

UNIVERSITY OF TARTU

Sayan Kundu

Food Allergy Among University of Tartu (UT) Students

CERCS CODE - B470

Master's Thesis

Supervised by - Professor Alastair Forbes,
Dr. Aileen Tappel

Tartu, 2026

Title of the master's thesis in Estonian:

“TOIDUALLERGIA TARTU ÜLIKOOLI ÜLIÕPILASTE SEAS”

Ethical approval:

The study protocol and data collection procedures were reviewed and formally approved by the Research Ethics Committee of the University of Tartu (UT REC). All research activities were conducted in strict accordance with the ethical standards established by the committee to ensure participant anonymity and data protection. Ethical approval was granted under the document “Approval_1T-5” (reference number 1/T-5) during the committee meeting held on 19 January 2026. The ethical approval letter is included in Appendix A of this research paper.

Acknowledgement:

I would like to express my sincere gratitude to my supervisors, Professor Alastair Forbes and Dr. Aileen Tappel, for their guidance, support, and valuable feedback throughout this research. Their insights and encouragement played an important role in the successful completion of this study.

I am also thankful to Professor Margus Lember, Head of the Department of Internal Medicine, University of Tartu, for allowing me to undertake this research project.

I would also like to thank the University of Tartu and the Research Ethics Committee for granting approval and providing the necessary framework to conduct this research.

I would like to extend my appreciation to all the students who participated in this study. Their time, cooperation, and honest responses made this research possible.

Finally, I would like to thank my friends and classmates for their support and assistance during data collection, as well as for their encouragement throughout this research process.

I also acknowledge the use of digital tools including ChatGPT, Gemini, Grammarly, Microsoft Excel, Google Sheets, and GitHub during the preparation of this research. These tools were used to assist with text organization, language and grammar checking, literature searching, data organization, and data analysis. All interpretations, analyses, and conclusions presented in this thesis are the original work of the author.

Research Performers:

1. First and last name of the responsible researcher: Professor Alastair Forbes
Scientific degree: MD FRCP
Occupation: Visiting Professor
Workplace: Department of Internal Medicine, University of Tartu, Tartu, Estonia
Workplace address: Puusepa tn 8, 50406 Tartu
Phone number: +372 5883 0422
E-mail: alastair.forbes@ut.ee

2. Associates

First and last name: Sayan Kundu
Scientific degree: MD Medicine
Occupation: Master's student in Clinical Nutrition
Workplace: Department of Internal Medicine, University of Tartu
Workplace address: Puusepa tn 8, 50406 Tartu
Phone number: +372 5861 8374
E-mail: sayan@ut.ee

3. Associates

First and last name: Dr Aileen Tampil
Scientific degree: MD Medicine
Occupation: Head: Toitmisravi Keskus
Workplace: University of Tartu Hospital
Workplace address: Puusepa tn 8, 50406 Tartu
Phone number: +372 5861 8374
E-mail: Aileen.Tampil@kliinikum.ee

4. The head of the responsible investigator's institution or his deputy agrees to the organization of the research work:

First and last name: Professor Margus Lember

Scientific degree: PhD, MD Medicine

Occupation: Professor, Head of the department of internal medicine, University of Tartu

Workplace: University of Tartu, Tartu, Estonia

Workplace address: Puusepa tn 8, 50406 Tartu

Phone number: +372 5331 8600

E-mail: margus.lember@ut.ee

Non-exclusive licence to reproduce the thesis and make the thesis public

I, Sayan Kundu,

1. grant the University of Tartu a free permit (non-exclusive licence) to reproduce, for the purpose of preservation, including for adding to the digital archives of the University of Tartu, until the expiry of the term of copyright, my thesis “FOOD ALLERGY AMONG UNIVERSITY OF TARTU (UT) STUDENTS”, Supervised by Professor Alastair Forbes and Dr. Aileen Tampil;
2. grant the University of Tartu a permit to make the thesis specified in point 1 available to the public via the web environment of the University of Tartu, including via the digital archives, under the Creative Commons licence CC BY NC ND 4.0, which allows, by giving appropriate credit to the author, to reproduce, distribute the work and communicate it to the public, and prohibits the creation of derivative works and any commercial use of the work until the expiry of the term of copyright;
3. am aware of the fact that the author retains the rights specified in points 1 and 2;
4. confirm that granting the non-exclusive licence does not infringe other persons' intellectual property rights or rights arising from the personal data protection legislation.

Sayan Kundu

15/05/2026

Contents

1. Summary	9
1.1 Title of the Master's Thesis	9
1.2 Abstract	9
1.3 Abbreviations	10
2. Introduction	11
2.1 Definition, Mechanism, and Health Impact of Food Allergy ...	11
2.1.1 Definition	11
2.1.2 Mechanism	11
2.1.3 Clinical and Health Impact	12
2.2 Global and European Context	12
2.3 Problem Statement	13
2.4 Research Objectives	14
3. Scientific Background and Literature Review	15
3.1 Global Context and Research Perspective	15
3.2 Review of Key Research Works	15
3.3 Risk Factors in the University Environment	18
3.4 Food Allergy vs. Food Intolerance	18
3.5 The Estonian Context and Research Gap	19
4. Methodology	20
4.1 Study Design	20
4.2 Ethical Approval and Guidelines	20

4.3 Participants and Sampling	20
4.4 Survey Tool	21
4.4.1 Participant Information Sheet	21
4.4.2 Questionnaire	22
4.4.3 Differentiation between Food Allergy and Food Intolerance	24
4.5 Finance	24
4.6 Recruitment and Data Collection	24
4.7 Timeline of Research	27
5. Results	28
5.1 Response Rate and Data Cleaning	28
5.2 Data Analysis Approach	28
5.3 Demographic Profile of Participants	29
5.4 Prevalence of Food Allergy	31
5.5 Clinical Presentation and Symptoms	34
5.6 Management and Emergency Preparedness ..	35
5.7 Social and Lifestyle Impact	36
5.8 Associated Allergic Conditions	36
6. Discussion	38
6.1 Prevalence and the “Allergy Gap”	38
6.2 Patterns of Food Triggers	38
6.3 High-Risk Behaviours and Adrenaline Underuse ..	39
6.4 Social Impact and University Life	39

6.5 Strengths and Limitations	40
6.6 Recommendations for the University of Tartu ..	41
7. Conclusions	42
8. References	44
9. Use of Digital Tools	47
10. Appendices	48
A. Ethical Approval	48
B. Participant Information Sheet	49
C. Questionnaire	52–56

1. Summary

1.1 Title of the Master's Thesis: FOOD ALLERGY AMONG UNIVERSITY OF TARTU (UT) STUDENTS

1.2 Abstract

Background: Food allergy is a growing health issue worldwide, but we know very little about how common it is among students in Europe, especially in Estonia. The university years are a major turning point because students start living on their own and making their own food choices. Without parents around to help, students often take more risks, such as failing to check food labels carefully or trying new or unfamiliar foods. These habits make them more likely to have a dangerous reaction. That is why we need more research and awareness about food allergy at the University of Tartu.

Objective: This study aims to estimate how common food allergies are among bachelor's and master's students at the University of Tartu and to look at how they manage their condition and prepare for emergencies.

Methods: The study was conducted using a paper based questionnaire adapted from the validated research tool developed by Hassan et al. (2020). The questionnaire was modified to align with the Estonian context and the requirements of this research protocol. A total of 42 University of Tartu (UT) students (Bachelor's and Master's level), aged 18–30, were included in the final analysis after a screening process to ensure they met the study criteria.

Results: Out of the 42 students, 26.2% reported experiencing food-related symptoms, but only 7.1% had a formal diagnosis from a doctor. The most commonly reported allergens were tree nuts (7.1%), followed by milk/dairy, shellfish/seafood, and fruits/vegetables (each 4.8%), and peanuts, fish, wheat, and eggs (each 2.4%). Among those with a doctor's diagnosis, 33.3% had been prescribed an emergency adrenaline auto-injector; however, none (0%) reported carrying it consistently.

Conclusion: The findings show a significant gap between having a food allergy and being prepared for an emergency. This suggests a strong need for better food safety rules and more allergy awareness programmes at the university to protect students.

Keywords: Food allergy, allergic reactions, anaphylaxis, adrenaline auto-injector, risk behaviour, allergy awareness, allergen avoidance, dietary risk, student health

1.3 Abbreviations

FA – Food Allergy

UT – University of Tartu

AAI – Adrenaline auto-injector

IgE – Immunoglobulin E

ED – Emergency Department

2. Introduction

2.1 Definition, Mechanism, and Health Impact of Food Allergy

2.1.1 Definition

Food allergy (FA) is an adverse health condition caused by an abnormal immune response to specific food proteins that occurs consistently upon exposure (Sicherer & Sampson, 2018; Muraro et al., 2014). It can affect individuals of all ages, although prevalence patterns vary across regions, lifestyles, and genetic backgrounds (Nwaru et al., 2014; Warren et al., 2020). Common allergenic foods include milk, eggs, wheat, peanuts, tree nuts, fish, and shellfish, which are responsible for the majority of allergic reactions worldwide (Nwaru et al., 2014; EFSA, 2014).

Food allergy should be clearly distinguished from food intolerance, which does not involve the immune system and is generally less severe (Lomer et al., 2008). Due to similarities in symptoms, confusion between these conditions is common, especially among non-clinical populations, which may lead to misreporting and unnecessary dietary restrictions (Sicherer & Sampson, 2018; Nwaru et al., 2014).

2.1.2 Mechanism

Food allergy is most commonly mediated by immunoglobulin E (IgE), although non-IgE-mediated and mixed mechanisms also exist (Sicherer & Sampson, 2018; Muraro et al., 2014). In IgE-mediated reactions, the immune system incorrectly identifies a harmless food protein as a threat, triggering the release of inflammatory mediators such as histamine from mast cells and basophils (Boyce et al., 2010; Sicherer & Sampson, 2018). These immune responses typically occur rapidly after exposure, often within minutes, and can affect multiple organ systems, including the skin, gastrointestinal tract, and respiratory system (Muraro et al., 2014; Simons et al., 2011; Sicherer & Sampson, 2018). The severity of reactions may vary depending on factors

such as the amount of allergen consumed, individual sensitivity, and co-existing conditions such as asthma (Turner et al., 2017).

2.1.3 Clinical and Health Impact

The clinical presentation of food allergy ranges from mild to severe and can involve multiple organ systems. Symptoms commonly affect the skin (e.g., urticaria, swelling), gastrointestinal system (e.g., nausea, vomiting), and respiratory system (e.g., wheezing, difficulty breathing) (Muraro et al., 2014; Boyce et al., 2010). In severe cases, food allergy may lead to anaphylaxis, a rapid and potentially life-threatening systemic reaction that requires immediate treatment with adrenaline (Turner et al., 2017; Simons et al., 2011).

In addition to physical symptoms, food allergy has a significant impact on overall health and quality of life. Individuals are required to strictly avoid allergenic foods, which can influence dietary habits, social interactions, and psychological well-being (Sicherer & Sampson, 2018; Cummings et al., 2010). The constant risk of accidental exposure may lead to anxiety, reduced participation in social activities, and increased dependence on precautionary behaviours (Gallagher et al., 2011). In rare cases, delayed treatment can result in fatal outcomes, emphasizing the importance of early recognition and proper management (Muraro et al., 2014; Turner et al., 2017; Simons et al., 2011).

2.2 Global and European Context

Food allergy (FA) is becoming an increasingly important public health concern worldwide (Nwaru et al., 2014; Warren et al., 2020). Studies estimate that approximately 10% of adults in Western countries report at least one food allergy, although prevalence varies significantly depending on diagnostic criteria and geographic location (Warren et al., 2020; Gupta et al., 2019). While a large proportion of research has focused on children, there is growing recognition that food allergy persists into adulthood and may develop later in life (Nwaru et al., 2014; Sicherer & Sampson, 2018).

In Europe, common food allergens include milk, eggs, wheat, peanuts, and tree nuts (Nwaru et al., 2014; EFSA, 2014). However, there is limited epidemiological data available from Estonia and other Eastern European countries, highlighting a significant regional research gap (Nwaru et al., 2014). Differences in dietary habits, environmental exposure, and healthcare access may influence the prevalence and patterns of food allergy across regions (Muraro et al., 2014; Nwaru et al., 2014).

University students represent a potentially higher-risk group because they begin living independently and must manage their own diets and health conditions (Hassan et al., 2020; Feng et al., 2022). This includes reading food labels, selecting safe foods, and carrying emergency medication such as adrenaline auto-injectors (Turner et al., 2017). At the same time, students may engage in risk-taking behaviours, such as not carrying emergency medication or not disclosing their allergies in social settings, which increases the risk of adverse outcomes (Hassan et al., 2020; Cummings et al., 2010).

Studies from different countries have highlighted the potential dangers associated with food allergy in this population (Turner et al., 2017; Muraro et al., 2014). Many students report experiencing allergic reactions, yet only a small proportion consistently carry emergency medication (Hassan et al., 2020; Sicherer & Sampson, 2018). Additionally, a significant proportion of fatal food allergy reactions occur in young adults aged 18–25, often in social or educational environments (Turner et al., 2017). These findings underline the need for improved awareness, education, and institutional support within universities.

2.3 Problem Statement

Entering higher education is an important stage of life in which students become more independent and begin making their own decisions about daily activities, including health-related behaviours, which may increase their risk of health problems (Arnett, 2000; Nelson et al., 2008). Most students, both Estonian and international, live away from their parents in dormitories or shared apartments, which makes managing food allergies more challenging. They must take responsibility for their own food choices,

including cooking, eating in cafeterias, and checking food ingredients (Hassan et al., 2020; Sicherer & Sampson, 2018).

Without regular parental support, it can be more difficult to avoid allergens and maintain safe eating habits (Begen et al., 2016). In addition, social pressure to fit in may lead some students to hide their allergies or take risks with unfamiliar foods, which may increase the risk of serious allergic reactions (Cummings et al., 2010; Gallagher et al., 2011). Limited awareness among peers, along with a lack of structured support systems, may further contribute to unsafe environments for students with food allergies.

At present, there is no available data on food allergies among university students in Estonia. More broadly, research in Europe remains limited and inconsistent, particularly in Eastern European populations (Nwaru et al., 2014). This lack of evidence makes it difficult for universities to design effective prevention strategies and safety measures (Muraro et al., 2014; Nwaru et al., 2014). Therefore, there is a clear need for context specific research to better understand the prevalence and management of food allergies within this population.

2.4 Research Objectives

The main objective of this study is to assess the impact of food allergies among students at the University of Tartu. Specifically:

- To determine the prevalence of self reported and doctor confirmed food allergies.
- To identify common food allergens and clinical symptoms among students.
- To assess emergency practices, including the use and carriage of adrenaline auto-injector (AAI).
- To evaluate the impact of food allergies on students' social lives and daily activities.

3. Scientific Background and Literature Review

3.1 Global Context and Research Perspective

Food allergy (FA) is increasingly recognized as a significant public health concern worldwide (Nwaru et al., 2014; Warren et al., 2020). Epidemiological studies suggest that approximately 10% of the population in Western countries is affected, although prevalence varies by region and methodology (Warren et al., 2020; Gupta et al., 2019).

Although much of the existing research has focused on pediatric populations, growing attention is being given to young adults, particularly university students, who represent a unique and understudied group. This stage of life is characterized by increased independence and responsibility for health-related behaviours, including dietary management (Arnett, 2000; Nelson et al., 2008).

In Europe, food allergy patterns vary depending on geographical, cultural, and dietary factors. However, available data remain limited and inconsistent, particularly in Eastern European regions (Nwaru et al., 2014), highlighting the need for more targeted research in specific populations such as university students.

3.2 Review of Key Research Works

Several international studies have examined how university students manage food allergies (Hassan et al., 2020; Feng et al., 2022). Five key studies provide the foundation for the current research at the University of Tartu:

I. University Students in Saudi Arabia (Hassan et al., 2020)

In 2020, a study titled *“Food allergy among university students: uncharted territory”* was published in the journal *Allergy, Asthma & Clinical Immunology*. Conducted among students at Imam Abdulrahman Bin Faisal University in Saudi Arabia, this large cross-sectional online survey included 5,497 participants. The study found that 9.6%

reported a clinician-diagnosed food allergy (FA), yet only 24.5% had ever been prescribed an epinephrine/adrenaline self-injector, and fewer than 5% carried it consistently (Hassan et al., 2020). Moreover, only 30% of students reported strict allergen avoidance, while nearly 70% had co-existing allergic conditions. The authors concluded that although food allergy is relatively common among university students, preparedness remains inadequate and risk-related behaviours are widespread.

II. Severe and Fatal Food Allergy in Young People (Turner et al., 2017)

In 2017, a study titled *“Can we identify patients at risk of life-threatening allergic reactions to food?”* examined severe and fatal food allergy reactions, focusing on risk factors associated with life-threatening outcomes, particularly among young individuals. The research highlighted that adolescents and young adults (aged 15–25 years) represent a high risk group for fatal anaphylaxis. The study found that many severe reactions occurred outside the home, often in social settings such as schools, universities, or restaurants, where individuals may be exposed to unfamiliar foods. A key finding was that delayed or absent use of epinephrine significantly increased the risk of fatal outcomes. Additionally, many individuals did not consistently carry their prescribed epinephrine auto-injectors or failed to recognize the severity of symptoms in time. The authors concluded that inadequate preparedness, risk-taking behaviours, and lack of timely intervention are major contributors to severe allergic reactions in this age group (Turner et al., 2017).

III. Food Allergy: Epidemiology, Pathogenesis, and Management (Sicherer & Sampson, 2018)

In 2018, a comprehensive review titled *“Food allergy: A review and update on epidemiology, pathogenesis, diagnosis, prevention, and management”* was published in the *Journal of Allergy and Clinical Immunology*. This study provided an updated overview of the global burden and mechanisms of food allergy. The authors reported that food allergy affects up to approximately 10% of the population, with increasing prevalence observed in recent decades, particularly in developed countries .

The review highlighted that food allergy results from a breakdown in immune tolerance, involving complex interactions between genetic, environmental, and immunological factors. Diagnosis is primarily based on clinical history supported by tests such as skin prick testing, serum IgE measurement, and oral food challenges, although newer diagnostic approaches are improving accuracy (Sicherer & Sampson, 2018).

In terms of management, strict avoidance of allergenic foods remains the primary strategy, along with prompt treatment of allergic reactions using medications such as epinephrine. The authors emphasized that effective management requires awareness, proper diagnosis, and coordinated support from healthcare systems and public health policies. Overall, the study concluded that food allergy represents a growing public health concern, requiring improved diagnostic tools, prevention strategies, and patient education (Sicherer & Sampson, 2018).

IV. University Students in China (Feng et al., 2022)

In 2022, the study *“Epidemiological survey of self-reported food allergy among university students in China”* was published in the journal *Medicine (Baltimore)*. This cross-sectional survey included 2,538 undergraduate students aged 18–25 years from six Chinese universities, with 2,313 valid responses collected (91.1% response rate). The prevalence of self-reported food allergy was 15.7%, while only 8.4% reported a doctor-diagnosed FA (Feng et al., 2022). The most frequently reported allergens were shrimp (5.8%), followed by shellfish, milk, egg, peach, mango, beef, and peanut. Common symptoms included skin, respiratory, gastrointestinal, and circulatory manifestations. Importantly, over 45% of students demonstrated limited knowledge about food allergies, highlighting the need for targeted health education programmes (Feng et al., 2022).

V. Systematic Review of Food Allergy in Europe (Nwaru et al., 2014)

In 2014, a systematic review and meta-analysis titled *“Prevalence of common food allergies in Europe”* (*Allergy*) analyzed 42 studies published between 2000 and 2012, covering common allergens such as milk, egg, wheat, soy, peanut, tree nuts, fish, and

shellfish (Nwaru et al., 2014). The prevalence of self-reported food allergy ranged from 0.4% (soy) to 6% (milk), while clinically confirmed allergies were substantially lower (0.1–0.6%). Milk and egg allergies were more common in children, whereas peanut, tree nuts, and shellfish allergies were more frequent in older age groups. The authors emphasized that self-reported reactions are more common than clinically confirmed allergies, highlighting the need for standardized diagnostic approaches across Europe (Nwaru et al., 2014).

3.3 Risk Factors in the University Environment

The university environment presents unique challenges for students with food allergies (Begen et al., 2016; Turner et al., 2017). Shared kitchens, cafeterias, and social gatherings increase the risk of cross-contamination, where allergenic foods may accidentally come into contact with non-allergenic foods or shared cooking surfaces (Muraro et al., 2014). In addition, social pressures may encourage students to conceal their allergies or take risks with unfamiliar foods in order to fit in with peers (Cummings et al., 2010; Gallagher et al., 2011). This combination of independent living and social factors places university students at increased risk of allergic reactions, including potentially severe outcomes (Hassan et al., 2020).

3.4 Food Allergy vs. Food Intolerance

It is important to distinguish between food allergy and food intolerance (Sicherer & Sampson, 2018). A food allergy involves an immune response and can be life-threatening, even with minimal exposure (Muraro et al., 2014). In contrast, food intolerance is typically a non-immune, dose-dependent reaction that results in milder symptoms, such as bloating or gastrointestinal discomfort (Lomer et al., 2008). This study focuses specifically on food allergy due to its greater clinical significance and potential for severe outcomes (Sicherer & Sampson, 2018).

3.5 The Estonian Context and Research Gap

Despite the global growth of food allergy research, there is a lack of data specific to Estonia (Nwaru et al., 2014). The University of Tartu has a diverse student population, including both local and international students, yet there is currently no available evidence on the prevalence of food allergies or how students manage their condition in this setting. This study aims to address this gap by providing the first structured assessment of food allergy prevalence and management behaviours among students in the Estonian context.

4. Methodology

4.1 Study Design

This study uses a cross-sectional survey design to evaluate the prevalence and characteristics of food allergies among the student population at the University of Tartu. A quantitative research approach was applied to assess the current status of allergy prevalence, clinical symptoms, and management behaviours at a single point in time. As a pilot study, this research provides initial data and serves as a basis for future epidemiological studies in Estonia.

4.2 Ethical Approval and Guidelines

The study protocol and data collection procedures were reviewed and formally approved by the Research Ethics Committee of the University of Tartu (UT REC). All research activities were conducted in strict accordance with the ethical standards established by the committee to ensure participant anonymity and data protection. Ethical approval was granted under the document “Approval_1T-5” (reference number 1T-5) during the committee meeting held on 19 January 2026.

In addition, the study followed the ethical principles outlined in the Declaration of Helsinki, developed by the World Medical Association (World Medical Association, 2013). These principles include requirements for informed consent, voluntary participation, confidentiality, data protection, and the ethical responsibility of researchers when conducting studies involving human participants.

4.3 Participants and Sampling

The study targeted Bachelor’s and Master’s students at the University of Tartu from various faculties to ensure a diverse sample.

Inclusion Criteria:

- Current Bachelor’s or Master’s students at the University of Tartu
- Aged 18–30 years

- Good proficiency in English

Exclusion Criteria:

- Students younger than 18 or older than 30
- PhD students (to focus on undergraduate and master's students)
- Incomplete or inconsistent questionnaires
- Insufficient English proficiency

To ensure anonymity, no personal identifiers such as names or student ID numbers were collected. Age was recorded in predefined ranges (18-21, 22-25, 26-30), and academic background was recorded only at the faculty level (e.g., Law, Medicine, Technology, Social Sciences), without collecting information on specific study programmes or courses.

4.4 Survey Tool

An online questionnaire was initially considered for this study. However, after discussing with potential participants, mainly classmates and friends, it was not used. Many students were not comfortable sharing personal email addresses or using identity-based logins due to concerns about spam and scams. As a result, the online method was not considered suitable for this research.

A paper-based participant information sheet and questionnaire were therefore used. This method was considered more private and trustworthy by participants. Students were advised to return the completed questionnaire in a sealed envelope to maintain anonymity. This approach helped participants feel more comfortable providing honest responses, especially when answering questions related to medical conditions and high-risk behaviours.

4.4.1 Participant Information Sheet

A paper-based participant information sheet was provided to all potential participants at the time of recruitment. This document included key details about the study, such as the

title of the research, study location, timeline, and information about the supervisors along with their contact details. It also clearly explained the purpose of the study, the reason for inviting participants, and emphasized that participation was entirely voluntary. In addition, the document specified who was eligible to participate by outlining the inclusion and exclusion criteria. Participants were informed that taking part in the study involved completing a questionnaire, and they could skip any questions or choose not to submit the questionnaire if they changed their mind before submission.

The information sheet further outlined potential risks and benefits, data protection measures, and how the collected data would be analyzed and used. To ensure clarity, the difference between food allergy and food intolerance was clearly explained, as these concepts can be difficult to distinguish, especially because students from different nationalities, religions, and ethnic groups participated in the study. Finally, it was stated that completion and submission of the questionnaire would be considered as informed consent, and that once submitted, the questionnaire could not be withdrawn due to the anonymous nature of the study. This document is included in Appendix B of this research summary.

4.4.2 Questionnaire

The questionnaire used in this study was adapted from a validated research tool developed by Hassan et al. (2020). As the questionnaire was in English, participants were required to have good proficiency in the language. Since it was not possible to formally check language proficiency, participants were approached in English and clearly informed that they should only take part if they were comfortable understanding and answering in English. The questionnaire was open access, with no restrictions on its use, and was slightly modified to fit the Estonian context while maintaining the original clinical definitions. We added commonly reported food allergens and allergic reactions as selectable response options to make the questionnaire easier for participants to complete. To help maintain anonymity, we collected information on faculty or study departments rather than specific study programmes, and age was recorded in predefined ranges instead of exact values.

Participants were given the questionnaire along with the participant information sheet in a white envelope by the researchers. They were provided with clear instructions on how to complete and return the questionnaire. It was stated that completing and submitting the questionnaire would be considered as informed consent. Participants were advised to return the completed questionnaire in the same envelope provided or in their own envelope, without including any personal identifiers or markings, to ensure anonymity. They were also reminded that participation was entirely voluntary and that they could stop completing the questionnaire at any point if they wished. Participants were informed that once the questionnaire was submitted, it could not be withdrawn, as it would not be possible to identify individual responses due to the anonymous nature of the study. It was also explained that the collected data would be used only for the purpose of this research, and that all completed questionnaires would be securely destroyed after the completion of the study. During the research process, access to the data was restricted solely to the research team and was not shared with any other individuals. In addition, participants were informed that incomplete questionnaires would not be included in the analysis and would be securely destroyed. We decided to exclude questionnaires with substantial missing responses to ensure the accuracy, reliability, and consistency of the collected data.

The questionnaire consisted of 26 questions, most of which were multiple-choice, allowing for single or multiple responses depending on the question. Demographic information included age (reported in ranges: 18–21, 22–25, 26–30), gender, and faculty of study, without collecting specific programme details to maintain anonymity. The questionnaire also included items related to food allergy symptoms, doctor diagnosis, types of allergens, management practices, history of hospital visits, and the impact of food allergy on social life. Participants were clearly instructed not to include any personal identifying information when returning the questionnaire. This document is included in Appendix C of this research summary.

4.4.3 Differentiation between Food Allergy and Food Intolerance

The difference between food allergy and food intolerance was clearly explained in both the participant information sheet and the questionnaire to help students distinguish between the two conditions:

- **Food allergy:** A rapid immune reaction (e.g., rash, breathing difficulties) that can be triggered by even small amounts of food.
- **Food intolerance:** A non-immune digestive reaction (e.g., bloating) that is usually milder.

Participants were asked to complete the questionnaire based on these definitions to improve clarity and reduce misunderstanding between the two conditions, particularly as students from different nationalities, religions, and ethnic backgrounds were included in the study.

4.5 Finance

There was no external funding or sponsorship for this research project. The only costs incurred were related to printing the questionnaire and participant information sheets, as well as purchasing envelopes and a secure lock box for data storage. All expenses were covered by the researchers.

4.6 Recruitment and Data Collection

Participants were recruited using a convenience sampling approach in public university spaces, including libraries, classes, campus areas, and dormitory common areas, as well as through friends and classmates. Students were approached in a polite manner, and participation was entirely voluntary.

The Procedure:

4.6.1 Introduction to Project:

Students were briefly informed about the research project and provided with a participant information sheet explaining the purpose of the study, data use, and confidentiality. Inclusion and exclusion criteria were also briefly explained before participation. It was emphasized that participation was voluntary, and students could stop completing the questionnaire at any point without giving a reason. They were also informed that once the questionnaire was submitted, it could not be withdrawn, as responses were fully anonymous and could not be linked to any individual. Completion of the questionnaire was considered as informed consent for participation and for the use of the provided data for research purposes.

4.6.2 Data Protection:

Participants were informed that the collected data would be used exclusively for this research project. During the study, access to the data was restricted only to the research team and was not shared outside of it. All completed questionnaires were stored securely during the research process and will be destroyed securely after completion of the study. Incomplete questionnaires were not included in the analysis.

4.6.3 Distribution:

A total of 138 questionnaires were distributed in university premises, dormitory ground floors, libraries, and through friends and classmates. Students who agreed to participate received a participant information sheet and a paper questionnaire, both placed inside a white envelope. Participants were also informed in advance about the return procedure.

4.6.4 Return Instructions:

Participants were clearly informed about how to return the questionnaire. The participant information sheet did not need to be returned. Questionnaires had to be returned in a sealed envelope, either using the original envelope provided or a personal one, without any identifying information to ensure anonymity. Two return options were provided:

- Return in a group at a pre-arranged time and location where a researcher collected the questionnaires.
- Anonymous mailbox drop at Turu 9-32, Tartu (51004), which belongs to one of the researchers. This method was used following the advice of the University of Tartu Research Ethics Committee to ensure anonymity and reduce participant pressure, and to prevent identification of non-respondents.

4.6.5 Completion:

Participants completed the survey independently in a private location of their choice (e.g., library corner, dormitory, or personal room), without the presence or influence of others. This was done to ensure privacy and reduce bias. Participants were instructed not to include any identifying information on the questionnaire or envelope.

4.6.6 Collection:

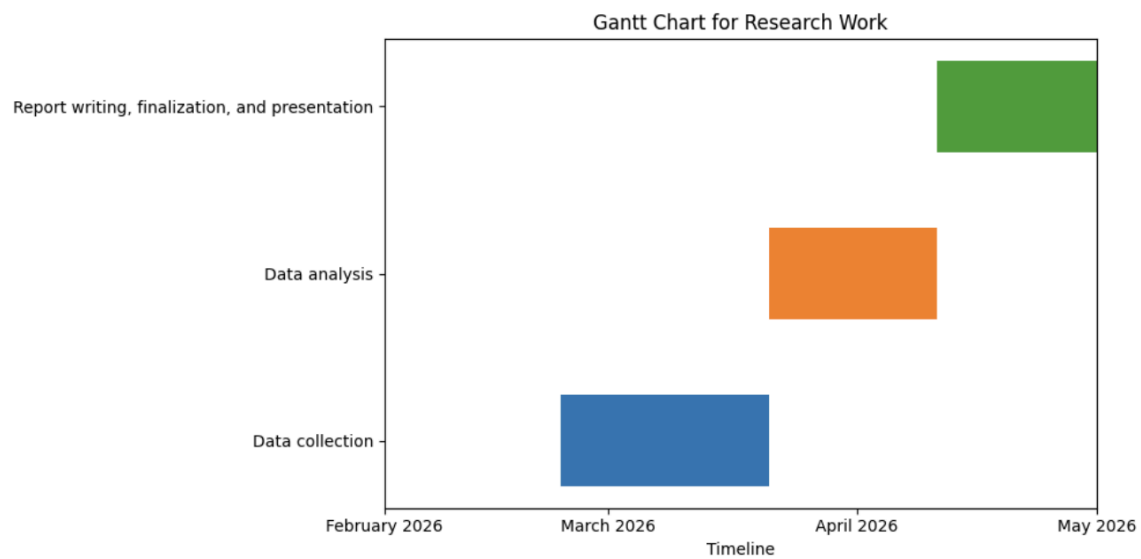
A total of 66 questionnaires were returned out of 138 distributed. Of these, 9 were collected from the mailbox and 57 were received directly from students. All completed questionnaires were returned in sealed envelopes. After collection, the envelopes were stored in a secure locked container accessible only to the researchers.

4.6.7 Anonymity:

No personal identifiers were collected at any stage of the study, ensuring that responses could not be traced back to individual participants. The research team had no means of identifying either participants or non-respondents.

4.7 Timeline of Research

- Data Collection: 23.02.2026 – 20.03.2026
- Data Analysis: 21.03.2026 – 10.04.2026
- Report Writing, Finalization, and Presentation: 11.04.2026 – 30.04.2026



5. Results

The following results are based on the participant responses to the "Food Allergy among University of Tartu (UT) students" questionnaire. Specific questions from the survey are referenced throughout this section (e.g., Q1, Q2) to indicate the data source.

5.1 Response Rate and Data Cleaning

A total of 138 questionnaires were distributed among students at the University of Tartu. Of these, 66 were returned, resulting in an initial response rate of 47.8%. All returned questionnaires were collected in sealed envelopes and stored securely in a locked container to ensure data protection.

Data entry was performed manually by transferring responses into a password-protected spreadsheet accessible only to the research team. Following the study protocol, a data screening and cleaning process was conducted. A total of 24 questionnaires were excluded: 17 were discarded as incomplete and securely destroyed by shredding, 4 were excluded for participants outside the defined age range of 18–30 years (Q2), and 3 were excluded as they were completed by PhD students outside the Bachelor's/Master's target group (Q1). Consequently, a final sample of 42 valid questionnaires ($n = 42$) was included in the analysis.

5.2 Data Analysis Approach

The collected data were analyzed using descriptive statistics, primarily focusing on frequencies and percentages. As this is a pilot study with a final sample size of $n = 42$, the analysis aims to identify preliminary trends and patterns rather than establish complex statistical correlations or associations.

The results are systematically organized into categories and presented in tables, including:

- Demographic Distribution: Analysis of age ranges, gender, and faculty affiliation.
- Prevalence Rates: Comparison between self-reported food-related symptoms and medically confirmed (doctor-diagnosed) food allergies.

- Clinical Presentation: Identification of the most frequently reported food allergens and the range of physical symptoms.
- Emergency Management: Evaluation of healthcare preparedness, particularly the prescription and consistent carriage of adrenaline auto-injector among diagnosed students.

5.3 Demographic Profile of Participants (Q1–Q4)

The socio-demographic characteristics of the study population ($n = 42$) are detailed in Table 1. The sample shows a higher concentration of female participants and a strong representation from the Faculty of Medicine.

(Please continue to the next page.)

Table 1. Socio-demographic Characteristics ($n = 42$)

Variable (Question No.)	Category	Frequency (n)	Percentage (%)
Gender (Q3)	Male	16	38.1%
	Female	26	61.9%
Age Group (Q2)	18–21	15	35.7%
	22–25	19	45.2%
	26–30	8	19.1%
Faculty (Q4)	Medicine	16	38.1%
	Social Sciences	9	21.4%
	Technology	8	19.1%
	Arts & Humanities	5	11.9%
	Law	4	9.5%

5.4 Prevalence of Food Allergy (Q9–Q12)

The study assessed the difference between self-reported symptoms and doctor-diagnosed food allergies.

- Self-reported food allergy/symptoms (Q9): 11 students (26.2%)
- Medical consultation for symptoms (Q10): 5 students (11.9%)
- Doctor-diagnosed food allergy (Q11): 3 students (7.1%)

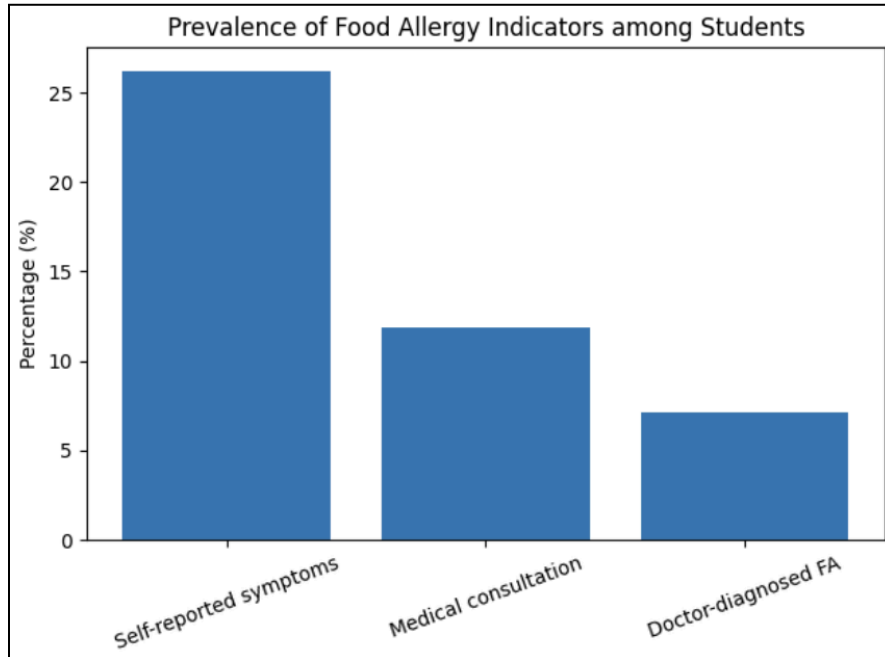


Figure 1. Prevalence of self-reported food-related symptoms, medical consultation, and doctor-diagnosed food allergy among students ($n = 42$).

Important Note on Mutual Exclusivity: The allergen types reported in Table 2 are not mutually exclusive. Participants were permitted to select multiple responses if they reacted to more than one food group, reflecting the prevalence of polysensitization.

(Please continue to the next page.)

Table 2. Types of Reported Food Allergens ($n = 42$)

Allergen Type (Q7)	Frequency (n)	Percentage (%)
Nuts (Tree Nuts)	3	7.1%
Milk / Dairy	2	4.8%
Shellfish / Seafood	2	4.8%
Peanuts	1	2.4%
Fruits / Vegetables	2	4.8%
Fish	1	2.4%
Wheat	1	2.4%
Eggs	1	2.4%

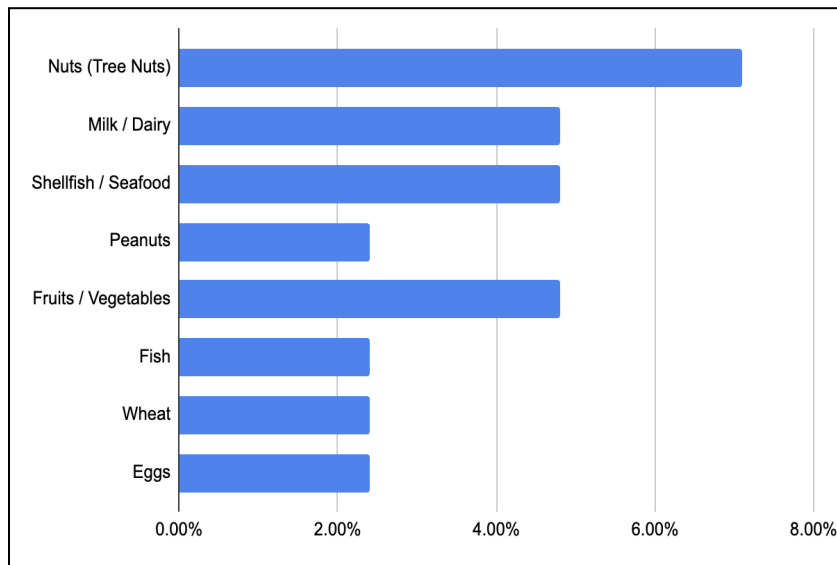


Figure 2. Distribution of reported food allergens among participants (multiple responses allowed, $n = 42$).

As shown in Figure 2, tree nuts were the most frequently reported allergen, while all other allergens were reported at relatively low and similar frequencies.

5.5 Clinical Presentation and Symptoms (Q5)

Symptomatic participants ($n = 11$) reported various reactions. Skin-related symptoms and gastrointestinal distress remained the primary clinical presentations.

Table 3. Distribution of Reported Symptoms (Multiple responses allowed)

Symptom Category (Q5)	Frequency (n)
Skin (Hives, swelling, itching)	9
Gastrointestinal (Pain, bloating, diarrhea)	5
Respiratory (Wheezing, tightness)	2
Systemic (Fainting, chest pain)	1

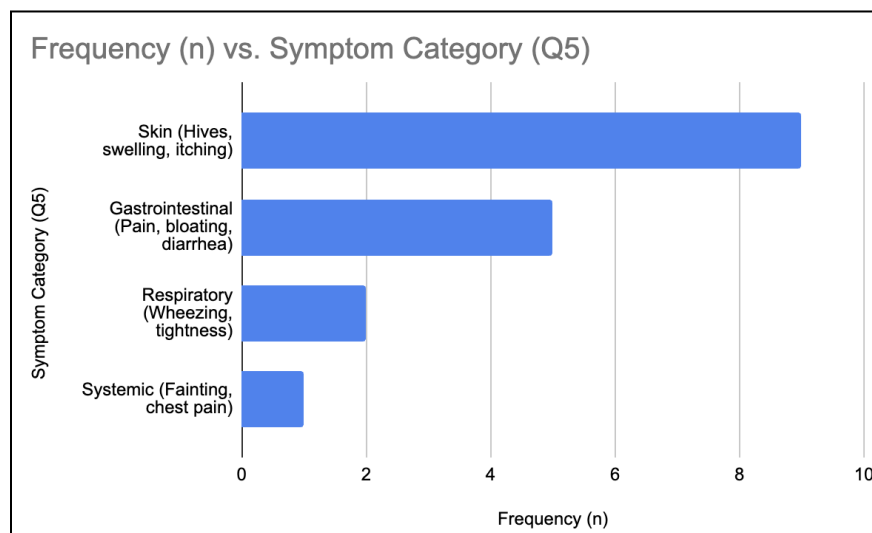


Figure 3. Distribution of reported food allergy symptoms among symptomatic students ($n = 11$)

As shown in Figure 3, skin-related symptoms were the most frequently reported, followed by gastrointestinal symptoms, while respiratory and systemic symptoms were less common.

5.6 Management and Emergency Preparedness (Q13–Q22)

Subgroup analysis ($n = 11$ symptomatic, $n = 3$ diagnosed) highlights significant gaps in emergency management.

Table 4. Subgroup Analysis (Symptomatic vs. Diagnosed)

Variable (Question No.)	Clinical Symptoms ($n = 11$)	Diagnosed FA ($n = 3$)
AAI prescription (Q17)	1 (9.1%)	1 (33.3%)
Always carrying AAI (Q18)	0 (0%)	0 (0%)
Know how to use AAI (Q19)	2 (18.2%)	1 (33.3%)
ED Visit due to FA (Q13)	3 (27.3%)	1 (33.3%)
Strict avoidance (Always) (Q22)	3 (27.3%)	1 (33.3%)
Associated allergic conditions (Q24)	8 (72.7%)	2 (66.7%)

5.7 Social and Lifestyle Impact (Q23–Q26)

- Social Restrictions (Q23): 3 out of 11 symptomatic students (27.3%) indicated that food allergies restricted their participation in social activities.
- Family History (Q25): 9 participants (21.4% of total sample) reported a confirmed food allergy in a first-degree relative.

5.8 Associated Allergic Conditions (Q24)

Concomitant atopic conditions were highly prevalent among those reporting food-related symptoms. Out of the 11 symptomatic students, 8 (72.7%) reported at least one additional allergic condition, indicating a high rate of atopy within this subgroup. The distribution of these conditions is presented in Table 5.

Table 5. Distribution of Allergic Conditions among Symptomatic Students ($n = 11$)

Allergic Condition (Q24)	Frequency (n)	Percentage (%)
Atopic Dermatitis	4	36.4%
Allergic Rhinitis	3	27.3%
Asthma	2	18.2%
Allergic Conjunctivitis	0	0.0%
No concomitant conditions	3	27.3%

Note. Participants could select multiple conditions; percentages are based on the symptomatic subgroup ($n = 11$).

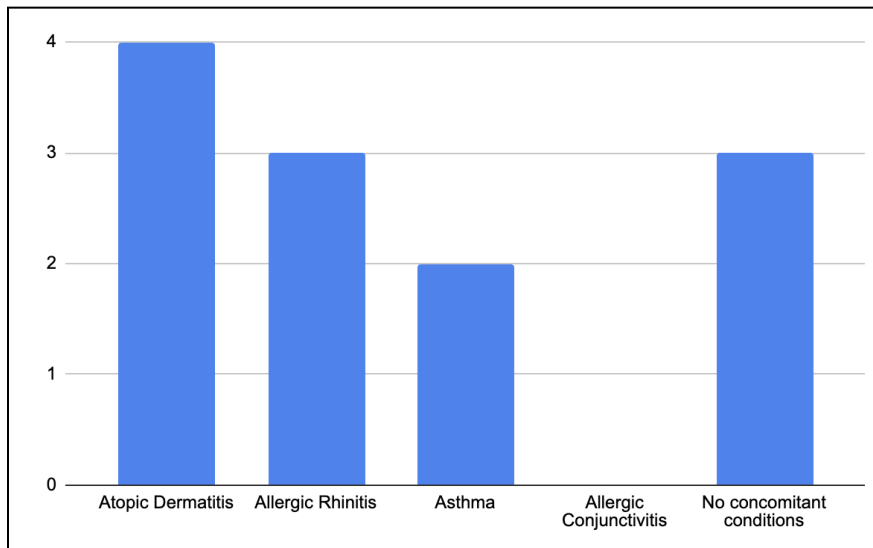


Figure 4. Distribution of associated allergic conditions among symptomatic students ($n = 11$).

6. Discussion

6.1 Prevalence and the “Allergy Gap”

The findings of this study indicate a self-reported food allergy (FA) prevalence of 26.2% (Q9), while doctor-diagnosed food allergy was considerably lower at 7.1% (Q11). This discrepancy reflects a commonly observed pattern in allergy research, where perceived food-related symptoms exceed clinically confirmed diagnoses (Nwaru et al., 2014). This gap is particularly relevant in young adult populations, where awareness and understanding of food-related conditions may be limited.

When compared to the study by Hassan et al. (2020), which reported a 9.6% prevalence of clinically diagnosed food allergy, the findings of the present study (7.1%) are comparable despite the smaller sample size ($n = 42$). The relatively high rate of self-reported symptoms suggests that some students may misinterpret food intolerance or mild sensitivities as true food allergy (Sicherer & Sampson, 2018). This may lead to unnecessary dietary restrictions, potential nutritional imbalance, and increased anxiety regarding food choices. Therefore, improving access to diagnostic services, such as skin prick testing or serum IgE testing, is essential to ensure accurate diagnosis and appropriate management (Muraro et al., 2014).

6.2 Patterns of Food Triggers

The most frequently reported food allergens in this study (Q7) were tree nuts (7.1%), followed by milk/dairy (4.8%), shellfish/seafood (4.8%), and fruits/vegetables (4.8%). Other reported allergens included peanuts, fish, wheat, and eggs (each at 2.4%). These findings are broadly consistent with global patterns, where nuts and dairy products are among the most common allergens in young adult populations (Nwaru et al., 2014; Sicherer & Sampson, 2018).

Compared to the study by Hassan et al. (2020), which reported higher rates of seafood allergy, the differences observed in this study may reflect regional dietary habits, cultural

food preferences, and patterns of food exposure in Estonia. Additionally, 72.7% of students with food allergy symptoms (8 out of 11) reported at least one additional allergic condition (Q24), such as atopic dermatitis or allergic rhinitis. This supports the concept of the “atopic profile,” where multiple allergic conditions commonly coexist within the same individual (Sicherer & Sampson, 2018). The presence of comorbid allergic conditions may further increase the overall health burden and complicate disease management among affected students.

6.3 High-Risk Behaviours and Adrenaline Underuse

A key finding of this study is the low level of emergency preparedness among students with diagnosed food allergy. Although one out of three diagnosed participants (33.3%) had been prescribed an adrenaline auto-injector (Q17), none reported carrying it consistently (Q18, 0%). This indicates a significant gap between medical prescription and actual preventative behaviour.

This finding is consistent with the results reported by Hassan et al. (2020), where low rates of regular adrenaline carriage were also observed. Such behaviour represents a significant public health concern, as delayed access to adrenaline / epinephrine during an anaphylactic reaction can result in severe or life-threatening outcomes (Turner et al., 2017). Several factors may explain this pattern in the university setting. Students may feel their allergy is not serious if they have only had mild reactions before. Some may not fully understand how dangerous anaphylaxis can be. Others may feel uncomfortable carrying a medical device in social situations, or find it inconvenient or expensive (Cummings et al., 2010). Addressing these issues is important to improve safety among students with food allergies.

6.4 Social Impact and University Life

The study found that 27.3% of students with food-related symptoms (3 out of 11) reported that food allergy restricted their participation in social events (Q23). This suggests that food allergy has a measurable impact on students' social experiences, daily activities, and overall quality of life.

University environments often involve shared meals, social gatherings, and group dining, which increase the risk of accidental allergen exposure. As a result, students with food allergies may experience anxiety, social withdrawal, or hesitation in participating in such activities. The social impact observed in this study is consistent with existing literature indicating that food allergies may contribute to reduced social participation and psychological stress among young adults (Gallagher et al., 2011). Although the sample size is small, these findings highlight the importance of supportive and inclusive environments within university settings.

6.5 Strengths and Limitations

Strengths: This study represents an initial assessment of food allergy prevalence and management behaviours among students using a validated questionnaire (Hassan et al., 2020). The use of anonymous, paper-based questionnaires and a secure submission system likely improved the accuracy and honesty of responses, particularly for sensitive behaviours such as not following medical advice. Additionally, the study provides valuable preliminary data in a context where limited research currently exists.

Limitations: The primary limitation of this study is the relatively small sample size ($n = 42$), which limits the generalizability of the findings. As a pilot study, the results are descriptive and should be interpreted with caution. Furthermore, the reliance on self-reported data introduces the possibility of recall bias and misclassification, particularly when distinguishing between food allergy and food intolerance (Nwaru et al., 2014). In addition, providing participants with definitions of food allergy and food intolerance before questionnaire completion may have influenced how some participants interpreted and reported their symptoms. Although this was done to improve clarity and reduce misunderstanding, it may have introduced response bias. Another limitation is the possibility of selection bias, as students with an interest in allergies or personal experience with food related symptoms may have been more likely to participate, while healthier students may have been less likely to respond. Future studies with larger sample sizes and clinical validation are needed to confirm these findings.

6.6 Recommendations for the University of Tartu

Based on the findings of this pilot study, several measures could be considered to improve food allergy awareness and safety within the university environment:

Increase Awareness: Clear and standardized allergen labeling in both Estonian and English in university canteen facilities could help reduce the risk of accidental allergen exposure.

Training and Education: Basic training on recognizing anaphylaxis and the use of adrenaline auto-injectors (Q19) could be made available to students and university event organizers.

Encourage Medical Consultation: Students reporting food related symptoms (Q5, Q9) could be encouraged to seek professional medical evaluation for accurate diagnosis. As individual students cannot be identified due to anonymity, this information could be shared through general university announcements or student newsletters.

Integrated Support Systems: Food allergy awareness could be included in student health services and orientation programmes to improve student safety and awareness.

7. Conclusions

This study provides the first preliminary insight into the prevalence and management of food allergies among university students in Estonia. The findings reveal a clear gap between self-reported food-related symptoms (26.2%) and clinically diagnosed food allergies (7.1%), suggesting that many students may misunderstand or misinterpret their condition. This highlights the need for improved awareness and access to proper medical diagnosis, consistent with previous findings in allergy research (Nwaru et al., 2014).

The results also show that common allergens such as tree nuts (7.1%), followed by milk/dairy, shellfish/seafood, and fruits/vegetables (each 4.8%), are present within the student population, broadly consistent with global trends (Sicherer & Sampson, 2018). However, a major concern identified in this study is the low level of emergency preparedness. Despite some diagnosed students being prescribed adrenaline auto injector, none reported carrying it consistently (0%), indicating a critical gap between medical advice and actual preventative practice. Additionally, the high proportion of students reporting other allergic conditions (72.7% of the symptomatic group) supports the presence of an atopic profile, which may increase overall health risks and complicate disease management (Sicherer & Sampson, 2018). The high proportion of associated allergic conditions may also provide an opportunity for earlier identification and education through healthcare providers, as students with existing atopic conditions are more likely to have regular medical contact.

Food allergies were also found to impact students' social lives, with 27.3% of symptomatic individuals reporting that their condition restricted participation in social activities or group dining. Although based on a small sample, these findings suggest that food allergy is not only a medical issue but also a significant social and behavioural concern within the university environment (Gallagher et al., 2011).

Overall, this study highlights the need for increased awareness, better education on anaphylaxis management, and improved institutional support systems—such as standardized allergen labeling—to enhance food allergy safety on campus. As a pilot study, these findings provide a foundation for future research with larger samples and clinical validation, emphasizing the importance of addressing food allergy as a growing public health concern among university students.

8. References

Arnett, J. J. (2000). *Emerging adulthood: A theory of development from the late teens through the twenties*. *American Psychologist*, 55(5), 469–480.

<https://doi.org/10.1037/0003-066X.55.5.469>

Begen, F. M., Barnett, J., Payne, R., Roy, D., Gowland, M. H., & Lucas, J. S. (2016). Consumer preferences for written and oral information about allergens when eating out. *PLOS ONE*, 11(5), Article e0156073. <https://doi.org/10.1371/journal.pone.0156073>

Boyce, J. A., Assa'ad, A., Burks, A. W., Jones, S. M., Sampson, H. A., Wood, R. A., Plaut, M., Cooper, S. F., Fenton, M. J., Arshad, S. H., Bahna, S. L., Beck, L. A., Byrd-Bredbenner, C., Camargo, C. A., Eichenfield, L., Furuta, G. T., Hanifin, J. M., Jones, C., Kraft, M., ... Schwaninger, J. M. (2010). Guidelines for the diagnosis and management of food allergy in the United States. *Journal of Allergy and Clinical Immunology*, 126(6), S1–S58. <https://doi.org/10.1016/j.jaci.2010.10.008>

Cummings, A. J., Knibb, R. C., King, R. M., & Lucas, J. S. (2010). The psychosocial impact of food allergy and food hypersensitivity in children, adolescents and their families: A review. *Allergy*, 65(8), 933–945.

<https://doi.org/10.1111/j.1398-9995.2010.02342.x>

EFSA NDA Panel (EFSA Panel on Dietetic Products, Nutrition and Allergies). (2014). Scientific opinion on the evaluation of allergenic foods and food ingredients for labelling purposes. *EFSA Journal*, 12(11), 3894. <https://doi.org/10.2903/j.efsa.2014.3894>

Feng, C., Kim, J. H., & Kim, H. (2022). Epidemiological survey of self-reported food allergy among university students in China. *Medicine*, 101(29), Article e29703.

<https://doi.org/10.1097/MD.00000000000029606>

Gallagher, M., Worth, A., Cunningham-Burley, S., & Sheikh, A. (2011). Epinephrine auto-injector use in adolescents at risk of anaphylaxis: A qualitative study in Scotland, UK. *Clinical & Experimental Allergy*, 41(6), 869–877.

<https://doi.org/10.1111/j.1365-2222.2011.03743.x>

Gupta, R. S., Warren, C. M., Smith, B. M., Blumenstock, J. A., Jiang, J., Davis, M. M., & Schleimer, R. P. (2019). Prevalence and severity of food allergies among US adults. *JAMA Network Open*, 2(1), Article e185630.

<https://doi.org/10.1001/jamanetworkopen.2018.5630>

Hassan, H., Al-Subaie, A., Al-Khalifa, M., & Al-Shaikh, A. (2020). Food allergy among university students: Uncharted territory. *Allergy, Asthma & Clinical Immunology*, 16, Article 23. <https://doi.org/10.1186/s13223-020-0415-5>

Lomer, M. C. E., Parkes, G. C., & Sanderson, J. D. (2008). Review article: Lactose intolerance in clinical practice—Myths and realities. *Alimentary Pharmacology & Therapeutics*, 27(2), 93–103. <https://doi.org/10.1111/j.1365-2036.2007.03557.x>

Muraro, A., Halken, S., Arshad, S. H., Beyer, K., Dubois, A. E. J., Du Toit, G., Eigenmann, P. A., Grimshaw, K. E. C., Høst, A., Lack, G., O'Mahony, L., Papadopoulos, N. G., Panesar, S., Prescott, S., Roberts, G., de Silva, D., Venter, C., Verhasselt, V., Akdis, A. C., & Sheikh, A. (2014). EAACI food allergy and anaphylaxis guidelines: Primary prevention of food allergy. *Allergy*, 69(5), 590–601. <https://doi.org/10.1111/all.12398>

Nelson, M. C., Story, M., Larson, N. I., Neumark-Sztainer, D., & Lytle, L. A. (2008). Emerging adulthood and college-aged youth: An overlooked age for weight-related behavior change. *Obesity*, 16(10), 2205–2211. <https://doi.org/10.1038/oby.2008.365>

Nwaru, B. I., Hickstein, L., Panesar, S. S., Roberts, G., Muraro, A., & Sheikh, A. (2014). Prevalence of common food allergies in Europe: A systematic review and meta-analysis. *Allergy*, 69(8), 992–1007. <https://doi.org/10.1111/all.12423>

Sicherer, S. H., & Sampson, H. A. (2018). Food allergy: A review and update on epidemiology, pathogenesis, diagnosis, prevention, and management. *Journal of Allergy and Clinical Immunology*, 141(1), 41–58. <https://doi.org/10.1016/j.jaci.2017.11.003>

Simons, F. E. R., Arduoso, L. R. F., Bilò, M. B., Dimov, V., Ebisawa, M., El-Gamal, Y. M., Ledford, D. K., Ring, J., Sanchez-Borges, M., Senna, G. E., Sheikh, A., & Thong, B. Y.

(2011). World allergy organization guidelines for the assessment and management of anaphylaxis. *World Allergy Organization Journal*, 4(2), 13–37.

<https://doi.org/10.1097/WOX.0b013e318211496c>

Turner, P. J., Baumert, J. L., Beyer, K., Boyle, R. J., Chan, C. H., Clark, A. T., Crevel, R. W. R., DunnGalvin, A., Fernandez-Rivas, M., Gowland, M. H., Hourihane, J. O., Lieberman, J., Taylor, S. L., & Worm, M. (2017). Can we identify patients at risk of life-threatening allergic reactions to food? *Allergy*, 72(9), 1247–1255.

<https://doi.org/10.1111/all.12924>

Warren, C. M., Jiang, J., & Gupta, R. S. (2020). Epidemiology and burden of food allergy. *Current Allergy and Asthma Reports*, 20(2), Article 6.

<https://doi.org/10.1007/s11882-020-0898-7>

World Medical Association. (2013). World Medical Association Declaration of Helsinki: Ethical principles for medical research involving human subjects. *JAMA*, 310(20), 2191–2194. <https://doi.org/10.1001/jama.2013.281053>

9. Use of Digital Tools

This study made use of several digital tools to support data organization, analysis, and writing.

- ChatGPT was used to assist in structuring and organizing sections of the text.
- Grammarly was used to review spelling, grammar, and overall language clarity.
- Gemini and Google Search were used to identify and access relevant academic literature and supporting information.
- Microsoft Excel and Google Sheets were used for data entry, cleaning, and analysis.
- GitHub was used for organizing and managing analytical work.

All final interpretations, analysis, and conclusions presented in this thesis are the original work of the author.

10. Appendices

A. Ethical Approval

Research Ethics Committee of the University of Tartu (UT REC)

Approval: 1/T-5

Date of meeting: 19 January 2026

Komitee koosseis:

Chairman

Maire Peters University of Tartu, Faculty of Medicine, Associate Professor in Genetics

Vice-chairman

Anni Tamm University of Tartu, Faculty of Social Sciences, Lecturer, Research Fellow of Developmental Psychology

Members

Diva Eensoo	National Institute of Health Development, researcher
Kalle Kisand	University of Tartu, Faculty of Medicine, Professor in Laboratory Medicine
Piret Koosa	Estonian National Museum, Researcher
Malle Kuum	University of Tartu, Faculty of Medicine, Lecturer in Pharmacology and Research Fellow in Pharmacology
Rael Laugesaar	University of Tartu, Faculty of Medicine, Lecturer of Paediatrics
Raivo Puhke	University of Tartu, Faculty of Medicine, Lecturer in Functional Morphology
Atko-Sulhan Remmel	University of Tartu, Faculty of Arts and Humanities, Associate Professor in Religious Studies
Anna-Liisa Tamm	Tartu Applied Health Sciences University, Professor
Kadri Tamme	University of Tartu, Faculty of Medicine, Associate Professor of Anesthesiology and Intensive Care
Maarja Torga	Counsellor to the Civil Chamber of the Supreme Court of Estonia

Resolution: Approval is given to conduct the study

Study titled: Food Allergy among University of Tartu (UT) Students

Investigator's name and address:

Alastair Forbes (University of Tartu, Faculty of Medicine, Institute of Clinical Medicine, L. Puusepa 8, Tartu, Estonia)

Documents reviewed:

1. Application for the approval of the Ethics Committee, 03.02.2026
2. Information Sheet, 03.02.2026
3. Questionnaire, 03.02.2026
4. CVs of the investigators (Alastair Forbes, Sayan Kundu, Aileen Tappel)

End of the study: 30 April 2026

Chairman of UT REC: Maire Peters/digitally signed/

Secretary of UT REC: Kaire Kallak /digitally signed/

Date of issue: date of the latest digital signature

University of Tartu
Grant Office
Ülikooli 18a
50090, Tartu

Phone +372 737 6215
e-post etikakomitee@ut.ee
<https://ut.ee/en/node/113848>

B. Participant Information Sheet

Participant Information Sheet and Consent Form

Research Project Title: **Food Allergy among University of Tartu (UT) Students**

Supervisor: Professor Alastair Forbes, Visiting Professor and Senior Doctor, Department of Internal Medicine, University of Tartu

Co-Supervisor : Aileen Tappel, Head of Toitmisravi Keskus, University of Tartu Hospital

Head of the responsible investigator's institution: Professor Margus Lember, Professor, Head of the department of internal medicine, University of Tartu

Associate: Sayan Kundu, MSc Student in Clinical Nutrition, University of Tartu

Contact Information: +372 5861 8374 | sayan@ut.ee

Purpose of the Study

This study examines the prevalence and characteristics of food allergy among University of Tartu students. It aims to identify common allergens, symptoms, and students' knowledge about managing food allergies, providing information to guide future health initiatives and encourage proper medical care. We will include 50 students in this study.

Why Have I Been Invited?

You are being asked to take part because you are a current bachelor's or master's student at the University of Tartu, aged 18–30, and have good proficiency in English.

Do I Have to Take Part?

No. Participation is entirely voluntary. You may refuse or withdraw before submitting, without giving a reason and without any consequences.

What Will Happen If I Take Part?

You will be given this information sheet and a paper-based questionnaire in an envelope. Answering the questions will be considered as consent. Filling out the questionnaire will take approximately 5–10 minutes. The questionnaire includes questions about your experiences with food allergies, common triggers, symptoms, and allergy management. You will complete the questionnaire privately and independently. You will submit the questionnaire in a closed envelope individually to the mailbox at Turu 9-32, 51004, Tartu, **within one week of receiving the questionnaire**, at your

convenience. You may use the envelope provided by the researchers or your own; however, you must ensure that no names or identifying information are written on the envelope when returning the documents. Later, researchers will collect the envelopes and store them securely in a plastic container with a zip lock. Only researchers will have access to your responses.

No identifying personal information will be collected, so your responses will remain completely anonymous. You will not be able to withdraw your answers once they have been submitted to the researchers.

Can I Skip Questions?

Yes. You have the right to leave any question unanswered.

What Happens If I Change My Mind?

You can stop completing the questionnaire at any point. Any data you have already provided before stopping will be securely destroyed and will not be used in the study.

Once you submit your questionnaire, it will be completely anonymous. This means it cannot be linked back to you, and it will not be possible to withdraw your responses afterward.

Are There Any Risks or Benefits?

Risks: The study involves minimal risk, as it only asks about your experiences with food allergies. You may skip any question that makes you uncomfortable.

Benefits: While there is no direct benefit to you, your participation will contribute to research that may guide future health initiatives and help students manage food allergies more effectively.

How Will My Data Be Kept Confidential?

No personal identifiers (such as your name or student ID) will be collected in the questionnaire, and all responses will remain confidential. Age will be collected in ranges, not as exact numbers (e.g., 18–21, 22–25, 26–30), to protect participants' privacy. Although the degree programme will be recorded, specific courses will not, ensuring that individual responses cannot be identified. The questionnaires will be stored securely in a separate locked container, and all materials will be destroyed after the research is completed.

What Will Happen to the Results?

The results will be analyzed descriptively and presented in a master's thesis. The findings may also be published in academic journals or presented at conferences, but no individual participant will be identifiable.

Important Information Before Completing the Questionnaire

Please note that a food allergy and a food intolerance are not the same:

Food allergy: A fast immune reaction that can occur even from a small amount of food and may cause strong symptoms. Eating even a tiny bit can make you feel very sick, like getting a rash, tummy ache, or trouble breathing.

Food intolerance: A non-immune reaction that usually appears later, is milder, and is often caused by difficulty digesting certain foods. It can make you feel uncomfortable, like a tummy ache or bloating, but it is not dangerous and does not involve your body 'fighting' the food.

Because people from different countries may react to different foods, this questionnaire focuses only on your personal experiences and the symptoms you have noticed after eating certain foods.

Has This Study Been Reviewed?

Yes. This study has been reviewed and approved by the Human Research Ethics Committee of the University of Tartu.

Agreement

I understand that I am invited to participate in the research project titled "*Food Allergy among University of Tartu (UT) Students*". The purpose of this study is to examine the prevalence and impact of food allergies among UT students. My participation is voluntary, and I may withdraw at any time **before submitting the questionnaire**. All information I provide will remain confidential and anonymous and will be used only for research purposes. By filling the questionnaire, I confirm that I consent to participate in this study.

C. Questionnaire

Questionnaire for Research topic “Food Allergy among University of Tartu (UT) students”

This questionnaire is anonymous. Please complete it independently and answer honestly in a quiet place at your convenience. Do not be influenced by any other person. Fill it out based on your personal experience. Answering the questions will be considered your consent. The responses will be used for research purposes only. Data will be analyzed descriptively (e.g., by gender, faculty, and percentages) to estimate prevalence and identify common allergens, symptoms, and behaviours. You may skip any questions you do not wish to answer and may stop filling it out at any time without penalty or consequences. Once you submit the questionnaire, it cannot be withdrawn because your responses are completely anonymous. You should return this questionnaire in a closed envelope individually to the mailbox at Turu 9-32, 51004, Tartu, within one week of receiving the questionnaire, at your convenience. You may use the envelope provided by the researchers or your own; however, you must ensure that no names or identifying information are written on the envelope when returning the documents. Later, researchers will collect the envelopes and store them securely in a plastic container with a zip lock. Only researchers will have access to your responses. Incomplete questionnaires will be destroyed by shredding. After the research is completed, all questionnaires will be securely shredded and recycled, ensuring that no personal data is disclosed outside the research team. Please note that a food allergy and a food intolerance are not the same:

Food allergy: A fast immune reaction that can occur even from a small amount of food and may cause strong symptoms. Eating even a tiny bit can make you feel very sick, like getting a rash, tummy ache, or trouble breathing.

Food intolerance: A non-immune reaction that usually appears later, is milder, and is often caused by difficulty digesting certain foods. It can make you feel uncomfortable, like a tummy ache or bloating, but it is not dangerous and does not involve your body ‘fighting’ the food.

Because people from different countries may react to different foods, this questionnaire focuses only on your personal experiences and the symptoms you have noticed after eating certain foods.

1. Are you a current student (Bachelor's / Master's) of the University of Tartu? Please circle Yes (Y) or No (N).

Y / N

2. What is your age? Please tick the correct age group.

- ☐ 18 - 21
- ☐ 22 - 25
- ☐ 26 - 30

3. What is your gender? Please circle the following options that apply to you.

M / F

4. What are you studying? Please mention your faculty, such as Engineering, Medicine, Social Studies, Law etc. You do not need to provide your specific course..

.....

5. Have you ever noticed any of the symptoms while consuming any specific food? Please circle any of the following options that apply to you.

Choices:

Abdominal pain
Diarrhea
Hives
Vomiting
Difficulty breathing
Cough
Swelling of lips and tongue
Chest pain
Wheezing
Fainting
Other (please specify)

6. Have you noticed any of these symptoms again when you eat that specific food? Please circle Yes (Y) or No (N).

Y / N

7. Do any of the following food items cause your symptoms? Please circle any of the following options that apply to you.

Choices:

Original Questionnaire: Hassan et al., 2020

Eggs
Milk
Fish
Nuts (Tree nuts)
Shellfish (Seafood)
Peanuts
Wheat
other (please specify)

8. At what age did you start having these symptoms?

9. Do you think you have a food allergy? Please circle Yes (Y) or No (N).

Y / N

10. Have you been seen by a doctor for these symptoms? Please circle Yes (Y) or No (N).

Y / N

11. Have your symptoms been diagnosed as food allergy by a doctor? Please circle Yes (Y) or No (N).

Y / N

12. If so, was your diagnosis of food allergy confirmed by an allergy test (e.g. skin prick test)? Please circle Yes (Y) or No (N).

Y / N

13. Have you ever been to the Emergency Department for an allergic reaction after food ingestion? Please circle Yes (Y) or No (N).

Y / N

14. If so – how many times?

15. If so - how many times were you admitted to hospital (kept in a bed overnight)?

.....

16. Which food(s) was thought to be the cause of these serious events?

.....

Original Questionnaire: Hassan et al., 2020

17. Have you been prescribed an injection for allergies (e.g., EpiPen®)? Please circle Yes (Y) or No (N).

Y / N

18. If so - how often do you carry the injection pen for allergies? Please circle the best response.

Choices:

Always
Often
Sometimes
Rarely
Never
Not applicable

19. If you have an injection pen do you and your family members know how to use the injection correctly? Please circle Yes (Y) or No (N).

Y / N

20. Have you ever had to use the injection? Please circle Yes (Y) or No (N).

Y / N

21. If so – how many times?

22. How much do you avoid foods that may contain the substance causing the allergy? Please circle the best of the following options.

Choices:

Always
Often
Sometimes
Rarely
Never
Not applicable

23. Does food allergy restrict you from attending social events? Please circle Yes (Y) or No (N).

Y / N

Original Questionnaire: Hassan et al., 2020

24. Have you been diagnosed with any of the following allergic conditions? Please circle any of the following options which apply to you.

Choices:

Atopic dermatitis
Allergic rhinitis
Asthma
Allergic conjunctivitis
Other
None

25. Do any of your relatives have a food allergy? Please circle Yes (Y) or No (N).

Y / N

26. If yes - please specify who by their relationship to you. Please circle any of the following options which apply to you.

Choices:

Grandparent
Parent
Aunt or uncle
Brother or sister
Cousin
Your child
Other

Thanks for your contribution.

Original Questionnaire: Hassan et al., 2020