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ASSESSMENT OF NUTRITIONAL KNOWLEDGE AMONG PARENTS OF 6-YEAR-OLD CHILDREN: FOOD ALLERGIES AND INTOLERANCES

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Abstract: Correct nutrition in early childhood plays an important role in the development of the body as the intensive process of physical and cognitive development continues. During this period, the parents are primarily responsible for meeting nutritional requirements. However, this challenge is complicated by the increasing incidence of food allergies and intolerances, which affect approximately 8% of children. The aim of this study was to assess parents' knowledge of nutrition, with a particular focus on food allergies and intolerances. The study was conducted using an electronic questionnaire that included socio-demographic questions about general and specific nutritional knowledge and food allergies and intolerances. The responses of 240 parents of children aged six years who answered all the questions were included in the analysis. The analysis showed that 71% of parents had very good general nutritional knowledge. However, parents of children with allergies showed a significantly more detailed understanding of nutrition, especially in areas related to allergen identification. Compared to parents of healthy children, they were also better at selecting allergen-free foods. At the same time, the results of the study reveal significant gaps in the nutritional knowledge of parents of healthy children, highlighting the need for nutritional education in this population group.

Key words: nutritional knowledge, allergies, intolerances, children

INTRODUCTION

Proper nutrition in early childhood plays an important role in the appropriate development of the body, as this is a time of intense physical, cognitive and emotional development. A balanced diet supports the proper development of the, i.a., immune, nervous and motor systems, which has a direct impact on a child's health in both the short and long term [1, 2]. During this time, the primary responsibility for meeting a child's nutritional requirements lies with the parents, who must provide healthy meals that contain all the essential nutrients. However, this challenge is becoming more complicated as the prevalence of allergies and food intolerances has increased in recent years, particularly among children [3, 4].

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Food allergies are estimated to affect approx. 8% of children and 2% of adults worldwide, and lactose and gluten intolerance are also common dietary restrictions in many regions [5]. These conditions require stricter dietary adherence and constant vigilance, especially by parents [6]. These allergies can severely limit food choices, so parents need to have sufficient knowledge about allergen elimination and be able to introduce safe alternative foods that provide their child with all the necessary nutrients. In addition, the growing awareness of the risks associated with food allergies and intolerances is forcing parents to plan their diets in greater detail, which can be time-consuming but is crucial for the child's proper development [7]. As a result, these parents often have a higher level of nutritional knowledge than parents of children without dietary restrictions [8].

However, there is evidence that parents of children with food allergies may also have nutritional knowledge gaps. While these parents may be able to avoid allergens, they may lack the knowledge to ensure that their children are getting all the nutrients they need, particularly when dietary restrictions limit the intake of important food groups [9]. Research suggests that such gaps in nutritional knowledge can have long-term consequences, as children of parents with limited nutritional understanding may be more likely to develop poor eating habits or nutrient deficiencies [10].

The number of gluten- and lactose-free products available has increased in recent years, while widespread discussion of intolerances has contributed to greater public awareness of nutrition [11]. It is now easier for parents of children with food allergies and intolerances to learn how to manage these conditions. However, popular-science sources can contain misinformation that is not supported by scientific evidence. As a result, misconceptions are common, with many adults believing that allergen-free products are healthier and should be included in the diet, even when there is no medical justification for doing so [12].

Given the above information and the importance of the role of parents in the proper nutrition of their children, the aim of this study was to assess their nutritional knowledge, particularly in relation to food allergies and intolerances.

MATERIAL AND METHODS

A cross-sectional study was conducted using a questionnaire prepared in Google Forms and shared on social media in open groups of public and private kindergartens. Inclusion criteria for the study were having a child aged 6 years and a parental declaration of no food allergies and intolerances or a food allergy and/or food intolerance diagnosed by an allergist. Exclusion criteria for the study were having a child younger or older than 6 years of age; reporting a food allergy and/or intolerance but not confirmed by an allergist; not answering all questions about knowledge of food allergies and intolerances; incomplete or incorrectly completed questionnaires. The age group (6 years) was chosen because this is the age at which children start school, and it is also the transition from early to middle childhood, which can have a significant impact on eating habits and allergies [13]. Furthermore, the choice of one age group ensured consistency and limited variability due to different developmental stages.

The sample for the study was selected using the voluntary response sampling method, which resulted in the collection of 318 questionnaires. However, this did not provide a representative sample of the study population. Of the total questionnaires collected, 240 questionnaires meeting the inclusion and exclusion criteria were used for further analyses (Fig. 1). Of these, 102 were from parents of children with confirmed food allergies or intolerances (group A+I), and 138 were from parents of healthy children (group non-(A+I)).

Data were collected using a self-administered questionnaire. It was designed in the Department of Human Nutrition (WULS-SGGW) for a survey of adults and developed based on a review of the relevant literature and previous experience to ensure that it covered the key variables. However, it is important to note that the questionnaire has not been formally validated through methods such as reliability testing or validity assessment in the context of this study.

Socio-demographic questions gathered information on the participants' age, place of residence, education, and socio-economic status. Lifestyle questions included self-reported data on physical activity levels, alcohol consumption, smoking, use of dietary supplements, and the number of meals consumed per day. Parents assessed their physical activity levels by selecting one of five predefined categories, which ranged from very low, low, moderate, high, to very high. Each category included specific examples of exercise types and the corresponding weekly duration to guide respondents in making an appropriate selection [14]. Respondents were given a choice of three predefined frequencies of alcohol consumption, ranging from never, once a week or less, to 2–3 times/week. The questions on current use of dietary supplements (yes, no, which ones) included a short definition and gave some an example of them.

The group of children with food allergies and intolerances was identified based on parental declarations. Parents were specifically asked if their child's condition had been diagnosed by an allergist, the type of allergy and/or intolerance, and the child's age at the time of diagnosis.

Parents' nutritional knowledge was assessed using a questionnaire that included 30 questions in the following categories:

- general nutritional knowledge – included five basic questions about dietary recommendations, the number of meals consumed per day, the consumption of the main food groups such as vegetables and fruit, fish and seafood, meat and processed meats, and water intake;
- detailed nutritional knowledge – included five specific questions on the role of selected nutrients (protein, fat, carbohydrates, vitamin D, and iron), the effects of protein deficiency, and excessive consumption of simple sugars;
- nutritional knowledge of food allergies and intolerances – included twenty questions, (five questions in each subcategory) about identifying common allergens (questions about food products that are particularly common allergens), the occurrence of allergens in food products (questions about the most common sources of allergens in processed foods and their identification on product labels), an indication of alternative food products without allergens (questions to test knowledge of how to substitute products containing allergens), and dietary rules for eliminating gluten and lactose (including knowledge of the exclusion of products containing even traces of gluten or lactose).

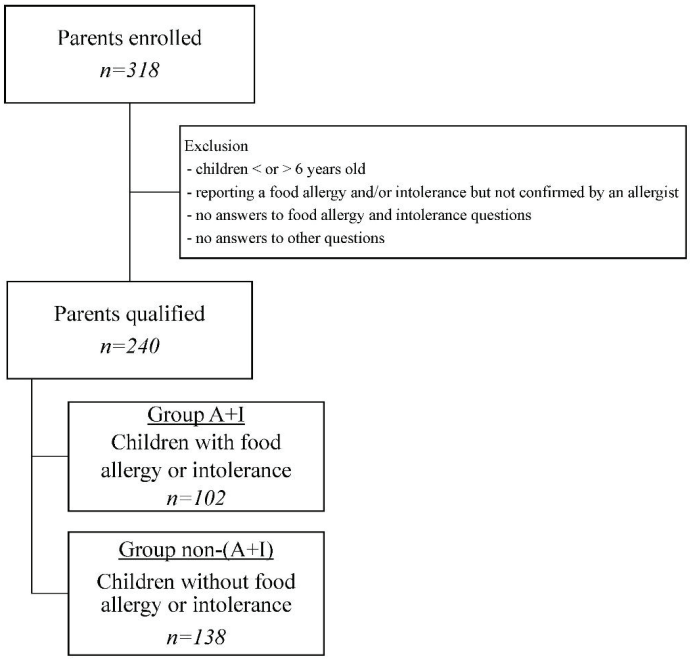


Figure 1. Study population flow chart

Source: own elaboration.

Each correct answer was worth 1 point and each incorrect answer was worth 0 points. Points were then added up within each category and subcategory. The maximum number of points that could be obtained in each category and subcategory was 5, so 5 points was considered very good, 4 good, 3 average, 2 poor, while 1 or less was considered very poor knowledge.

All survey procedures were conducted in accordance with the Declaration of Helsinki (1964) and its later amendments. The study was also approved by the Ethical Committee of the Warsaw University of Life Sciences (Resolution No. 25p/2018). The time required to complete the questionnaire was not burdensome and should not have exceeded 30 minutes. Apart from the information obtained from the questionnaire, no informed consent was required, as no other assignments were planned with the study participants.

Statistical analyses were performed using the Statistica software (version 13.4, StatSoft, USA). Characteristic data were presented as mean values ± standard deviation (*SD*) and as the percentage of parents. To determine differences in baseline characteristics between parents of children with a food allergy or intolerance and parents of children without these conditions, the Chi-square test was used for categorical variables. Based on the Shapiro-

Wilk test, the hypothesis of normality of the numerical variables (age and nutritional knowledge scores) was rejected; therefore, the Mann-Whitney U test was used to determine statistically significant differences between groups. *P*-values ≤0.05 were admitted as statistically significant.

Results and discussion

The mean age of both study groups was similar: parents of children with allergies and intolerances (A+I) had a mean age of 36.5 ±2.7 years, while parents of healthy children (non-(A+I)) had a mean age of 34.4 ±2.9 years (Tab. 1). Most parents lived in urban areas (82% in the allergic group and 98% in the non-allergic group). Both groups had similar levels of education, with higher education being the most common level observed (75% and 77%, respectively). A significant proportion of parents in both groups reported having a 'good' or 'very good' socio-economic status. Importantly, there were no statistically significant differences between the groups in these socio-demographic characteristics (p >0.05).

Table 1. Characteristics of the studied group

Variables	Total (n = 240)	A+I (n = 102)	Non-(A+I) (n = 138)	*P*-value *
Age (years) mean ± *SD*	35.1 ±3.9	36.5 ±2.7	34.4 ±2.9	0.582
Residence (%)				
urban area	96	82	98	0.541
suburban area	4	18	2	
Education (%)				
primary	4	3	4	
secondary	14	18	11	0.221
vocational	6	4	8	
higher	76	75	77	
Socioeconomic status (%)				
average	17	18	17	0.699
good	41	42	40	
very good	42	40	43	
Physical activity (%)				
very low	0	0	0	
low	16	15	17	0.511
moderate	66	67	65	
high	18	18	18	
very high	0	0	0	
Drinking alcohol (%)				
never	43	45	42	0.443
once a week or less	48	47	49	
2–3 times/week	10	8	11	
Cigarette smoking (%)				
no	80	79	81	0.512
yes	20	21	19	
Dietary supplements use (%)				
no	57	54	59	0.336
yes	43	46	41	
Number of meals/day (%)				
≤3	23	22	24	0.389
4	40	40	40	
≥5	37	38	36	

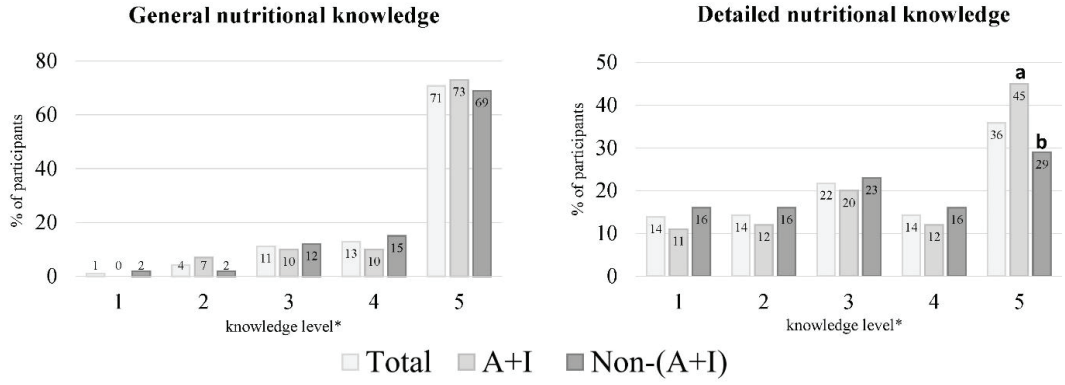
Group A+I – parents of children with food allergies or intolerances; non-(A+I) – parents of children without food allergies or intolerances. **P*-values were calculated using the Mann-Whitney's test for continuous variables and the chi-squared test for categorical data.

Source: own elaboration.

Physical activity levels were also similar in both groups, with most volunteers reporting moderate activity. Alcohol consumption was comparable, with the majority consuming alcohol 'once a week or less'. Smoking habits were nearly identical between the groups, and 43% of parents used dietary supplements. The largest group of participants (40%) reported eating four meals a day. There were no statistically significant differences in lifestyle factors between the groups (p >0.05).

In group A+I, the most common allergies in children, as declared by the parents, included egg white (39%), peanuts (34%), fish and seafood (16%), and other allergens (11%), such as citrus fruits, tomatoes, strawberries, and soy. Lactose intolerance was the most common (74%), while gluten intolerance was demonstrated less frequently (26%). It should be emphasised that such a high proportion of individual allergies may be due to the limitations of this study. Allergies were not diagnosed directly and were based on parental report – only those questionnaires where parents confirmed the result obtained by a specialist were qualified. In addition, the sample selection for the study was based on the voluntary response sampling method, so it is possible that the subsequent lack of representativeness led to such a high proportion of individual food allergies and intolerances.

The majority of parents participating in the study (71%) demonstrated a very high level of general nutritional knowledge, regardless of whether their children had a food allergy or intolerance (73% and 69%, respectively); (Fig. 2). It is crucial for this group to have a high level of nutritional awareness, because they are responsible for shaping their children's dietary habits and behaviour. This increased awareness can be attributed to the many educational campaigns and programmes implemented in recent years, as well as the widespread availability of health and nutrition information [15]. Some researchers have observed a growing trend among adults to seek nutrition information from Internet sources and social media [16, 17]. While the Internet and social media are popular sources of nutrition information, it is important to note that they also carry the risk of disseminating inaccurate and unverified data, which often lacks scientific backing [18]. It is therefore important to encourage individuals to verify the information they receive from these sources, for example, by consulting a qualified dietitian. Some researchers have also found that despite the high levels of knowledge about basic nutrition principles, this knowledge does not always translate into healthier eating behaviours [19]. This phenomenon is particularly common among adults without medical conditions or health problems that require dietary restrictions [20]. A similar dependency has been observed in parents of children without food allergies or intolerances [21].



Group A+I – parents of children with food allergies or intolerances; non-(A+I) – parents of children without food allergies or intolerances; a, b – significant differences between the study groups, $p \leq 0.05$ (Mann-Whitney test); *scale of knowledge, where 1 indicates very poor, 2 poor, 3 average, 4 good and 5 points indicates very good knowledge.

Figure 2. Results of the parents' general and detailed nutritional knowledge assessment

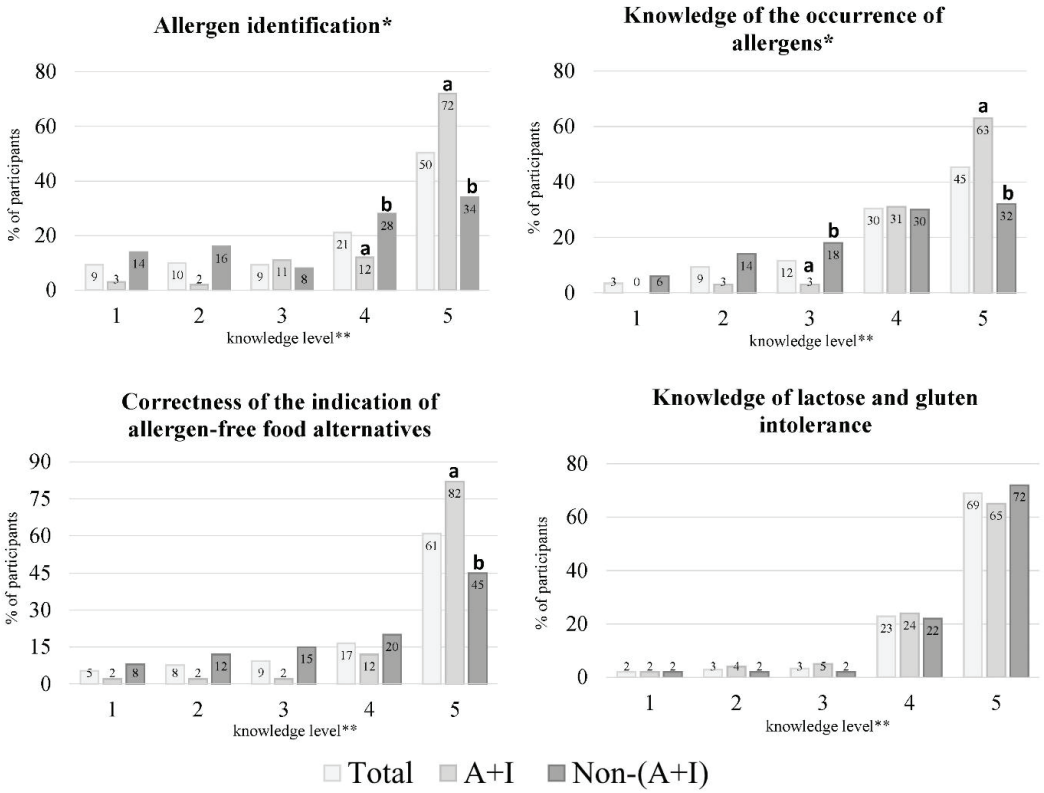
Source: own elaboration.

A significant proportion of participants had very good (36%) or good (14%) detailed nutritional knowledge. However, the A+I group had a statistically significantly higher level of very good knowledge (level 5) than the parents of healthy children ($p = 0.005$). Many participants in this group gave correct answers about the role of selected nutrients (protein, fat, carbohydrate, vitamin D, and iron) and the effects of protein deficiency and excessive intake of simple sugars. Several studies also confirm that people with food allergies were more motivated to learn about their diet [8, 22, 23]. They were significantly more likely to give correct information about the effects of specific nutrients on bodily functions, assess the consequences of nutrient deficiencies, and report that they frequently read labels and pay attention to the composition of the products they consume. It is, therefore, understandable that parents of healthy children were more likely to increase their knowledge about their children's nutrition.

In contrast, some of the parents studied had average or poor nutritional knowledge. Several studies have shown that people with food allergies and intolerances may be very knowledgeable about avoiding harmful substances, but only sometimes very knowledgeable about nutrition [24, 25]. In addition, people without allergies

or intolerances often have misconceptions about the nutritional benefits of foods without problematic ingredients [26]. Many people without specific dietary needs mistakenly believe that allergen-free products are inherently healthier when these products may lack essential nutrients needed for proper body function [25].

The A+I group were statistically significantly more knowledgeable at the very good level (level 5) in identifying selected allergens compared to parents of healthy children (p = 0.006) (Fig. 3). In contrast, the non-(A+I) group was significantly more knowledgeable at the good level (p = 0.003). The vast majority of parents in the A+I group correctly identified allergens in ingredients such as shellfish (82% correct answers), fish (76%), eggs (78%), nuts (81%), soya (76%), as well as milk (85%) and hazelnuts (92%). An allergy or intolerance in a child often forces parents to increase their understanding of allergens. Studies by other authors support these results; people with food allergies or intolerances were more motivated to learn about allergen identification because of the direct health risks involved [27, 28, 29].



Group A+I – parents of children with food allergies or intolerances; non-(A+I) – parents of children without food allergies or intolerances. *Allergen identification (questions about food products that are particularly common allergens); occurrence of allergens in food products (questions about the most common sources of allergens in processed foods and their identification on product labels); a, b – significant differences between the study groups, $p \leq 0.05$ (Mann-Whitney test);**scale of knowledge, where 1 indicates very poor, 2 poor, 3 average, 4 good and 5 points indicates very good knowledge.

Figure 3. Results of the parents' nutritional knowledge of food allergies and intolerances assessment

Source: own elaboration.

At the same time, the A+I group had significantly better knowledge (at a very good level) than the parents of healthy children (p = 0.002) about the sources of allergens and their presence in processed foods. The vast majority of parents in the A+I group correctly identified the allergens on the labels of these foods (86% correct answers). A study by other researchers confirms that people with allergies tend to be vigilant and cautious in their food choices. They often showed better skills in reading labels and identifying potential allergens in food [30]. These individuals often become experts in identifying hidden allergens and understanding where potential cross-contamination may occur during food production or processing. This is crucial to avoid accidental exposure, especially when eating prepared meals in restaurants or canteens [7]. On the other hand, despite the increasing public awareness of allergens, many people still find it difficult to correctly identify hidden allergens, especially in processed foods [29, 31]. However, increasingly sophisticated allergen labelling systems are helping to make allergen identification much easier [9].

The studied parents of children with food allergies and intolerances (A+I group) had statistically significantly higher knowledge at a very good level (level 5) in identifying allergen-free alternatives than the non-(A+I) group (p = 0.004). Most parents of sick children correctly indicated that the substitutes must be completely free of allergens (78%). They were also able to identify specific equivalents of products, replacing products containing allergens correctly (average 86% correct answers). People with food allergies or intolerances often have greater knowledge of such products because they actively seek safe substitutes for foods they cannot consume. This includes familiarity with specific brands and products designed for allergen-sensitive consumers [11, 32]. Developing specialised markets, such as gluten- or lactose-free products, has significantly improved the availability and labelling, making it easier for people with allergies to identify foods that are safe for them [31]. However, some researchers suggest that despite the increase in allergen-free products, their marketing may mislead healthy individuals into believing that these products are healthier or necessary for everyone. This misconception may lead to unnecessary dietary changes for those without allergies [6].

The awareness of lactose and gluten intolerance was similar in both groups and again the highest proportion of participants had a very good level of knowledge (level 5). There has been a significant increase in public awareness of these intolerances, linked to the increasing availability of gluten- and lactose-free products and the increased presence of these issues in the media. Social media and marketing by manufacturers of these types of foods play an important role [33, 34]. However, it is important to note that this awareness does not always translate into an understanding of the medical necessity of such diets [10, 35]. Despite the high level of awareness, many people follow gluten-free or lactose-free diets because of the perceived health benefits rather than the actual need due to intolerance to these ingredients. This trend towards unjustified dietary restrictions can lead to serious nutrient deficiencies [12].

The strength of the study was the participation of many parents, both parents of children with food allergies or intolerances and parents of healthy children. The clear comparison between the two groups provided detailed insight into how allergies and intolerances affect parents' knowledge, particularly in identifying allergens and product alternatives free of problematic ingredients. However, the study had several limitations. It was based on a voluntary response sampling method, which prevented the collection of a representative sample. It is important to note that, although the questionnaire was carefully designed to collect the necessary data, it was not formally validated. In addition, information on the presence of food allergies and intolerances was obtained only on the basis of the parents' declaration of a medical diagnosis by a specialist, which may introduce a degree of reporting bias. Another limitation of the study was the need to reduce the number of questions assessing the knowledge about nutrition and food allergies and intolerances, as the longer questionnaire was met with a negative response and a low number of completed responses. This limited the ability to use more advanced statistical methods.

CONCLUSIONS AND FUTURE PERSPECTIVES

In summary, the results indicate that most parents, regardless of their children's health status, had a high level of general nutrition knowledge. Parents of children with food allergies or intolerances showed significantly higher detailed knowledge, particularly in areas such as allergen identification and better identification of allergen-free food alternatives. These results highlight the need for targeted education to improve nutritional knowledge, especially among parents of children without food allergies or intolerances. A better understanding of the more specific issues related to nutrition can have a significant impact on the proper nutrition and development of their children.

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