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# Investigation of Parent-Reported Food Allergic Reactions in Preschool Children in Greece

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## Abstract

Food allergies are a growing public health problem during childhood, significantly affecting the health and quality of life of children and their families. The aim of this study was to investigate parent-reported food allergic reactions among preschool children in Greece. A cross-sectional survey was conducted using an anonymous online questionnaire completed by parents or legal guardians of 151 preschool children aged 3–6.5 years. Fifty-seven percent of participating parents reported that their child had experienced a food allergic reaction-related. The most commonly reported symptoms were skin rash, eczema and itching, while cow's milk and dairy products were the most frequently reported allergenic foods. Among children with parent-reported food allergic reactions (n = 86), 8.1% had a reported diagnosis of asthma and 7.0% had experienced a food-induced anaphylactic reaction requiring adrenaline administration. No statistically significant associations were found between gender, age and the occurrence of parent-reported food allergic reactions. The findings indicate that parent-reported food allergic reactions were frequently reported within the study sample. However, because the results were based exclusively on parental reports and were not clinically confirmed, they should not be interpreted as estimates of the prevalence of food allergy in the general population. Future nationwide studies using representative sampling strategies and standardized diagnostic methods are warranted.

**Keywords:** parent-reported food allergic reactions; preschool children; cow's milk allergy; Greece

## 1. Introduction

Food allergies in childhood are a growing public health problem worldwide, causing significant concern for both parents and healthcare professionals. The presence of food allergy significantly affects children's daily lives and quality of life, as it is associated with dietary restrictions, increased need for medical monitoring and the possibility of serious allergic reactions [1]. At the same time, food allergies often coexist with other atopic conditions, such as asthma, atopic dermatitis and allergic rhinitis, further burdening the physical and psychosocial health of children and their families [2,3]. Furthermore, food allergies are the main cause of anaphylaxis in children, accounting for approximately 81% of pediatric anaphylaxis cases [4].

Food allergy is defined as an adverse immune response to specific food allergens and encompasses a wide spectrum of clinicopathological disorders [5]. Depending on the underlying immunological mechanism, food allergies are classified into IgE-mediated, non-IgE-mediated, and mixed forms [6]. Their manifestations include cutaneous, respiratory,

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gastrointestinal, and cardiovascular reactions, with the severity of symptoms ranging from mild itching and rashes to severe and potentially life-threatening conditions, such as anaphylaxis [7]. Furthermore, food allergies are one of the main manifestations of the "atopic course", together with eczema, allergic rhinitis and asthma [8,9].

The international literature demonstrates a significant increase in the prevalence of food allergies in recent decades. It is estimated that approximately 6–8% of children exhibit some form of food allergy, while self-reported cases by parents show a continuous upward trend [10]. In the United States, the prevalence of food allergies increased by 18% between 1997 and 2007, while in a survey of children aged 0–17 years the rate of self-reported food allergies reached 8%, with even higher rates in preschool children [11]. Similarly, high rates of self-reported food allergies have been recorded in Asian and Latin American countries, such as China [12], Korea [13] and Brazil [14], suggesting that food allergies are now a global phenomenon.

Despite the increasing incidence of food allergies, accurate estimates of their prevalence remain difficult due to differences between countries, races, age groups, dietary habits, and geographic regions [7]. Furthermore, significant discrepancies are observed between self-reported food allergies and confirmed cases through food challenge testing [15]. Studies show that rates reported by parents often overestimate the true prevalence of allergies, which highlights the importance of using reliable diagnostic methods and epidemiological studies with clear evaluation criteria [16,17].

Although questionnaire-based studies cannot establish the true prevalence of clinically confirmed food allergy, they provide valuable information regarding parental perceptions, awareness, and reported food-related allergic reactions. Such information is particularly important because parental perceptions frequently influence dietary restrictions, healthcare-seeking behaviour, and children's nutritional management, even before a formal medical diagnosis is established.

In Europe, available data show significant heterogeneity in the prevalence of food allergies between countries. According to the systematic review by Nwaru et al. [16], the prevalence of food allergies confirmed by food challenge testing in Europe is low for most foods, while self-reported allergies show significantly higher rates. Furthermore, EuroPrevall studies have shown significant variations between European countries in cow's milk and egg allergy, with Mediterranean countries showing lower rates compared to northwestern European countries [18,19]. These differences are likely related to dietary, environmental, genetic and epigenetic factors.

Regarding Greece, epidemiological data on food allergies in children remain limited and not fully documented. According to available studies, the incidence of food allergies in the Greek pediatric population ranges between 0.3% and 2.5%, with the most frequent allergies being those to cow's milk, eggs and nuts [20,21]. Furthermore, EuroPrevall data showed that Greece has one of the lowest rates of food allergies in Europe, both for cow's milk allergy and egg allergy [18,19]. However, despite the available data, there is still limited information regarding food allergy among preschool children in Greece. Therefore, further research is needed to better characterize food allergic reactions in this age group.

In addition, little information is available regarding parent-reported food allergic reactions among preschool children in Greece. Investigating parental reports may contribute to a better understanding of parents' perceptions of food allergic reactions and help identify areas where further clinical and epidemiological research is needed.

Based on the above, the aim of the present study was to investigate parent-reported food allergic reactions among preschool children in Greece, as well as to record the most frequently reported food allergens, associated symptoms, and their possible association with demographic and family characteristics.

## 2. Materials and Methods

This cross-sectional study was conducted to investigate parent-reported food allergic reactions among preschool children in Greece. A quantitative research approach was selected because it allows the collection and analysis of data from a relatively large number of participants and facilitates the investigation of the frequency and characteristics of parent-reported food allergic reactions within the study sample.

Data collection was carried out through a structured questionnaire specifically developed for the present study, which was created on the Google Forms electronic platform and shared online, aiming at the participation of parents from different geographical areas of Greece. The use of an electronic questionnaire facilitated the rapid collection of data and allowed access to a larger number of participants, regardless of place of residence.

The questionnaire was disseminated online using the Google Forms platform through social media applications and networks, including Facebook, Messenger, Viber, parenting groups, and personal contacts, with the aim of reaching parents of preschool children from different geographical regions of Greece. Participation was voluntary, anonymous, and based on convenience sampling. Because the survey was distributed through publicly accessible online platforms and social media groups, it was not possible to determine the number of parents who viewed the invitation or received access to the questionnaire. Therefore, a response rate could not be calculated.

The research sample consisted of 151 preschool children, aged 3 to 6.5 years, from various regions of Greece. The questionnaire was completed by the children's parents or guardians, who provided information regarding the history of food allergies, clinical symptoms, potential allergenic foods and the presence of allergies in first-degree relatives. The demographic characteristics of the children are summarized in Table 1. Only fully completed questionnaires meeting the inclusion criteria were included in the final analysis.

**Table 1.** Demographic characteristics of the participating preschool children (n = 151).

| Variable | Category | n | % |
|---|---|---|---|
| Gender | Boys | 71 | 47.0 |
| | Girls | 80 | 53.0 |
| Age | 3 to <4 years | 61 | 40.4 |
| | 4 to <5 years | 37 | 24.5 |
| | 5 to <6 years | 23 | 15.2 |
| | 6 to <7 years | 30 | 19.9 |

Data are presented as number (n) and percentage (%).

The questionnaire included questions about the demographic characteristics of the children, such as gender and age, as well as questions regarding the existence of a food allergic reaction, the diagnosis of asthma, the occurrence of an anaphylactic reaction and the administration of adrenaline. In addition, the most frequent foods that, according to the parents, were associated with the occurrence of allergic reactions were recorded, such as cow's milk, eggs, fish, peanuts, soy and other foods. At the same time, the existence of a history of allergies, food allergies and anaphylaxis in first-degree relatives of the children was investigated. The complete questionnaire is provided as Supplementary Material S1 to facilitate the evaluation of the study methodology and improve transparency.

The present study employed a cross-sectional observational design using an anonymous online questionnaire completed by parents or legal guardians of preschool children. The study aimed to describe parent-reported food allergic reactions within the study sample

and was not designed to estimate the true population prevalence of clinically confirmed food allergy in Greece.

The statistical analysis of the data was performed using the IBM SPSS software (version 22). Initially, descriptive statistics were applied to present the demographic characteristics and the main variables of the study, by calculating absolute and relative frequencies. Subsequently, possible associations between study variables, such as gender, age, food allergy, asthma, anaphylactic reaction and family history of allergies, were investigated. For this reason, chi-square tests were used and the level of statistical significance was set at $p < 0.05$.

Participation in the study was voluntary and anonymous. Before completing the questionnaire, participants were informed about the purpose of the study and the use of the data exclusively for research purposes, while the confidentiality and protection of the participant's personal data were ensured. Submission of the completed questionnaire was considered to indicate informed consent for participation in the study.

## 3. Results

### *3.1. Parent-Reported Food Allergic Reactions and Related Clinical Conditions Among Participating Preschool Children (n = 151)*

Of the parents who participated in the survey, 57% (n = 86) reported that their child had experienced a food allergic reaction, while 43% (n = 65) reported that no such reaction had occurred. As the data were based exclusively on parental reports obtained through an anonymous online questionnaire, the reported frequency reflects parent-reported food allergic reactions within the study sample and should not be interpreted as the prevalence of clinically confirmed food allergy. Among the 86 children with parent-reported food allergic reactions, 8.1% (n = 7) had a parent-reported diagnosis of asthma and 7.0% (n = 6) had experienced a reported food-induced anaphylactic reaction requiring adrenaline administration. The results are summarized in Table 2.

**Table 2.** Parent-reported food allergic reactions and related clinical conditions among participating preschool children.

| Variable | Response | n | % |
|---|---|---|---|
| Occurrence of food allergic reaction | Yes | 86 | 57.0 |
| | No | 65 | 43.0 |
| Asthma diagnosis | Yes | 7 | 8.1 |
| | No | 79 | 91.9 |
| Anaphylactic reaction requiring adrenaline administration | Yes | 6 | 7.0 |
| | No | 80 | 93.0 |

Percentages for food allergic reactions were calculated using the total study sample (n = 151). Percentages for asthma and anaphylaxis were calculated among children with parent-reported food allergic reactions (n = 86). All information was parent-reported.allergy reaction.

### *3.2. Clinical Manifestations Reported by Parents Among Children with Food Allergic Reactions (n = 86)*

Of the parents who reported that their child had experienced a food allergic reaction (n = 86), 76.7% (n = 66) reported skin rash, eczema or itching. In addition, 32.6% (n = 28) reported diarrhea or vomiting, 17.4% (n = 15) swelling of the mouth, lips or eyes, while 12.8% (n = 11) reported cough and allergic rhinitis. Furthermore, 11.6% (n = 10) experienced symptoms of allergic conjunctivitis, 10.5% (n = 9) dyspnea and 2.3% (n = 2) fainting. These findings represent symptoms reported by parents and were not clinically verified. The results are summarized in Table 3.

**Table 3.** Clinical manifestations reported by parents among children with food allergic reactions (n = 86).

| Clinical Manifestation | n | % |
|---|---|---|
| Skin rash/eczema/itching | 66 | 76.7 |
| Diarrhea or vomiting | 28 | 32.6 |
| Swelling of mouth/lips/eyes | 15 | 17.4 |
| Cough/allergic rhinitis | 11 | 12.8 |
| Allergic conjunctivitis | 10 | 11.6 |
| Dyspnea | 9 | 10.5 |
| Fainting | 2 | 2.3 |

Multiple responses were allowed.

### *3.3. Most Common Allergenic Foods*

Parents of children who had experienced a food allergic reaction (n = 86) were asked to report the foods associated with the onset of the reaction. The most common allergenic food was cow's milk and its derivatives, which was reported by 46.5% of parents (n = 40). This was followed by chicken egg with a percentage of 27.9% (n = 24), fish with 16.3% (n = 14) and peanut with 12.8% (n = 11). In addition, tomato, orange, soy and chocolate were reported by 9.3% (n = 8), while sesame and hazelnut were reported by 8.1% of parents (n = 7). Lentils and strawberries were recorded at a rate of 7% (n = 6), while banana and wheat along with its products were reported by 5.8% of parents (n = 5). Furthermore, kiwi and corn were reported at a rate of 4.7% (n = 4), while avocado and chickpeas at a rate of 3.5% (n = 3). Almond, apricot, carrot, melon and peach were reported at lower rates (2.3%, n = 2). Finally, at a rate of 1.2% (n = 1) were recorded artichoke, peas, pear, shrimp, walnut, cashew, zucchini, chicken, honey, eggplant, apple, beef, paprika, potato, pepper, pomegranate, rice and celery. The reported foods reflect parental perceptions of the suspected triggering foods and were not confirmed through standardized allergy diagnostic procedures. The results are summarized in Table 4.

**Table 4.** Foods reported by parents as causing allergic reactions (n = 86).

| Food | n | % |
|---|---|---|
| Cow's milk and dairy products | 40 | 46.5 |
| Egg | 24 | 27.9 |
| Fish | 14 | 16.3 |
| Peanut | 11 | 12.8 |
| Tomato | 8 | 9.3 |
| Orange | 8 | 9.3 |
| Soy | 8 | 9.3 |
| Chocolate | 8 | 9.3 |
| Sesame | 7 | 8.1 |
| Hazelnut | 7 | 8.1 |
| Lentils | 6 | 7.0 |
| Strawberry | 6 | 7.0 |
| Banana | 5 | 5.8 |
| Wheat | 5 | 5.8 |
| Kiwi | 4 | 4.7 |
| Corn | 4 | 4.7 |
| Other reported foods * | 34 | 39.5 |

Multiple responses were allowed. Percentages were calculated using the 86 children with parent-reported food allergic reactions as the denominator. * The category "Other reported foods" includes less frequently reported foods. Other reported foods included avocado, chickpeas, almond, apricot, carrot, melon, peach, artichoke, peas, pear, shrimp, walnut, cashew, zucchini, chicken, honey, eggplant, apple, beef, paprika, potato, pepper, pomegranate, rice, and celery.

### *3.4. Family History of Allergies*

Regarding family history of allergies, 49% of parents of children with reported food allergic reactions (n = 42) reported that there was some form of allergy in first-degree relatives, while 51% (n = 44) reported that there was no corresponding history. In addition, 30% of parents (n = 26) reported a known food allergy in first-degree relatives, while 14% (n = 12) reported a history of anaphylactic reaction in first-degree relatives.

### *3.5. Association of Children's Gender with the Occurrence of Allergies and Family History*

Chi-square tests were performed to investigate a possible association between children's gender and the occurrence of allergies, asthma, anaphylactic reaction and family history of allergies. The results showed that children's gender was not statistically significantly associated with the occurrence of a food allergic reaction ($p = 0.241$), the diagnosis of asthma ($p = 0.606$) or the occurrence of an anaphylactic reaction leading to the administration of adrenaline ($p = 0.185$). Similarly, no statistically significant association was found between the gender of the children and the presence of allergy in first-degree relatives ($p = 0.258$), known food allergy in first-degree relatives ($p = 0.805$) or anaphylactic reaction in first-degree relatives ($p = 0.750$).

### *3.6. Association of Children's Age with the Occurrence of Allergies and Family History*

The possible association between children's age and the occurrence of allergies, asthma, anaphylactic reaction and family history of allergies was also investigated through chi-square tests. The results showed that children's age was not statistically significantly associated with the occurrence of a food allergic reaction ($p = 0.388$), the diagnosis of asthma ($p = 0.283$), the presence of allergy in first-degree relatives ($p = 0.401$), known food allergy in first-degree relatives ($p = 0.642$) or the presence of anaphylactic reaction in first-degree relatives ($p = 0.451$).

### *3.7. Association Between Food Allergic Reactions in Children and Family History of Allergies*

The possible association between the occurrence of food allergic reactions in children and the presence of allergies in first-degree relatives was investigated. The results showed that the occurrence of food allergic reactions in children was not statistically significantly associated with the presence of allergy in first-degree relatives ($p = 0.098$) nor with the presence of known food allergy in first-degree relatives ($p = 0.155$).

### *3.8. Association of Anaphylactic Reaction in Children with a Family History of Anaphylaxis*

The possible association between the occurrence of a food-related anaphylactic reaction in children, which led to the administration of adrenaline, and the existence of an anaphylactic reaction in first-degree relatives was investigated. The results showed that there was no statistically significant association between the two variables ($p = 0.905$).

Overall, the results provide an overview of parent-reported food allergic reactions among participating preschool children and should be interpreted within the context of the study design and the limitations associated with questionnaire-based data collection.

## 4. Discussion

This study investigated parent-reported food allergic reactions among preschool children in Greece through an anonymous online questionnaire completed by their parents. More than half of the participating parents reported that their child had experienced a food-related allergic reaction. Although this proportion appears considerably higher than estimates reported in studies using standardized diagnostic procedures, the findings should be interpreted in the context of the study design and should not be

considered representative of the prevalence of clinically confirmed food allergy in the Greek preschool population.

This finding is consistent with the international trend of increasing self-reported food allergies in children, as described by Keet et al. [22], who report a gradual increase in food allergies according to parental reports over the past decades. However, the literature highlights that there is often a significant discrepancy between the cases reported by parents and the food allergies confirmed by diagnostic testing [15].

This discrepancy has been consistently reported in epidemiological studies and reflects the tendency of questionnaire-based surveys to overestimate clinically confirmed food allergy. Parents may attribute a variety of symptoms, including food intolerance, viral infections, or other non-allergic adverse reactions, to food allergy. Nevertheless, parental reports remain clinically relevant because they influence dietary choices, healthcare-seeking behaviour, and quality of life.

For example, in the study by Gonçalves et al. [14], the rate of self-reported food allergies was 17.6%, while the rate confirmed through diagnostic tests was only 0.4%. Therefore, it is possible that the high rate in the present study reflects more the perception and concern of parents about food allergies than the actual prevalence of clinically confirmed cases. Regarding the clinical manifestations of food allergies, the majority of parents reported skin reactions, such as rash, eczema or itching. This finding is in agreement with previous studies, according to which skin manifestations are the most common form of food allergic reaction in preschool children [12–14]. At the same time, a significant proportion of parents reported gastrointestinal symptoms, such as diarrhea and vomiting, as well as respiratory symptoms, such as allergic rhinitis and dyspnea. In contrast, the proportion of children who experienced a fainting episode, which is a serious manifestation of anaphylaxis, was particularly low. This finding is considered positive, as anaphylaxis is the most serious and potentially life-threatening manifestation of food allergy [23]. In the present study, 8.1% of children with parent-reported food allergic reactions had a parent-reported diagnosis of asthma. This percentage is considered relatively low and is in agreement with other international studies, in which the rate of coexistence of food allergy and asthma ranged between 3.3% and 8% [2,24]. Although asthma is recognized as a significant risk factor for severe allergic reactions and anaphylaxis, the results of the present study show that it did not coexist to a large extent with food allergies in the children in this sample.

In addition, 7.0% of children with parent-reported food allergic reactions had experienced an anaphylactic reaction to a food, which had led to the administration of adrenaline. Food-induced anaphylaxis is considered the most common form of anaphylaxis in childhood, according to studies conducted in Europe and America [7,25,26]. Although the rate in the present study was not high, the finding remains particularly important, as anaphylaxis is a medical emergency with potentially serious consequences. The main foods reported as causes of allergic reactions were cow's milk and its derivatives, eggs, fish and peanuts. Cow's milk was the most common allergenic food, a finding that is consistent with both Greek [20,21] and international studies [11,27].

Cow's milk allergy is highly prevalent, especially in the first years of life, which explains the intense research interest in it. However, there are geographical differences in the most common allergenic foods. In many Asian countries, such as China and Korea, egg allergy is more common than cow's milk allergy in young children [28], while in Thailand, shrimp allergy is predominant [29].

Although cow's milk was the most frequently reported food associated with allergic reactions in the present study, these findings should be interpreted cautiously because the suspected allergens were reported exclusively by parents and were not confirmed by allergy testing or oral food challenges.

One possible explanation for the high frequency of parent-reported cow's milk allergy in early childhood is that many children gradually develop tolerance over time. According to Schoemaker et al. [18], cow's milk allergy often resolves during the first few years of life, while Menco Contreras et al. [30] report that resolution of the allergy before the age of 5–6 years is expected in 75–90% of cases. The development of tolerance seems to be related to the maturation of the immune system and to immunological changes, such as the reduction of specific IgE antibodiesin and the enhancement of immune tolerance mechanisms through regulatory T cells (Tregs) and cytokines such as IL-10 and TGF-β [31].

At the same time, several studies have shown lower rates of allergies to specific foods compared to the present study. For example, in the HealthNuts study, the rates of allergy to peanuts, eggs and sesame in preschool children were 1.9%, 1.2% and 0.4%, respectively [32], while in the present study the corresponding parent-reported rates were higher. Accordingly, in the study by Gonçalves et al. [14] in Brazil, the rates of allergy to cow's milk, eggs, soy, peanuts and fish were lower than the findings of the present study. These results support the view that parental reports may overestimate the true prevalence of food allergies.

Regarding family history, almost half of the parents reported the presence of some form of allergy in first-degree relatives. This finding supports the possible contribution of genetic and hereditary factors to the occurrence of food allergies, as has been reported in previous studies [33]. However, in the statistical analyses of the present study, no significant correlation was found between the presence of food allergic reactions in children and the presence of allergies or food allergies in first-degree relatives.

The absence of statistically significant associations between family history and parent-reported food allergic reactions should also be interpreted with caution, given the relatively small sample size and the non-probability sampling strategy employed in the present study.

Finally, the analyses showed that neither gender nor age of the children were statistically significantly associated with the occurrence of parent-reported food allergic reactions, asthma or anaphylactic reaction, nor with family history of allergies. This finding differs from the literature that reports that the prevalence of food allergies is influenced by factors such as age and gender [34,35]. A possible explanation is the relatively small and non-random sample of the present study, which may have limited the ability to highlight statistically significant differences.

Despite these limitations, the study provides useful preliminary information regarding parent-reported food allergic reactions among preschool children in Greece. Such findings may contribute to future nationwide studies employing representative sampling strategies and standardized diagnostic methods for the assessment of food allergic reactions.

### *4.1. Limitations*

The present study has several limitations that should be taken into account when interpreting the results. First, the sample was collected through non-random and convenience sampling, which limits the generalizability of the findings to the entire population of preschool children in Greece. Furthermore, the relatively small sample size may have affected the statistical power of the analyses. Recruitment through online social media platforms may have introduced additional selection bias. As participation was voluntary, parents whose children had experienced suspected food allergic reactions may have been more motivated to complete the questionnaire than parents without such experiences. Consequently, selection bias cannot be excluded, and the findings should not be considered representative of the entire Greek preschool population.

Furthermore, because the questionnaire was disseminated through publicly accessible online platforms, it was not possible to determine the number of individuals who viewed or received the invitation to participate. Therefore, a response rate could not be calculated.

Finally, food allergic reactions were reported exclusively by parents and were not verified using standardized diagnostic procedures such as skin prick testing, serum-specific IgE measurements, oral food challenges, or component-resolved diagnostics. Therefore, the reported frequencies should be interpreted as parent-reported food allergic reactions rather than clinically confirmed food allergy. Despite these limitations, this study provides one of the few available datasets on parent-reported food allergic reactions among preschool children in Greece.

### *4.2. Suggestions for Further Research*

Future nationwide studies using representative sampling strategies and standardized diagnostic methods are required to provide more accurate estimates of food allergic reactions among preschool children in Greece. Combining questionnaire-based information with clinical assessment would improve the validity of epidemiological findings and contribute to a better understanding of food allergic reactions in the Greek pediatric population.

## 5. Conclusions

The present study provides valuable information regarding parent-reported food allergic reactions among preschool children in Greece. Although food-related allergic reactions were frequently reported by participating parents, these findings should be interpreted with caution because they were based on parental reports obtained through an anonymous online questionnaire and were not clinically confirmed. Nevertheless, the study highlights the importance of parental awareness regarding food allergic reactions and underscores the need for larger nationwide studies employing representative sampling methods and standardized diagnostic procedures to better understand the epidemiology of food allergic reactions in Greek preschool children.

**Supplementary Materials:** The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/allergies6040039/s1, Supplementary Material S1: Questionnaire used for data collection.

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**Informed Consent Statement:** Participants were informed that completion and submission of the questionnaire constituted their consent to participate in the study. Accordingly, informed consent was implied through the voluntary completion and submission of the questionnaire.

**Data Availability Statement:** The data supporting the findings of this study are available from the corresponding author upon reasonable request, subject to applicable data protection and confidentiality requirements.

**Conflicts of Interest:** The authors declare no conflicts of interest.

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