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Prevalence of food intolerance in bronchial asthma in India

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Abstract

Background and Objective : Food intolerance is an adverse reaction to food in which there is no involvement of defense (immune) system. There is some evidence for the use of food-specific immunoglobulin G (IgG) levels as a guide to identify food intolerance. The current study was thus planned to study the prevalence of IgG-based food intolerance in bronchial asthma (BA) patients and healthy controls in Indian population. **Materials and Methods:** A total of 65 subjects were recruited for the study comprising 50 cases of BA and 15 healthy controls. These were assessed for food intolerance using specific IgG against selected food items. The results were graded as specific IgG against the selected food item: >30 U/mL - elevated and <30 -normal as per manufacturer's recommendation. **Results:** The BA group had highest food intolerance against the vegetables, whereas in control subjects the food intolerance was highest for nuts. The prevalence of food intolerance was higher in male asthmatic patients, but in the control group females showed higher intolerance. The common food items to which food intolerance test was positive in descending order were cow milk (56%), casein (48%), tiger nut (48%), almond (46%), amaranth (46%), peanut (46%), soybean (44%), alga wakame (44%), scallop (44%), mulberry (42%) in asthmatic patients and almond (80%), cowmilk (73%), casein (66.6%), peanut (60%), cashew nut (60%), tiger nut (53.3%), carrot (53.3%), flax seed (53.3%), quino (53.3%), clan (53.3%), sunflower seed (53.3%) in control subjects. **Conclusion:** The specific IgG is a test to evaluate food intolerance. The common food items to which food intolerance test was positive in descending order were cow milk (56%), casein (48%), tiger nut (48%), almond (46%), amaranth (46%), peanut (46%), soybean (44%), alga wakame (44%), scallop (44%), mulberry (42%) in asthmatic patients.

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Full Text

Introduction

Non allergic food hypersensitivity also referred to as food intolerance is an adverse reaction to food in which there is no involvement of defense (immune) system. The gold standard method for diagnosing food intolerance is double-blind

placebo-controlled food control tests. [1],[2] The test is laborious and difficult to test all combinations of food types that may be causing symptoms. On the contrary, studies have shown evidence for the use of food specific IgG levels as a guide for identification of food intolerance. It was proposed that presence of food specific IgG may indicate a potential sensitivity and eliminating the corresponding food item from diet may be beneficial to the patient's clinical status. [3],[4] Thus, the current study was planned to study the prevalence of IgG-based food intolerance in bronchial asthma (BA) patients and healthy controls.

Materials and Methods

Study population and design

The diagnosed patients of BA and healthy volunteers as controls were enrolled for the study from the outpatient clinics. A total of 65 subjects (21 females and 44 males) aged between 6 and 40 years were evaluated. The diagnosis of asthma was based on Global Initiative for Asthma guidelines. [5]

Specific IgG test

Specific IgG was estimated in all the subjects using Genesis Diagnostic kit, UK. This test was performed by Genarrayt microarray System, UK, is produced by printing hundreds of protein spots onto a specially prepared glass slide, each spot measuring only 130 μ m across. The Genarrayt system includes a recommended wash station, microcentrifuge, and scanner to ensure optimum assay performance. On completion of the assay, the microarray slide was scanned using a high-resolution optical scanner. The data were processed by the Genarrayt Report Writer software, which presents final results in a simple, straightforward manner. The specific IgG measurement was done by Genarrayt microarray System using Genesis Diagnostic Kit, (UK) and results were graded as: >30 U/mL - elevated; 24-30 U/mL- Borderline; and <24- Normal.

Statistical analysis

All data analysis was performed using SPSS statistical package version 16.0 for windows (SPSS, Chicago, IL, USA). The number of subjects positive for the food item in both the BA and control groups was compared using Chi-square test. A $P < 0.05$ was considered statistically significant.

Results

Subject characteristics

The study included 65 subjects; 21 females and 44 males. The subjects belonged to age group of 6-40 years. The study included 50 BA patients and 15 control subjects. The average age in BA group was 28.8 years, the control group had average age of 31.07 years.

A total of 221 food items were tested for food intolerance in each of the 65 subjects. The prevalence of food intolerance was higher in male (66.7%) as compared with female (56.2%) asthma subjects [Figure 1]. However, in the control group more females (75%) showed intolerance to food items as compared with males (69.7%) [Figure 2]. The prevalence of food intolerance in male and female bronchial asthma and control subjects in different food groups is summarized in [Figure 3].{Figure 1}{Figure 2}{Figure 3}

On subgroup analysis, in dairy products food intolerance was found to range from 60% to cow's milk to minimum of 3% to alpha-lactalbumin in the studied subjects [Table 1]. Alga Wakame (44.6%) showed the highest intolerance in the sea food category, while no food intolerance was found to cod, monkfish, and mussels [Table 2]. Among the fruits, mulberry showed the highest intolerance among 41.5% subjects studied, while no intolerance was found to apple or olive [Table 3]. Couscous intolerance was found in 31%, while no intolerance was found to millets among the grains in the study subjects [Table 4]. Among the spices, currey showed intolerance among 18.5% of subjects, while no intolerance was found to basil, dill, nettle, saffron, and tarragon [Table 5]. Rabbit showed the highest intolerance among the meat foods among 12% of studied subjects, while lowest intolerance among meat food was found for beef, chicken, partridge, and veal (among 3% of studied subjects in each) [Table 6]. Intolerance to almonds was found in 53% of subjects, while walnuts were least intolerant (6%)

among the nuts [Table 7]. Similarly, among vegetables amaranth was found to be most intolerant (46%), while no intolerance was detected for cauliflower, cucumber, chard, chicory, rocket, and shallot [Table 8]. Highest intolerance was found to green tea in 21.5%, while no intolerance was found to black tea, cocoa, honey, tapioca, and rapeseed among the studied subjects in the miscellaneous group [Table 9].{Table 1}{Table 2}{Table 3}{Table 4}{Table 5}{Table 6}{Table 7}{Table 8}{Table 9}

The BA group had highest food intolerance against the vegetables and lowest was recorded against the meat food. However, in control subjects the food intolerance was highest for nuts and lowest for meat food.

BA patients were found to have higher statically significant food intolerance to almonds ($P = 0.003$), flax seeds ($P = 0.006$) and quino ($P = 0.003$) as compared with control group. Further food intolerance levels to goat milk, sheep milk, and cashew nuts were higher in BA patients but could not reach statistically significant levels.

The common food items to which food intolerance test was positive in descending order were cow milk (56%), casein (48%), tiger nut (48%), almond (46%), amaranth (46%), peanut (46%), soybean (44%), alga wakame (44%), scallop (44%), mulberry (42%) in asthmatic patients [Figure 4] and almond (80%), cow milk (73%), casein (66.6%), peanut (60%), cashew nut (60%), tiger nut (53.3%), carrot (53.3%), flax seed (53.3%), quino (53.3%), clan (53.3%), sunflower seed (53.3%) in control subjects [Figure 5].{Figure 4}{Figure 5}

Discussion

In our day to day practice, a number of asthma subjects report that they have eliminated a large number of products from their diet based on suspicion that these are worsening their asthma symptoms. In a study from New Zealand, it was found that 64% of parents had altered their asthmatic child's diet in the belief that dietary modifications would help control their child's underlying asthma. But, it has also been demonstrated that unnecessarily restrictive diets can result in nutritional deficiencies and in extreme cases may be fatal. [5],[6],[7] Hence, there is a need for an objective test for guidance of dietary elimination of food items and IgG against specific food item may suggest a potential sensitivity to that food. The current study showed food specific IgG is raised in both asthmatics as well as in control subjects; there being no significant difference between the two groups. The findings of our study are consistent with questionnaire based assessment of food intolerance by Woods et al.[8] which concluded that participants with current asthma did not had a higher prevalence of food-related illness in general than those without asthma. A number of studies have shown that diet elimination based on raised IgG has led to symptom improvement in respiratory symptoms, [8] irritable bowel syndrome, [8],[9] celiac disease, [10],[11] and rheumatoid arthritis. [12]

Intolerance to vegetables ($P = 0.717$) and fruits ($P = 0.377$) was found more commonly in asthmatics as compared to controls, although intolerance to none of the food items could reach statically significance. On an individual level, intolerance to almonds, flax seeds, quino, goat milk, sheep milk, and cashew nuts was more common in asthma patients in comparison to controls. This is consistent with study by Woods et al.,[7] who found that fresh fruit, dried fruit, dairy, chocolate, sauces, alcohol, and high fat foods are the products most likely to induce respiratory symptoms.

One of the limitations of our study was that we were not able to follow-up the raised food specific IgG levels with elimination of those foods from diet and evaluating the response to avoidance of food. A further study is required to evaluate if avoidance of these particular food items leads to improvement in asthma control.

Conclusion

The specific IgG is a test to evaluate food intolerance. The common food items to which food intolerance test was positive in descending order were cow milk (56%), casein (48%), tiger nut (48%), almond (46%), amaranth (46%), peanut (46%), soybean (44%), alga wakame (44%), scallop (44%), and mulberry (42%) in asthmatic patients.

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Figure 1: Prevalence of food intolerance in bronchial asthma

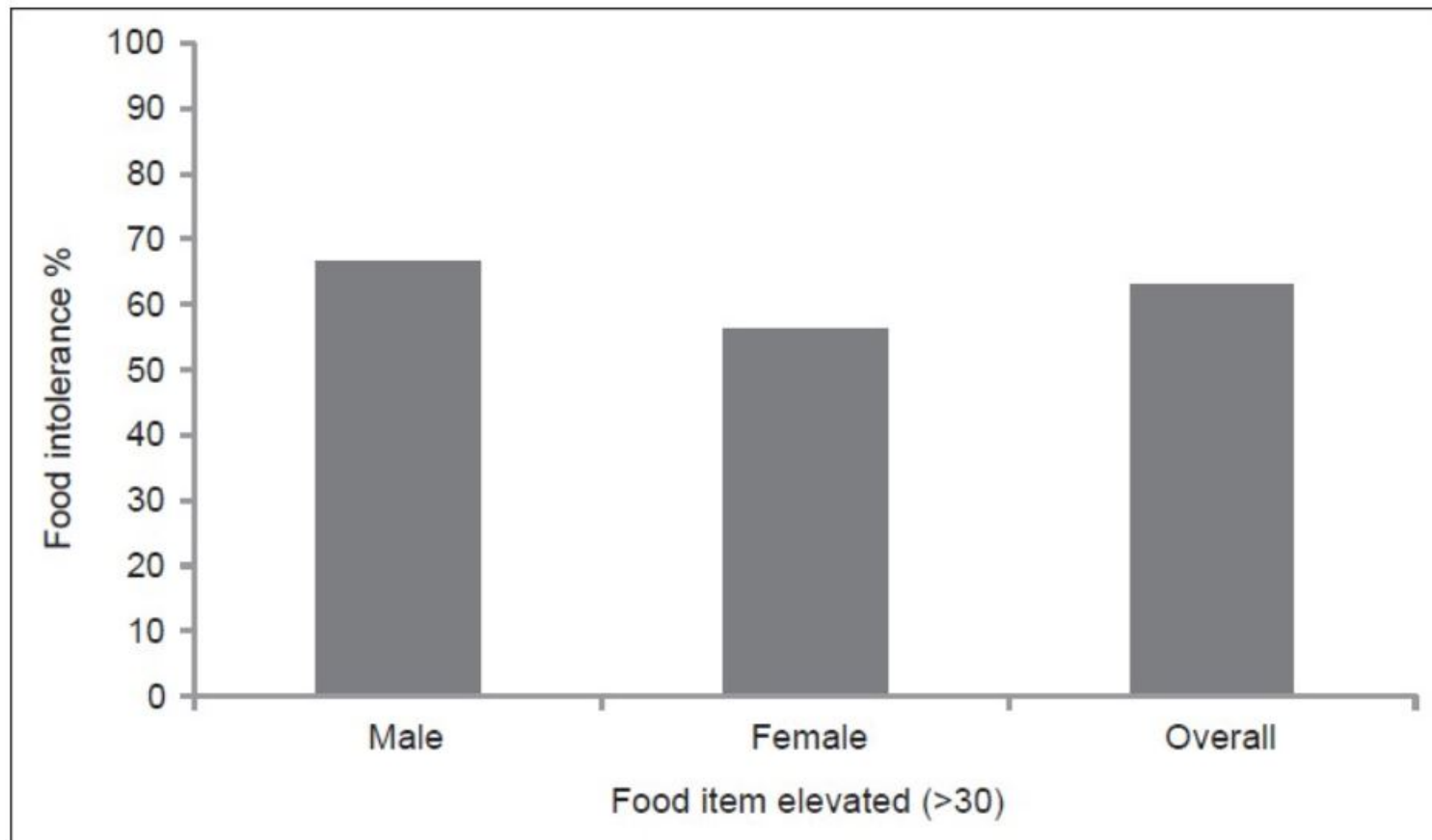


Figure 2: Prevalence of food intolerance in control subjects

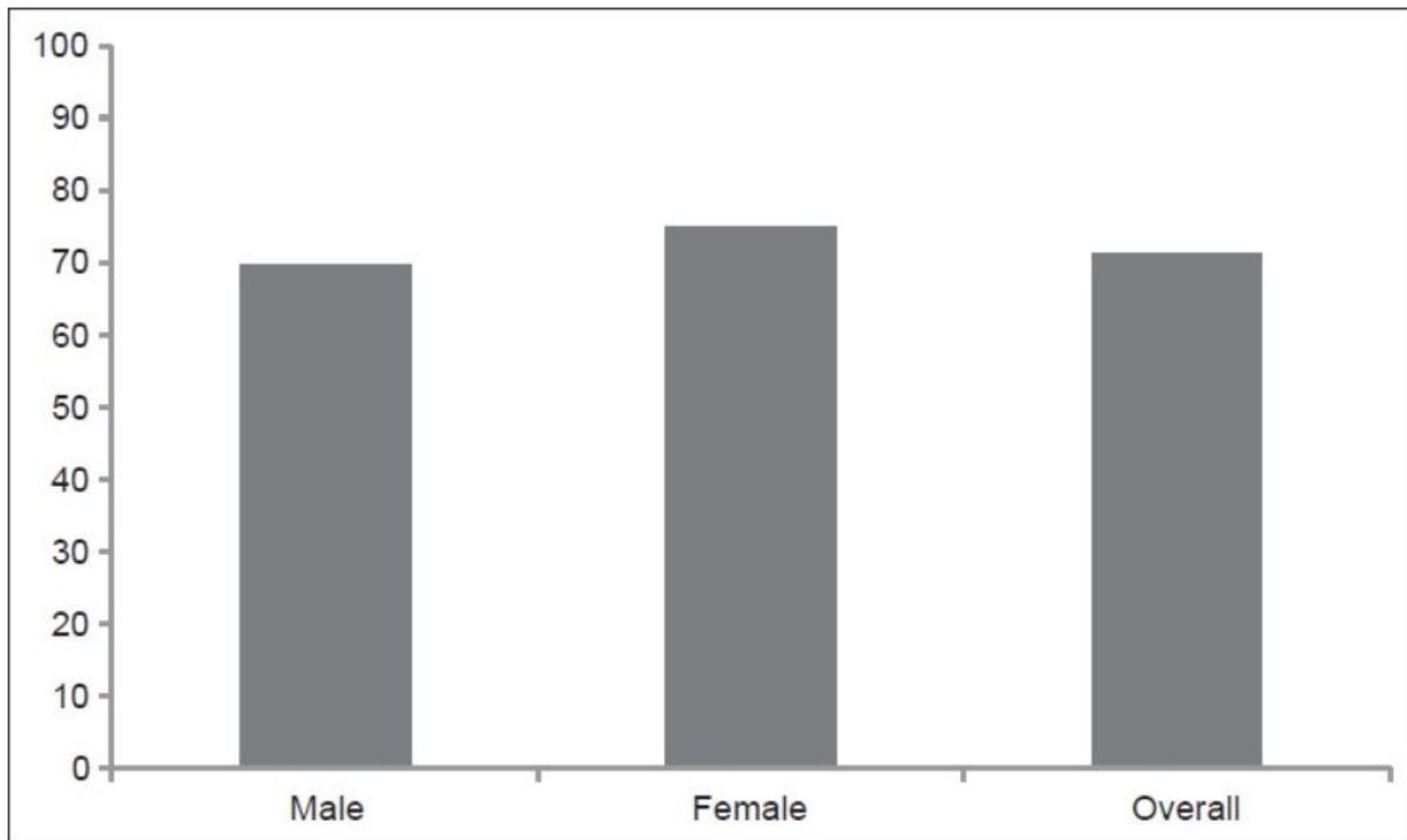


Figure 3: Prevalence of food intolerance in bronchial asthma and control subjects in different food groups

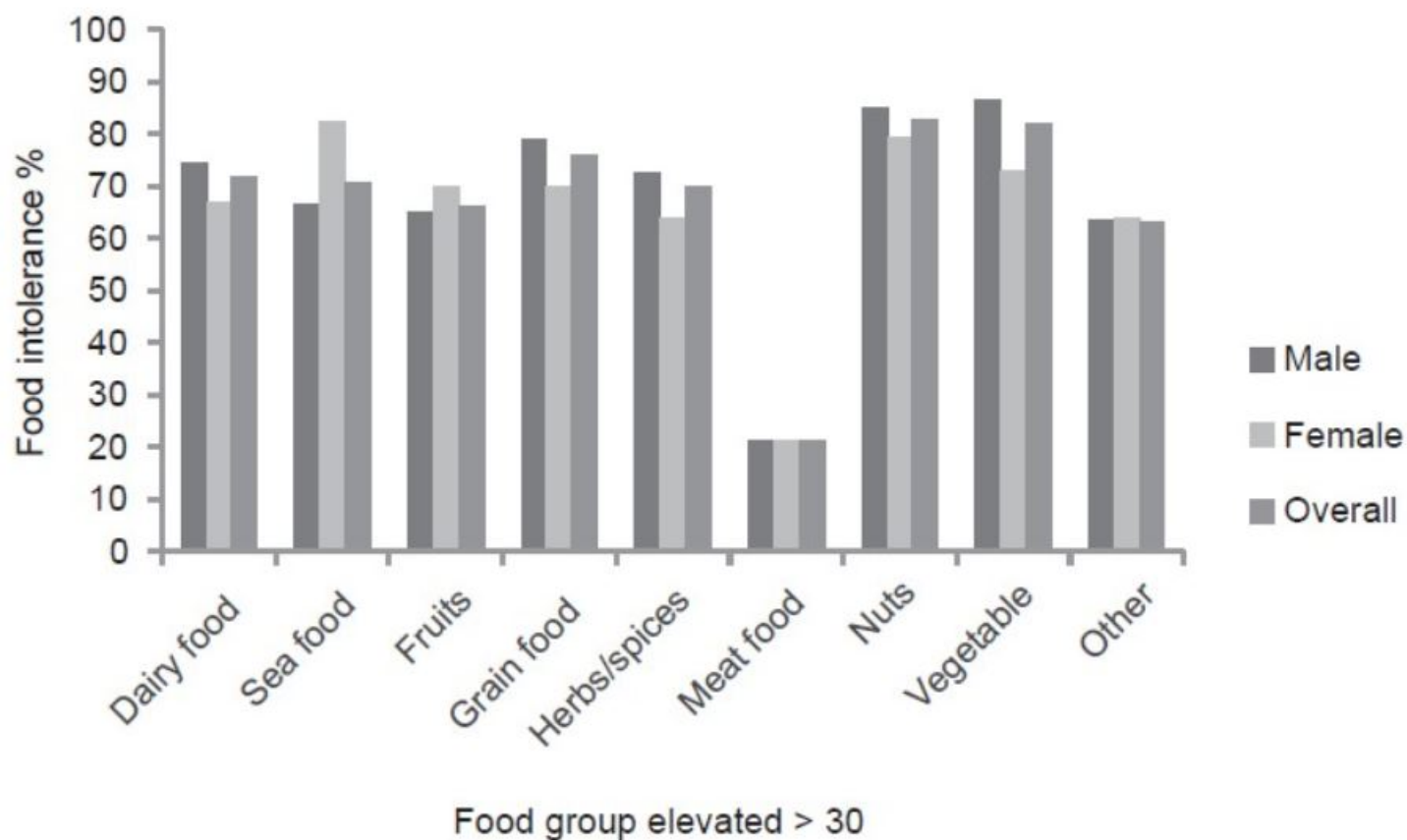


Figure 4: Prevalence of common food item intolerance in bronchial asthma

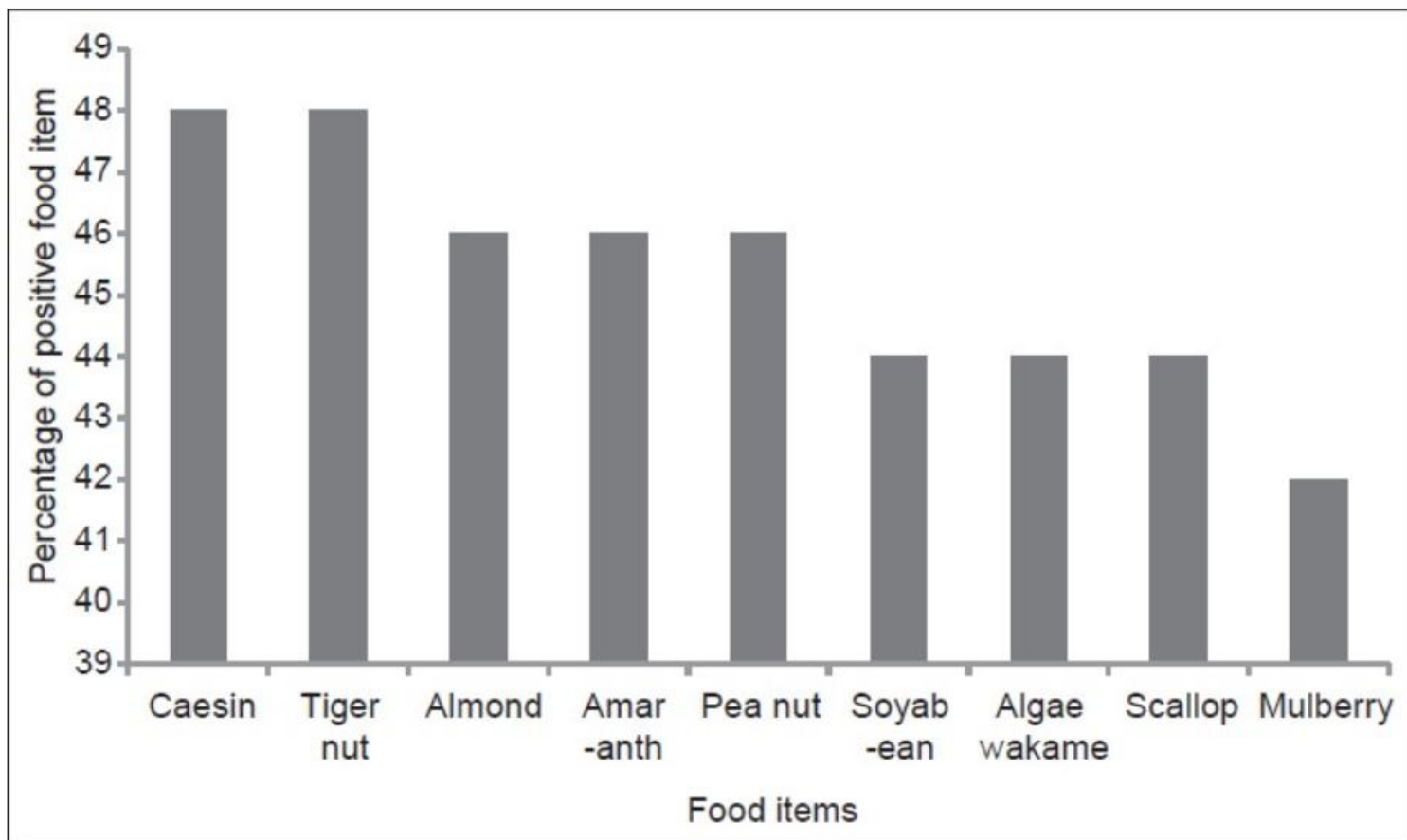


Figure 5: Prevalence of common food item intolerance in control subjects

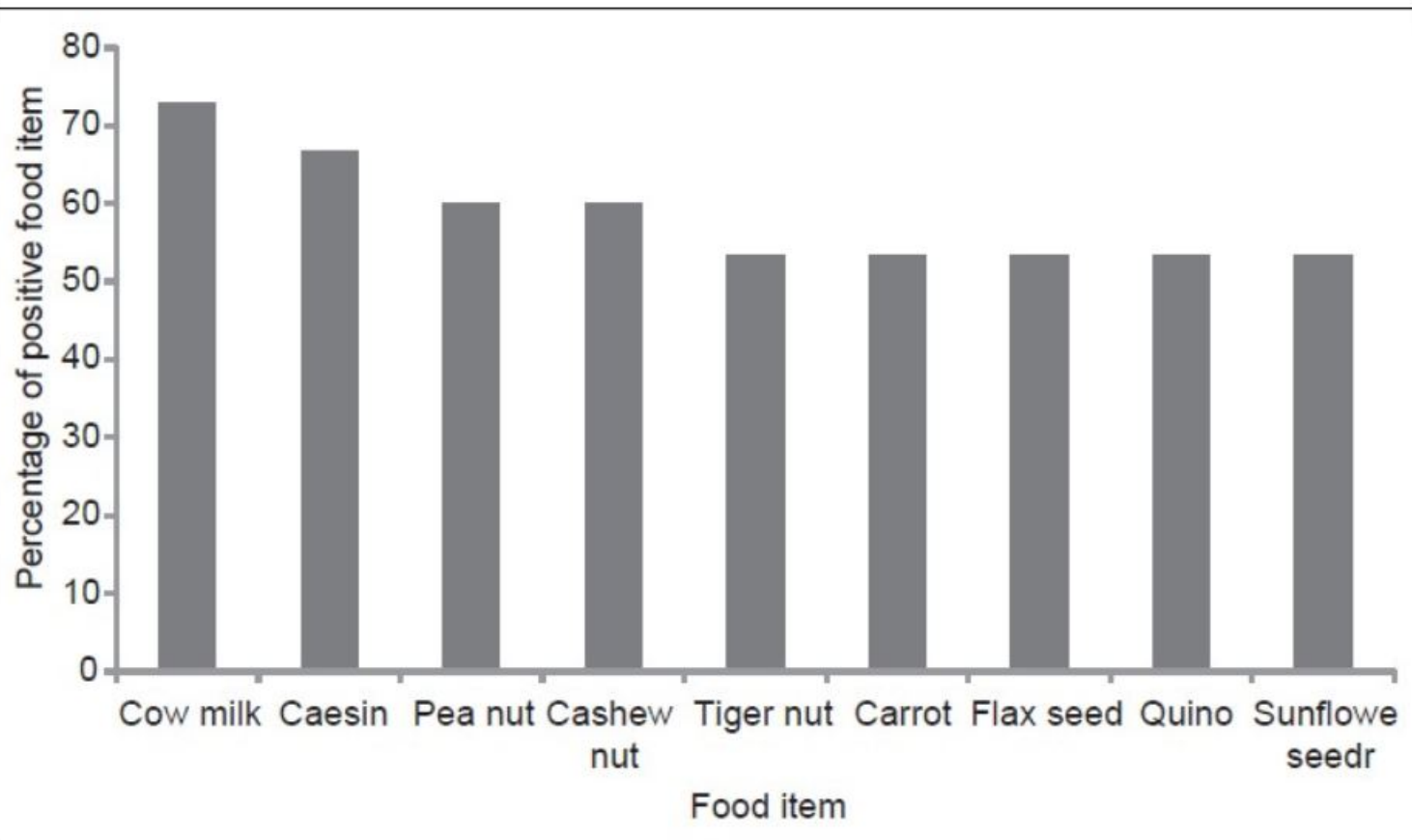


Table 1: Food intolerance to dairy food item in bronchial asthma and control subjects

Name of food	Elevated n (%)	Asthma (<i>n</i> = 50)			Control (<i>n</i> = 15)			<i>P</i> value
		Total (%)	Males (%)	Females (%)	Total (%)	Males (%)	Females (%)	
Cow's milk	39 (60.0)	28 (56.00)	18 (64.28)	10 (31.72)	11 (73.00)	8 (72.72)	3 (27.28)	0.229
Casein	34 (55.3)	24 (48.00)	14 (58.33)	10 (41.67)	10 (66.6)	8 (80.00)	2 (20.00)	0.204
Goat milk	24 (36.92)	18 (36.00)	11 (61.11)	7 (38.89)	6 (40.00)	6 (100.00)	0	0.059
Sheep milk	21 (32.3)	19 (38.00)	13 (68.42)	6 (31.58)	2 (13.3)	2 (100.00)	0	0.051
Egg white	18 (27.69)	11 (22.00)	9 (81.81)	2 (18.19)	7 (46.6)	7 (100.00)	0	0.061
Beta-lactoglobulin	5 (7.6)	3 (6.00)	2 (66.67)	1 (33.33)	2 (13.3)	2 (100.00)	0	
Buffalo milk	3 (4.6)	2 (4.00)	1 (50.00)	1 (50.00)	1 (6.6)	1 (100.00)	0	
Egg yolk	3 (4.6)	2 (4.00)	1 (50.00)	1 (50.00)	1 (6.6)	1 (100.00)	0	
Alpha-lactalbumin	2 (3.0)	1 (2.00)	1 (100.00)	0	1 (6.6)	0	1 (100.00)	

Table 2: Food intolerance to sea food in bronchial asthma and control subjects

Name of food	Elevated <i>n</i> (%)	Asthma (<i>n</i> = 50)			Control (<i>n</i> = 15)			<i>P</i> value
		Total (%)	Males (%)	Females (%)	Total (%)	Males (%)	Females (%)	
Alga Wakame	29 (44.6)	22 (44.00)	14 (63.63)	8 (36.37)	7 (46.6)	5 (71.42)	2 (28.58)	0.855
Scallop	27 (41.5)	22 (44.00)	17 (77.27)	5 (22.73)	5 (33.3)	3 (60.00)	2 (40.00)	0.462
Clam	25 (38.4)	17 (34.00)	12 (70.58)	5 (29.42)	8 (53.3)	5 (62.5)	3 (37.5)	0.177
Crab	15 (23.0)	9 (18.00)	4 (44.44)	5 (55.56)	6 (40)	3 (50.00)	3 (50.00)	0.076
Alga Espaguette	12 (18.4)	8 (16.00)	6 (75.00)	2 (25.00)	4 (26.6)	3 (75.00)	1 (25.00)	
Caviar	12 (18.4)	6 (12.00)	3 (50.00)	3 (50.00)	6 (40)	4 (66.66)	2 (33.34)	
Salmon	9 (13.84)	4 (8.00)	1 (25.00)	3 (75.00)	5 (33.3)	3 (60.00)	2 (40.00)	
Tuna	9 (13.84)	8 (16.00)	4 (50.00)	4 (50.00)	1 (6.6)	1 (100.00)	0	
Alga Spirulina	8 (12.30)	4 (8.00)	3 (75.00)	1 (25.00)	4 (26.6)	2 (50.00)	2 (50.00)	
Winkle	7 (10.7)	3 (6.00)	1 (33.33)	2 (66.67)	4 (26.6)	2 (50.00)	2 (50.00)	
Carp	6 (9.2)	3 (6.00)	2 (66.67)	1 (33.33)	3 (20.0)	2 (66.66)	1 (33.34)	
Oyster	6 (9.2)	6 (12.00)	3 (50.00)	3 (50.00)	0	0	0	
Turbot	6 (9.2)	3 (6.00)	1 (33.33)	2 (66.67)	3 (20.0)	2 (66.66)	1 (33.34)	
Anchovy	5 (7.6)	3 (6.00)	2 (66.67)	1 (33.33)	2 (13.3)	2 (100.00)	0	
Barnacle	5 (7.6)	2 (4.00)	1 (50.00)	1 (50.00)	3 (20.0)	2 (66.66)	1 (33.34)	
Pike	5 (7.6)	2 (4.00)	0	2 (100.00)	3 (20.0)	2 (66.66)	1 (33.34)	
Plaice	5 (7.6)	3 (6.00)	1 (33.33)	2 (66.67)	2 (13.3)	1 (50.00)	1 (50.00)	
Cockle	4 (6.1)	2 (4.00)	0	2 (100.00)	2 (13.3)	2 (100.00)	0	
Shrimp/Prawn	4 (6.1)	4 (8.00)	3 (75.00)	1 (25.00)	0	0	0	
Bass	3 (4.6)	1 (2.00)	0	1 (100.00)	2 (13.3)	2 (100.00)	0	
Eel	3 (4.6)	3 (6.00)	1 (33.33)	2 (66.67)	0	0	0	
Mackerel	3 (4.6)	3 (6.00)	2 (66.67)	1 (33.33)	0	0	0	
Perch	3 (4.6)	2 (4.00)	1 (50.00)	1 (50.00)	1 (6.6)	1 (100.00)	0	
Razor clam	3 (4.6)	1 (2.00)	0	1 (100.00)	3 (20.0)	1 (33.34)	2 (66.66)	
Sardine	3 (4.6)	1 (2.00)	0	1 (100.00)	2 (13.3)	1 (50.00)	1 (50.00)	
Sole	3 (4.6)	3 (6.00)	2 (66.67)	1 (33.33)	0	0	0	
Haddock	2 (3.0)	2 (4.00)	1 (50.00)	1 (50.00)	0	0	0	
Hake	2 (3.0)	2 (4.00)	1 (50.00)	1 (50.00)	0	0	0	
Herring	2 (3.0)	2 (4.00)	1 (50.00)	1 (50.00)	0	0	0	
Octopus	2 (3.0)	2 (4.00)	0	2 (100.00)	0	0	0	
Swordfish	2 (3.0)	0	0	0	2 (13.3)	2 (100.00)	0	
Cuttle fish	1 (1.5)	1 (2.00)	1 (100.00)	0	0	0	0	
Dorado	1 (1.5)	1 (2.00)	0	1 (100.00)	0	0	0	
Lobster	1 (1.5)	1 (2.00)	1 (100.00)	0	0	0	0	
Squid	1 (1.5)	1 (2.00)	1 (100.00)	0	0	0	0	
Trout	1 (1.5)	1 (2.00)	0	1 (100.00)	0	0	0	
Cod	0	0	0	0	0	0	0	
Monkfish	0	0	0	0	0	0	0	
Mussel	0	0	0	0	0	0	0	

Table 3: Food intolerance to fruits in bronchial asthma and control subjects

Name of food	Elevated <i>n</i> (%)	Asthma (<i>n</i> = 50)			Control (<i>n</i> = 15)			
		Total (%)	Males (%)	Females (%)	Total (%)	Males (%)	Females (%)	
Mulberry	27 (41.5)	21 (42.00)	16 (76.19)	5 (23.81)	6 (40.00)	5 (83.3)	1 (16.7)	0.89
Nectarine	21 (32.30)	17 (34.00)	11 (64.70)	6 (33.30)	4 (26.6)	4 (100.00)	0	0.594
Pineapple	21 (32.30)	15 (30.00)	10 (66.66)	5 (33.34)	6 (40)	3 (50.00)	3 (50.00)	0.806
Pomegranate	21 (32.30)	16 (32.00)	9 (56.25)	7 (43.75)	5 (33.3)	3 (60.00)	2 (40.00)	0.917
Plum	17 (26.1)	12 (24.00)	8 (75.00)	4 (25.00)	5 (33.3)	3 (60.00)	2 (40.00)	0.593
Lemon	13 (20.0)	11 (22.00)	8 (72.72)	3 (27.28)	2 (13.3)	2 (100.00)	0	
Raisin	13 (20.0)	9 (18.00)	5 (55.55)	4 (44.45)	4 (26.6)	2 (50.00)	2 (50.00)	
Cranberry	12 (18.4)	10 (20.00)	7 (70.00)	3 (30.00)	2 (13.3)	2 (100.00)	0	
Mango	11 (16.9)	8 (16.00)	7 (87.5)	1 (12.5)	3 (20.0)	2 (66.66)	1 (33.34)	
Lime	10 (15.3)	10 (20.00)	7 (70.00)	3 (30.00)	0	0	0	
Raspberry	10 (15.3)	7 (14.00)	4 (57.14)	3 (42.86)	3 (20.0)	2 (66.66)	1 (33.34)	
Tomato	10 (15.3)	9 (18.00)	6 (66.66)	3 (33.34)	1 (6.6)	1 (100.00)	0	
Cherry	8 (12.30)	5 (10.00)	3 (60.00)	2 (40.00)	3 (20.0)	3 (100.00)	0	
Grapefruit	8 (12.30)	5 (10.00)	4 (80.00)	1 (20.00)	3 (20.0)	3 (100.00)	0	
Blackberry	6 (9.2)	3 (6.00)	1 (33.33)	2 (66.67)	3 (20.0)	2 (66.66)	1 (33.34)	
Strawberry	6 (9.2)	3 (6.00)	1 (33.33)	2 (66.67)	3 (20.0)	2 (66.66)	1 (33.34)	
Watermelon	6 (9.2)	3 (6.00)	2 (66.67)	1 (33.33)	3 (20.0)	1 (33.34)	2 (66.66)	
Apricot	5 (7.6)	2 (4.00)	0	2 (100.00)	3 (20.0)	2 (66.66)	1 (33.34)	
Avocado	5 (7.6)	2 (4.00)	1 (50.00)	1 (50.00)	3 (20.0)	2 (66.66)	1 (33.34)	
Fig	5 (7.6)	4 (8.00)	2 (50.00)	2 (50.00)	1 (6.6)	1 (100.00)	0	
Grape	5 (7.6)	3 (6.00)	1 (33.33)	2 (66.67)	2 (13.3)	2 (100.00)	0	
Guava	5 (7.6)	3 (6.00)	2 (66.67)	1 (33.33)	2 (13.3)	2 (100.00)	0	
Pear	5 (7.6)	3 (6.00)	1 (33.33)	2 (66.67)	2 (13.3)	2 (100.00)	0	
Date	4 (6.1)	2 (4.00)	0	2 (100.00)	2 (13.3)	2 (100.00)	0	
Blackcurrant	3 (4.6)	2 (4.00)	0	2 (100.00)	1 (6.6)	1 (100.00)	0	
Kiwi	3 (4.6)	1 (2.00)	1 (100.00)	0	2 (13.3)	1 (50.00)	1 (50.00)	
Melon (honeydew)	3 (4.6)	2 (4.00)	2 (100.00)	0	1 (6.6)	1 (100.00)	0	
Papaya	3 (4.6)	1 (2.00)	0	1 (100.00)	2 (13.3)	2 (100.00)	0	
Redcurrant	3 (4.6)	3 (6.00)	1 (33.33)	2 (66.67)	0	0	0	
Banana	2 (3.0)	0	0	0	2 (13.3)	0	2	
Peach	2 (3.0)	1 (2.00)	0	1 (100.00)	1 (6.6)	1 (100.00)	0	
Tangerine	2 (3.0)	0	0	0	2 (13.3)	0	2 (100.00)	
Blueberry	1 (1.5)	1 (2.00)	0	1 (100.00)	0	0	0	
Lychee	1 (1.5)	1 (2.00)	1 (100.00)	0	0	0	0	
Rhubarb	1 (1.5)	1 (2.00)	0	1 (100.00)	0	0	0	
Olive	0	0	0	0	0	0	0	
Apple	0	0	0	0	0	0	0	
Olive	0	0	0	0	0	0	0	

Table 4: Food intolerance against grains in bronchial asthma and control subjects

Couscous	20 (30.7)	13 (26.00)	9 (69.20)	4 (30.80)	7 (46.6)	6 (85.71)	1 (14.29)	0.279
Flax seed	17 (26.1)	9 (18.00)	6 (66.66)	3 (33.34)	8 (53.3)	5 (62.5)	3 (37.5)	0.006
Quino	16 (24.6)	8 (16.00)	6 (75.00)	2 (25.00)	8 (53.3)	5 (62.5)	3 (37.5)	0.003
Corn (maize)	14 (21.5)	11 (22.00)	8 (72.72)	3 (27.28)	3 (20.0)	3 (100.00)	0	
Spelt	13 (20.0)	6 (12.00)	4 (66.66)	2 (33.34)	7 (46.6)	5 (71.42)	2 (28.58)	
Barley	12 (18.4)	8 (16.00)	7 (87.5)	1 (12.5)	4 (26.6)	3 (75.00)	1 (25.00)	
Durum wheat	11 (16.9)	8 (16.00)	7 (87.5)	1 (12.5)	3 (20.0)	3 (100.00)	0	
Wheat	11 (16.9)	5 (10.00)	3 (60.00)	2 (40.00)	6 (40)	4 (66.66)	2 (33.34)	
Rye flour	9 (13.84)	4 (8.00)	3 (75.00)	1 (25.00)	5 (33.3)	3 (60.00)	2 (40.00)	
Buckwheat	8 (12.30)	5 (10.00)	2 (40.00)	3 (60.00)	3 (20.0)	2 (66.66)	1 (33.34)	
Oat	8 (12.30)	4 (8.00)	3 (75.00)	1 (25.00)	4 (26.6)	4 (100.00)	0	
Rice	7 (10.7)	3 (6.00)	2 (66.67)	1 (33.33)	4 (26.6)	2 (50.00)	2 (50.00)	
Malt	5 (7.6)	2 (4.00)	2 (100.00)	0	3 (20.0)	2 (66.66)	1 (33.34)	
Gliadin	4 (6.1)	1 (2.00)	1 (100.00)	0	3 (20.0)	3 (100.00)	0	
Wheat bran	3 (4.6)	0	0	0	3 (20.0)	2 (66.66)	1 (33.34)	
Transglutaminase	2 (3.0)	0	0	0	2 (13.3)	2 (100.00)	0	
Polenta	1 (1.5)	0	0	0	1 (6.6)	1 (100.00)	0	
Millet	0	0	0	0	0	0	0	

Table 5: Food intolerance against herbs/spices in bronchial asthma and control subjects

Name of food	Elevated <i>n</i> (%)	Asthma (<i>n</i> = 50)			Control (<i>n</i> = 15)			
		Total (%)	Males (%)	Females (%)	Total (%)	Males (%)	Females (%)	
Currey (Mixed spices)	12 (18.4)	7 (14.00)	5 (71.42)	2 (28.58)	5 (33.3)	2 (40.00)	3 (60.00)	0.091
Ginkgo	8 (12.30)	4 (8.00)	2 (50.00)	2 (50.00)	4 (26.6)	2 (50.00)	2 (50.00)	0.075
Mustard seed	7 (10.7)	2 (4.00)	1 (50.00)	1 (50.00)	5 (33.3)	4 (80.00)	1 (20.00)	
Aloe vera	6 (9.2)	4 (8.00)	2 (50.00)	2 (50.00)	2 (13.3)	2 (100.00)	0	
Vanilla	6 (9.2)	1 (2.00)	0	1 (100.00)	5 (33.3)	2 (40.00)	3 (60.00)	
Cayenne	5 (7.6)	2 (4.00)	2 (100.00)	0	3 (20.0)	1 (33.34)	2 (66.66)	
Cinnamon	5 (7.6)	4 (8.00)	2 (50.00)	2 (50.00)	1 (6.6)	1 (100.00)	0	
Clove	4 (6.1)	0	0	0	4 (26.6)	2 (50.00)	2 (50.00)	
Ginger	4 (6.1)	1 (2.00)	0	1 (100.00)	3 (20.0)	2 (66.66)	1 (33.34)	
Mint	4 (6.1)	1 (2.00)	1 (100.00)	0	3 (20.0)	2 (66.66)	1 (33.34)	
Camomile	3 (4.6)	0	0	0	3 (20.0)	1 (33.34)	2 (66.66)	
Cumin	3 (4.6)	0	0	0	3 (20.0)	2 (66.66)	1 (33.34)	
Marjoran	3 (4.6)	0	0	0	3 (20.0)	2 (66.66)	1 (33.34)	
peppercorn	3 (4.6)	0	0	0	3 (20.0)	2 (66.66)	1 (33.34)	
Thyme	3 (4.6)	0	0	0	3 (20.0)	2 (66.66)	1 (33.34)	
Aniseed	2 (3.0)	0	0	0	2 (13.3)	2 (100.00)	0	
Coriandar (leaf)	2 (3.0)	0	0	0	2 (13.3)	1 (50.00)	1 (50.00)	
Garlic	2 (3.0)	0	0	0	2 (13.3)	2 (100.00)	0	
Ginseng	2 (3.0)	0	0	0	2 (13.3)	2 (100.00)	0	
Hops	2 (3.0)	0	0	0	2 (13.3)	2 (100.00)	0	
Nutmeg	2 (3.0)	0	0	0	2 (13.3)	2 (100.00)	0	
Peppermint	2 (3.0)	0	0	0	2 (13.3)	2 (100.00)	0	
Sage	2 (3.0)	0	0	0	2 (13.3)	0	0	
Bayel	1 (1.5)	0	0	0	1 (6.6)	1 (100.00)	0	
Liquorice	1 (1.5)	0	0	0	1 (6.6)	1 (100.00)	0	
Parsley	1 (1.5)	0	0	0	1 (6.6)	1 (100.00)	0	
Basil	0	0	0	0	0	0	0	
Dill	0	0	0	0	0	0	0	
Nettle	0	0	0	0	0	0	0	
Saffron	0	0	0	0	0	0	0	
Tarragon	0	0	0	0	0	0	0	

Table 6: Food intolerance against meat food in bronchial asthma and control subjects

Name of food	Elevated <i>n</i> (%)	Asthma (<i>n</i> = 50)			Control (<i>n</i> = 15)			<i>P</i> value
		Total (%)	Males (%)	Females (%)	Total (%)	Males (%)	Females (%)	
Rabbit	8 (12.30)	5 (10.00)	4 (80.00)	1 (20.00)	3 (20.0)	2 (66.66)	1 (33.34)	0.366
Horse	6 (9.2)	3 (6.00)	1 (33.33)	2 (66.67)	3 (20.0)	2 (66.66)	1 (33.34)	0.13
Ox	6 (9.2)	3 (6.00)	1 (33.33)	2 (66.67)	3 (20.0)	2 (66.66)	1 (33.34)	0.13
Quail	6 (9.2)	3 (6.00)	1 (33.33)	2 (66.67)	3 (20.0)	2 (66.66)	1 (33.34)	
Lamb	5 (7.6)	2 (4.00)	1 (50.00)	1 (50.00)	3 (20.0)	2 (66.66)	1 (33.34)	
Pork	4 (6.1)	2 (4.00)	0	2 (100.00)	2 (13.3)	2 (100.00)	0	
Wild boar	4 (6.1)	1 (2.00)	0	1 (100.00)	3 (20.0)	2 (66.66)	1 (33.34)	
Billy goat	3 (4.6)	1 (2.00)	1 (100.00)	0	2 (13.3)	2 (100.00)	0	
Duck	3 (4.6)	1 (2.00)	0	1 (100.00)	2 (13.3)	2 (100.00)	0	
Ostrich	3 (4.6)	1 (2.00)	0	1 (100.00)	2 (13.3)	2 (100.00)	0	
Turkey	3 (4.6)	1 (2.00)	0	1 (100.00)	2 (13.3)	2 (100.00)	0	
Venison	3 (4.6)	1 (2.00)	1 (100.00)	0	2 (13.3)	1 (50.00)	1 (50.00)	
Beef	2 (3.0)	0	0	0	2 (13.3)	2 (100.00)	0	
Chicken	2 (3.0)	0	0	0	2 (13.3)	2 (100.00)	0	
Partridge	2 (3.0)	1 (2.00)	0	1 (100.00)	1 (6.6)	0	1 (100.00)	
Veal	2 (3.0)	0	0	0	2 (13.3)	0	2 (100.00)	

Table 7: Food intolerance against nut food in bronchial asthma and control subjects

Name of food	Elevated <i>n</i> (%)	Asthma (<i>n</i> = 50)			Control (<i>n</i> = 15)			<i>P</i> value
		Total (%)	Males (%)	Females (%)	Total (%)	Males (%)	Females (%)	
Almond	35 (53.8)	23 (46.00)	17 (73.91)	6 (22.09)	12 (80.0)	10 (83.3)	2 (16.7)	0.003
Peanut	32 (49.2)	23 (46.00)	14 (60.86)	9 (29.14)	9 (60.00)	6 (66.67)	3 (33.33)	0.341
Tiger nut	32 (49.2)	24 (48.00)	17 (70.83)	7 (29.17)	8 (53.3)	5 (62.5)	3 (37.5)	0.717
Cashew nut	25 (38.46)	16 (32.00)	12 (75.00)	4 (25.00)	9 (60.00)	5 (55.5)	4 (44.5)	0.051
Pistachio	18 (27.69)	12 (24.00)	7 (58.33)	5 (41.67)	6 (40.00)	4 (66.66)	2 (33.34)	0.056
Hazelnut	11 (16.9)	6 (12.00)	3 (50.00)	3 (50.00)	5 (33.3)	3 (60.00)	2 (40.00)	
Pine nut	11 (16.9)	8 (16.00)	5 (62.5)	3 (37.5)	3 (20.0)	2 (66.66)	1 (33.34)	
Macadamia nut	8 (12.30)	4 (8.00)	2 (50.00)	2 (50.00)	4 (26.6)	3 (75.00)	1 (25.00)	
Brazil nut	7 (10.7)	2 (4.00)	1 (50.00)	1 (50.00)	5 (33.3)	3 (60.00)	2 (40.00)	
Coconut	7 (10.7)	4 (8.00)	3 (75.00)	1 (25.00)	3 (20.0)	3 (100.00)	0	
Walnut	4 (6.1)	2 (4.00)	2 (100.00)	0	2 (13.3)	2 (100.00)	0	

Table 8: Food intolerance against vegetables in bronchial asthma and control subjects

Name of food	Elevated <i>n</i> (%)	Asthma (<i>n</i> = 50)			Control (<i>n</i> = 15)			<i>P</i> value
		Total (%)	Males (%)	Females (%)	Total (%)	Males (%)	Females (%)	
Amarnath	30 (46.15)	23 (46.00)	15 (65.21)	8 (34.79)	7 (46.6)	4 (57.14)	3 (42.86)	0.964
Pea	28 (43.07)	21 (42.00)	14 (66.66)	7 (33.34)	7 (46.6)	7 (100.00)	0	0.749
Soybean	27 (41.5)	22 (44.00)	15 (68.18)	7 (31.72)	5 (33.3)	2 (40.00)	3 (60.00)	0.784
Bean (red kidney)	16 (24.6)	14 (28.00)	12 (85.71)	2 (14.29)	2 (13.3)	1 (50.00)	1 (50.00)	0.195
Lentil	16 (24.6)	14 (28.00)	10 (71.42)	4 (28.58)	2 (13.3)	2 (100.00)	0	0.195
Bean (white haricot)	15 (23.07)	11 (22.00)	9 (81.81)	2 (19.19)	4 (26.6)	3 (75.00)	1 (25.00)	0.959
Bean (broad)	11 (16.9)	7 (14.00)	6 (85.71)	1 (14.29)	4 (26.6)	3 (75.00)	1 (25.00)	
Potato	10 (15.3)	8 (16.00)	6 (75.00)	2 (25.00)	2 (13.3)	2 (100.00)	0	
Caper	9 (13.84)	3 (6.00)	1 (33.33)	2 (66.67)	6 (40)	3 (50.00)	3 (50.00)	
Carrot	9 (13.84)	1 (2.00)	1 (100.00)	0	8 (53.3)	6 (75.00)	2 (25.00)	
Turnip	9 (13.84)	5 (10.00)	3 (60.00)	2 (40.00)	4 (26.6)	3 (75.00)	1 (25.00)	
Leek	8 (12.30)	7 (14.00)	4 (57.14)	3 (42.86)	1 (6.6)	1 (100.00)	0	
Radish	8 (12.30)	4 (8.00)	3 (75.00)	1 (25.00)	4 (26.6)	2 (50.00)	2 (50.00)	
Marrow	6 (9.2)	3 (6.00)	1 (33.33)	2 (66.67)	3 (20.0)	2 (66.66)	1 (33.34)	
Yucca	6 (9.2)	3 (6.00)	1 (33.33)	2 (66.67)	3 (20.0)	2 (66.66)	1 (33.34)	
Artichoke	5 (7.6)	2 (4.00)	1 (50.00)	1 (50.00)	3 (20.0)	3 (100.00)	0	
Brussel sprout	5 (7.6)	2 (4.00)	2 (100.00)	0	3 (20.0)	2 (66.66)	1 (33.34)	
Aubergine	4 (6.1)	2 (4.00)	1 (50.00)	1 (50.00)	2 (13.3)	2 (100.00)	0	
Gourd (squash)	4 (6.1)	1 (2.00)	1 (100.00)	0	3 (20.0)	2 (66.66)	1 (33.34)	
Onion	4 (6.1)	1 (2.00)	0	1 (100.00)	3 (20.0)	3 (100.00)	0	
Sweet potato	4 (6.1)	3 (6.00)	2 (66.67)	1 (33.33)	1 (6.6)	1 (100.00)	0	
Broccoli	3 (4.6)	1 (2.00)	0	1 (100.00)	2 (13.3)	1 (50.00)	1 (50.00)	
Cabbage (red)	3 (4.6)	1 (2.00)	1 (100.00)	0	2 (13.3)	2 (100.00)	0	
Watercress	3 (4.6)	1 (2.00)	0	1 (100.00)	2 (13.3)	2 (100.00)	0	
Bean (green)	2 (3.0)	0	0	0	2 (13.3)	1 (50.00)	1 (50.00)	
Beetroot	2 (3.0)	1 (2.00)	1 (100.00)	0	1 (6.6)	0	1 (100.00)	
Cabbage	2 (3.0)	2 (4.00)	1 (50.00)	1 (50.00)	0	0	0	
Fennel (leaf)	2 (3.0)	0	0	0	2 (13.3)	2 (100.00)	0	
Lettuce	2 (3.0)	1 (2.00)	0	1 (100.00)	1 (6.6)	1 (100.00)	0	
Spinach	2 (3.0)	1 (2.00)	1 (100.00)	0	1 (6.6)	1 (100.00)	0	
Asparagus	1 (1.5)	0	0	0	1 (6.6)	1 (100.00)	0	
Celery	1 (1.5)	1 (2)	0	0	0	0	0	
Chickpea	1 (1.5)	1 (2.00)	1 (100.00)	0	0	0	0	
Peppers (mixed)	1 (1.5)	1 (2.00)	0	1 (100.00)	0	0	0	
Cauliflower	0	0	0	0	0	0	0	
Chard	0	0	0	0	0	0	0	
Chicory	0	0	0	0	0	0	0	
Cucumber	0	0	0	0	0	0	0	
Rocket	0	0	0	0	0	0	0	
Shallot	0	0	0	0	0	0	0	

Table 9: Food intolerance against other food items in bronchial asthma and control subjects

Name of food	Elevated (%)	Asthma (<i>n</i> = 50)			Control (<i>n</i> = 15)			<i>P</i> value
		Total (%)	Males (%)	Females (%)	Total (%)	Males (%)	Females (%)	
Tea (green)	14 (21.5)	7 (14.00)	5 (71.42)	2 (28.58)	7 (46.6)	4 (57.14)	3 (42.86)	0.235
Sunflower seed	13 (20.0)	5 (10.00)	4 (75.00)	1 (25.00)	8 (53.3)	5 (62.5)	3 (37.5)	
Cola nut	12 (18.4)	6 (12.00)	4 (66.66)	2 (33.34)	6 (40)	4 (66.66)	2 (33.34)	0.22
Agar agar	10 (15.3)	5 (10.00)	3 (60.00)	2 (40.00)	5 (33.3)	3 (60.00)	2 (40.00)	
Yeast (baker's)	10 (15.3)	5 (10.00)	3 (60.00)	2 (40.00)	5 (33.3)	3 (60.00)	2 (40.00)	0.043
Cane sugar	9 (13.84)	4 (8.00)	2 (50.00)	2 (50.00)	5 (33.3)	3 (60.00)	2 (40.00)	
Chestnut	8 (12.30)	3 (6.00)	3 (100.00)	0	5 (33.3)	2 (40.00)	3 (60.00)	
Yeast (brewer's)	8 (12.30)	4 (8.00)	2 (50.00)	2 (50.00)	4 (26.6)	3 (75.00)	1 (25.00)	
Coffee	6 (9.2)	3 (6.00)	2 (66.67)	1 (33.33)	3 (20.0)	1 (33.34)	2 (66.66)	
Mushroom	5 (7.6)	1 (2.00)	1 (100.00)	0	4 (26.6)	1 (25.00)	3 (75.00)	
Sesame seed	5 (7.6)	1 (2.00)	1 (100.00)	0	4 (26.6)	2 (50.00)	2 (50.00)	
Carob	3 (4.6)	1 (2.00)	1 (100.00)	0	2 (13.3)	2 (100.00)	0	
Cocoa Bean	3 (4.6)	0	0	0	3 (20.0)	2 (66.66)	1 (33.34)	
Tea (black)	3 (4.6)	0	0	0	3 (20.0)	2 (66.66)	1 (33.34)	
Honey	2 (3.0)	0	0	0	2 (13.3)	2 (100.00)	0	
Rapeseed	1 (1.5)	0	0	0	1 (6.6)	1 (100.00)	0	
Tapioca	1 (1.5)	0	0	0	1 (6.6)	1 (100.00)	0	