# A STUDY ON CORRELATION OF FOOD INTOLERANCE TEST AND COMMON SYMPTOMS AND THE INCIDENCE OF VARIOUS KINDS OF FOOD CAUSING FOOD ALLERGY AMONG POPULATION IN GREATER BANGKOK

**NATANA KIMSAVET**

**MASTER OF SCIENCE**
**IN**
**ANTI-AGING AND REGENERATIVE SCIENCE**

**SCHOOL OF ANTI-AGING AND REGENERATIVE MEDICINE**
**MAE FAH LUANG UNIVERSITY**
**2012**

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2012

INDEPENDENT STUDY COMMITTEE

.....CHAIRPERSON
(Lecturer Jarasphol Rintra)

.....ADVISOR
(Dr. Karnt Wongsuphasawat)

.....EXTERNAL EXAMINER
(Asst. Prof. Dr. Tawee Saiwichai)

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Natana Kimsavet

| | |
|---|---|
| **Independent Study Title** | A study on Correlation of Food Intolerance Test and Common Symptoms and the Incidence of Various Kinds of Food Causing food Allergy Among Population in Greater Bangkok |
| **Author** | Natana Kimsavet |
| **Degree** | Master of Science (Anti-Aging and Regenerative Science) |
| **Advisor** | Dr. Karnt Wongsuphasawat |

# ABSTRACT


Background: Food is necessary for daily life. Most of people are allergic to limited kinds of foods, which is an immediate-onset reaction. That they can perceived such allergies and avoid those specific foods. Nowadays, many researches reported delayed-onset food allergy that significantly associated with common symptoms. Due to the delayed reactions, therefore, it is hard to identify associations between specific kinds of food and combinations of symptoms, which consequence in non-specific treatments. Hence, this research is aimed to find the incidence of hidden food allergy/food intolerance among population in greater Bangkok, and also associations between hidden food allergy/food intolerance with combinations of symptoms. Besides, we aimed to identify common hidden food allergies, which can be the guidance for protection and treatment.

Objective: Identifying the most common 20 allergic food in Thai people living in greater Bangkok, to understand and confirm the cause and effect of delayed-onset food allergies to protect chronic syndrome in the future, to evaluate correlation among common allergic foods with symptoms, and to be used as a basic information for evaluate correlation between common allergic foods symptoms before developing to chronic syndrome.

Method: A retrospective study from 224 male and female patients who had normal meals in daily life with IgG antibody levels tested.

Result: The top 20 delayed-onset of food allergy were egg white, cow's milk, yeast (baker's), casein, bean (red kidney), cola nut, goat milk, yeast (brewer's),wheat, sheep milk, corn (maize), soya bean, pea, amaranth, agar agar, alga (wakame), pine nut, peppercorns (b/w), gliadin, and cocoa bean. With limitations of data, the results of

correlation analysis between food allergies and allergic symptoms mainly showed negative associations without significances. Some had significantly positive associations but some had significantly negative associations.

Conclusion: Significantly positive association between goat milk allergy with bloating after meal, wheat allergy with foul smell gas and acne vulgaris around mouth and chin, and amaranth allergy with dry skin were observed.

**Keywords:** Food Allergy/Food Intolerance/IgE-mediated/Non IgE-mediated

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# CHAPTER 1

# INTRODUCTION

## 1.1 Background

Food allergy is related to daily life. There are many journals to confirm the specific symptoms or diseases from immunoglobulin E (IgE) -mediated food allergy. The IgE-mediated is an immediate-onset. Allergic symptoms are immediate reactions occur within 2 hours of eating, it is usually self-diagnosed. So it is easy to treatment, just only eliminate the allergic foods. The only few kinds (2 to 3) allergic foods and rare foods, so it is easy to cure, permanently cure, just stop eating.

IgG food allergy, is a delayed-onset food allergies (24 to 48 hours or appearing 3 to 7 days), a combination of delayed symptoms, multiple foods (more than 10 kinds of common foods), and food craving. It is not self-diagnose, it necessary need the skills of a health professional about foods allergy with the validated laboratory to detect the food allergies. And it is difficult to find out to the specific allergic foods and specific symptoms to cure.

Although knowing that, just only temporary stop eating, it can cure, if it is uncertain about the cause and effect or the correlation of the delayed-onset food allergies with the symptoms, why we have to stop eating the lovely foods?

Sometimes the symptoms are not severe, so many people are not interest to cure, and these things can be the big problems in the future. Who know?

This study occurred from the requirement to confirm that only little common things (common foods) could bring which bigger problems in the future (specific symptoms and can develop to chronic disease in the future)

## 1.2 Research Objectives

1.2.1 To study and ranking the 20 first delayed-onset food allergies for Thai People in Bangkok and in metropolitan area.

1.2.2 To understand and confirm the cause and effect of delayed-onset food allergies to protect chronic syndrome in the future.

1.2.3 To evaluate correlation between common allergic foods with combination of symptoms.

1.2.4 To be use as a basic information for evaluate correlation between common allergic foods with combination of symptoms before developing to chronic syndrome.

## 1.3 Hypothesis

The IgG food allergy can be the pre-diagnosis the common combination of symptoms.

## 1.4 Conceptual Framework

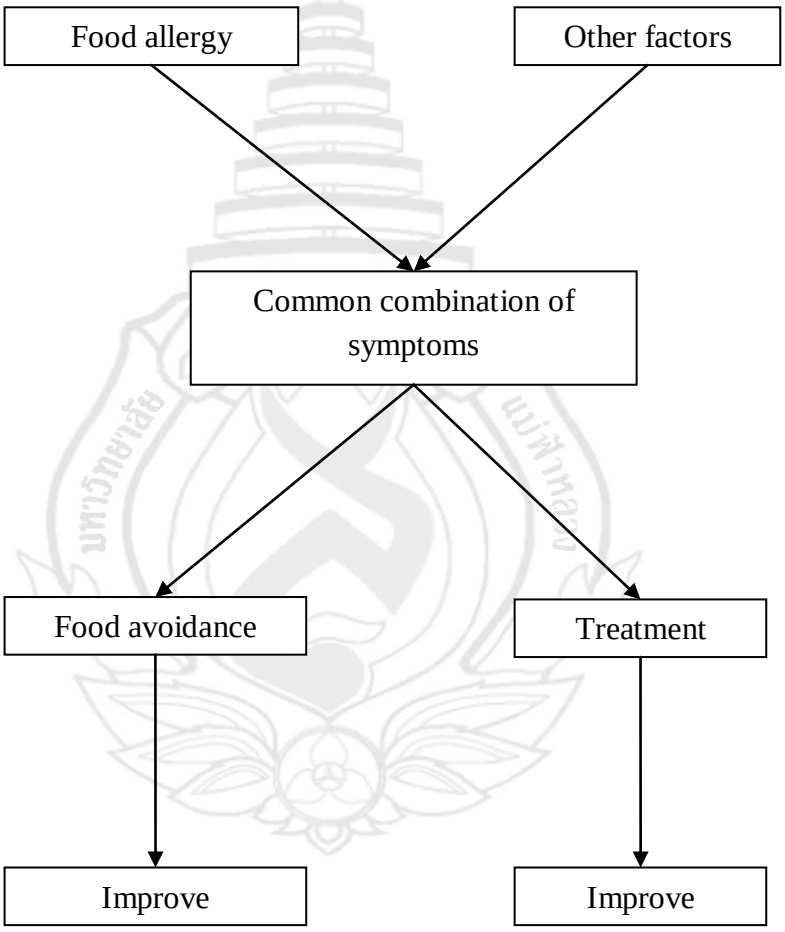


**Figure 1.1** Conceptual framework

The common combination of symptoms can happen from food allergy and the other factors. If they are caused by the other factors, then treated, they will improve. If they happen from food allergy, food avoidance, they will improve.

## 1.5 Contribution of Study

The acknowledgement of the correlation between the IgG food allergy and the combination of symptoms will be the benefit to prevent the chronic diseases in the future.

## 1.6 Keywords

1.6.1 Food Allergy is an adverse immune response to a food protein. They are distinct from other adverse responses to food, such as food intolerance, pharmacological reactions, and toxin-mediated reactions. The protein in the food is the most common allergic component. These kinds of allergies occur when the body's immune system mistakenly identifies a protein as harmful. Some proteins or fragments of proteins are resistant to digestion and those that are not broken down in the digestive process are tagged by the IgE.

1.6.2 Food Intolerance or non-allergic food hypersensitivity is a term used widely for varied physiological responses associated with a particular food, or compound found in a range of foods. Food intolerance is negative reaction, often delayed, to a food, beverage, food additive, or compound found in foods that produces symptoms in one or more body organs and systems, but it is not a true food allergy. A true food allergy requires the presence of IgE antibodies against the food, and food intolerance does not.

1.6.3 IgE-mediated are the reactions (i.e., immediate hypersensitivity reactions) involving IgE–mediated release of histamine and other mediators from mast cells and basophils.

1.6.4 Non IgE-mediated are the reactions (i.e., delayed hypersensitivity reactions, cell-mediated immunity) are mediated by T cells rather than by antibodies.

# CHAPTER 2

# LITERATURE REVIEW

## 2.1 Definition of Food Allergy

A food allergy is an adverse immune response to a food protein. A protein in the food is the most common allergic component. These kinds of allergies occur when the body's immune system mistakenly identifies a protein as a harmful. Patients with food-induced allergic disorders may be seen with a variety of symptoms affecting the skin, respiratory tract, gastrointestinal tract, and/or cardiovascular system. Conditions caused by food allergies are classified into 2 groups according to the mechanism of the allergic response; IgE-mediated and non-IgE-mediated. The skin and respiratory tract are most often affected by IgE-mediated, whereas gastrointestinal disorders are most often caused by non-IgE-mediated reactions.

## 2.2 Pathophysiology

There are 4 different types of immune reactions in food allergy. These are called type 1,2,3, and 4. More than one type of reaction can occur at the same time in the same allergic individual. Type 1 and 3 will be focused; Type 1 Immediate-onset food allergy and Type 3 Delayed-onset food allergy (Braly, 2006).

### 2.2.1 Type 1 Immediate-Onset Food Allergy

Type 1 food allergy occur in less than 5% of population, mostly in children, usually occurring in the genetically predisposed individual, the immune system begins creating a specific type of antibody called IgE (immunoglobulin IgE) to certain foods. One side of the IgE antibody will recognize and tenaciously bind to allergic food. The other side of antibody is attached to a specialized immune cell packed with histamine, called Mast cell. The allergic response will occur immediately to 2 hours after meal. These symptoms will occur in rhinorrhea, itchiness, dyspnea, and anaphylaxis.

### 2.2.2 Type 3 Delayed-Onset Food Allergy

Type 3 food allergy also involved the immune system. They occur when the immune system creates an overabundance of IgG antibodies to a particular food. The IgG antibodies instead of attaching to mast cells like IgE antibodies in Type 1 allergies, bind directly to the food as it enters the bloodstream, forming different sizes of so-called

circulating immune complexes (food allergens bound to antibodies circulating in the bloodstream). The allergic symptoms in Type 3 immune reactions are delayed in onset, appearing anywhere from within 2 hours up to several days after consuming allergic foods. An estimated 60-80 million Americans suffer from clinically significant food allergies, most of whom suffer delayed symptoms.

### 2.2.3 The Important Difference Between 2 Types of Good Allergy

2.2.3.1 Type 1 Immediate-onset food allergy (IgE-mediated)

1. The immediate food allergy is common in children, rare in adults.
2. Allergic symptoms in immediate reactions occur within 2 hours of eating.
3. Involves 1 or 2 foods in allergic diets.
4. Immediate food allergy is usually self-diagnosed.
5. Immediate food allergy involves foods that are rarely eaten.
6. When patients stop eating allergic foods, they don't crave or miss these foods.
7. Immediate food allergens primarily affect the skin, airway and digestive tract.
8. Immediate-onset food allergies are frequently permanent and fixed allergies.
9. Immediate-onset food allergy is often a skin-test positive, the doctor can diagnosed with a simple skin test

2.2.3.2 Type 3 Delayed-onset food allergy (non-IgE-mediated)

1. Delayed food allergy is common in children and adults.
2. Allergic symptoms do not appear within 2 hours, not frequently showing up 24 to 48 hours later (there are even reports of delayed symptoms appearing 3 to 7 days after eating).
3. Delayed reactions characteristically involve 3 to 10 allergic foods, sometimes as many of 20 allergic foods individuals.
4. Type 3 Delayed-onset food allergies are difficult to self-diagnose, to detect the allergic foods will need the skills of a health professional about food allergies and the reliable laboratory to diagnosis the allergy.
5. Delayed-food allergy involves commonly eaten food.
6. Powerful addictive cravings and disabling withdrawal symptoms are reported in over 30% of delayed food allergy patients when stop eating food.
7. Any tissue, organ or system of the body can be affected by delayed food allergy, this includes the brain, joints, muscles, hormone-producing glands, lung, kidneys, and nervous system.
8. Delayed-onset food allergies are commonly reversible, if strictly eliminate the allergic foods for 3 to 6 months, can bring back into common diet without allergic symptoms.
9. Delayed food allergies are skin-test negative, the traditional skin tests are poor tests for detecting delayed food allergies.
10. Delayed food allergies are not immediate, they are difficult to detect without sophisticated laboratory testing.

## 2.3 Diagnosis

Thereare 3 common types of IgE-mediated allergy testing: skin prick test, blood test and food changes test.

### 2.3.1 Skin Prick Test

A tiny board with protruding needle is used. The allergens are placed either on the board or directly on the skin. The board is then placed on the skin, in order to puncture the skin and for the allergens to enter the body. If a hive appears, the person will be considered positive for the allergy. This test only works for IgE-mediates. Allergic reactions caused by other antibodies cannot be detected through skin prick test.

### 2.3.2 Blood Testing

The other way to detect only IgE allergens and does not work for every possible allergens. RAST, Radio Allergo Sorbent Test, id used to detect IgE antibodies present to a certain allergen. The score taken from the RAST test is compared to predictive values, taken from a specific type of RAST test. If the score is higher than the predictive values, there is a great chance the allergy is present in the person. One advantage of this test is that it can test many allergens at one time.

### 2.3.3 Food Challenges Test

The allergen is given to the person in the form of pill, so the person can ingest the allergen directly. The person is watched for sign and symptoms. The problem with food challenges is that they must be performed in the hospital under careful watch, due to the possibility of anaphylaxis.

Delayed food allergies are skin-test negative. The traditional skin tests are poor tests for Detecting delayed food allergies. Delayed food allergies do not appear immediately and can be caused by multiple foods, they are difficult to detect without sophisticated laboratory testing. This is very important, not only is detailed information important, but simple to interpret results are equally important so to support a program which provide actual benefit to the patients. The IgG ELISA test is proper procedures to provide reliability testing. It is also very easy to read and interpret the print results of 96 and 184 foods test.

**Table 2.1** Comprehensive 96 IgG ELISA Food Panel by Serum

| Lists of 96 IgG allergenic food | | | | | |
|---|---|---|---|---|---|
| Almond | Cantaloupe | Corn | Lobster | Pepper, Chili | Squash |
| Apple | Carrot | Crab | Malt | Pepper, Green | Strawberry |
| Asparagus | Cashew | Cucumber | Milk, Cow's | Pineapple | Sugar, Cane |
| Avocado | Cauliflower | Dill | Mushrooms | Pork | Sunflower |
| Banana | Celery | Eggplant | Mustard | Potato, Sweet | Swordfish |
| Barley | Cheese, Cheddar | Egg Yolk | NutraSweet | Potato, White | Tea, Black |
| Basil | Cheese Cottage | Garlic | Oats | Rice, Brown | Tomato |
| Bay Leaf | Cheese Swiss | Ginger | Olive, Green | Rye | Tuna |
| Bean, Green | Chicken | Gluten | Onion, White | Safflower | Turkey |
| Bean, Lima | Cinnamon | Grape | Orange | Salmon | Walnut, Black |
| Bean, Pinto | Clam | Grapefruit | Oregano | Scallop | Watermelon |
| Beef | Cocoa | Haddock | Pea, Green | Sesame | Wheat |
| Blueberry | Coconut | Honey | Peach | Shrimp | Yeast, Baker's |
| Bran | Codfish | Lamp | Peanut | Sole | Yeast, Brewer's |
| Broccoli | Coffee | Lemon | Pear | Soybean | Yogurt |
| Cabbage | Cola | Lettuce | Pepper, Black | Spinach | |

**From** Alletess, A. (2008). **Available Tests.** Retrieved 22 September, 2011, from http://www.foodallergy.com/test.html

**Table 2.2** Comprehensive 184 IgG ELISA Food Panel by Serum

| Lists of 184 IgG allergenic food | | | | | |
|---|---|---|---|---|---|
| Almond | Carob | Flounder | Milk, Goat's | Peppermint | Squash |
| Amaranth | Carrot | Garlic | Mustard | Perch, Sea | Strawberry |
| Anchovy | Casein | Ginger | Mushrooms | Pike, walleye | Sugar Beet |
| Apple | Cashew | Gingko Biloba | Mussel | Pineapple | Sugar, Cane |
| Apricot | Cauliflower | Ginseng | Navy Bean | Pistachio | Sunflower |
| Arrowroot | Celery | Gluten | Nutmeg | Plum | Swordfish |
| Artichoke | Cheese, Blue | Grape | NutraSweet | Poppy Seed | Tangerine |
| Asparagus | Cheese, Cheddar | Grapefruit | Oats | Pork | Tapioca |
| Avocado | Cheese, Swiss | Haddock | Okra | Potato, Sweet | Tea, Black |
| Banana | Cherry | Halibut | Olive, Green | Potato, White | Teff |
| Barley | Chestnut | Hazelnut | Onion, White | Pumpkin | Thyme |
| Basil | Chicken | Herring | Orange | Quinoa | Tomato |
| Bass (Black) | Chick Pea | Honey | Oregano | Rabbit | Trout |
| Blackberry | Cinnamon | Hops | Oyster | Radish | Tuna |
| Blueberry | Clam | Horseradish | Parsnip | Raspberry | Turkey |
| Bran | Cloves | Kiwi | Papaya | Red Snapper | Turmeric |
| Brazil Nut | Cocoa | Lamb | Paprika | Rhubarb | Turnip |
| Broccoli | Coconut | Lemon | Parsley | Rice, Brown | Vanilla |
| Brussels Sprouts | Codfish | Lentil | Pear | Rosemary | Walnut, Black |

**Table 2.2** (Continued)

| Lists of 184 IgG allergenic food | | | | | |
|---|---|---|---|---|---|
| Buckwheat | Coffee | Lettuce | Pea, Black Eyed | Rye | Wheat |
| Buffalo | Cola | Licorice | Pea, Green | Safflower | Whey |
| Cabbage | Date | Lime | Peach | Sage | White Fish |
| Bean Canola | Deer | Litchi | Peanut | Salmon | Yeast, Baker's |
| Corn | Dill | Lobster | Pear | Scallop | Yeast, Brewer's |
| Crab | Duck | Mango | Pecan | Sesame | Yogurt |
| Cucumber | Eggplant | Mackerel | Pepper | Shrimp | Zucchini |
| Cranberry | Egg White | Malt | Pepper, Black | Sole | |
| Cottonseed | Egg York | Melon | Pepper, Chili | Sorghum | |
| Cantaloupe | Fennel | Millet | Pepper, Green | Soybean | |
| Capsicum | Flaxseed | Milk, Cow's | Pepper, Red | Spinach | |

**From** Alletess, A. (2008). **Available Tests.** Retrieved 22 September, 2011, from http://www.foodallergy.com/test.html

## 2.4 The Common Comparative of Symptoms

Patients with food-induced allergic disorders may be first seen with a variety of symptoms affecting the skin, respiratory tract, gastrointestinal tract, and/or cardiovascular system. The skin and respiratory tract are most often affected by IgE-mediated food-induced allergic reactions, whereas isolated gastrointestinal disorders are most often caused by non-IgE-mediated reactions (Hugh, 1999).

Any tissue, organ or system of the body can be affected by delayed-onset food allergy, this includes the brain, joints, muscles, hormone-producing glands, lung, kidneys, and nervous system.

### 2.4.1 General Symptoms: Headaches, Fatigue, Depression

2.4.1.1 Headache (Medical News Today, 2007)

1. Tension headache are the most common, and generally affect adults and adolescents.

2. It was thought that tension headaches were mainly caused by tension that built up in the scalp and neck muscles as a result of stress, depression, anxiety, or a head injury. However, the exact cause or causes are unknown.

3. Experts today believe that a change in certain brain chemicals may be the main factors that contribute to tension headaches. These chemicals are the ones that help nerves communicate, such as serotonin, endorphins, and several others. It is not clear that, why the levels of these chemicals change.

4. Some people believe food allergies may be the main factor for some people. However, further studies are needed.

2.4.1.2 Fatigue (Edwards, 1996)

1. Fatigue (either physical, mental or both) is a symptom that may be difficult for the patient to describe.

2. Individuals with fatigue may have 3 primary complaints; lack of motivation, tires easily, and has mental fatigue or difficulty with concentration and memory to start or complete their activity.

3. However, in about a third of patients the cause is not found and the diagnosis is not known.

4. There are numerous causes or fatigue symptoms. Examples of some treatable causes of fatigue include anemia, diabetes, thyroid disease, heart disease, COPD and sleep disorder.

5. Fatigue can be described as the lack of energy and motivation (both physical and mental).

6. Fatigue can be a normal response to physical and mental activity; in most normal individuals, it is quickly relieved (usually in hours to about a day, depending on the intensity of the activity) by reducing the activity.

7. Fatigue is a very common complaint and it is important to remember that it is a symptom and not a disease.

8. The patients may presume that their fatigue is due to aging and ignore the symptom. This may lead to a delay in seeking care.

2.4.1.3 Depression (Wadro, 1996)

1. Major depression disorder is manifested by a combination of symptoms that interferes with the ability to work, study, sleep, eat, and enjoy once pleasurable activities.

2. A less severe type of depression, dysthymia (or dysthymic disorder), involves long lasting, chronic symptoms that do not seriously disable, but keep one from functioning well or feeling good.

3. Another type of depressive illness is bipolar disorder (or manic depressive illness).

4. Bipolar disorder is characterized by cycling mood changes: severe highs (mania) and lows (depression), often with periods of normal mood in between.

5. Mania often affects thinking, judgment, and social behavior in ways that cause serious problems and embarrassment.

6. Depressive disorders are a huge public-health problem, due to its affecting million of people. About 10% of adults, up to 8% of teens and 2% of preteen children experience some kind of depressive disorder.

7. Depression in elderly tends to be chronic. This is of particular concern given that elderly men, particularly elderly white men have the highest suicide rate.

**2.4.2 Respiratory System: Asthma**

Asthma (MedlinePlus, 2011; Szeftel, 1996)

24.2.1 Asthma is a chronic disease that affects the airways.

24.2.2 Symptoms include wheezing, coughing, chest tightness, and shortness of breath.

24.2.3 There is currently no cure for asthma, and no single exact cause has been identified. Therefore, understanding the changes that occur in asthma, how it makes

the one's feel, and how it can behave over time is essential. This knowledge can empower people with asthma to take an active role in their own health.

24.2.4 Uncontrolled asthma may result in emergency hospitalization and possible death.

### 2.4.3 Digestive System: Bloating, Mouth Ulcer, Constipation, and Diarrhea

2.4.3.1 Bloating (Goldfinger, 2011)

1. There are 2 primary sources of intestinal gas: air swallowing and bacterial production
2. There are several conditions that may lead to increased gas formation.
   1) Foods that cause gas: bean, cabbage, cauliflower, Brussels sprouts, broccoli, and asparagus.
   2) Starch and soluble fiber: potatoes, corn, noodles, and wheat.
   3) Lactose intolerance: occurs when the body has difficulty digesting lactose, the sugar found in most milk-based products. Symptoms of lactose intolerance include diarrhea, abdominal pain, and flatulence after consuming milk or milk-containing products.
   4) Intolerance to food sugars: fructose (contained in dried fruit, honey, sucrose, onions, artichokes, and many foods and drinks that contain high fructose corn syrup and sorbitol).
   5) Diseases associated with increased gas: a number of diseases can cause difficulty absorbing carbohydrates, which can lead to increased gas. This problem can occur in people with celiac disease.

2.4.3.2 Mouth ulcer (Walton, 2003)

1. Physical damage: accidentally biting ones cheek or tongue, puncture wounds caused by objects such sharp crisps, wear and tear from vigorous licking.
2. For someone who has an allergic reaction or auto-immune system response to chemical or biological agents, these can initiate the formation of ulcers.

2.4.3.3 Constipation (Marks, 1996a)

1. Constipation is defined medically as fewer than three stools per week and severe constipation as less than one stool per week.
2. There are many causes of constipation including:
   1) Medications
   2) Poor bowel habits
   3) Low fiber diets
   4) Abuse of laxatives
   5) Hormonal disorder
   6) Diseases primarily of other parts of the body that also affect the colon.

2.4.3.4 Diarrhea (Marks, 1996b)

1. Diarrhea can be defined in absolute or relative terms based on either the frequency of bowel movements or the consistency (looseness) of stools.
2. Diarrhea needs to be distinguished from 4 other conditions:
   1) Incontinence of stool, which is the inability to control (delay) bowel movements until an appropriate time.
   2) Rectal urgency, which is a sudden urge to have a bowel movement that is so strong.

3) Incomplete evacuation, which is a sensation that another bowel movement is necessary soon after a bowel movement, yet there is difficulty passing further stool the second time.

4) Bowel movements immediately after eating a meal.

# CHAPTER 3

# RESEARCH METHODOLOGY

## 3.1 Population and Sample Size

Study Population from all patients who have IgG food allergy test, male and female in Bangkok and metropolitan area.

## 3.2 Sample Size

$$n = \frac{Z^2\delta^2}{d^2}$$

n = Sample size
Z = Confident interval at 95% =1.96
$\delta^2$ = Standard deviation
($SD_1$ = Clinical sign positive: $SD_2$=Silent clinical sign)
($SD_1$ $SD_2$ From Kang, et al. (2010). Relationship between silent Gastroesophageal Reflux and Food Sensitization in Infant and Young Children with Recurrent Wheezing)
d = Allowance error in estimating sample size in evaluation the real population = 20%
= $\overline{\chi}$ - μ when
$\overline{\chi}$ = mean of sample
μ = mean of population

$$N = \frac{(1.96)^2(0.92344)}{0.2^2}$$

= 89

## 3.3 Research Design

Cross-sectional study from secondary data.

## 3.4 Selection of Sample

People who decided to take IgG food allergy test in Bangkok and in metropolitan area.

### 3.4.1 Inclusion Criteria

3.4.1.1 Thai people at any age who has IgG food allergy test.
3.4.1.2 His/her clinical signs and symptoms are available to access.
3.4.1.3 People Including male and female.
3.4.1.4 People who live in Bangkok and in metropolitan area.
3.4.1.5 People who have normal meal.

### 3.4.2 Exclusion Criteria

3.4.2.1 People who don't want to test IgG food allergy.
3.4.2.2 Data from people who are not Thai.
3.4.2.3 People who are vegetarians.
3.4.2.4 People who have allergic to specific substance.
3.4.2.5 People who have IBS.

## 3.5 Research Tools

3.5.1 Review secondary data from lab.
3.5.2 Computer
3.5.3 Statistical software: SPSS Version 11.

## 3.6 Research Procedure

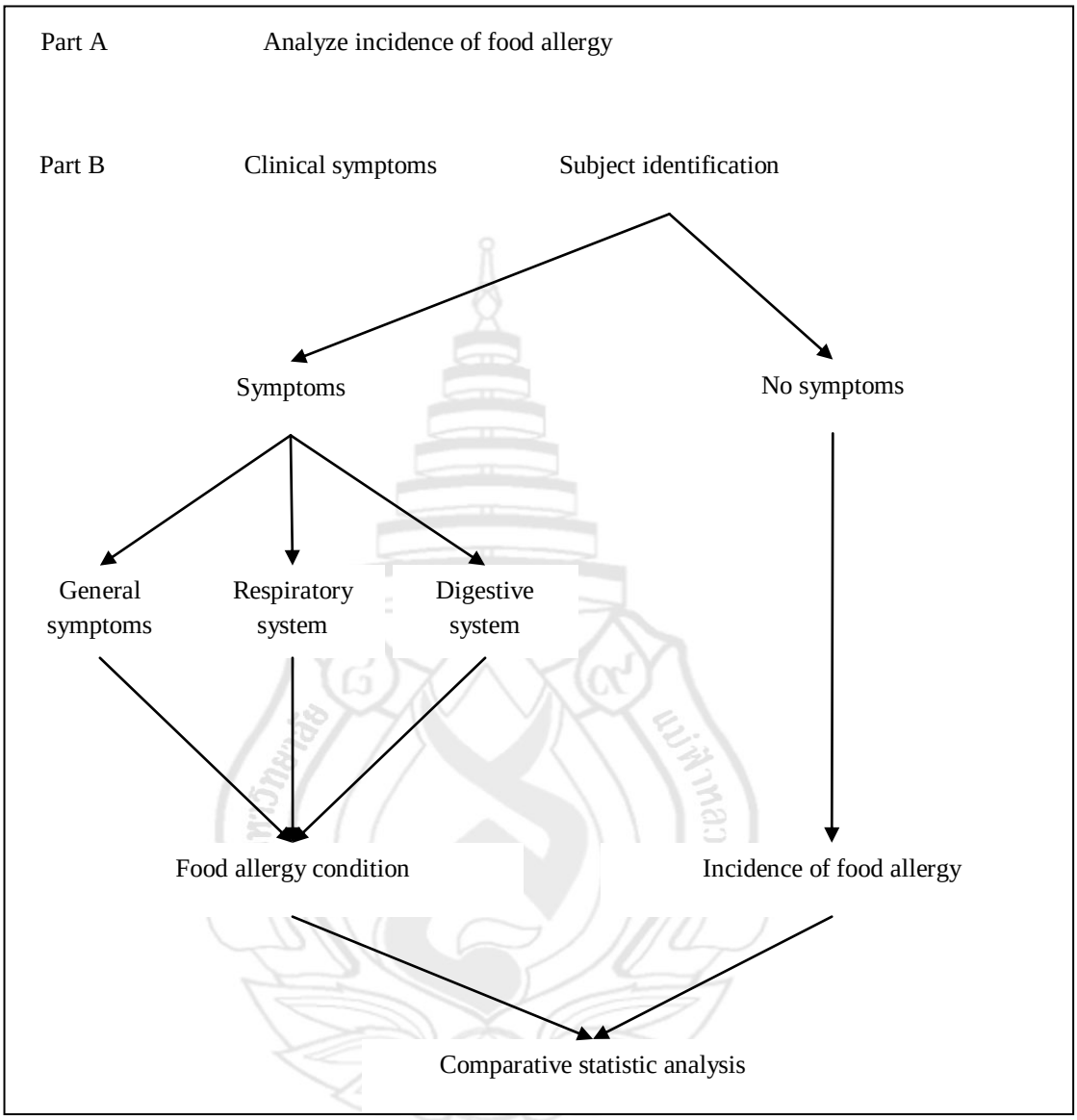


**Figure 3.1** Research Procedure

3.6.1 Collect secondary data about IgG food allergy test from Laboratories in Bangkok.

3.6.2 Analyze the secondary data using Chi-square test and ranking the result of food allergy for Thai people.

3.6.3 Analyze the correlation of symptoms awareness and the result of food allergy.

## 3.7 Data Collection

Collect all secondary data.

## 3.8 Statistic Used for Data Analysis

3.8.1 Use descriptive statistic to determine the result of IgG food allergy for Thai people in Bangkok and in metropolitan area.

3.8.2 Use inferential statistic to find the correlation of specific symptoms with IgG food allergy.

## 3.9 Ethical Consideration

3.9.1 All secondary data obtained are secondary data.

3.9.2 No detail of patient revealed

# CHAPTER 4

# RESULTS

This study is retrospective from secondary data from people who decided to evaluate IgG food allergy test in Bangkok and in metropolitan area.The results from the study are Thai people at any age, included male and female, having normal meal in everyday life.The research objectives are study into two parts. The first is to study and ranking the 20$^{th}$ first delayed-onset food allergies for Thai People in Bangkok and in metropolitan area. The second is to evaluate the correlation between the common allergic foods with the combination of symptoms.

## 4.1 Population Data

There are 224 persons, 43 persons were males (with percentage of 19.20), and 181 persons were females (with percentage of 80.80). The most population are females, the average age is 34 years old.

## 4.2 The 20th First Delayed-Onset Food Allergies

The outcome of the data comes from 224 people, with getting 221 IgG ELISA test. The results are evaluated into 3 methods. The first is to count from the frequency of the allergic kinds of foods, the details are provided in table 4.1 The second is summary of result of serum IgG antibody, the details are provided in table 4.2 The third is weighted ranking by frequency of serum IgG antibody, the details are provided in table 4.3

**Table 4.1** The20$^{th}$First Delayed-Onset Food Allergies Counting From Frequency of Allergic Kinds of Food

| No. | Kinds of food |
|---|---|
| 1 | Egg white |
| 2 | Cow's milk |
| 3 | Cola nut |
| 4 | Bean (red kidney) |

**Table 4.1** (Continued)

| No. | Kinds of food |
|---|---|
| 5 | Yeast (baker's) |
| 6 | Casein |
| 7 | Yeast (brewer's) |
| 8 | Wheat |
| 9 | Sheep milk |
| 10 | Alga (wakame) |
| 11 | Corn (maize) |
| 12 | Soya bean |
| 13 | Pea |
| 14 | Goat milk |
| 15 | Agar agar |
| 16 | Cashew nut |
| 17 | Amaranth |
| 18 | Ginkgo |
| 19 | Barley |
| 20 | Almond |

**Table 4.2** The20th First Delayed-Onset Food Allergies Evaluate From Summary of Serum IgG Antibody

| No. | Kinds of food |
|---|---|
| 1 | Yeast (baker's) |
| 2 | Egg white |
| 3 | Cow’s milk |
| 4 | Casein |
| 5 | Bean (red kidney) |
| 6 | Cashew nut |
| 7 | Wheat |
| 8 | Cola nut |
| 9 | Goat milk |
| 10 | Yeast (brewer's) |
| 11 | Sheep milk |
| 12 | Soya bean |
| 13 | Corn (maize) |
| 14 | Alga (wakame) |
| 15 | Pea |
| 16 | Amaranth |
| 17 | Agar agar |
| 18 | Ginkgo |
| 19 | Cocoa bean |
| 20 | Pine nut |

**Table 4.3** The20th First Delayed-Onset Food Allergies From Weighted Ranking by Frequency of Serum IgG Antibody

| No. | Kinds of food |
|---|---|
| 1 | Egg white |
| 2 | Cow's milk |
| 3 | Yeast (baker's) |
| 4 | Casein |
| 5 | Bean (red kidney) |
| 6 | Cola nut |
| 7 | Goat milk |
| 8 | Yeast (brewer's) |
| 9 | Wheat |
| 10 | Sheep milk |
| 11 | Corn (maize) |
| 12 | Soya bean |
| 13 | Pea |
| 14 | Amaranth |
| 15 | Agar agar |
| 16 | Alga (wakame) |
| 17 | Pine nut |
| 18 | Peppercorns (B/W) |
| 19 | Gliadin |
| 20 | Cocoa bean |

## 4.3 The Association Between Allergic to One Kind of Food with Other Kinds of Food

The association between allergic to egg white with cow's milk, yeast (baker's), casein, yeast (brewer's), bean (red kidney), goat milk, cola nut, sheep milk, soya bean, wheat, alga (wakame), pea, peppercorns (b/w), corn (maize), agar agar, amaranth, gliadin, cocoa bean, pine nut were r=0.224 (p=0.001), r=0.016 (p=0.814), r=0.231 (p=0.001), r=0.083 (p=0.214), r=0.186 (p=0.005), r=0.289 (p<0.001), r=0.146 (p=0.029), r=0.196 (p=0.003), r=0.295 (p<0.001), r=0.109 (p=0.104), r=0.015 (p=0.818), r=0.104 (p=0.120), r=0.021 (p=0.751), r=0.274 (p<0.001), r=0.005 (p=0.937), r=0.104 (p=0.121), r=0.285 (p<0.001), r=0.095 (p=0.158), r=0.095 (p=0.158), respectively shown in table 4.4

**Table 4.4** Association Between Allergic to Egg White with Other Kinds of Food

| Variable | Allergic to egg white with other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Cow's milk | 0.224 | 0.001* |
| Yeast (baker's) | 0.016 | 0.814 |
| Casein | 0.231 | 0.001* |
| Yeast (brewer's) | 0.083 | 0.214 |
| Bean (red kidney) | 0.186 | 0.005* |
| Goat milk | 0.298 | <0.001* |
| Cola nut | 0.146 | 0.029* |
| Sheep milk | 0.196 | 0.003* |
| Soya bean | 0.295 | <0.001* |
| Wheat | 0.109 | 0.104 |
| Alga (wakame) | 0.015 | 0.818 |
| Pea | 0.104 | 0.120 |
| Peppercorns (b/w) | 0.021 | 0.751 |
| Corn (maize) | 0.274 | <0.001* |
| Agar agar | 0.005 | 0.937 |
| Amaranth | 0.104 | 0.121 |
| Gliadin | 0.285 | <0.001* |
| Cocoa bean | 0.095 | 0.158 |
| Pine nut | 0.095 | 0.158 |

**Note.** *Significant association at $P \leq 0.05$

The association between allergic to cow's milk with yeast (baker's), casein, yeast (brewer's), bean (red kidney), goat milk, cola nut, sheep milk, soya bean, wheat, alga (wakame), pea, peppercorns (b/w), corn (maize), agar agar, amaranth, gliadin, cocoa bean, pine nut, egg white were r=-0.043 (p=0.526), r=0.646 (p<0.001), r=0.044 (p=0.511), r=0.018 (p=0.787), r=0.436 (p<0.001), r=0.040 (p=0.553), r=0.540 (p<0.001), r=0.269 (p<0.001), r=0.049 (p=0.470), r=0.014 (p=0.830), r=0.182 (p=0.006), r=0.170 (p=0.011), r=-0.017 (p=0.805), r=-0.804 (p=0.211), r=0.095 (p=0.155), r=0.243 (p<0.001), r=0.188 (p=0.005), r=0.188 (p=0.005), r=0.224 (p=0.001), respectively shown in table 4.5

**Table 4.5** Association Between Allergic to Cow's Milk with Other Kinds of Food

| Variable | Allergic to cow's milk with other kinds of food | |
|---|---|---|
| | **(r)** | **(p)** |
| Yeast (baker's) | -0.043 | 0.526 |
| Casein | 0.646 | <0.001* |
| Yeast (brewer's) | 0.044 | 0.511 |

**Table 4.5** (Continued)

| Variable | Allergic to cow's milk with other kinds of food | |
|---|---|---|
| | (r) | (p) |
| Bean (red kidney) | 0.018 | 0.787 |
| Goat milk | 0.436 | <0.001* |
| Cola nut | 0.040 | 0.553 |
| Sheep milk | 0.540 | <0.001* |
| Soya bean | 0.269 | <0.001* |
| Wheat | 0.049 | 0.470 |
| Alga (wakame) | 0.014 | 0.830 |
| Pea | 0.182 | 0.006* |
| Peppercorns (b/w) | 0.170 | 0.011* |
| Corn (maize) | -0.017 | 0.805 |
| Agar agar | -0.804 | 0.211 |
| Amaranth | 0.095 | 0.155 |
| Gliadin | 0.243 | <0.001* |
| Cocoa bean | 0.188 | 0.005* |
| Pine nut | 0.188 | 0.005* |
| Egg white | 0.224 | 0.001* |

**Note.** *Significant association at $P \leq 0.05$

The association between allergic to yeast (baker's) with casein, yeast (brewer's), bean (red kidney), goat milk, cola nut, sheep milk, soya bean, wheat, alga (wakame), pea, peppercorns (b/w), corn (maize), agar agar, amaranth, gliadin, cocoa bean and pine nut, egg white, cow's milk were r=-0.010 (p=0.897), r=0.043 (p<0.001), r=-0.008 (p=0.908), r=0.018 (p=0.793), r=0.322 (p<0.001), r=-0.115 (p=0.086), r=0.112 (p=0.093), r=0.086 ( p=0.201), r=0.101 (p=0.133), r=0.169 (p=0.012), r=0.299 (p<0.001), r=0.105 (p=0.119), r=0.109 (p=0.105), r=0.209 (p=0.002), r=0.150 (p=0.024), r=0.286 (p<0.001), r=0.260 (p<0.001), r=0.016 (p=0.814), r=-0.043 (p=0.526) respectively shown in table 4.6

**Table 4.6** Association Between Allergic to Yeast (Baker's) with Other Kinds of Food

| Variable | Allergic to Yeast (baker's) with other kinds of food | |
|---|---|---|
| | (r) | (*p*) |
| Casein | -0.010 | 0.897 |
| Yeast (brewer's) | 0.043 | <0.001* |
| Bean (red kidney) | -0.008 | 0.908 |
| Goat milk | 0.018 | 0.793 |
| Cola nut | 0.322 | <0.001* |
| Sheep milk | -0.115 | 0.086 |
| Soya bean | 0.112 | 0.093 |

**Table 4.6** (Continued)

| Variable | Allergic to Yeast (baker's) with other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Wheat | 0.086 | 0.201 |
| Alga (wakame) | 0.101 | 0.133 |
| Pea | 0.169 | 0.012* |
| Peppercorns (b/w) | 0.299 | <0.001* |
| Corn (maize) | 0.105 | 0.119 |
| Agaragar | 0.109 | 0.105 |
| Amaranth | 0.209 | 0.002* |
| Gliadin | 0.150 | 0.024* |
| Cocoa bean | 0.286 | <0.001* |
| Pine nut | 0.260 | <0.001* |
| Egg white | 0.016 | 0.814 |
| Cow's milk | -0.043 | 0.526 |

**Note.** *Significant association at $P \leq 0.05$

The association between allergic to casein with yeast (brewer's), bean (red kidney), goat milk, cola nut, sheep milk, soya bean, wheat, alga (wakame), pea, peppercorns (b/w), corn (maize), agar agar, amaranth, gliadin, cocoa bean, pine nut, egg white, cow's milk, yeast (baker's) were r=0.047 (p=0.483), r=0.108 (p=0.106), r=0.556 (p<0.001), r=0.078 (p=0.247), r=0.584 (p<0.001), r=0.301 (p<0.001), r=0.152 (p=0.023), r=0.126 (p=0.059), r=0.338 (p<0.001), r=0.159 (p=0.017), r=-0.016 (p=0.813), r=0.017 (p=0.800), r=0.131 (p=0.051), r=0.339 (p<0.001), r=0.219 (p=0.001), r=0.245 (p<0.001), r=0.231 (p=0.001), r=0.646 (p<0.001), r=-0.010 (p=0.879) respectively shown in table 4.7

**Table 4.7** Association Between Allergic to Casein with Other Kinds of Food

| Variable | Allergic to Casein with other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Yeast (brewer's) | 0.047 | 0.483 |
| Bean (red kidney) | 0.108 | 0.106 |
| Goat milk | 0.556 | <0.001* |
| Cola nut | 0.078 | 0.247 |
| Sheep milk | 0.584 | <0.001* |
| Soya bean | 0.301 | <0.001* |
| Wheat | 0.152 | 0.023* |
| Alga (wakame) | 0.126 | 0.059 |
| Pea | 0.338 | <0.001* |
| Peppercorns (b/w) | 0.159 | 0.017 |

**Table 4.7** (Continued)

| Variable | Allergic to Casein with other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Corn (maize) | -0.016 | 0.813 |
| Agar agar | 0.017 | 0.800 |
| Amaranth | 0.131 | 0.051 |
| Gliadin | 0.339 | <0.001* |
| Cocoa bean | 0.219 | 0.001* |
| Pine nut | 0.245 | <0.001* |
| Egg white | 0.231 | 0.001* |
| Cow's milk | 0.646 | <0.001* |
| Yeast (baker's) | -0.010 | 0.879 |

**Note.** *Significant association at $P \leq 0.05$

The association between allergic to yeast (brewer's) with bean (red kidney), goat milk, cola nut, sheep milk, soya bean, wheat, alga (wakame), pea, peppercorns (b/w), corn (maize), agar agar, amaranth, gliadin, cocoa bean, pine nut, egg white, cow's milk, yeast (baker's) and casein were r=-0.033 (p=0.625), r=0.052 (p=0.436), r=0.404 (p<0.001), r=-0.015 (p=0.818), r=0.168 (p=0.012), r=-0.026 (p=0.699), r=0.341 (p<0.001), r=0.240 (p<0.001), r=0.224 (p=0.001), r=0.199 (p=0.003), r=0.287 (p<0.001), r=0.137 (p=0.041), r=0.204 (p=0.002), r=0.233 (p<0.001), r=0.207 (p=0.002), r=0.083 (p=0.214), r=0.044 (p=0.511), r=0.403 (p<0.001), r=0.047 (p=0.483) respectively shown in table 4.8

**Table 4.8** Association Between Allergic to Yeast (Brewer's) with Other Kinds of Food

| Variable | Allergic to Yeast (brewer's) with other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Bean (red kidney) | -0.033 | 0.625 |
| Goat milk | 0.052 | 0.436 |
| Cola nut | 0.404 | <0.001* |
| Sheep milk | -0.015 | 0.818 |
| Soya bean | 0.168 | 0.012* |
| Wheat | -0.026 | 0.699 |
| Alga (wakame) | 0.341 | <0.001* |
| Pea | 0.240 | <0.001* |
| Peppercorns (b/w) | 0.224 | 0.001* |
| Corn (maize) | 0.199 | 0.003* |
| Agar agar | 0.287 | <0.001* |
| Amaranth | 0.137 | 0.041* |
| Gliadin | 0.204 | 0.002* |

**Table 4.8** (Continued)

| Variable | Allergic to Yeast (brewer's) with other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Cocoa bean | 0.233 | <0.001* |
| Pine nut | 0.207 | 0.002* |
| Egg white | 0.083 | 0.214 |
| Cow's milk | 0.044 | 0.511 |
| Yeast (baker's) | 0.403 | <0.001* |
| Casein | 0.047 | 0.483 |

**Note.** *Significant association at $P \leq 0.05$

The association between allergic to bean (red kidney) with goat milk, cola nut, sheep milk, soya bean, wheat, alga (wakame), pea, peppercorns (b/w), corn (maize), agar agar, amaranth, gliadin, cocoa bean, pine nut, egg white, cow's milk, yeast (baker's), casein, yeast (brewer's) were r=0.149 (p=0.026), r=-0.011 (p=0.875), r=0.215 (p=0.001), r=0.064 (p=0.339), r=0.063 (p=0.348), r=-0.107 (p=0.109), r=0.052 (p=0.438), r=-0.351 (p<0.001), r=0.222 (p=0.001), r=0.080 (p=0.234), r=-0.045 (p=0.506), r=0.103 (p=0.124), r=-0.244 (p<0.001), r=-0.270 (p<0.001), r=0.186 (p=0.005), r=0.018 (p=0.787), r=-0.008 (p=0.908), r=0.108 (p=0.106), r=-0.0033 (p=0.625), respectively shown in table 4.9

**Table 4.9** Association Between Allergic to Bean (Red Kidney) with Other Kinds of Food

| Variable | Allergic to Bean (red kidney) with other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Goat milk | 0.149 | 0.026* |
| Cola nut | -0.011 | 0.875 |
| Sheep milk | 0.215 | 0.001* |
| Soya bean | 0.064 | 0.339 |
| Wheat | 0.063 | 0.348 |
| Alga (wakame) | -0.107 | 0.109 |
| Pea | 0.052 | 0.438 |
| Peppercorns (b/w) | -0.351 | <0.001* |
| Corn (maize) | 0.222 | 0.001* |
| Agar agar | 0.080 | 0.234 |
| Amaranth | -0.045 | 0.506 |
| Gliadin | 0.103 | 0.124 |
| Cocoa bean | -0.244 | <0.001* |
| Pine nut | -0.270 | <0.001* |
| Egg white | 0.186 | 0.005* |
| Cow's milk | 0.018 | 0.787 |

**Table 4.9** (Continued)

| Variable | Allergic to Bean (red kidney) with other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Yeast (baker's) | -0.008 | 0.908 |
| Casein | 0.108 | 0.106 |
| Yeast (brewer's) | -0.033 | 0.625 |

**Note.** *Significant association at $P \leq 0.05$

The association between allergic to goat milk with cola nut, sheep milk, soya bean, wheat, alga (wakame), pea, peppercorns (b/w), corn (maize), agar agar, amaranth, gliadin, cocoa bean pine nut, egg white, cow's milk, yeast (baker's), casein, yeast (brewer's), bean (red kidney) were r=0.113 (p=0.091), r=0.604 (p=<0.001), r=0.365 (p<0.001), r=0.184 (p=0.006), r=0.047 (p=0.487), r=0.149 (p=0.026), r=0.161 (p=0.016), r=-0.011 (p=0.873), r=0.013 (p=0.844), r=0.170 (p=0.011), r=0.440 (p<0.001), r=0.238 (p=<0.001), r=0.238 (=<0.001), r=0.298 (p<0.001), r=0.436 (p<0.001), r=0.018 (p=0.793), r=0.556 (p<0.001), r=0.052 (p=0.436), r=0.149 (p=0.026), respectively shown in table 4.10

**Table 4.10** Association Between Allergic to Goat Milk with Other Kinds of Food

| Variable | Allergic to Goat Milk with the other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Cola nut | 0.113 | 0.091 |
| Sheep milk | 0.604 | <0.001* |
| Soya bean | 0.365 | <0.001* |
| Wheat | 0.184 | 0.006* |
| Alga (wakame) | 0.047 | 0.487 |
| Pea | 0.149 | 0.026* |
| Peppercorns (b/w) | 0.161 | 0.016 |
| Corn (maize) | -0.011 | 0.873 |
| Agar agar | 0.013 | 0.844 |
| Amaranth | 0.170 | 0.011* |
| Gliadin | 0.440 | <0.001* |
| Cocoa bean | 0.238 | <0.001* |
| Pine nut | 0.238 | <0.001* |
| Egg white | 0.298 | <0.001* |
| Cow's milk | 0.436 | <0.001* |
| Yeast (baker's) | 0.018 | 0.793 |
| Casein | 0.556 | <0.001* |

**Table 4.10** (Continued)

| Variable | Allergic to Goat Milk with the other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Yeast (brewer's) | 0.052 | 0.436 |
| Bean (red kidney) | 0.149 | 0.026* |

**Note.** *Significant association at $P \leq 0.05$

The association between allergic to cola nut with sheep milk, soya bean, wheat, alga (wakame), pea, peppercorns (b/w), corn (maize), agar agar, amaranth, gliadin, cocoa bean, pine nut, egg white, cow's milk, yeast (baker's), casein, yeast (brewer's), bean (red kidney), goat milk, were r=0.020 (p=0.769), r=0.216 (p=0.001), r=-0.022 (p=0.744), r=0.288 (p<0.001), r=0.231 (p<0.001), r=0.229 (p=0.001), r=0.155 (p=0.020), r=0.259 (p<0.001), r=0.188 (p=0.005), r=0.248 (p<0.001), r=0.249 (p<0.001), r=0.191 (p=0.004), r=0.146 (p=0.029), r=0.040 (p=0.553), r=0.322 (p<0.001), r=0.078 (p=0.247), r=0.404 (p<0.001), r=-0.011 (p=0.875), r=0.113 (p=0.091), respectively shown in table 4.11

**Table 4.11** Association Between Allergic to Cola Nut with Other Kinds of Food

| Variable | Allergic to Cola Nut with the other kinds of food | |
|---|---|---|
| | **(r)** | **(p)** |
| Sheep milk | 0.020 | 0.769 |
| Soya bean | 0.216 | 0.001* |
| Wheat | -0.022 | 0.744 |
| Alga (wakame) | 0.288 | <0.001* |
| Pea | 0.231 | <0.001* |
| Peppercorns (b/w) | 0.229 | 0.001* |
| Corn (maize) | 0.155 | 0.020* |
| Agar agar | 0.259 | <0.001* |
| Amaranth | 0.188 | 0.005* |
| Gliadin | 0.248 | <0.001* |
| Cocoa bean | 0.249 | <0.001* |
| Pine nut | 0.191 | 0.004* |
| Egg white | 0.146 | 0.029* |
| Cow's milk | 0.040 | 0.553 |
| Yeast (baker's) | 0.322 | <0.001* |
| Casein | 0.078 | 0.247 |
| Yeast (brewer's) | 0.404 | <0.001* |
| Bean (red kidney) | -0.011 | 0.875 |
| Goat milk | 0.113 | 0.091 |

**Note.** *Significant association at $P \leq 0.05$

The association between allergic to sheep milk with soya bean, wheat, alga (wakame), pea, peppercorns (b/w), corn (maize), agar agar, amaranth, gliadin, cocoa bean, pine nut, egg white, cow's milk, yeast (baker's), casein, yeast (brewer's), bean (red kidney), goat milk, cola nut were r=0.187 (p=0.005), r=0.299 (p<0.001), r=-0.010 (p=0.885), r=0.196 (p=0.003), r=-0.128 (p=0.057), r=0.026 (p=0.702), r=-0.032 (p=0.633), r=0.041 (p=0.541), r=0.310 (p<0.001), r=-0.056 (p=0.408), r=-0.030 (p=0.651), r=0.196 (p=0.003), r=0.540 (p<0.001), r=-0.115 (p=0.086), r=0.584 (p<0.001), r=-0.015 (p=0.818), r=0.215 (p=0.001), r=0.604 (p<0.001), r=0.020 (p=0.769), respectively shown in table 4.12

**Table 4.12** Association Between Allergic to Sheep Milk with Other Kinds of Food

| Variable | Allergic to Sheep Milk with other kinds of food | |
|---|---|---|
| | (r) | (p) |
| Soya bean | 0.187 | 0.005* |
| Wheat | 0.299 | <0.001* |
| Alga (wakame) | -0.010 | 0.885 |
| Pea | 0.196 | 0.003* |
| Peppercorns (b/w) | -0.128 | 0.057 |
| Corn (maize) | 0.026 | 0.702 |
| Agar agar | -0.032 | 0.633 |
| Amaranth | 0.041 | 0.541 |
| Gliadin | 0.310 | <0.001* |
| Cocoa bean | -0.056 | 0.408 |
| Pine nut | -0.030 | 0.651 |
| Egg white | 0.196 | 0.003* |
| Cow's milk | 0.540 | <0.001* |
| Yeast (baker's) | -0.115 | 0.086 |
| Casein | 0.584 | <0.001* |
| Yeast (brewer's) | -0.015 | 0.818 |
| Bean (red kidney) | 0.215 | 0.001* |
| Goat milk | 0.604 | <0.001* |
| Cola nut | 0.020 | 0.769 |

**Note.** *Significant association at $P \leq 0.05$

The association between allergic to soya bean with wheat, alga (wakame), pea, peppercorns (b/w), corn (maize), agar agar, amaranth, gliadin, cocoa bean, pine nut, egg white, cow's milk, yeast (baker's), casein, yeast (brewer's), bean (red kidney), goat milk, cola nut, sheep milk were r=0.030 (p=0.659), r=0.193 (p=0.004), r=0.376 (p<0.001), r=0.327 (p<0.001), r=0.048 (p=0.477), r=0.105 (p=0.117), r=0.251 (p<0.001), r=0.333 (p<0.001), r=0.383 (p<0.001), r=0.332 (p<0.001), r=0.295 (p<0.001), r=0.269 (p<0.001), r=0.112 (p=0.093), r=0.301 (p<0.001), r=0.168 (p=0.012), r=0.064 (p=0.339), r=0.365 (p<0.001), r=0.216 (p=0.001), r=0.187 (p=0.005), respectively shown in table 4.13

**Table 4.13** Association Between Allergic to Soya Bean with Other Kinds of Food

| Variable | Allergic to Soya Bean with the other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Wheat | 0.030 | 0.659 |
| Alga (wakame) | 0.193 | 0.004* |
| Pea | 0.376 | <0.001* |
| Peppercorns (b/w) | 0.327 | <0.001* |
| Corn (maize) | 0.048 | 0.477 |
| Agar agar | 0.105 | 0.117 |
| Amaranth | 0.251 | <0.001* |
| Gliadin | 0.333 | <0.001* |
| Cocoa bean | 0.383 | <0.001* |
| Pine nut | 0.332 | <0.001* |
| Egg white | 0.295 | <0.001* |
| Cow's milk | 0.269 | <0.001* |
| Yeast (baker's) | 0.112 | 0.093 |
| Casein | 0.301 | <0.001* |
| Yeast (brewer's) | 0.168 | 0.012* |
| Bean (red kidney) | 0.064 | 0.339 |
| Goat milk | 0.365 | <0.001* |
| Cola nut | 0.216 | 0.001* |
| Sheep milk | 0.187 | 0.005* |

**Note.** *Significant association at $P \leq 0.05$

The association between allergic to wheat with alga (wakame), pea, peppercorns (b/w), corn (maize), agar agar, amaranth, gliadin, cocoa bean, pine nut, egg white, cow's milk, yeast (baker's), casein, yeast (brewer's), bean (red kidney), goat milk, cola nut, sheep milk, soya bean were r=-0.085 (p=0.206), r=0.062 (p=0.354), r=-0.186 (p=0.005), r=0.187 (p=0.005), r=0.011 (p=0.876), r=0.022 (p=0.745), r=0.196 (p=0.003), r=-0.137 (p=0.040), r=-0.137 (p=0.040), r=0.109 (p=0.104), r=0.049 (p=0.470), r=0.086 (p=0.201), r=0.152 (p=0.023), r=-0.026 (p=0.699), r=0.063 (p=0.348), r=0.184 (p=0.006), r=-0.022 (p=0.744), r=0.299 (p<0.001), r=-0.030 (p=0.659), respectively shown in table 4.14

**Table 4.14** Association Between Allergic to Wheat with Other Kinds of Food

| Variable | Allergic to Wheat with the other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Alga (wakame) | -0.085 | 0.206 |
| Pea | 0.062 | 0.354 |
| Peppercorns (b/w) | -0.186 | 0.005* |

**Table 4.14** (Continued)

| Variable | Allergic to Wheat with the other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Corn (maize) | 0.187 | 0.005* |
| Agar agar | 0.011 | 0.876 |
| Amaranth | 0.022 | 0.745 |
| Gliadin | 0.196 | 0.003* |
| Cocoa bean | -0.137 | 0.040* |
| Pine nut | -0.137 | 0.040* |
| Egg white | 0.109 | 0.104 |
| Cow's milk | 0.049 | 0.470 |
| Yeast (baker's) | 0.086 | 0.201 |
| Casein | 0.152 | 0.023* |
| Yeast (brewer's) | -0.026 | 0.699 |
| Bean (red kidney) | 0.063 | 0.348 |
| Goat milk | 0.184 | 0.006* |
| Cola nut | -0.022 | 0.744 |
| Sheep milk | 0.299 | <0.001* |
| Soya bean | 0.030 | 0.659 |

**Note.** *Significant association at $P \leq 0.05$

The association between allergic to alga (wakame) with pea, peppercorns, corn (maize), agar agar, amaranth, gliadin, cocoa bean, pine nut, egg white, cow's milk, yeast (baker's), casein, yeast (brewer's), bean (red kidney), goat milk, cola nut, sheep milk, soya bean, wheat were r=0.219 (p=0.001), r=0.302 (p<0.001), r=0.033 (p=0.623), r=0.191 (p=0.004), r=0.249 (p<0.001), r=0.110 (p=0.101), r=0.334 (p<0.001), r=0.283 (p<0.001), r=0.015 (p=0.818), r=0.014 (p=0.830), r=0.101 (p=0.133), r=0.126 (p=0.059), r=0.341 (p<0.001), r=-0.107 (p=0.109), r=0.047 (p=0.487), r=0.288 (p<0.001), r=-0.010 (p=0.885), r=0.193 (p=0.004), r=-0.085 (p=0.206), respectively shown in table 4.15

**Table 4.15** Association Between Allergic to Alga (Wakame) With Other Kinds of Food

| Variable | Allergic to Alga (wakame) with other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Pea | 0.219 | 0.001* |
| Peppercorns (b/w) | 0.302 | <0.001* |
| Corn (maize) | 0.033 | 0.623 |
| Agar agar | 0.191 | 0.004* |
| Amaranth | 0.249 | <0.001* |
| Gliadin | 0.110 | 0.101 |

**Table 4.15** (Continued)

| Variable | Allergic to Alga (wakame) with other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Cocoa bean | 0.334 | <0.001* |
| Pine nut | 0.283 | <0.001* |
| Egg white | 0.015 | 0.818 |
| Cow's milk | 0.014 | 0.830 |
| Yeast (baker's) | 0.101 | 0.133 |
| Casein | 0.126 | 0.059 |
| Yeast (brewer's) | 0.341 | <0.001* |
| Bean (red kidney) | -0.107 | 0.109 |
| Goat milk | 0.047 | 0.487 |
| Cola nut | 0.288 | <0.001* |
| Sheep milk | -0.010 | 0.885 |
| Soya bean | 0.193 | 0.004* |
| Wheat | -0.085 | 0.206 |

**Note.** *Significant association at $P \leq 0.05$

The association between allergic to pea with peppercorns (b/w), corn (maize), agar agar, amaranth, gliadin, cocoa bean, pine nut, egg white, cow's milk, yeast (baker's), casein, yeast (brewer's), bean (red kidney), goat milk, cola nut, sheep milk, soya bean, wheat, alga (wakame) were r=0.248 (p<0.001), r=0.145 (p=0.030), r=0.197 (p=0.003), r=0.208 (p=0.002), r=0.294 (p<0.001), r=0.276 (p<0.001), r=0.251 (p<0.001), r=0.104 (p=0.120), r=0.182 (p=0.006), r=0.169 (p=0.012), r=0.338 (p<0.001), r=00.240 (p<0.001), r=0.052 (p=0.438), r=0.149 (p=0.026), r=0.231 (p<0.001), r=0.196 (p=0.003), r=0.376 (p<0.001), r=0.062 (p=0.354), r=0.219 (p=0.001), respectively shown in table 4.16

**Table 4.16** Association Between Allergic to Pea with Other Kinds of Food

| Variable | Allergic to Pea with other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Peppercorns (b/w) | 0.248 | <0.001* |
| Corn (maize) | 0.145 | 0.030* |
| Agar agar | 0.197 | 0.003* |
| Amaranth | 0.208 | 0.002* |
| Gliadin | 0.294 | <0.001* |
| Cocoa bean | 0.276 | <0.001* |
| Pine nut | 0.251 | <0.001* |
| Egg white | 0.104 | 0.120 |
| Cow's milk | 0.182 | 0.006* |

**Table 4.16** (Continued)

| Variable | Allergic to Pea with other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Yeast (baker's) | 0.169 | 0.012* |
| Casein | 0.338 | <0.001* |
| Yeast (brewer's) | 0.240 | <0.001* |
| Bean (red kidney) | 0.052 | 0.438 |
| Goat milk | 0.149 | 0.026* |
| Cola nut | 0.231 | <0.001* |
| Sheep milk | 0.196 | 0.003* |
| Soya bean | 0.376 | <0.001* |
| Wheat | 0.062 | 0.354 |
| Alga (wakame) | 0.219 | 0.001* |

**Note.** *Significant association at $P \leq 0.05$

The association between allergic to peppercorns (b/w) with corn (maize), agar agar, amaranth, gliadin, cocoa bean, pine nut, egg white, cow's milk, yeast (baker's), casein, yeast (brewer's), bean (red kidney), goat milk, cola nut, sheep milk, soya bean, wheat, alga (wakame), pea were r=-0.281 (p<0.001), r=0.170 (p=0.011), r=0.346 (p<0.001), r=0.301 (p<0.001), r=0.827 (p<0.001), r=0.862 (p<0.001), r=0.021 (p=0.751), r=0.170 (p=0.011), r=0.299 (p<0.001), r=0.159 (p=0.017), r=0.224 (p=0.001), r=-0.351 (p<0.001), r=0.161 (p=0.016), r=0.229 (p=0.001), r=-0.128 (p=0.057), r=-0.327 (p<0.001), r=-0.186 (p=0.005), r=0.302 (p<0.001), r=0.248 (p<0.001), respectively shown in table 4.16

**Table 4.16** Association Between Allergic to Peppercorns (B/W) with Other Kinds of Food

| Variable | Allergic to peppercorns (b/w) with other kinds of food | |
|---|---|---|
| | **(r)** | **(p)** |
| Corn (maize) | -0.281 | <0.001* |
| Agar agar | 0.170 | 0.011* |
| Amaranth | 0.346 | <0.001* |
| Gliadin | 0.301 | <0.001* |
| Cocoa bean | 0.827 | <0.001* |
| Pine nut | 0.862 | <0.001* |
| Egg white | 0.021 | 0.751 |
| Cow's milk | 0.170 | 0.011* |
| Yeast (baker's) | 0.299 | <0.001* |
| Casein | 0.159 | 0.017* |
| Yeast (brewer's) | 0.224 | 0.001* |
| Bean (red kidney) | -0.351 | <0.001* |

**Table 4.16** (Continued)

| Variable | Allergic to peppercorns (b/w) with other kinds of food | |
|---|---|---|
| | (r) | (p) |
| Goat milk | 0.161 | 0.016* |
| Cola nut | 0.229 | 0.001* |
| Sheep milk | -0.128 | 0.057 |
| Soya bean | 0.327 | <0.001* |
| Wheat | -0.186 | 0.005* |
| Alga (wakame) | 0.302 | <0.001* |
| Pea | 0.248 | <0.001* |

**Note.** *Significant association at $P \leq 0.05$

The association between allergic to corn (maize) with agar agar, amaranth, gliadin, cocoa bean, pine nut, egg white, cow's milk, yeast (baker's), casein, yeast (brewer's), bean (red kidney), goat milk, cola nut, sheep milk, soya bean, wheat, alga (wakame), pea, peppercorns (b/w) were r=0.113 (p=0.090), r=-0.098 (p=0.145), r=0.077 (p=0.254), r=-0.214 (p=0.001), r=-0.189 (p=0.005), r=0.274 (p<0.001), r=-0.017 (p=0.805), r=0.105 (p=0.119), r=-0.016 (p=0.813), r=0.199 (p=0.003), r=0.222 (p=0.001), r=-0.011 (p=0.873), r=0.155 (p=0.020), r=0.026 (p=0.702), r=0.048 (p=0.477), r=0.187 (p=0.005), r=0.033 (p=0.623), r=0.145 (p=0.030), r=-0.281 (p<0.001), respectively shown in table 4.17

**Table 4.17** Association Between Allergic to Corn (Maize) with Other Kinds of Food

| Variable | Allergic to Corn (maize) with other kinds of food | |
|---|---|---|
| | (r) | (*p*) |
| Agar Agar | 0.113 | 0.090 |
| Amaranth | -0.098 | 0.145 |
| Gliadin | 0.077 | 0.254 |
| Cocoa Bean | -0.214 | 0.001* |
| Pine Nut | -0.189 | 0.005* |
| Egg White | 0.274 | <0.001* |
| Cow's Milk | -0.017 | 0.805 |
| Yeast (baker's) | 0.105 | 0.119 |
| Casein | -0.016 | 0.813 |
| Yeast (brewer's) | 0.199 | 0.003* |
| Bean (red kidney) | 0.222 | 0.001* |
| Goat Milk | -0.011 | 0.873 |
| Cola Nut | 0.155 | 0.020* |

**Table 4.17** (Continued)

| Variable | Allergic to Corn (maize) with other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Sheep Milk | 0.026 | 0.702 |
| Soya Bean | 0.048 | 0.477 |
| Wheat | 0.187 | 0.005* |
| Alga (wakame) | 0.033 | 0.623 |
| Pea | 0.145 | 0.030* |
| Peppercorns (b/w) | -0.281 | <0.001* |

**Note.** *Significant association at $P \leq 0.055$

The association between allergic to agar agar with amaranth, gliadin, cocoa bean, pine nut, egg white, cow's milk, yeast (baker's), casein, yeast (brewer's), bean (red kidney), goat milk, cola nut, sheep milk, soya bean, wheat, alga (wakame), pea, peppercorns (b/w), corn (maize) were r=0.225 (p=0.001), r=0.089 (p=0.185), r=0.220 (p=0.001), r=0.168 (p=0.012), r=0.005 (p=0.937), r=0.084 (p=0.211), r=0.109 (p=0.105), r=0.017 (p=0.800), r=0.287 (p<0.001), r=0.080 (p=0.234), r=0.013 (p=0.844), r=0.259 (p<0.001), r=-0.032 (p=0.633), r=0.105 (p=0.117), r=0.011 (p=0.876), r=0.191 (p=0.004), r=0.197 (p=0.003), r=0.170 (p=0.011), r=0.113 (p=0.090), respectively shown in table 4.18

**Table 4.18** Association Between Allergic to Agar Agar with Other Kinds of Food

| Variable | Allergic to Agar Agar with other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Amaranth | 0.225 | 0.001* |
| Gliadin | 0.089 | 0.185 |
| Cocoa bean | 0.220 | 0.001* |
| Pine nut | 0.168 | 0.012* |
| Egg white | 0.005 | 0.937 |
| Cow's milk | 0.084 | 0.211 |
| Yeast (baker's) | 0.109 | 0.105 |
| Casein | 0.017 | 0.800 |
| Yeast (brewer's) | 0.287 | <0.001* |
| Bean (red kidney) | 0.080 | 0.234 |
| Goat milk | 0.013 | 0.844 |
| Cola nut | 0.259 | <0.001* |
| Sheep milk | -0.032 | 0.633 |
| Soya bean | 0.105 | 0.117 |
| Alga (wakame) | 0.191 | 0.004* |
| Pea | 0.197 | 0.003* |
| Wheat | 0.011 | 0.876 |

**Table 4.18** (Continued)

| Variable | Allergic to Agar Agar with other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Peppercorns (b/w) | 0.170 | 0.011* |
| Corn (maize) | 0.113 | 0.090 |

**Note.** *Significant association at $P \leq 0.05$

The association between allergic to amaranth with gliadin, cocoa bean, pine nut, egg white, cow's milk, yeast (baker's), casein, yeast (brewer's), bean (red kidney), goat milk, cola nut, sheep milk, soya bean, wheat, alga (wakame), pea, peppercorns (b/w), corn (maize), agar agar were r=0.165 (p=0.013), r=0.346 (p<0.001), r=0.346 (p<0.001), r=0.104 (p=0.121), r=0.095 (p=0.155), r=0.209 (p=0.002), r=0.131 (p=0.051), r=0.137 (p=0.041), r=-0.045 (p=0.506), r=0.170 (p=0.011), r=0.188 (p=0.005), r=0.041 (p=0.541), r=0.251 (p<0.001), r=0.022 (p=0.745), r=0.249 (p<0.001), r=0.208 (p=0.002), r=0.346 (p<0.001), r=-0.098 (p=0.145), r=0.225 (p=0.001), respectively shown in table 4.19

**Table 4.19** Association Between Allergic to Amaranth with Other Kinds of Food

| Variable | Allergic to Amaranth with the other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Gliadin | 0.165 | 0.013* |
| Cocoa bean | 0.346 | <0.001* |
| Pine nut | 0.346 | <0.001* |
| Egg white | 0.104 | 0.121 |
| Cow's milk | 0.095 | 0.155 |
| Yeast (baker's) | 0.209 | 0.002* |
| Casein | 0.131 | 0.051 |
| Yeast (brewer's) | 0.137 | 0.041* |
| Bean (red kidney) | -0.045 | 0.506 |
| Goat milk | 0.170 | 0.011* |
| Cola nut | 0.188 | 0.005* |
| Sheep milk | 0.041 | 0.541 |
| Soya bean | 0.251 | <0.001* |
| Wheat | 0.022 | 0.745 |
| Alga (wakame) | 0.249 | <0.001* |
| Pea | 0.208 | 0.002* |
| Peppercorns (b/w) | 0.346 | <0.001* |
| Corn (maize) | -0.098 | 0.145 |
| Agar agar | 0.225 | 0.001* |

**Note.** *Significant association at $P \leq 0.05$

The association between allergic to gliadin with cocoa bean, pine nut, egg white, cow's milk, yeast (baker's), casein, yeast (brewer's), bean (red kidney), goat milk, cola nut, sheep milk, soya bean, wheat, alga (wakame), pea, peppercorns (b/w), corn (maize), agar agar, amaranth were r=0.322 (p<0.001), r=0.352 (<0.001), r=0.352 (<0.001), r=0.243 (p<0.001), r=0.150 (p=0.024), r=0.339 (p<0.001), r=0.204 (p=0.002), r=0.103 (p=0.124), r=0.440 (p<0.001), r=0.248 (p<0.001), r=0.310 (p<0.001), r=0.333 (p<0.001), r=0.196 (p=0.003), r=0.110 (p=0.101), r=0.294 (p<0.001), r=0.301 (p<0.001), r=0.077 (p=0.254), r=0.089 (p=0.185), r=0.165 (p=0.013) respectively shown in table 4.20

**Table 4.20** Association Between Allergic to Gliadin with Other Kinds of Food

| Variable | Allergic to Gliadin with the other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Cocoa bean | 0.322 | <0.001* |
| Pine nut | 0.352 | <0.001* |
| Egg white | 0.285 | <0.001* |
| Cow's milk | 0.243 | <0.001* |
| Yeast (baker's) | 0.150 | 0.024* |
| Casein | 0.339 | <0.001* |
| Yeast (brewer's) | 0.204 | 0.002* |
| Bean (red kidney) | 0.103 | 0.124 |
| Goat milk | 0.440 | <0.001* |
| Cola nut | 0.248 | <0.001* |
| Sheep milk | 0.310 | <0.001* |
| Soya bean | 0.333 | <0.001* |
| Wheat | 0.196 | 0.003* |
| Alga (wakame) | 0.110 | 0.101 |
| Pea | 0.294 | <0.001* |
| Peppercorns (b/w) | 0.301 | <0.001* |
| Corn (maize) | 0.077 | 0.254 |
| Agar agar | 0.089 | 0.185 |
| Amaranth | 0.165 | 0.013* |

**Note.** *Significant association at $P \leq 0.05$

The association between allergic to cocoa bean with pine nut, egg white, cow's milk, yeast (baker's), casein, yeast (brewer's), bean (red kidney), goat milk, cola nut, sheep milk, soya bean, wheat, alga (wakame), pea, peppercorns (b/w), corn (maize), agar agar, amaranth, gliadin were r=0.822 (p<0.001), r=0.095 (p=0.158), r=0.188 (p=0.005), r=0.286 (p<0.001), r=0.219 (p=0.001), r=0.233 (p<0.001), r=-0.244 (p<0.001), r=0.238 (p<0.001), r=0.249 (p<0.001), r=-0.056 (p=0.408), r=0.383 (p<0.001), r=-0.137 (p=0.040), r=0.334 (p<0.001), r=0.276 (p<0.001), r=0.827 (p<0.001), r=-0.214 (p=0.001), r=0.220 (p=0.001), r=0.346 (p<0.001), r=0.322 (p<0.001), respectively shown in table 4.21

**Table 4.21** Association Between Allergic to Cocoa Bean with Other Kinds of Food

| Variable | Allergic to Cocoa Bean with other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Pine nut | 0.822 | <0.001* |
| Egg white | 0.095 | 0.158 |
| Cow's milk | 0.188 | 0.005* |
| Yeast (baker's) | 0.286 | <0.001* |
| Casein | 0.219 | 0.001* |
| Yeast (brewer's) | 0.233 | <0.001* |
| Bean (red kidney) | -0.244 | <0.001* |
| Goat milk | 0.238 | <0.001* |
| Cola nut | 0.249 | <0.001* |
| Sheep milk | -0.056 | 0.408 |
| Soya bean | 0.383 | <0.001* |
| Wheat | -0.137 | 0.040* |
| Alga (wakame) | 0.334 | <0.001* |
| Pea | 0.276 | <0.001* |
| Peppercorns (b/w) | 0.827 | <0.001* |
| Corn (maize) | -0.214 | 0.001* |
| Agar agar | 0.220 | 0.001* |
| Amaranth | 0.346 | <0.001* |
| Gliadin | 0.322 | <0.001* |

**Note.** *Significant association at $P \leq 0.05$

The association between allergic to pine nut with egg white, cow's milk, yeast (baker's), casein, yeast (brewer's), bean (red kidney), goat milk, cola nut, sheep milk, soya bean, wheat, alga (wakame), pea, peppercorns (b/w), corn (maize), agar agar, amaranth, gliadin, cocoa bean were r=0.095 (p=0.158), r=0.188 (p=0.005), r=0.260 (p<0.001), r=0.245 (p<0.001), r=0.207 (p=0.002), r=-0.270 (p<0.001), r=0.238 (p<0.001), r=0.191 (p=0.004), r=-0.030 (p=0.651), r=0.332 (p<0.001),r=-0.137 (p=0.040), r=0.283 (p<0.001), r=0.251 (p<0.001), r=0.862 (p<0.001), r=-0.189 (p=0.005), r=0.168 (p=0.012), r=0.346 (p<0.001), r=0.352 (p<0.001), r=0.822 (p<0.001), respectively shown in table 4.22

**Table 4.22** Association Between Allergic to Pine Nut with Other Kinds of Food

| Variable | Allergic to Pine Nut with other kinds of food | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Egg white | 0.095 | 0.158 |
| Cow's milk | 0.188 | 0.005* |
| Yeast (baker's) | 0.260 | <0.001* |
| Casein | 0.245 | <0.001* |
| Yeast (brewer's) | 0.207 | 0.002* |
| Bean (red kidney) | -0.270 | <0.001* |
| Goat milk | 0.238 | <0.001* |
| Cola nut | 0.191 | 0.004* |
| Sheep milk | -0.030 | 0.651 |
| Soya bean | 0.332 | <0.001* |
| Wheat | -0.137 | 0.040* |
| Alga (wakame) | 0.283 | <0.001* |
| Pea | 0.251 | <0.001* |
| Peppercorns (b/w) | 0.862 | <0.001* |
| Corn (maize) | -0.189 | 0.005* |
| Agar agar | 0.168 | 0.012* |
| Amaranth | 0.346 | <0.001* |
| Gliadin | 0.352 | <0.001* |
| Cocoa bean | 0.822 | <0.001* |

**Note.** *Significant association at $P \leq 0.05$

## 4.4 Correlation Between Common Allergic Foods and Symptoms

The allergic to egg white with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=-0.217 (p=0.001), r=-0.107 (p=0.109), r=-0.133 (p=0.046), r=-0.093 (p=0.166), r=-0.093 (p=0.166), r=0.165 (p=0.013), r=-0.207 (p=0.002), r=-0.100 (p=0.136), r=-0.250 (p<0.001), r=-0.055 (p=0.414), r=-0.164 (p=0.014) respectively shown in table 4.23

**Table 4.23** Correlation between Allergic to Egg White and Symptoms

| Variable | Correlation between allergic to Egg White and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Flatulence | -0.217 | 0.001* |
| Burp | -0.107 | 0.109 |
| Foul smell gas | -0.133 | 0.046* |
| Difficult to control weight | -0.093 | 0.166 |
| Easily swelling | -0.093 | 0.166 |
| Bloating after meal | 0.165 | 0.013* |
| Rash | -0.207 | 0.002* |
| Acne | -0.100 | 0.136 |
| Acne Vulgaris around mouth and chin | -0.250 | <0.001* |
| Dry skin | -0.055 | 0.414 |
| Constipation | -0.164 | 0.014* |

**Note.** *Significant association at $P \leq 0.05$

The allergic to cow's milk with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=-0.127 (p=0.058), r=-0.101 (p=0.130), r=-0.011 (p=0.870), r=-0.127 (p=0.058), r=-0.046 (p=0.498), r=-0.115 (p=0.086), r=-0.045 (p=0.500), r=-0.026 (p=0.700), r=-0.149 (p=0.026), r=0.056 (p=0.043), r=0.056 (p=0.043), respectively shown in table 4.24

**Table 4.24** Correlation Between Allergic to Cow's Milk and Symptoms

| Variable | Correlation between allergic to Cow's Milk and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Flatulence | -0.127 | 0.058 |
| Burp | -0.101 | 0.130 |
| Foul smell gas | -0.011 | 0.870 |
| Difficult to control weight | -0.127 | 0.058 |
| Easily swelling | -0.046 | 0.498 |
| Bloating after meal | -0.115 | 0.086 |
| Rash | -0.045 | 0.500 |
| Acne | -0.026 | 0.700 |
| Acne Vulgaris around mouth and chin | -0.149 | 0.026* |
| Dry skin | 0.056 | 0.403 |
| Constipation | 0.056 | 0.403 |

**Note.** *Significant association at $P \leq 0.05$

The allergic to yeast (baker's) with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=-0.111 (p=0.098), r=-0.069 (p=0.305), r=-0.064 (p=0.341), r=-0.001 (p=0.983), r=0.072 (p=0.286), r=0.006 (p=0.924), r=-0.067 (p=0.316), r=-0.161 (p=0.016), r=-0.111 (p=0.097), r=-0.077 (p=0.251), r=-0.020 (p=0.767), respectively shown in table 4.25

**Table 4.25** Correlation Between Allergic to Yeast (Baker's) and Symptoms

| Variable | Correlation between allergic to Yeast (baker's) and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Flatulence | -0.111 | 0.098 |
| Burp | -0.069 | 0.305 |
| Foul smell gas | -0.064 | 0.341 |
| Difficult to control weight | -0.001 | 0.983 |
| Easily swelling | 0.072 | 0.286 |
| Bloating after meal | 0.006 | 0.924 |
| Rash | -0.067 | 0.316 |
| Acne | -0.161 | 0.016* |
| Acne Vulgaris around mouth and chin | -0.111 | 0.097 |
| Dry skin | 0.077 | 0.251 |
| Constipation | -0.020 | 0.767 |

**Note.** *Significant association at $P \leq 0.05$

The allergic to casein with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=-0.139 (p=0.037), r=-0.104 (p=0.102), r=-0.007 (p=0.923), r=-0.067 (p=0.320), r=-0.030 (p=0.650), r=-0.103 (p=0.123), r=-0.084 (p=0.213), r=-0.034 (p=0.618), r=-0.104 (p=0.120), r=-0.079 (p=0.238), r=-0.017 (p=0.798), respectively shown in table 4.26

**Table 4.26** Correlation Between Allergic to Casein and Symptoms

| Variable | Correlation between allergic to Casein and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Flatulence | -0.139 | 0.037* |
| Burp | -0.104 | 0.102 |
| Foul smell gas | -0.007 | 0.923 |
| Difficult to control weight | -0.067 | 0.320 |
| Easily swelling | 0.030 | 0.650 |
| Bloating after meal | -0.103 | 0.123 |
| Rash | -0.084 | 0.213 |
| Acne | -0.034 | 0.618 |
| Acne Vulgaris around mouth and chin | -0.104 | 0.120 |
| Dry skin | 0.079 | 0.238 |
| Constipation | -0.017 | 0.798 |

**Note.** *Significant association at $P \leq 0.05$

The allergic to bean (red kidney) with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=-0.040 (p=0.555), r=-0.016 (p=0.811), r=-0.038 (p=0.577), r=-0.002 (p=0.980), r=0.036 (p=0.589), r=0.012 (p=0.859), r=-0.125 (p=0.062), r=-0.125 (p=0.062), r=-0.148 (p=0.027), r=-0.034 (p=0.610), r=-0.135 (p=0.043), respectively shown in table 4.27

**Table 4.27** Correlation Between Allergic of Bean (Red Kidney) and Symptoms

| Variable | Correlation between allergic to Bean (red kidney) and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Flatulence | -0.040 | 0.555 |
| Burp | -0.016 | 0.811 |
| Foul smell gas | -0.038 | 0.577 |
| Difficult to control weight | -0.002 | 0.980 |
| Easily swelling | 0.036 | 0.589 |
| Bloating after meal | 0.012 | 0.859 |
| Rash | -0.125 | 0.062 |
| Acne | -0.125 | 0.062 |
| Acne Vulgaris around mouth and chin | -0.148 | 0.027 |
| Dry skin | -0.034 | 0.610 |
| Constipation | -0.135 | 0.043* |

**Note.** *Significant association at $P \leq 0.05$

The allergic to cola nut with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=-0.245 (p<0.001), r=-0.192 (p=0.004), r=-0.184 (p=0.006), r=-0.205 (p=0.002), r=-0.205 (p=0.002), r=-0.285 (p<0.001), r=-0.162 (p=0.015), r=-0.088 (p=0.191), r=-0.192 (p=0.004), r=-0.057 (p=0.398), r=-0.057 (p=0.398), respectively shown in table 4.28

**Table 4.28** Correlation Between Allergic to Cola Nut and Symptoms

| Variable | Correlation between allergic to Cola Nut and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Flatulence | -0.245 | <0.001* |
| Burp | -0.192 | 0.004* |
| Foul smell gas | -0.184 | 0.006* |
| Difficult to control weight | -0.205 | 0.002* |
| Easily swelling | -0.205 | 0.002* |
| Bloating after meal | -0.285 | <0.001* |
| Rash | -0.162 | 0.015* |
| Acne | -0.088 | 0.191 |
| Acne Vulgaris around mouth and chin | -0.192 | 0.004* |
| Dry skin | 0.057 | 0.398 |
| Constipation | 0.057 | 0.398 |

**Note.** *Significant association at $P \leq 0.05$

The allergic to goat milk with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=-0.191 (p=0.004), r=-0.109 (p=0.106), r=-0.048 (p=0.476), r=-0.155 (p=0.021), r=-0.118 (p=0.078), r=0.133 (p=0.048), r=-0.138 (p=0.040), r=-0.167 (p=0.012), r=-0.193 (p=0.004), r=0.112 (p=0.094), r=0.112 (p=0.094) respectively shown in table 4.29

**Table 4.29** Correlation Between Allergic to Goat Milk and Symptoms

| Variable | Correlation between allergic to Goat Milk and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Flatulence | -0.191 | 0.004* |
| Burp | -0.109 | 0.106 |
| Foul smell gas | -0.048 | 0.476 |
| Difficult to control weight | -0.155 | 0.021* |
| Easily swelling | -0.118 | 0.078 |
| Bloating after meal | 0.133 | 0.048* |
| Rash | -0.138 | 0.040* |
| Acne | -0.167 | 0.012* |
| Acne Vulgaris around mouth and chin | -0.193 | 0.004* |
| Dry skin | 0.112 | 0.094 |
| Constipation | 0.112 | 0.094 |

**Note.** *Significant association at $P \leq 0.05$

The allergic to yeast (brewer's) with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=-0.129 (p=0.054), r=-0.137 (p=0.040), r=-0.156 (p=0.020), r=-0.093 (p=0.166), r=-0.021 (p=0.759), r=-0.094 (p=0.162), r=-0.042 (p=0.503), r=-0.108 (p=0.106), r=-0.221 (p=0.001), r=-0.082 (p=0.220), r=0.082 (p=0.220) respectively shown in table 4.30

**Table 4.30** Correlation Between Allergic to Yeast (Brewer's) and Symptoms

| **Variable** | **Correlation between allergic to Yeast (brewer's) and symptoms** | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Flatulence | -0.129 | 0.054 |
| Burp | -0.137 | 0.040* |
| Foul smell gas | -0.156 | 0.020* |
| Difficult to control weight | -0.093 | 0.166 |
| Easily swelling | -0.021 | 0.759 |
| Bloating after meal | -0.094 | 0.162 |
| Rash | -0.042 | 0.503 |
| Acne | -0.108 | 0.106 |
| Acne Vulgaris around mouth and chin | -0.221 | 0.001* |
| Dry skin | 0.082 | 0.220 |
| Constipation | 0.082 | 0.220 |

**Note.** *Significant association at $P \leq 0.05$

The allergic to wheat with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=0.059 (p=0.383), r=-0.077 (p=0.248), r=-0.160 (p=0.017), r=0.059 (p=0.383), r=-0.059 (p=0.383), r=0.106 (p=0.115), r=-0.049 (p=0.469), r=-0.076 (p=0.259), r=-0.161 (p=0.016), r=-0.011 (p=0.869), r=-0.107 (p=0.111), respectively shown in table 4.31

**Table 4.31** Correlation Between Allergic to Wheat and Symptoms

| Variable | Correlation between allergic to Wheat and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Flatulence | 0.059 | 0.383 |
| Burp | 0.077 | 0.248 |
| Foul smell gas | 0.160 | 0.017* |
| Difficult to control weight | 0.059 | 0.383 |
| Easily swelling | 0.059 | 0.383 |
| Bloating after meal | 0.106 | 0.115 |
| Rash | 0.049 | 0.469 |
| Acne | 0.076 | 0.259 |
| Acne Vulgaris around mouth and chin | 0.161 | 0.016* |
| Dry skin | -0.011 | 0.869 |
| Constipation | -0.107 | 0.111 |

**Note.** *Significant association at $P \leq 0.05$

The allergic to sheep milk with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=-0.049 (p=0.467), r=-0.058 (p=0.388), r=0.029 (p=0.667), r=-0.085 (p=0.208), r=-0.049 (p=0.467), r=-0.053 (p=0.431), r=-0.086 (p=0.199), r=-0.109 (p=0.103), r=-0.058 (p=0.388), r=0.002 (p=0.980), r=0.002 (p=0.980), respectively shown in table 4.32

**Table 4.32** Correlation Between Allergic to Sheep Milk and Symptoms

| Variable | Correlation between allergic to Sheep Milk and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Flatulence | -0.049 | 0.467 |
| Burp | -0.058 | 0.388 |
| Foul smell gas | 0.029 | 0.667 |
| Difficult to control weight | -0.085 | 0.208 |
| Easily swelling | -0.049 | 0.467 |
| Bloating after meal | -0.053 | 0.431 |
| Rash | -0.086 | 0.199 |
| Acne | -0.109 | 0.103 |
| Acne Vulgaris around mouth and chin | -0.058 | 0.388 |
| Dry skin | 0.002 | 0.980 |
| Constipation | 0.002 | 0.980 |

The allergic to corn (maize) with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=-0.001 (p=0.987), r=0.035 (p=0.603), r=-0.014 (p=0.830), r=0.035 (p=0.606), r=0.035 (p=0.606), r=0.035 (p=0.606), r=-0.069 (p=0.303), r=-0.065 (p=0.332), r=-0.172 (p=0.010), r=0.006 (p=0.930), r=-0.089 (p=0.184), respectively shown in table 4.33

**Table 4.33** Correlation Between Allergic to Corn and Symptoms

| Variable | Correlation between allergic to Corn (maize) and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Flatulence | -0.001 | 0.987 |
| Burp | 0.035 | 0.603 |
| Foul smell gas | -0.014 | 0.830 |
| Difficult to control weight | 0.035 | 0.606 |
| Easily swelling | 0.035 | 0.606 |
| Bloating after meal | 0.035 | 0.606 |

**Table 4.33** (Continued)

| Variable | Correlation between allergic to Corn (maize) and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Rash | -0.069 | 0.303 |
| Acne | -0.065 | 0.332 |
| Acne Vulgaris around mouth and chin | -0.172 | 0.010* |
| Dry skin | 0.006 | 0.930 |
| Constipation | -0.089 | 0.184 |

**Note.** *Significant association at $P \leq 0.05$

The allergic to soya bean with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=-0.099 (p=0.139), r=-0.004 (p=0.553), r=-0.111 (p=0.097), r=-0.027 (p=0.683), r=-0.027 (p=0.683), r=-0.110 (p=0.101), r=-0.109 (p=0.104), r=-0.053 (p=0.431), r=-0.123 (p=0.066), r=-0.009 (p=0.889), r=-0.086 (p=0.002), respectively shown in table 4.34

**Table 4.34** Correlation Between Allergic to Soya Bean and Symptoms

| Variable | Correlation between allergic to Soya Bean and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Flatulence | -0.099 | 0.139 |
| Burp | -0.004 | 0.553 |
| Foul smell gas | -0.111 | 0.097 |
| Difficult to control weight | -0.027 | 0.683 |
| Easily swelling | -0.027 | 0.683 |
| Bloating after meal | -0.110 | 0.101 |
| Rash | -0.109 | 0.104 |
| Acne | -0.053 | 0.431 |
| Acne Vulgaris around mouth and chin | -0.123 | 0.066 |
| Dry skin | 0.009 | 0.889 |
| Constipation | -0.086 | 0.002* |

**Note.** *Significant association at $P \leq 0.05$

The allergic to Pea with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=-0.052 (p=0.443), r=-0.072 (p=0.286), r=-0.104 (p=0.122), r=-0.052 (p=0.443), r=-0.052 (p=0.443), r=0.099 (p=0.139), r=-0.012 (p=0.864), r=0.050 (p=0.457), r=-0.113 (p=0.091), r=0.110 (p=0.102), r=0.014 (p=0.838), respectively shown in table 4.35

**Table 4.35** Correlation Between Allergic to Pea and Symptoms

| Variable | Correlation between allergic to Pea and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Flatulence | -0.052 | 0.443 |
| Burp | -0.072 | 0.286 |
| Foul smell gas | -0.104 | 0.122 |
| Difficult to control weight | -0.052 | 0.443 |
| Easily swelling | -0.052 | 0.443 |
| Bloating after meal | -0.099 | 0.139 |
| Rash | -0.012 | 0.864 |
| Acne | 0.050 | 0.457 |
| Acne Vulgaris around mouth and chin | -0.113 | 0.091 |
| Dry skin | 0.110 | 0.102 |
| Constipation | 0.014 | 0.838 |

The allergic to amaranth with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=-0.114 (p=0.088), r=-0.074 (p=0.272), r=-0.073 (p=0.276), r=-0.039 (p=0.565), r=-0.077 (p=0.254), r=-0.095 (p=0.156), r=-0.076 (p=0.255), r=-0.093 (p=0.166), r=-0.074 (p=0.272), r=0.134 (p=0.045), r=0.033 (p=0.621) respectively shown in table 4.36

**Table 4.36** Correlation Between Allergic to Amaranth and Symptoms

| Variable | Correlation between allergic to Amaranth and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Flatulence | -0.114 | 0.088 |
| Burp | -0.074 | 0.272 |
| Foul smell gas | -0.073 | 0.276 |
| Difficult to control weight | -0.039 | 0.565 |
| Easily swelling | -0.077 | 0.254 |

**Table 4.36** (Continued)

| Variable | Correlation between allergic to Amaranth and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Bloating after meal | -0.095 | 0.156 |
| Rash | -0.076 | 0.255 |
| Acne | -0.093 | 0.166 |
| Acne Vulgaris around mouth and chin | -0.074 | 0.272 |
| Dry skin | 0.134 | 0.045* |
| Constipation | 0.033 | 0.621 |

**Note.** *Significant association at $P \leq 0.05$

The allergic to agar agar with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=-0.062 (p=0.354), r=-0.093 (p=0.167), r=-0.035 (p=0.605), r=-0.025 (p=0.705), r=-0.025 (p=0.705), r=-0.076 (p=0.257), r=0.000 (p=0.999), r=-0.092 (p=0.168), r=-0.135 (p=0.043), r=0.121 (p=0.070), r=0.024 (p=0.726), respectively shown in table 4.37

**Table 4.37** Correlation Between Allergic to Agar Agar and Symptoms

| Variable | Correlation between allergic to Agar Agar and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Flatulence | -0.062 | 0.354 |
| Burp | -0.093 | 0.167 |
| Foul smell gas | -0.035 | 0.605 |
| Difficult to control weight | -0.025 | 0.705 |
| Easily swelling | -0.025 | 0.705 |
| Bloating after meal | -0.076 | 0.257 |
| Rash | 0.000 | 0.999 |
| Acne | -0.092 | 0.168 |
| Acne Vulgaris around mouth and chin | -0.135 | 0.043* |
| Dry skin | 0.121 | 0.070 |
| Constipation | 0.024 | 0.726 |

**Note.** *Significant association at $P \leq 0.05$

The allergic to alga (wakame) with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=0.030 (p=0.657), r=0.031 (p=0.646), r=-0.018 (p=0.793), r=0.101 (p=0.103), r=-0.030 (p=0.657), r=0.030 (p=0.653), r=0.057 (p=0.394), r=0.102 (p=0.127), r=-0.052 (p=0.404), r=0.099 (p=0.139), r=0.004 (p=0.095), respectively shown in table 4.38

**Table 4.38** Correlation Between Allergic to Alga (Wakame) and Symptoms

| Variable | Correlation between allergic to Alga (wakame) and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Flatulence | 0.030 | 0.657 |
| Burp | 0.031 | 0.646 |
| Foul smell gas | -0.018 | 0.793 |
| Difficult to control weight | 0.101 | 0.103 |
| Easily swelling | 0.030 | 0.657 |
| Bloating after meal | 0.030 | 0.653 |
| Rash | 0.057 | 0.394 |
| Acne | 0.102 | 0.127 |
| Acne Vulgaris around mouth and chin | -0.052 | 0.404 |
| Dry skin | 0.099 | 0.139 |
| Constipation | 0.004 | 0.905 |

The allergic to pine nut with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=-0.111 (p=0.096), r=-0.094 (p=0.159), r=-0.075 (p=0.266), r=-0.061 (p=0.364), r=-0.061 (p=0.364), r=-0.103 (p=0.124), r=-0.048 (p=0.477), r=-0.144 (p=0.031), r=-0.094 (p=0.159), r=0.094 (p=0.159), r=0.094 (p=0.159), respectively shown in table 4.39

**Table 4.39** Correlation Between Allergic to Pine Nut and Symptoms

| Variable | Correlation between allergic to Pine Nut and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Flatulence | -0.111 | 0.096 |
| Burp | -0.094 | 0.159 |
| Foul smell gas | -0.075 | 0.266 |
| Difficult to control weight | -0.061 | 0.364 |
| Easily swelling | -0.061 | 0.364 |
| Bloating after meal | -0.103 | 0.124 |
| Rash | -0.048 | 0.477 |

**Table 4.39** (Continued)

| Variable | Correlation between allergic to Pine Nut and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Acne | -0.144 | 0.031* |
| Acne Vulgaris around mouth and chin | -0.094 | 0.159 |
| Dry skin | 0.094 | 0.159 |
| Constipation | 0.094 | 0.159 |

**Note.** *Significant association at $P \leq 0.05$

The allergic to Peppercorns (b/w) with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=-0.115 (p=0.085), r=-0.098 (p=0.145), r=-0.077 (p=0.249), r=-0.066 (p=0.325), r=-0.066 (p=0.325), r=-0.107 (p=0.111), r=-0.093 (p=0.167), r=-0.109 (p=0.103), r=-0.041 (p=0.543), r=0.009 (p=0.180), r=0.009 (p=0.180) respectively shown in table 4.40

**Table 4.40** Correlation Between Allergic to Peppercorns (B/W) and Symptoms

| Variable | Correlation between allergic to Peppercorn (b/w) and symptoms | |
|---|---|---|
| | **(r)** | **(p)** |
| Flatulence | -0.115 | 0.085 |
| Burp | -0.098 | 0.145 |
| Foul smell gas | -0.077 | 0.249 |
| Difficult to control weight | -0.066 | 0.325 |
| Easily swelling | -0.066 | 0.325 |
| Bloating after meal | -0.107 | 0.111 |
| Rash | -0.093 | 0.167 |
| Acne | -0.109 | 0.103 |
| Acne Vulgaris around mouth and chin | -0.041 | 0.543 |
| Dry skin | 0.009 | 0.180 |
| Constipation | 0.009 | 0.180 |

The allergic to gliadin with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=-0.101 (p=0.133), r=-0.072 (p=0.282), r=-0.096 (p=0.151), r=-0.101 (p=0.133), r=-0.101 (p=0.133), r=-0.087 (p=0.193), r=-0.111 (p=0.098), r=-0.116 (p=0.082), r=-0.072 (p=0.282), r=0.063 (p=0.347), r=-0.063 (p=0.347), respectively shown in table 4.41

**Table 4.41** Correlation Between Allergic to Gliadin and Symptoms

| Variable | Correlation between allergic to Gliadin and symptoms | |
|---|---|---|
| | **(r)** | ***(p)*** |
| Flatulence | -0.101 | 0.133 |
| Burp | -0.072 | 0.282 |
| Foul smell gas | -0.096 | 0.151 |
| Difficult to control weight | -0.101 | 0.133 |
| Easily swelling | -0.101 | 0.133 |
| Bloating after meal | -0.087 | 0.193 |
| Rash | -0.111 | 0.098 |
| Acne | -0.116 | 0.082 |
| Acne Vulgaris around mouth and chin | -0.072 | 0.282 |
| Dry skin | 0.063 | 0.347 |
| Constipation | -0.051 | 0.449 |

The allergic to cocoa bean with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, acne, acne vulgaris around mouth and chin, dry skin, and constipation were r=-0.111 (p=0.096), r=-0.094 (p=0.159), r=-0.075 (p=0.266), r=-0.061 (p=0.364), r=-0.061 (p=0.364), r=-0.103 (p=0.124), r=-0.085 (p=0.204), r=-0.144 (p=0.031), r=-0.094 (p=0.159), r=0.094 (p=0.159), r=0.094 (p=0.449) respectively shown in table 4.42

**Table 4.42** Correlation Between Allergic to Cocoa Bean and Symptoms

| Variable | Correlation between allergic to Cocoa Bean and symptoms | |
|---|---|---|
| | **(r)** | ***(p)*** |
| Flatulence | -0.111 | 0.096 |
| Burp | -0.094 | 0.159 |
| Foul smell gas | -0.075 | 0.266 |
| Difficult to control weight | -0.061 | 0.364 |
| Easily swelling | -0.061 | 0.364 |
| Bloating after meal | -0.103 | 0.124 |

**Table 4.42** (Continued)

| Variable | Correlation between allergic to Cocoa Bean and symptoms | |
|---|---|---|
| | **(r)** | **(*p*)** |
| Rash | -0.085 | 0.204 |
| Acne | -0.144 | 0.031* |
| Acne Vulgaris around mouth and chin | -0.094 | 0.159 |
| Dry skin | 0.094 | 0.159 |
| Constipation | 0.094 | 0.449 |

**Note.** *Significant association at $P \leq 0.05$

# CHAPTER 5

# CONCLUSION AND DISCUSSION

## 5.1 Conclusions

There are 224 persons in this study, 43 persons are males (with percentage of 19.20), 181 are females (with percentage of 80.80), the average age is 34, most of the subjects living in Bangkok Metropolitan area, all of subjects are Thai nationality.

5.1.1 There were 3 methods to arrange the 20$^{th}$ first delay-onset food allergy. First was ranking from count the frequency of person who had allergic to specific kinds of food, it was not as reliable as the other ways. Second was ranking from summary the results of serum IgG antibody, it is reliable but only within each individual. Third was weighted ranking from results of serum IgG antibody, by finding the maximum range allergic foods items individual. The third method was chosen as it was more comparatively reliable, setting same range of ranking factor for each subject. The results were a little different kinds of allergic food for the first, and they were same results in second and in third method, at different order. The list of commonly found allergic foods were identified in table 4.2.3, they were egg white, cow's milk, yeast (baker's), casein, bean (red kidney), cola nut, goat milk, yeast (brewer's),wheat, sheep milk, corn (maize), soya bean, pea, amaranth, agar agar, alga (wakame), pine nut, peppercorns (b/w), gliadin, and cocoa bean.

5.1.2 Alan collected data from many medical literatures related to hidden food allergy and listed types of foods commonly associated with food allergy or food intolerance in chronic disease. It was found that the common item were the following; dairy product, wheat, eggs, corn, chocolate, tea, coffee, sugar, yeast, soy, citrus fruits, pork, rye, beef, tomato, barley, nuts, and seafood (Alan, 1998).

5.1.3 In this study, the author found associations between allergic to one kind of food with the other kinds of food, as described in Table4.3.1 to Table 4.3.20.Remarkable findings from this study were cross allergic among kinds of foods which can be classified into 3 groups as follow:

5.1.3.1 Cross allergic reaction among egg white, cow's milk, casein, goat milk, sheep milk, soya bean, and gliadin.

5.1.3.2 Cross allergic reaction among wheat, gliadin, casein, goat milk, and sheep milk.

5.1.3.3 Cross allergic reaction among yeast (baker's), yeast (brewer's), pea, peppercorn (b/w), amaranth, gliadin, cocoa bean, and pine nut.

5.1.4 In this study, the author found significantly positive association between allergic symptoms to kinds of food as described below:

5.1.4.1 Association between goat milk allergy with bloating after meal.

5.1.4.2 Association between wheat allergy with foul smell gas and acne vulgaris around mouth and chin.

5.1.4.3 Association between amaranth allergy with dry skin.

5.1.5 In this study, the author found significantly negative association between allergic symptoms to kinds of food as described below:

5.1.5.1 Association between egg white allergy with flatulence, foul smell gas, rash, acne vulgaris around mouth and chin, and constipation.

5.1.5.2 Association between cow's milk allergy with acne vulgaris around mouth and chin.

5.1.5.3 Association between yeast (baker's) allergy with acne.

5.1.5.4 Association between casein allergy with flatulence.

5.1.5.5 Association between bean (red kidney) allergy with acne vulgaris around mouth and chin.

5.1.5.6 Association between cola nut allergy with flatulence, burp, foul smell gas, difficult to control weight, easily swelling, bloating after meal, rash, and acne vulgaris around mouth and chin.

5.1.5.7 Association between goat milk allergy with flatulence, difficult to control weight, rash, acne, and acne vulgaris around mouth and chin.

5.1.5.8 Association between yeast (brewer's) allergy with burp, foul smell gas, and acne vulgaris around mouth and chin.

5.1.5.9 Association between corn (maize) allergy with acne vulgaris around mouth and chin.

5.1.5.10 Association between soya bean allergy with constipation.

5.1.5.11 Association between agar agar allergy with acne vulgaris around mouth and chin.

5.1.5.12 Association between pine nut allergy with acne.

5.1.5.13 Association between cocoa bean allergy with acne.

5.1.6 With limited data available, the results of correlation analysis between food allergies and allergic symptoms mainly showed negative associations without significances. Some had significantly positive associations but some had significantly negative associations. The causes of data limitation were :

5.1.6.1 Retrospective data comes with limited dimension.

5.1.6.2 Food intolerance knowledge is relatively new.

5.1.6.3 The patients may give inaccurate data about their symptoms.

5.1.6.4 There are not sufficient raw data to analyze the correlation with has significant.

5.1.6.5 There are not specific data toward the patient symptoms before getting IgG food allergy test.

5.1.6.6 There are not follow-up period program to patients after getting IgG food allergy test.

## 5.2 Discussion

Many studies suggested the identification and avoidance of allergenic foods can relieve a number of common and difficult-to-treat medical problems. This study found many correlations and identified ranks of common potential allergic food items among Thai subject that can lead to further studies and application in health promoting and medical practice.

5.2.1 Food intolerance had been associated with a myriad of chronic symptoms including headaches (Rees et al., 2005), intestinal and skin symptoms (Sampson & McCaskill, 1985), behavioral changes and respiratory disorders (Pelikan, 1988). Currently, the best accepted method for diagnosing and confirming food intolerance is empirical, by elimination diet and subsequent challenge (Radcliffe, 2002).

Food allergy is an important and triggering factor for a wide range of chronic physical and mental disorders. Routine use of elimination diets can greatly increase the response rate in many difficult-to-treat medical conditions (Alan, 1998).

5.2.2 There are many studies to identify a cause-effect relationship between ingestion of specific foods and development of certain chronic conditions.

5.2.2.1 Migraine

In a 1935 study, 66.3 percent of 127 migraine patients experienced partial or complete relief of symptoms after following an elimination diet (Sheldon & Randolph, 1935).

In a study of 55 migraine patients, avoidance of allergenic foods, combined with general supportive care, resulted in complete or near-complete freedom from symptoms in 29 patients (52.7%) and partial improvement in additional 21 (38.2%) (Balyeat & Brittain, 1930).

Heymann reported in 1952 that food reactions were the cause of migraine in 15 of 20 patients (Heymann, 1952).

Speer found that foods mainly were: milk, chocolate, cola, and corn were common triggers for migraine (Speer, 1971).

Diet restriction based on IgG antibodies might be an effective strategy in reducing the frequency of migraine attacks and could be implemented for therapy-resistant patient (Alpay et al., 2010).

5.2.2.2 Arthritis

Ratner et al, reported the case of 14-year-old female with a six-year history of juvenile rheumatoid arthritis who recovered after elimination of all cow's milk protein from her diet (Ratner, Eshel & Vodger, 1985).

Hicklin et al administered an elimination diet to 22 patients with rheumatoid arthritis. 20 of patients (91%) noted an improvement in their symptoms, and 19 found that certain foods repeatedly caused exacerbations (Hicklin, McEwen & Morgan, 1980).

Darlington treated 70 patients with rheumatoid arthritis by identifying and eliminating symptom-provoking foods. Of these 17 patients, 19 percent remained well and did not require any medications during follow-up periods ranging from 1.5-5 years (mean = 37 months). The foods that most commonly caused symptoms were: corn (56%), wheat (54%), bacon/pork (39%), milk, oat (37% each), rye (34%), egg, beef, coffee (32% each), malt (27%), cheese, grapefruit ( 24% each), tomato (22%), peanut, cane sugar (20% each), and butter, lamb, lemon, and soy (17% each) (Darlington, 1991).

5.2.2.3 Irritable Bowel Syndrome

Irritable bowel syndrome is the most common functional gastrointestinal disorder with a reported prevalence in the general population between 12%-22% (Everhart & Renault, 1991; Horwitz & Fisher, 2001; Maxwell, Mendall & Kumar, 1997; Mertz, 2003).IBS is a disorder that is poorly understood with high direct and indirect association medical costs (Levy et al., 2001; Talley, Gabriel, Harmsen, Zinsmeister & Evans, 1995). Successful therapeutic have been difficult to develop because of the lack of pharmacological targets and wide range of symptom-atology (Dunphy & Verne, 2001; Maxwell, et al.,1997; Villanueva, Dominguez-Munoz & Mearin, 2001). As a result, an attempt is made to suppress symptoms with anti-cholinergic, anti-spasmodic, anti-diarrheal, and serotonergic agents with variable success as symptoms are not completely eliminated.

A study of 21patients with irritable bowel syndrome limited their diet for one week. In 14 of 21 patients, symptoms disappeared on the elimination diet (Jones, McGlaughlan, Shorthouse, Workman & Hunter, 1982).

Some 189 patients with irritable bowel syndrome consumed an elimination diet for three weeks. Ninety-one patients (48.2%) improved. The elimination foods were: cereals, citrus fruits, potatoes, tea, coffee, alcohol, additives, and preservatives (Nanda, James, Smith, Dudley & Jewell, 1989).

5.2.2.4 Asthma

Hoj et al randomly assigned 41 patients with severe asthma to an antigen-free elemental diet or to a control diet for two weeks, in a double-blind trial. Improvement was observed in 1 of 16 patients in the control group, compared with 9 of 21 patients consuming the elemental diet (Hoj, Osterballe, Bundgaard, Weeke & Weiss, 1981)**.**

## 5.3 Recommendations for Further Study

5.3.1 Prospective research could be performed to further confirm the allergic outcome.

5.3.2 Patient should be given clear guides on reporting their symptoms, e.g. by using formatted questionnaires.

5.3.3 New study should be included follow-up after getting IgG allergy test.

5.3.4 Non-allergenic foods are interested in further study, in addition to study about allergenic foods.

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# CURRICULUM VITAE

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| | |
|---|---|
| **NAME** | Miss Natana Kimsavet |
| **DATE OF BIRTH** | 18 October 1972 |
| **ADDRESS** | 26/30 Ladphrao soi 71, Ladphrao province, Ladphrao, Bangkok 10230 |

**EDUCATIONAL BACKGROUND**

| | |
|---|---|
| 1991-1995 | Bachelor of Business Administrative<br>Assumption University, Thailand |

**WORK EXPERIENCE**

| | |
|---|---|
| 2003-Present | Owner<br>Natana Limited Partnership |