PAPERS AND SHORT REPORTS

Parents' perceptions of food intolerance in primary school children

R J RONA, S CHINN

Abstract

In a study of about 7000 children, parents' perceptions were used to examine the prevalence of food intolerance, the types of food implicated, the association of intolerance with diseases, and the social background of those identified as being food intolerant. One hundred and ninety two children (3%) were perceived as being food intolerant, with a further 105 (2%) being classed as intolerant under a less stringent definition of intolerance. For 128 (67%) of these children a doctor was consulted. The pattern of food avoided was very similar in children for whom the decision to exclude certain foods was made by health staff and in those for whom the parents themselves made decisions about their child's diet. A strong association was seen between the mother's level of education and the child being perceived as being food intolerant. Between 20% and 30% of children with a disease associated with food intolerance—for example, eczema—had currently or previously avoided some types of food.

The results of this study emphasise the need to develop criteria to tackle the growing demand for National Health Service treatment by parents who believe their child to be food intolerant.

Introduction

Intolerance to certain foods has become a preoccupation of the general public and health staff.¹ The subject has been influenced greatly by coverage by the media and the formation of articulate organisations such as the Hyperactive Children's Support Group and the London Food Commission. Though classifications of adverse reactions to food are available,^{2,4} it is difficult enough to distinguish between an organic reaction and a psychogenic reaction in clinical practice; in field studies it is impossible. The difficulties are due to a lack of understanding of the underlying pathogenesis of the disease, the lack of a reliable single diagnostic laboratory test, the low availability of histopathological evidence, and the subjectivity of the symptoms. Delayed reactions, reactions to more

than one type of food, and the contribution of emotional problems are not uncommon.^{1,3,5,6} The expert advice of a general paediatrician is that clinical evidence may be more helpful than laboratory investigations,⁷ but this view is not unanimous.¹

The lack of a clear definition of food intolerance severely limits an assessment of the magnitude of the problem in the community. Yet a description of the main characteristics of food intolerance in terms of magnitude and distribution would greatly help health staff to develop policies to cope with patients' complaints. Parents' perceptions of food intolerance in their children offer a way of assessing the prevalence of food intolerance in the community and can help the planning of health education for the community and staff in the National Health Service by describing its distribution in terms of social and biological characteristics.

We determined the prevalence of parents' perceptions of food intolerance in schoolchildren, the person who diagnosed the disorder, the types of treatment prescribed, and the illnesses associated with food intolerance.

Subjects and methods

In the 1984 survey in the national study of health and growth, 8049 children from 27 areas in England and Scotland selected by stratified random sampling participated, with proportionately more from poorer social groups. Primary schools were selected to provide about 350 children in the age range 5 to 11 in each study area.⁸

Children are measured at each survey, and the parents are sent a questionnaire for them to fill in that includes questions on the father's occupation, the mother's level of education, the number of children in the family, and respiratory illnesses of the children in terms of wheezing, asthma attacks, coughing first thing in the morning, and coughing during the day or night. In 1984 a section on food intolerance was also included. This section comprised questions to help to identify a case of food intolerance and to ascertain whether a doctor had diagnosed or managed children with alleged food intolerance; a list of foods that might have been avoided for a long time; and questions about illnesses in the child or the parents often associated with food intolerance or allergic reactions to other sources.

Table I gives the foods listed in the questionnaire. The exact question in the questionnaire was: "Have you cut out any of the following types of food from this child's meals for a long period of time and if so was it following a doctor's advice or your own decision?" The list included foods often associated with food intolerance—for example, milk, eggs, and nuts—as well as foods rarely related to food intolerance—for example, lamb, cauliflower, and potatoes. For each item we asked if the food had been avoided for six months or longer.

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TABLE I—Food avoided and origin of advice

Food avoided	Intolerant (n=192)		Uncertain (n=105)		Tolerant (n=6546)	
	As decided by health staff	As decided by parents	As decided by health staff	As decided by parents	As decided by health staff	As decided by parents
Potatoes		1		1	1	4
Eggs	18	22	10	10	6	24
Chocolate or cocoa	17	11	6	4	12	36
Milk or dairy products	30	19	16	10	15	24
Orange or lemons	12	18	1	5	3	16
Fish or shellfish	12	13			2	35
Chicken or other poultry	2	1		1	2	22
Lamb		5		1	5	62
Beef or pork	7	5	1	1	3	42
Orange squash	18	33	5	10	11	184
Fish fingers	10	10		1	4	62
Flour	4	4	4		7	18
Apples	1	3	1	1		6
Cauliflower		2		1		36
Tomatoes	4	5		4		32
Nuts	6	16		3	6	120
Peas, beans, or other legumes	2	3				16

We asked about the following illnesses in the child: eczema, urticaria, frequent diarrhoea and vomiting, rhinitis, hay fever, excessive irritability, and severe headaches. The precise question was "Has your child frequently had any of the following illnesses?" For excessive irritability we asked whether it had been "observed by you and others, for example, friends or child's teachers." In addition, other sections of the questionnaire asked about the number of asthma attacks in the past 12 months and whether the child's chest ever sounded wheezy. The parents themselves were questioned about whether they suffered from eczema, urticaria, asthma, rhinitis, hay fever, and wheezing.

A child was classed as being food intolerant if his parents answered yes to the questions "Has the child ever had an illness or trouble caused by eating a particular food or foods?" and "Has this child nearly always had the same illness or trouble after eating this type of food?" He or she was classed as being tolerant if the answer to the first question was no and uncertain if the answer to the first question was yes but not to the second. Among those answering the relevant questions there were thus three groups. In this paper the term "food intolerance" is based on the parents' perceptions as determined by the specific replies given to the two questions above. Food avoidance is not included in the definition because parents may have decided to omit a food from a child's diet for reasons unrelated to food intolerance, such as after recommendations from a friend or after reading an article in a newspaper.

In the first part of the analysis the prevalence and characteristics of food intolerance and the type of food avoided by the children in the study was assessed. In the second two multiple logistic regressions (with the statistical package for the social sciences version $\times 2.0$) were performed. The first was to assess the contribution of the father's social class, the mother's level of education and whether she was currently working outside the home, and the number of children at home to the perception of food intolerance in the child. The second was to assess the association between each of the illnesses and food intolerance after adjustment for age, sex, either parent being atopic (suffering from any of asthma, hives, eczema, or hay fever), and social factors, such as the father's social class, the mother's level of education, and the number of children in the family. The change in the doubled log likelihood ratio after food intolerance had been omitted from the regression was compared with the χ^2 distribution with two degrees of freedom to assess the significance.

The first multiple regression analysis tried to answer the question, "Are social factors associated with parents' perception of food intolerance in the child?" and, if the answer was yes, "Which are the factors related to it?" The second analysis tried to assess if the illnesses in the child were associated with parents' perception of food intolerance after adjustments had been made for social and biological factors.

Results

Table II groups the children by their state of food intolerance, sex, and country. The prevalence of food intolerance was similar in both sexes in England and more common, but not significantly, in Scottish boys than in Scottish girls. If the "yes" and "uncertain" categories are summed to give an upper limit of perceived food intolerance 297 (4%) of 6813 children

(excluding the "not known" group) would be classified as being food intolerant.

Of the 192 children perceived as definitely being food intolerant, 50 (26%) did not consult a doctor, 72 (38%) were recommended only to avoid the problematic foods, 17 (9%) were given other treatment in addition to being told to avoid the problematic foods, 26 (14%) were given treatment, and 13 (7%) were not given treatment. Complete information was not available for 14 children (7%).

The association between the mother's level of education and her perception of food intolerance was very strong. The proportion of food intolerant children was about three times higher in mothers with university or polytechnic education than in those who reached only secondary education level (table III). Food intolerance was also associated with the father's social class and the number of siblings but not with the mother's hours of working outside the home (table IV). Food intolerance was more prevalent in the upper social classes and slightly more common in large families. After adjustment for the other factors only the mother's level of education was associated with food intolerance, and this remained strong ($p < 0.01$).

Table I shows the types of food avoided and the origin of advice (health staff or parents). In absolute numbers more children who were food tolerant than food intolerant avoided each type of food. Most of the children who were tolerant were avoiding a type of food after a decision by the parents, and 117 children (2%) in this group were avoiding three or more food items. In the group defined as being food intolerant the types of foods avoided were very similar, regardless of the origin of the decision. Dairy products and orange squash were the most commonly avoided foods.

The parents' perception of food intolerance in a child was highly associated with the presence of eczema, hives, hay fever, asthma, headache, rhinitis, wheeze, diarrhoea and vomiting, and excessive irritability after

TABLE II—Number (percentage) of children who are food intolerant by sex and country

Food intolerance	England		Scotland	
	Boys	Girls	Boys	Girls
Yes	76 (2)	77 (3)	25 (3)	13 (2)
Uncertain	46 (1)	34 (1)	12 (1)	12 (2)
No	2704 (81)	2459 (80)	695 (84)	661 (84)
Not known	514 (15)	523 (17)	99 (12)	99 (13)
Total	3340 (100)	3093 (100)	831 (100)	785 (100)

TABLE III—Number of children with food intolerance and mother's level of education (excluding children with no information on food intolerance)

Level of education attained by mother	No (%) of mothers		
	No	Certain about food intolerance in children	Uncertain about food intolerance in children
No formal education	55		1 (2)
Primary school	195	2 (1)	
Secondary school	4311	95 (2)	48 (1)
Commercial or technical	1276	52 (4)	26 (2)
University or polytechnic	344	20 (6)	16 (5)
Other or not known	660	23 (3)	14 (2)
Total	6841	192 (3)	105 (2)

TABLE IV—Significance of association of food intolerance with social factors before and after adjustment for other factors in model

Independent factors	df	Currently food intolerant (n=6541)		Currently or previously food intolerant (n=6635)	
		Unadjusted χ^2	Adjusted χ^2	Unadjusted χ^2	Adjusted χ^2
No of children†	1	5.94*	0.70	6.28*	0.72
Mother's work‡	1		0.62		0.66
Father's social class§	3	10.76*	4.92	16.14**	3.82
Mother's level of education	4	26.74***	17.40**	45.44***	28.94***

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

† No of children as continuous variable.

‡ Mother classed as working outside home or as housewife.

§ Father's social class classed as non-manual, skilled manual, semiskilled, unskilled, or not known.

|| Mother's education classed as elementary, secondary, technical, university, or not known.

adjustment for the child's age, the parents' history of atopy, the father's social class, and the mother's level of education (table V). The parents' history of atopy was not included in the analyses of the symptoms of headache, diarrhoea and vomiting, and irritability. This explains the larger number of children in the analyses for these symptoms than in the others, as fewer children were excluded because of missing data. Of all the factors in the model, the parents' perception of food intolerance in the child was the single factor most strongly associated with each symptom.

Table VI shows the prevalence of symptoms according to the perception of tolerance and the differences between the intolerant and tolerant groups. As adjustments for other independent variables in the logistic regression did not greatly alter these differences the unadjusted values are shown. Generally there was a gradient, with the intolerant group having the highest prevalence, followed by the uncertain group, the not known group, and the food tolerant group, in that order. The 95% confidence interval for the difference between the food intolerant group and the food tolerant group gave quite a narrow range of values for each estimate.

TABLE V—Significance of association of symptoms with food intolerance after adjustment for age, sex, number of children, parents' clinical atopy, father's social class, and mother's education. (All associations significant at $p < 0.001$)

	No of children with symptoms	χ^2 (2 df)*
Eczema	5773	70.8
Hives	5756	41.8
Hay fever	5766	37.0
Asthma	5772	54.1
Headache	6438	60.8
Rhinitis	5733	39.0
Wheeze	5785	61.6
Diarrhoea and vomiting	6453	49.3
Irritability	6439	60.8

* Variable food tolerance divided into tolerant, uncertain, and intolerant groups.

TABLE VI—Prevalence of symptoms according to parents' perceptions of food intolerance, and 95% confidence intervals for difference between tolerant and intolerant. (Except for difference and confidence intervals, values are numbers (percentages) of patients)

	Intolerant	Uncertain	Tolerant	Not known	Differences (%) between tolerant and intolerant	95% Confidence interval
Eczema	177 (33)	101 (14)	6348 (6)	354 (10)	27	23.3 to 30.7
Hives	170 (11)	99 (9)	6291 (2)	348 (2)	10	7.7 to 11.7
Hay fever	172 (21)	99 (14)	6321 (6)	322 (10)	15	11.6 to 18.8
Asthma	191 (19)	105 (10)	6475 (4)	432 (5)	15	12.2 to 18.0
Headache	174 (13)	96 (13)	6268 (2)	343 (4)	11	8.3 to 12.9
Rhinitis	172 (22)	98 (21)	6310 (6)	349 (8)	15	11.7 to 19.1
Wheeze	189 (36)	104 (18)	6521 (10)	436 (14)	26	21.0 to 30.0
Diarrhoea and vomiting	168 (12)	99 (5)	6287 (1)	344 (2)	11	9.2 to 12.6
Irritability	170 (17)	97 (6)	6271 (2)	347 (4)	15	12.5 to 16.9

Discussion

We were worried that the inclusion of a section on food intolerance in the questionnaire of the national study of health and growth might reduce the overall response rate in the survey. For 6813 children (85%) of the total sample, however, valid answers to the questions on food intolerance were available, and the overall response rate to the questionnaire was similar to that in previous surveys. This in itself is an indication of the interest that issues on food, particularly food intolerance, arouse in the community.

Though prevalences of adverse reactions to food in children have been reported,⁹⁻¹¹ the methods of detection, the definition of a case, the age range of the samples, and the sampling methods have been too different for useful comparison with our study. The lack of laboratory tests and clinical input in this study does not allow any distinction to be made between the different types of food reaction. Another obvious limitation of this study is the uncertainty about how the questions on food intolerance in the questionnaire correlate with clinical criteria. As stated in the introduction, however, there is no accepted set of clinical criteria for food intolerance for comparison.

This community study provided the opportunity to study an unselected sample in which less severe cases were also included. The number of positive answers to both the questions defining food intolerance described in the methods section gives a current estimate of prevalence in the community as perceived by parents, and the number of positive answers to the first question gives the upper limit of prevalence of food intolerance in the community, including that among children who, according to their parents, have grown out of the disease. Altogether 297 (4%) of the children in the study were perceived by their parents as ever having had food intolerance. For half of these children a doctor had recommended avoiding the problematic foods. Thus in the food intolerant group a large proportion of children were perceived by their parents as being food intolerant either without seeking a medical opinion or despite this opinion being to the contrary.

More importantly, this survey has shown that about 2% of the food tolerant children are told by their parents to avoid three or more items of food. It is surprising that some parents ask their children to avoid certain foods but did not give a positive answer to the questions on food intolerance. This apparent contradiction could be explained by some parents following written or verbal advice, unrelated to their child's health, on avoiding certain foods. Some parents, however, may have been unable to associate their child's complaint and food avoidance with food intolerance. Between these alternatives there might be explanations that have elements of both.

This study shows evidence that the diagnosis and management of food intolerance in the community are occurring outside the health system for a large proportion of children. Possible explanations for this finding include the high profile given by the media to voluntary organisations that believe in and preach about a strong relation between certain diseases and food intake and the inadequate response by the medical profession to parents' anxieties, from either

excessive scepticism, lack of time, or insufficient training in the subject. The danger of inappropriate management of food intolerance outside the National Health Service has been well documented.¹²

The issue is further complicated by the very strong association between the mother's level of education and her perception of food intolerance in her children, together with the strong association between the mother's education and reported disease, the aetiology of which may include a reaction to specific food. This implies that at present health staff have to give advice to mothers who are well informed and are not readily dismissed. Some indication of how well informed the parents were is given by the similar types of food being avoided in the food intolerant group regardless of whether the decision was taken by the parents or by health staff. Parents seldom excluded from the diet food that is rarely associated with intolerance—for example, potatoes, lamb, or cauliflower.

In the multiple regression analyses food intolerance was highly associated with each disease studied after adjustment for a series of explanatory variables. Thus food intolerance is perceived as contributing to the cause of every common disease explored in this study. The prevalence of these diseases varied from 93 children

(1%) for vomiting and diarrhoea to 471 (7%) for rhinitis and hay fever and 799 (11%) for wheeze. Between 20% and 30% of the children with each of these disorders has been perceived as being food intolerant. The potential for an increase in the proportion of children with these diseases being recorded as being food intolerant will depend largely on changes in the clinical appreciation of these issues and the parents' expectations from doctors. Though clinical judgment is the main criterion for diagnosis, and the diagnostic tests for a slow reaction to food are of low validity or cumbersome and time consuming, the number of children labelled as being food intolerant will increase in the community unless clear, simple, and credible criteria for diagnosis and management are worked out by specialists and general practitioners.

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Impaired responsiveness of homosexual men with HIV antibodies to plasma derived hepatitis B vaccine

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Abstract

Thirty five homosexual men (17 positive for antibody to the human immunodeficiency virus (HIV) and 18 consistently negative) were vaccinated against hepatitis B virus infection. Eight of the 17 seropositive patients failed to develop detectable hepatitis B surface antibody within three months of the third injection compared with only one of the 18 seronegative patients ($p < 0.01$).

HIV infection is prevalent in the developed world in groups at risk for hepatitis B infection and in certain Third World countries where widespread vaccination programmes exist. This study shows the impact that coincident HIV infection may have on an otherwise efficacious vaccine. The efficacy of this and other vaccines in patients infected with HIV needs to be studied urgently.

Introduction

The immune dysfunction occurring during chronic infection with human immunodeficiency virus (HIV) does not consist only of a

quantitative and qualitative abnormality of T helper or inducer lymphocytes. Other features include polyclonal B cell activation, with an increased number of B lymphocytes spontaneously secreting antibody, impaired in vitro B cell responsiveness to mitogens and antigens, and an impaired in vivo primary humoral response.¹

There are areas in the Third World where HIV infection is already well established in the adult heterosexual population.²⁻³ In these countries neonatal transmission is likely to become a dominant route of infection, leading to an increasing prevalence of infected and affected infants. Widespread vaccination programmes exist in many of these countries and are important for public health. In this context the possibility of a decrease in primary immune responsiveness in people infected with HIV is likely to have a profound effect on the efficacy of such programmes.

A vaccine against hepatitis B derived from plasma has been shown to be effective in controlled trials among homosexuals reported in 1980-3,^{4,6} and trials conducted among other risk groups have confirmed its efficacy.^{7,9} The vaccination of homosexual men has been shown to be cost effective in both the United States and the United Kingdom.^{10,11} It has been recommended that susceptible homosexually active men should be vaccinated regardless of their ages or the duration of their homosexual practices.¹²

The largest trials of hepatitis B vaccines were carried out in the United States at a time when the prevalence of HIV infection was low. The prevalence of antibody to HIV among homosexuals in a cohort study in San Francisco, however, increased from 4.5% in 1978 to 67.3% in 1984¹³ and from 3.7% in 1982 to 24.5% in 1986 among homosexual men in London attending this sexually transmitted disease clinic.^{13a} The aim of this study was to examine whether the patient's responsiveness to hepatitis B vaccine was influenced by coexistent HIV infection.

Patients and methods

Thirty eight homosexual men were recruited between January and November 1985, 22 from a cohort study on the clinical course of HIV

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