an elective in the pre-graduate curriculum. The first years of PSAM's existence were dedicated to offering regular workshops and training initiatives. Its first National Congress took place in 2002 in Évora, a joint initiative with the 14th Meeting of the Adolescent Committee of the Latin American Association of Pediatrics (ALAPE).

Figure 1. Portuguese Society of Adolescent Medicine logo.

In 2004, the Famalicão Hospitalar Center, following the reconstruction of the pediatric department wards, created a specific unit for the hospitalization of adolescents up to 18 years of age. Meanwhile, hospital management locally allowed the admission of adolescents up to the age of 18 in the emergency room[7].

However, it was only in 2010 that the age for pediatric care was officially extended to 17 years and 364 days at the national level[8]. Pediatric departments were compelled to adapt to this new reality gradually.

In 2005, PSAM was invited to organize the 8th World Congress on Adolescent Health around the topic of "Positive Youth Development: Empowering youth in a world in transition", which was a success and an opportunity to boost the dissemination of the field.

In the following years, many other departments of pediatrics in Portuguese hospitals developed outpatient clinics for adolescents, across the continent and islands (Madeira and Azores).

In 2010, the first edition of the master's course in adolescent health took place at the University of Lisbon. Later, in 2014, the first cycle of special studies in AM was launched at the Department of Pediatrics, at the Hospital de Santa Maria.

Final comments

Unfortunately, AM was quite neglected in the past[9].

Nowadays, with the increase in knowledge and advances in science[10], almost all Portuguese Faculties of Medicine have included AM to some extent in their pre-graduate curriculum and the large majority of

Portuguese departments of pediatrics have outpatient clinics dedicated to adolescents.

This is in line with the current evidence of the importance of investing in adolescent health and well-being[11,12,13].

A word of appreciation to all those who throughout the years have contributed to the launch of this field in our country as well as to the vast group of Portuguese pediatricians who believe deeply in AM and are engaged in providing the best possible care to adolescents in Portugal.

Authors' contributions

Paula Fonseca: Conception and design of the study, report, review or other type of work or paper; Drafting the article; Final approval of the version to be published. Helena Fonseca: Conception and design of the study, report, review or other type of work or paper.

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GUIDELINES

Growth charts from birth for infants born at term and preterm: updated guidelines from the Portuguese Neonatal Society

Luís Pereira-da-Silva[1,2,3], Daniel Virella[2], Susana Pissarra[1,4], Catarina Valpaços[5], Manuel Cunha[6], and Gustavo Rocha[4] on behalf of the Portuguese Neonatal Society*

[1]Committee on Nutrition of the Portuguese Neonatal Society; [2]Neonatal Unit, Hospital Dona Estefânia and Maternidade Dr. Alfredo da Costa, Unidade Local de Saúde São José, Lisbon; [3]NOVA Medical School I Faculdade de Ciências Médicas, Universidade NOVA de Lisboa, Lisbon; [4]Neonatal Intensive Care Unit, Unidade Local de Saúde de São João, Porto; [5]Neonatal Service, Centro Materno Infantil do Norte Albino Aroso, Unidade Local de Saúde de Santo António, Porto; [6]Neonatal and Pediatrics Unit, Hospital de Cascais Dr. José de Almeida, Cascais. Portugal

Abstract

The Portuguese Neonatal Society updates the growth charts recommended for term and preterm infants. The suitability of the growth chart depends on the gestational age, the purpose of the measurement, and the life cycle stage. To classify intrauterine growth at birth, the Fenton 2013 growth charts, which are based on anthropometric records at birth, are the most appropriate for both term and preterm infants. For monitoring postnatal growth in full-term infants, the WHO 2006 Growth Prescriptive Standards are strongly recommended. To specifically monitor weight loss in the initial postnatal days, the NEWT® (http://newbornweight.org) nomogram is recommended. To assess body weight changes in preterm infants while in hospital, an accurate open-access online calculator (www.growthcalculator.org), based on weight trajectories that take into account the initial physiological weight loss, is recommended. The Fenton 2013 growth charts can be employed concurrently to monitor growth in length and head circumference. To assess growth in preterm infants following their discharge from hospital, the Intergrowth-21 prescriptive standards are appropriate for infants born at more than 27 weeks of gestation, up to 64 weeks postmenstrual age. Beyond this age, the prescriptive WHO 2006 growth standards should be employed.

Keywords: Anthropometry. Growth charts. Guidelines. Preterm infant. Term infant.

Curvas de crescimento desde o nascimento para crianças nascidas de termo e pré-termo: recomendações atualizadas pela Sociedade Portuguesa de Neonatologia

Resumo

A Sociedade Portuguesa de Neonatologia atualiza as recomendações para o uso de curvas de crescimento de crianças nascidas de termo e pré-termo. A adequação das curvas de crescimento depende da idade de gestação, da finalidade da medição e do período no ciclo de vida. Para classificar o crescimento intrauterino, as curvas de Fenton 2013, baseadas em registos antropométricos ao nascer, são as mais adequadas tanto em recém-nascidos de termo como pré-termo. Para monitorizar o crescimento pós-natal de crianças nascidas de termo, são inequivocamente recomendadas as curvas padrão da OMS 2006. Para monitorizar especificamente a perda ponderal nos primeiros dias pós-natais, é recomendado o nomograma NEWT® (http://newbornweight.org). Para avaliar as variações do peso em recém-nascidos pré-termo durante o internamento,

Correspondence:
Luís Pereira-da-Silva
E-mail: l.pereira.silva@nms.unl.pt

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é recomendada uma calculadora confiável, *online* e de livre acesso (www.growthcalculator.org), baseada em trajetórias de peso que têm em conta a perda ponderal fisiológica inicial. Durante o internamento, as curvas de crescimento de Fenton 2013 podem ser usadas para monitorizar os crescimentos linear e cefálico. Para monitorizar, após a alta, o crescimento de crianças nascidas pré-termo, as curvas padrão do Intergrowth-21 são as mais adequadas para crianças nascidas com mais de 27 semanas de gestação, até às 64 semanas de idade pós-menstrual. Após esta idade, devem de ser usadas as curvas padrão da OMS 2006.

Palavras-chave: Antropometria. Curvas de crescimento. Recém-nascido de termo. Recém-nascido pré-termo. Recomendação.

Keypoints

What is known
- A single representative longitudinal growth chart to classify term and preterm infants would be the gold standard.
- Such a tool is not currently available.
- As an alternative, multiple charts are used, at least with preterm infants.

What is added
- Updated guidelines are provided for growth charts to be used in infants born both at term and preterm.
- Growth charts specific to classifying intrauterine growth at birth and monitoring postnatal growth in the short and long term are recommended.

Introduction

The anthropometric measurements most commonly used to assess growth in infants born at term[1,2] and preterm[3,4] are body weight, length, and head circumference.

The suitability of the growth chart depends on the infant's gestational age, the intended purpose of the measurement, and the infant's stage of life[5].

Depending on the stage of life, it is recommended that appropriate growth charts be selected for the purpose of diagnosing intrauterine growth deviations at birth, monitoring the effectiveness of nutritional intervention while in hospital, particularly in preterm infants, and monitoring growth and nutritional status after hospital discharge[1,6]. Furthermore, it is recommended that specific growth charts be selected for infants born at term or born preterm[2,3].

Prescriptive standards versus descriptive references

Anthropometric measurements can be interpreted in comparison with either prescriptive standards or descriptive references[7].

Prescriptive standards are typically derived from measurements obtained from a cohort of individuals assumed to be healthy, i.e., with no exposures known to adversely affect growth. Consequently, these describe the way healthy individuals are expected to grow[7].

Descriptive references are typically derived from cross-sectional measurements of a convenience sample of individuals and describe how most individuals actually grow. Consequently, they may inadvertently set unhealthy attainment targets[7]. Nevertheless, they are the most widely available, due to their cost-effectiveness and feasibility in construction, compared to prescriptive standards[7].

Objective

In 2013 and 2020, the Portuguese Society of Neonatology critically reviewed the published growth charts for infants born preterm and provided guidelines for their use in clinical practice[6,8].

This paper contains the updated guidelines for growth charts for infants born at term and preterm.

Table 1 presents a summary of the currently recommended growth charts, along with their respective levels of evidence (LOE) and strengths of recommendation (SOR)[9].

1. Growth charts for classifying intrauterine growth at birth in term and preterm infants

Recommended: Fenton 2013 growth charts[10] (LOE 1, SOR A) (Table 1).

Charts based on anthropometric measurements at birth are appropriate for classifying intrauterine growth and should not be confused with growth charts based on fetal ultrasound measurements, which are appropriate for monitoring fetal growth[6,10].

The cross-sectional sex-specific and gestational age-specific Fenton 2013 growth charts[10] include directly measured birth weight, length, and head circumference of preterm infants. These charts are based on a meta-analysis of six large population-based surveys of size at birth, covering gestational ages from 22

Table 1. Recommended growth charts for infants born at term and preterm, according to the purpose and the period of life cycle

Infant's maturity	Purpose	Recommendation	LOE*	SOR*
Term and preterm neonates	To classify intrauterine growth	Fenton 2013 growth charts[10]	1	A
Infants born at term	To monitor weight loss in the initial postnatal days	Online NEWT® nomogram http://newbornweight.org	3	C
	To monitor short- and long-term growth	WHO 2006 growth standards[1]	2	B
Infants born preterm	To monitor growth while in hospital:			
	Weight changes	Online calculator www.growthcalculator.org	2	B
	Length and head growth	Fenton 2013 growth charts[10]	1	A
	To monitor growth after discharge	Intergrowth-21 standards[28] to monitor growth from 32 to 64 weeks postmenstrual age, in infants born > 27 weeks gestation.	2	B
		Fenton 2013 charts[10] to monitor growth from up to 50 weeks postmenstrual age, in infants born ≤ 27 weeks gestation†	1	A
		WHO 2006 growth standards[1] after reaching term equivalent age or the more advanced ages covered by Intergrowth-21[28] or Fenton 2013[10] growth charts	2	B

*LOE: level of evidence; SOR: strength of recommendation *(adapted from[9])*.
†In multicenter studies of preterm infants, Fenton 2013 charts are suggested to monitor growth from birth, as they were constructed from large samples of neonates that include gestational ages at the threshold of viability.

to 36 weeks. They were harmonized with the WHO 2006 Growth Standards for infants born at term[1], smoothing the data between the preterm and WHO estimates while maintaining integrity with the data from 22 to 36 weeks and at 50 weeks[10]. The portions of the curves between 37 and 50 weeks were validated by comparing them with the growth of contemporary preterm infants[11]. Consequently, Fenton 2013 growth charts are currently the most appropriate to classify intrauterine growth at birth, both for neonates born at term and preterm.

The criterion most commonly used to classify intrauterine growth relates birth weight with gestational age, classing neonates as large-, appropriate-, or small-for-gestational age[5]. However, there is no consensus on the cut-offs for this classification[12,13]. While some authors define the 10th and 90th percentiles as lower and higher thresholds, respectively, others consider as lower thresholds the 5th percentile, 3rd percentile, or –2 standard deviations to classify as small-for-gestational age, and the 95th percentile, 97th percentile or +2 standard deviations as higher thresholds to classify as large-for-gestational age[12,13]. The rationale for this derives from the power of a chart to accurately estimate statistically defined thresholds, which is dependent on the sample size for each gestational age group of interest. Only samples comprising a minimum of 120 individuals possess sufficient statistical power to define the 3rd or the 5th percentiles[14,15].

Accordingly, the 3rd and 97th percentiles, as defined by the Fenton 2013 growth charts[10], may be employed as statistical thresholds for the identification of small-for-gestational age and large-for-gestational age infants, respectively.

Strengths[6]:

- The Fenton meta-analysis[10] is the most comprehensive study to date, encompassing a sample size of nearly four million neonates with measured weight, 151,527 neonates with measured length, and 173,612 neonates with measured head circumference.
- The curves are stratified throughout percentiles three to 97, which allows for a more precise classification.
- The open-access online application *PediTools: Fenton 2013 for iOS* (https://peditools.org/fenton2013/index.php), based on the Fenton 2013 growth charts[10], makes it possible to calculate z-scores online. This allows for a precise quantification of deviations in weight, length, and head circumference, particularly with extreme cases.

Limitations[6]:

- Although the meta-analysis[10] was based on selected studies from developed countries, the charts provided are not prescriptive standards for birth weight, as they included cross-sectional studies and, in some cases, twin pregnancies, morbidity during pregnancy, poor surveillance, and an altered nutrition status of pregnant women were not counted as exclusion criteria.

- In the construction of percentile curves, every study included in the meta-analysis[10] considered gestational age in complete weeks, except for the study by Voigt et al.[16], which used gestational age in weeks and days. For the remaining reference curve proposals, anthropometric values for gestational ages between full weeks were mathematically extrapolated.
- To determine the values of each reference percentile (3, 10, 50, 90, and 97) for weight, length, and head circumference, the meta-analysis used the percentiles calculated in each individual study that met the inclusion criteria for each gestational age, instead of the collection of the recorded values for each neonate, thus reducing the accuracy, by accumulation of rounding and estimation errors.

Growth charts to assess postnatal growth in term infants

Monitoring weight loss in the initial postnatal days

Recommended: NEWT® nomogram (http://newbornweight.org) (LOE 3, SOR C) (Table 1).

Systematic reviews on expected postnatal weight changes in breastfed infants indicate that the average weight loss during the initial postnatal period is expected to be between 5% and 8% of the infant's birth weight by two to four postnatal days[17,18]. Furthermore, most neonates regain their birth weight by 10 to 14 postnatal days. A weight loss exceeding 10% of the infant's birth weight warrants attention. This occurs with greater frequency in neonates delivered by cesarean section than by vaginal delivery[19]. In this context, nomograms designed for monitoring early infant weight changes, which take into account the major factors influencing early infant weight loss, are of great value for pediatric healthcare providers and parents[20].

The online open-access *Newborn Early Weight Tool - NEWT®* (http://newbornweight.org) comprises nomograms that make it possible to plot the infant's weight percentile at any given time during the initial postnatal days on an hourly basis. This enables users to identify infants with excessive weight loss. The NEWT® was constructed from a cohort of 161,471 healthy, singleton newborns born at 36 weeks gestation or more at 14 Northern California Kaiser Permanente hospitals between 2009 and 2013. Data were extracted from hospital records with a particular focus on the mode of delivery (vaginal or caesarean section), feeding type (exclusive breastfeeding, exclusive formula feeding, or both), and infant body weights (https://newbornweight.org/about/).

For breastfed newborns, percentiles were estimated from six to 72 hours of age for those delivered vaginally (96 hours if cesarean). For exclusively formula-fed newborns, these nomograms have a lower accuracy and period of surveillance, given the smaller sample size. In these nomograms, weight loss trajectories equal to or greater than the 90th percentile for vaginal deliveries, and equal to or greater than the 75th percentile for caesarean deliveries, are considered excessive. A crossing of percentiles can also serve as an early warning for potential breastfeeding difficulties, which should be addressed before hospital discharge[21,22].

Monitoring short- and long-term growth

Recommended: WHO 2006 growth charts[1] (LOE 2, SOR B) (Table 1).

The WHO Multicentre Growth Reference Study[23] developed sex- and age-specific growth charts to describe the growth of healthy term infants in six countries from diverse geographical regions, with no significant morbidities, living in conditions with good sanitation and hygiene, and socioeconomic conditions favorable to growth.

This study combined a longitudinal follow-up of 882 children, generating growth charts from birth to 23 months, with a cross-sectional sample of 6,669 children, from 24 months to five years of age[1]. While exclusive or predominant breastfeeding for at least four months was required for participants in the longitudinal component, a minimum of three months of any breastfeeding was required for participants on the cross-sectional component[23]. Consequently, the growth charts of the longitudinal component are more closely aligned with prescriptive standards than those derived from the cross-sectional component.

Strengths:

- The WHO growth charts are the closest available methods to prescriptive standards for monitoring growth in term infants up to five years of age living anywhere, regardless of their ethnicity, socio-economic status, and type of feeding[1].
- The WHO offers online access to age- and sex-specific values for centiles and z-cores, which are presented in both graphical and tabular formats (https://www.who.int/tools/child-growth-standards/standards/weight-for-age). Furthermore, the open-access *WHO AnthroPlus* software for calculating centiles and z-cores can be downloaded (https://who-anthroplus.freedownloadscenter.com/windows/).

Limitations:

- The generation of two distinct growth curves from two different samples results in a slight disjunction at two years of age, where the transition from longitudinal to cross-sectional curves occurs[1].
- The inter-country differences in social determinants of health, environmental factors, and genetic composition led some authors to question the suitability of the one-size-fits-all approach of the WHO 2006 growth standards to several settings[24,25].
- This problem does not seem to arise in Portugal, given the country's favorable socioeconomic and health conditions for growth. Therefore, as in several other countries where these standards are widely implemented[26], in 2013 the Portuguese Directorate General of Health adopted the WHO 2006 growth standards[1] for general use (norm nº 010/2013, May 31st, 2013). Changes in social demographics may affect its suitability.

Growth charts to assess postnatal growth in preterm infants

The ideal growth charts for assessing postnatal growth in infants born preterm would be prescriptive standards constructed from a large, long-term follow-up cohort of infants recruited at the prenatal period from uneventful pregnancies, including neonates from the threshold of viability to term gestational age at birth, with no significant neonatal morbidities, thereby enabling representative use throughout the infant's early life. Such a tool is currently unavailable[6]. Consequently, while in the neonatal intensive care unit, there is a frequent need to use multiple charts, which may affect compliance with routine growth monitoring[27].

Monitoring growth while in hospital

Body weight changes

Recommended: the online calculator: www.growthcalculator.org (LOE 2, SOR B) (Table 1).

Defining postnatal growth charts for preterm infants is a complex task. In these infants, the assessment of early postnatal weight changes is affected by suboptimal nutrition that may be confused with postnatal weight loss secondary to adaptive contraction of extracellular volume, particularly when weight loss is excessive[27].

The longitudinal Intergrowth-21 prescriptive standards[28] and the cross-sectional Fenton 2013 descriptive references[10] have been the most frequently used tools to assess postnatal growth in infants born preterm[29]. Both growth charts describe a steady increase in body weight from birth[10,28], which is an erroneous assumption, as the physiological weight loss that occurs during the early postnatal period is not reflected in these charts[30,31].

In this context, a comprehensive longitudinal study in preterm infants revealed that, provided postnatal adaptation is uncomplicated, body weight transits at the 21th postnatal day to a trajectory at 0.8 SD below birth weight, regardless of the gestational age at birth[32,33]. Consequently, it is neither anticipated nor desirable that the weight gain of preterm neonates should approximate intrauterine weight gain during the first postnatal month[6] as had previously been suggested[34,35].

An open-access online calculator (www.growthcalculator.org) was constructed from a large longitudinal study[32,33] to accurately monitor the weight changes in preterm neonates while they remain in hospital. This tool graphically displays the percentile in which the current weight is plotted, as well as the target weight and the deviation from the current weight in grams. By way of limitations, this tool does not yet provide a graphic trend or a curve from the infant's weight records.

Linear growth and head growth

Recommended: Intergrowth-21[28] (LOE 2, SOR B) or Fenton 2013 growth charts[10] (LOE 1, SOR B) (Table 1).

As length and head circumference increase in a linear fashion from birth, the cross-sectional Fenton 2013 growth charts[10] can be employed to monitor postnatal linear growth and head growth[36].

Monitoring growth after discharge

Recommended: Intergrowth-21[28] (LOE 2, SOR B) or Fenton 2013 growth charts[10] (LOE 1, SOR A), and, when reaching term corrected age, the WHO 2006 growth standards[1] (LOE 2, SOR B) (Table 1).

Very preterm and extremely preterm infants are usually discharged after the first postnatal month. By this age, it is expected that most infants' body weight has caught up. Both Intergrowth-21[28] and Fenton 2013 growth charts[10] were constructed in such a way that, at those advanced ages, the infant growth overlaps with the WHO 2006 growth standards designed for full-term infants[1]. Therefore, the WHO 2006 growth standards should be employed in preterm infants upon attaining term corrected age or when the age limits of both recommended growth charts for preterm infants have been exceeded. It is noteworthy that to date, no long-term growth follow-up of extremely low and very low birth

weight infants has validated such a transition from growth charts constructed for preterm infants[10,28] to those constructed for term infants[1].

For infants born at more than 27 weeks of gestation, the longitudinal Intergrowth-21 prescriptive standards are recommended for monitoring growth from 32 postmenstrual weeks to 64 postmenstrual weeks (6 months after term age)[28].

For infants born at less than 27 weeks of gestation, the cross-sectional Fenton 2013 charts can be employed as an alternative to monitor growth up to 50 postmenstrual weeks (2.5 months after term age)[10].

The Intergrowth-21 charts have strengths and one limitation[6]:

Strengths:

- These prescriptive standards are well-designed and should be preferred to monitor the growth of infants born preterm after hospital discharge.
- An online calculator for body weight, length, and head circumference (http://intergrowth21.ndog.ox.ac.uk/en/ManualEntry/Compute) provides percentiles and z-scores, which permit the precise quantification of growth deviations.

Limitation:

- A strength of the Intergrowth-21 study led to a limitation: because only healthy pregnant women were included, they gave birth to very few preterm neonates (5%), mostly late preterm births[4,28]. In fact, of the 201 healthy and stable preterm infants included in the cohort, only 28 infants born at 33 weeks' gestation or earlier contributed data to these standards. Consequently, Intergrowth-21 standards can be considered reliable for monitoring postnatal growth only in infants born at more than 27 weeks of gestation and from 32 weeks' postmenstrual age[28]. It is noteworthy that the American Academy of Pediatrics has expressed reservations about the Intergrowth-21 charts, citing concerns about their construction from a limited sample size, and advising against their use in infants with a gestational age of less than 36 weeks' postmenstrual age[37].

Growth charts for use in multicenter and population studies of preterm infants

In the setting of multicenter studies and population databases of infants born preterm, such as the Portuguese Register of Very Low Birth Weight Infants - *Registo Nacional do Recém-Nascido de Muito Baixo Peso*[38], the use of a single representative longitudinal growth chart would be preferable for the classification of intrauterine growth and the assessment of postnatal growth, covering gestational ages from the threshold of viability. Currently, such a tool is lacking.

As an alternative, during the first postnatal month, the www.growthcalculator.org[32,33] should be employed to assess postnatal weight gain and the Fenton 2013 charts[10] can be employed to monitor length and head growth[6]. In preterm infants, the Fenton 2013 charts[10] may overestimate postnatal weight gain during the first month and misclassify growth within the normal range as growth restriction.

After the first postnatal month, the cross-sectional Fenton 2013 charts[10] can be employed to monitor weight, length, and head growth, taking advantage of the fact that they were constructed from the anthropometry at birth of large samples of neonates from the threshold of viability, which is not the case with Intergrowth-21 prescriptive standards[28]. Once the infant has reached term corrected age, the WHO 2006 growth standards for infants born at term[1] should be employed[10,28].

Conclusions

The suitability of the growth chart depends on the infant's gestational age, the intended use of the measurement, and the infant's life cycle stage.

To summarize (Table 1):

- To classify intrauterine growth, the Fenton 2013 growth charts[10] based on anthropometric measurements at birth are the most appropriate for both neonates born at term and preterm.
- To monitor growth in infants born at term, the WHO 2006 growth standards[1] are highly recommended. To specifically monitor weight loss in the initial postnatal days, the NEWT® (http://newbornweight.org) nomogram is a good tool.
- To monitor body weight changes in very preterm infants while under intensive care, the open-access online calculator (www.growthcalculator.org) is recommended. Concurrently, the Fenton 2013 growth charts[10] can be employed to monitor growth in length and head circumference.
- To monitor growth in preterm infants after discharge, the Intergrowth-21 prescriptive standards[28] are suitable for infants born at more than 27 weeks of gestation, from 32 to 64 weeks postmenstrual age. Subsequently, the WHO 2006 growth standards[1] for term infants should be employed.
- In multicenter studies and population databases of very preterm infants, the www.growthcalculator.org should be used to monitor weight gain during the first postnatal month and the Fenton 2013 charts[10] should be employed concurrently to monitor growth in length and head circumference. After the first postnatal month, the Fenton 2013 charts[10] are recommended for monitoring all anthropometric parameters.

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Authors' contribution

Luís Pereira-da-Silva and Daniel Virella: Conception and design of the study, report, review, or another type of work; Drafting the article; Critical review of the manuscript for important intellectual content; Final approval of the version to be published (mandatory for all authors); Agreement to be accountable for the accuracy or integrity of the work (mandatory for all authors). Susana Pissarra, Catarina Valpaços, Manuel Cunha and Gustavo Rocha: Critical review of the manuscript for important intellectual content; Final approval of the version to be published (mandatory for all authors); Agreement to be accountable for the accuracy or integrity of the work (mandatory for all authors).

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Right to privacy and informed consent. The authors declare that no patient data appear in this article.

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CASE REPORT

Gastric perforation by a trichobezoar – Case report

Mafalda Sousa Cardoso[1], *Ana Catarina Rosa*[1], *Tiago Ferro*[1,2], *Joana Pereira*[3], *Rui Alves*[3], *and Isabel Brito Lança*[1]

[1]*Pediatric Service, Hospital José Joaquim Fernandes, Beja;* [2]*Higher Institute of Health Sciences Egas Moniz, Lisbon;* [3]*Pediatric Surgery Service, Hospital Dona Estefânia, Lisbon. Portugal*

Abstract

Introduction: Bezoars are masses resulting from the ingestion and accumulation of undigested material in the gastrointestinal tract. They can be divided into trichobezoars (hair), phytobezoars (plant fibers), pharmacobezoars (drugs), and lactobezoars (cow's milk). The most common symptoms are abdominal pain, nausea, vomiting, anorexia, and weight loss. **Case report:** We report the clinical case of a 13-year-old boy with a trichobezoar that had developed over the course of several years, which resulted in gastric perforation. A surgical laparotomy was performed to remove the trichobezoar and close the gastric wall. **Discussion:** Trichobezoars can present in the form of an acute abdomen. In these situations, surgical treatment is necessary.

Keywords: Trichobezoar. Trichotillomania. Gastric perforation. Acute abdomen. Case report.

Perfuración gástrica por un tricobezoar – Caso clínico

Resumo

Introdução: Os bezoares são massas resultantes da ingestão e acumulação de material não digerido no trato gastrointestinal. Podem dividir-se em tricobezoares (cabelo), fitobezoares, (fibras vegetais), farmacobezoares (fármacos) e lactobezoares (leite de vaca). Os sintomas mais frequentes são dor abdominal, náuseas, vómitos, anorexia e perda ponderal. **Relato do caso:** Relatamos um caso clínico de um rapaz de 13 anos com um tricobezoar com anos de evolução, que resultou em perfuração gástrica. Foi tratado com laparotomia cirúrgica com remoção do tricobezoar e encerramento da parede gástrica. **Discussão:** Os tricobezoares podem apresentar-se sob a forma de abdómen agudo. Nestas situações, o tratamento cirúrgico é necessário.

Palavras-chave: Tricobezoar. Tricotilomania. Perfuração gástrica. Abdómen agudo. Caso clínico.

Keypoints

What is known
- A bezoar is an accumulation of undigested material in the gastrointestinal tract.
- The most common symptoms are nausea, vomiting, and weight loss.
- Trichobezoars may cause gastric perforation and present as an acute abdomen.

What is added
- A trichobezoar may manifest symptoms only after having developed for years.
- Although more common in girls, trichobezoars occur in boys with a habit of eating hair and who, in most cases, suffer from anxiety.
- A child with a trichobezoar does not always show signs of alopecia or weight loss.

***Correspondence:**
Mafalda Sousa Cardoso
E-mail: mafaldadesousacardoso@gmail.com

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Introduction

Bezoars are compact masses of partially digested or undigested material that accumulates in the gastrointestinal tract. They can be divided into trichobezoars (hair), phytobezoars (plant fibres), pharmacobezoars (drugs), and lactobezoares (cow's milk). Among the various bezoars, the most common are phytobezoars. They are usually seen in elderly patients with certain risk factors, such as previous surgery of the digestive tract, especially procedures that involve the removal of part of the stomach or intestine (e.g. surgery for peptic ulcer disease or surgery for obesity), disorders that prevent the stomach from emptying food completely (e.g. diabetes, some autoimmune diseases, and mixed connective tissue disease), and taking certain medications that slow stomach contraction. Trichobezoars occur most often in young females who have mental health disorders, and who chew and swallow their own hair[1].

In this pathology, the initial gastrointestinal symptoms are usually nonspecific. More rarely, complications can occur, such as iron deficiency anemia resulting from chronic bleeding due to ulcerations of the gastric mucosa, protein-losing enteropathy, intestinal obstruction, perforation or invagination, acute appendicitis, obstructive jaundice, or acute pancreatitis.

Case report

A 13-year-old male, Tanner stage 4, presented to the emergency room at Beja Hospital, reporting abdominal pain, nausea, anorexia, and a feeling of gastric fullness over the past two to three days. He denied vomiting, gastrointestinal transit abnormalities, or weight loss. The patient also reported no recent immunizations and no recent travels. In terms of his personal history, he underwent an appendectomy at the age of five for which the surgical specimen showed no signs of appendicitis. There was no history of psychiatric illness.

Upon physical examination, he exhibited short hair with no areas of alopecia. His gait was tilted to the right for pain relief. Abdominal examination revealed a distended abdomen, widespread pain, with guarding and signs of peritoneal irritation. Due to the tensing of the abdominal wall muscles, no masses or organomegaly could be felt. In regard to laboratory testing, the patient did not have anemia (Hb 14.1 g/dL), but had mild leukocytosis (10,400/L) with neutrophilia (60%) and a CRP of 0.20 mg/dL.

A standing abdominal X-ray was performed, revealing air-fluid levels. Two enemas were administered with no effect. As ultrasound was unavailable at Beja Hospital that night, an abdominal CT scan was ordered,

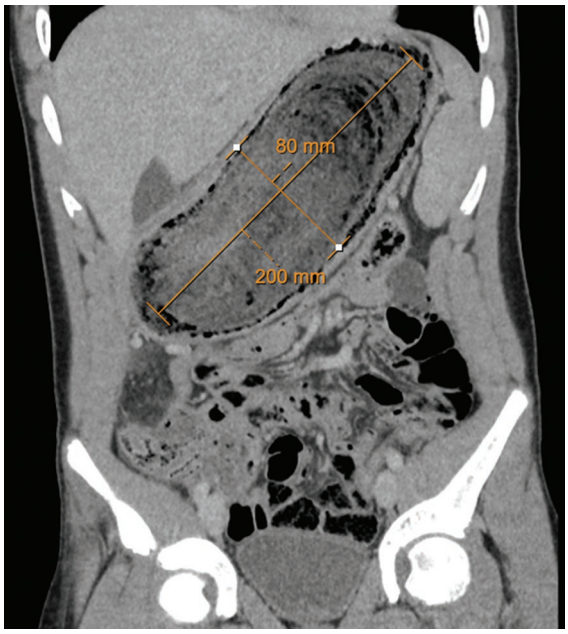

Figure 1. Abdominal CT scan showing a "voluminous mass in the gastric region measuring 20 cm x 8 cm".

which identified a "voluminous mass in the gastric region, measuring 20 cm, with a laminated appearance, filled and surrounded by air bubbles, suggestive of a hair cluster" (Fig. 1). Upon further questioning, the patient confirmed the ingestion of hair over several years. He was transferred to Dona Estefânia Hospital with the suspicion of a large trichobezoar.

Attempts to extract the trichobezoar through upper gastrointestinal endoscopy were unsuccessful. Consequently, the patient underwent laparotomy, during which the bulky trichobezoar was removed and the gastric wall perforation caused by the size of the trichobezoar was closed (Figs. 2-4). The patient completed a seven-day course of cefuroxime and metronidazole intravenously.

Discussion

Trichobezoars are rare in pediatric age. Around 90% of instances are observed in females, primarily during adolescence, and are frequently linked with psychiatric comorbidity. In this particular case, we have a boy with hair-eating habits practiced in private and without parental awareness. Despite the absence of weight loss or alopecia, the initial presentation of a trichobezoar may be an acute abdomen resulting from a gastric perforation caused by the size of the bezoar. The CT scan played a crucial role in hypothesizing the diagnosis[1].

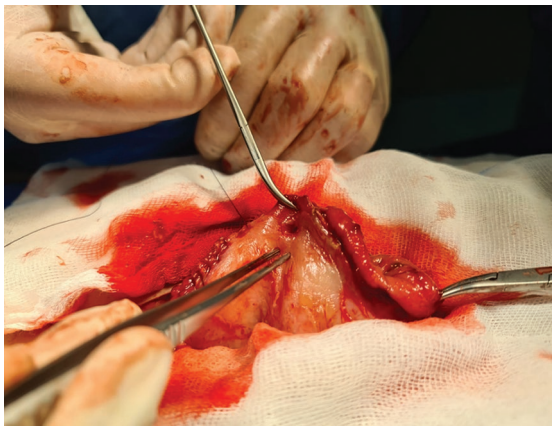

Figure 2. Anterior gastric wall perforation.

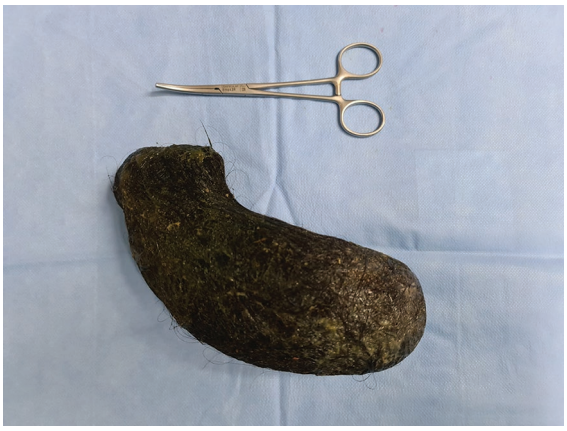

Figure 4. Gastric bezoar.

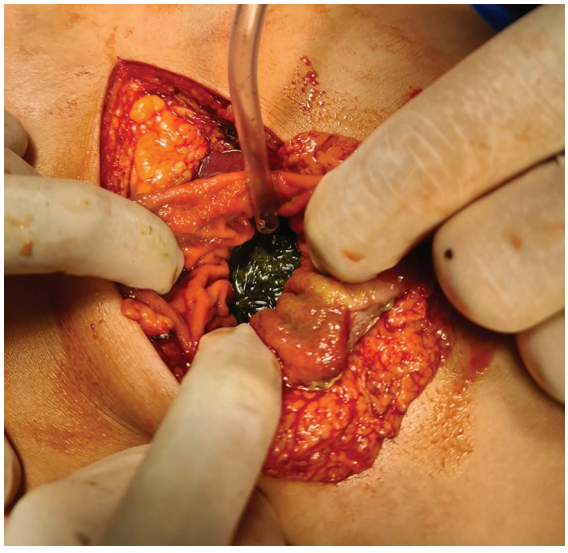

Figure 3. Gastric bezoar.

Whenever feasible, conservative treatment for bezoars is recommended. The preferred method is endoscopy, which not only serves as a diagnostic tool but also offers therapeutic benefits. However, endoscopy is typically reserved for small or medium-sized bezoars with no complications. Enzymatic dissolution with cellulase has proven to be ineffective in the case of trichobezoars. For large bezoars, surgical treatment through laparotomy becomes necessary[2].

Referring the child to pedopsychiatry is imperative, as these behaviors may persist, and the adolescent requires treatment for the underlying condition, such as generalized anxiety[3].

Previous presentations

23º Congresso Nacional de Pediatria (Poster com Discussão) - PD200 “Perfuração gástrica por tricobezoar com anos de evolução”.

Authors’ contribution

Mafalda Sousa Cardoso: Conception and design of the study, report, review, or another type of work; Acquisition of data either from patients, research studies, or literature; Drafting the article. Ana Catarina da Silva Branquinho Rosa: Acquisition of data either from patients, research studies, or literature; Critical review of the manuscript for important intellectual content. Tiago Ferro: Acquisition of data either from patients, research studies, or literature; Analysis or interpretation of data from patients, research results, or literature search; Final approval of the version to be published; Agreement to be accountable for the accuracy or integrity of the work. Joana Queirós Pereira: Agreement to be accountable for the accuracy or integrity of the work. Rui Alves: Agreement to be accountable for the accuracy or integrity of the work. Isabel Brito Lorga: Conception and design of the study, report, review, or another type of work; Acquisition of data either from patients, research studies, or literature; Analysis or interpretation of data from patients, research results, or literature search; Drafting the article; Critical review of the manuscript for important intellectual content; Final approval of the version to be published; Agreement to be accountable for the accuracy or integrity of the work.

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Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained approval from the Ethics Committee for analysis and publication of routinely acquired clinical data and informed consent was not required for this retrospective observational study.

Use of artificial intelligence for generating text. The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript, nor for the creation of images, graphics, tables, or their corresponding captions.

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IMAGES IN PEDIATRICS

Radiography – An effective method of detecting glass shards in wounds

Radiografia — Um método eficaz para deteção de fragmentos de vidro em feridas

Beatriz Pedreira[1], Kaylene Freitas[1], and Ema Santos[2]*

[1]Serviço de Pediatria; [2]Serviço de Cirurgia Pediatrica. Hospital Central do Funchal, Funchal, Portugal

Keypoints

What is known

- Most deep wounds from shards of glass require minor surgical care.
- The removal of all glass fragments is of paramount importance as any pieces left behind can cause mechanical damage to nearby structures.
- Radiography is a quick, inexpensive method that is widely available in emergency rooms.

What is added

- Glass is visible on radiography, regardless of the percentage of lead in its constitution and its color.
- Radiography is particularly useful in injuries caused by glass objects, in circumstances where neither the patient nor the physician is certain about the presence or number of foreign bodies.

A 15-year-old adolescent was admitted to the pediatric emergency department with pain relating to wounds on the extensor surface of the right forearm. The wounds resulted from a bicycle fall near trash cans and loose glass bottle pieces. The wounds were cleaned, disinfected, sutured, and dressed, with no glass shards visible and the patient was discharged.

On readmission, ten months later, the pain described was associated with the sensation of foreign bodies (glass shards) in the right forearm. Physical examination revealed two palpable hard foreign bodies next to the scars on the extensor surface of the right forearm (Fig. 1), which were mobile in relation to the superficial planes. The patient was referred to a pediatric surgery appointment for elective removal of the foreign bodies.

A radiography was requested, and the image revealed five rectangular fragments, all under one cm in length, superficially located on the proximal third of the right forearm (Fig. 2a and 2b). In view of the patient's symptoms, the five fragments were excised, with no intraoperative fluoroscopic support. The fragments were made of transparent glass (Fig. 3). At the end of the procedure the patient reported clinical improvement.

Through this case, we intend to highlight the role of radiography in the search for glass in body tissues. It is a quick, inexpensive method that is widely available in emergency departments.

The medical community should be aware that glass is visible on radiography, regardless of the percentage of lead in its constitution or its color[1,2]. There are studies that indicate that radiography detects approximately 99% of fragments with a thickness of over two mm.

Although not always necessary, radiography is particularly useful in cases where there are injuries caused by glass objects, as well as in circumstances in which neither the patient nor the physician is certain about the number of foreign bodies[1]. It is difficult to establish objective guidelines owing to the few cases described in the literature and the great variety of injuries that glass can cause. Despite this, the removal of all glass fragments is

***Correspondence:**
Beatriz Pedreira
E-mail: beabopedreira@gmail.com

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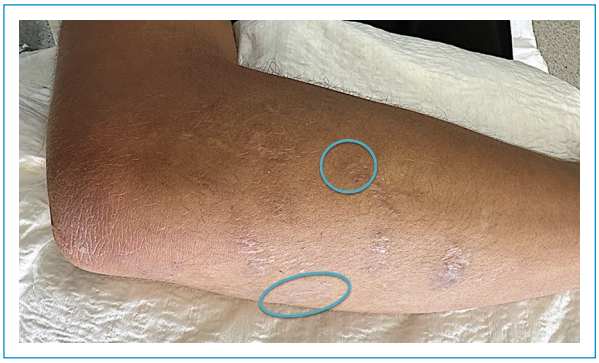

Figure 1. Scars on the extensor surface of the right forearm before the removal of the glass fragments.

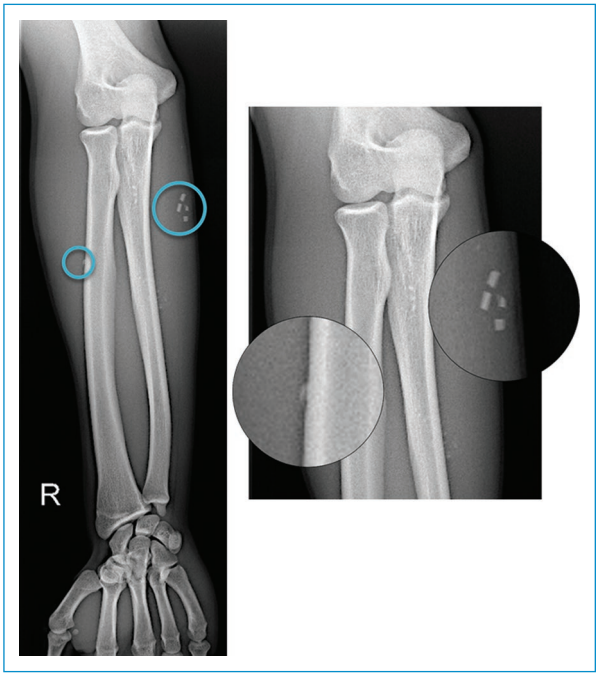

Figure 2. Radiography of the right forearm (anteroposterior view): the circles highlight five glass fragments located on the proximal third of the forearm (four on the medial and one on the lateral face).

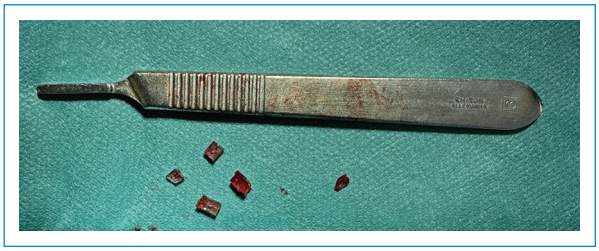

Figure 3. Glass fragments removed.

of paramount importance as any pieces left behind can cause mechanical damage to nearby structures[1].

Authors' contribution

Beatriz Pedreira: Came up with and designed the study, report, review, or other types of paper. Acquired data from patients, research studies, or literature. Analyzed and interpreted data from patients, research studies, or literature. Drafted the article. Critically reviewed the article for important intellectual content. Provided final approval of the version to be published. Agreed to be held accountable for the accuracy and integrity of the paper. Kaylene Freitas: Acquired data from patients, research studies, or literature. Drafted the article. Provided final approval of the version to be published. Agreed to be held accountable for the accuracy and integrity of the paper. Ema Santos: Analyzed or interpreted data from patients, research studies, or literature. Provided final approval of the version to be published. Agreed to be held accountable.

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Conflicts of interest

None.

Ethical disclosures

Protection of human and animal subjects. The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

Use of artificial intelligence for generating text. The authors declare that they have not used any type of generative artificial intelligence for the writing of this manuscript, nor for the creation of images, graphics, tables, or their corresponding captions.

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IN MEMORIAM

José Miguel Ramos de Almeida (1930-2024): a tribute

José Miguel Ramos de Almeida (1930-2024): uma homenagem

João M. Videira Amaral

Emeritus Full Professor of Pediatrics. NOVA Medical School, Lisbon, Portugal

On June 24, 2024, at the age of 94, José Miguel Ramos de Almeida (JMRA) passed away peacefully. The field of pediatrics lost a remarkable and respected pediatrician. He was a teacher, a supportive mentor and a friend.

His lifelong excellence in the fields of culture, pediatric research, education, healthcare and advocacy is widely recognized among colleagues and the general public. His unparalleled contributions to individual lives, the community and society will always be remembered and paid forward for years to come. His keen sense of humor and humanity, his eloquence and his determination to spearhead novel avenues for understanding the link between science and humanities, will be missed by all he touched.

JMRA enjoyed a rich and varied medical career, with a special interest in Neonatology/Perinatology. He was an internationally recognized health visionary in practice standards, curriculum development and research. He received his medical degree from the Faculdade de Medicina da Universidade Clássica de Lisboa in 1954 and completed his pediatric residency at the Hospital de Santa Maria (HSM), linked to the same medical school.

After his pediatric residency, he continued his training in pediatrics at the Pediatrics Department of HSM, Lisbon. As a result of his exceptional profile and expertise, he was also invited to teach on pediatrics for students. He later received several scholarships, namely from the World Health Organization (WHO), and was chosen to receive training, mainly in intensive care in prestigious hospitals in Europe and the United States (Toronto, Boston, Cambridge in Massachusetts and Britain, London, Oxford, Newcastle, etc.), establishing professional and personal contacts with prestigious pediatricians all over the world.

Teaching students was the first step in a brilliant academic career, which continued in another university in Lisbon (Universidade Nova de Lisboa/UNL - Faculdade de Ciências Médicas) following the awarding of his doctorate (PhD) (1987) with research on "*Adolescence and Motherhood*". Following this, he became an associate professor (1991) before reaching the position of full professor/chair (1993).

During a period of transition, JMRA applied for another position as head of the department of Neonatology at the Maternidade Dr. Alfredo da Costa (MAC) in Lisbon, which is attached to the aforementioned UNL. Most of his hospital career was therefore spent in Lisbon at HSM and MAC.

To emphasize his special interest in medical education and the need for a human relationship between patient, family and the clinician, he supported the idea that "*the educator should give each medical trainee/student (in a simulated scenario) the opportunity to experience the fears and feelings of the actual patient who is being hospitalized*". As a matter of fact, JMRA was a master of teaching and education in medicine, working closely with medical students, pediatric residents and neonatology trainees. At the hospital, his inpatient rounds were legendary among subspecialty residents.

Correspondence:
João M. Videira Amaral
E-mail: jmvamaral@nms.unl.pt

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He was invited to lead and work alongside a range of committees, scientific societies and groups devoted to public health, health organization, human rights, medical education, professional medical issues, ethics, etc. Of particular note was the fact that he was elected president of the Sociedade Portuguesa de Pediatria/SPP (1979-1981), honorary member of Academia Portuguesa de Medicina, member of the Conselho Técnico do Instituto de Apoio à Criança - IAC (Technical Council of the Child Support Institute) and member of the Conselho Disciplinar da Ordem dos Médicos (Disciplinary Board of the Portuguese Medical Council). Among other distinctions, he was awarded the "Memorial Arce Sanchez Villares (2000)" Prize by the Sociedad de Pediatría de Asturias, Cantabria y Castilla y Leon.

It was always pleasant to talk with him about a range of topics. His conversations were enjoyable and offered passionate messages beyond medicine, reflecting an extraordinary culture in different fields.

JMRA was also a passionate thinker, a highly regarded writer and an avid reader.

As a guest speaker, he gave more than 300 speeches/lectures/conferences at scientific events and was the author of more than 150 peer-reviewed publications (national and international papers) in scientific journals. At times, he expressed criticism and disagreement with less-accurate published data through the "Letters to the Editors" section.

His spirit of intelligent citizenship also led him to write opinion articles with important statements devoted to the general public on critical analysis, pedagogy, democracy, politics, history, art, sociology, personal clinical experience, etc.

He published seven books related to some of the aforementioned topics. Among these seven books, three of them are particularly noteworthy: *"Do Sótão das Memórias", "Vício de Pensar"* and *"Camuflado"*. Incorporating biographical data and important content on Science and Humanities, they carry useful ideas for medical students and new generations facing the future.

In conclusion, José Miguel Ramos de Almeida truly left an important legacy. He was a prestigious pediatrician, an academic and an internationally recognized health visionary in standards in pediatric practice, curriculum development and research. The memory of his many contributions will be cherished.

Our heartfelt thoughts and sympathies are with JMRA's family, friends and colleagues during this difficult time. He will be dearly missed. I shall miss him as a friend and a colleague, for whom I retain the greatest respect and admiration.