

The Prevalence Of Common Allergy Types Among Karakoram International University Staff And Students Of Gilgit-Baltistan.

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Abstract

This cross-sectional descriptive survey was carried out to evaluate the prevalence, types, and causative factors of prevalent allergies among Karakoram International University (KIU) students and employees in Gilgit-Baltistan. The study was conducted from March to May 2025. Using a structured, self-administered questionnaire, the study was applied to a randomly drawn sample of 390 subjects from an estimated population of 8,000 at the university. The data were processed using SPSS Version 23, with descriptive statistics at a significance level of $p < 0.05$.

The results indicated that 32.5% of the population of the university had symptoms of allergies, with the most common types being dermatitis (28.5%), rhinitis (24.1%), and seasonal allergies (20.8%). Dust (30.3%), sunlight (27.7%), and pollen Female respondents (57.9%) and the age group of 20–25 years (84.6%) were affected the most. Positive blood groups, particularly B+ and A+, had a greater incidence of allergic reaction than the negative groups. Allergic history in family was mentioned in 33.1%

cases and a formal diagnosis was possible in just 30.3% cases. The majority of participants belonged to Gilgit, followed by Nagar and Ghizer. Lack of vaccination (25.4%), exposure to pollution (34.6%), and unbalanced diet (48.5%) were also contributing factors for allergic results.

Author Details

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The research concludes that allergies are a major health issue among the university population, driven by environmental exposures, genetic factors, and lifestyle. The results emphasize the importance of greater awareness, early diagnosis, and preventive measures designed for the region's specific geographic and environmental setting.

Introduction

Background

An allergy is an inappropriately “overactive” immune response to antigens that may result in the development of the allergic disorders such as atopic dermatitis, allergic rhinitis, asthma, and food allergy (candiceet al, 2020). Allergies occur when the body's immune system overreacts to something that is otherwise harmless, like dust, pollen, foods, or pet dander. These allergens may include pollens, dust mites, foods, animal dander, and chemicals (Mehta, k. (2015). The immune system responds to these allergens like they are attacking substances and mounts a response that makes one have symptoms like sneezing, itchiness, and swelling (Royalet al, 2020). The population of allergy sufferers has been on the increase globally. The initial rapid rise in respiratory allergy, first seen in developed countries and subsequently developing worldwide, has been followed by a significant increase in the prevalence of atopic dermatitis and food allergy. Allergies have become a significant public health concern globally, affecting millions of people worldwide (Journal of Clinical & Experimental Allergy, 2009). The prevalence of allergic diseases has been increasing, with a substantial impact on quality of life, academic performance, and healthcare systems (). University students, in particular, are vulnerable to allergies due to their unique lifestyle and environmental factors. Allergies can also increase the burden on healthcare systems, with many students seeking medical attention for allergic reactions (Von Hertzen and Haahtela, 2005).

Allergies primarily occur through a mechanism known as Type I hypersensitivity. This is where the body produces a unique class of antibody known as IgE, which overreacts to allergens (Gould & Sutton, 2008). The initial time an individual is exposed to an allergen, immune cells break it down and present it to helper T cells (Th0), which are converted into Th2 cells. The Th2 cells then emit chemicals such as IL-4 and IL-13, which instruct B cells to produce IgE antibodies (Akdis & Akdis, 2011). These antibodies bind to mast cells and basophils in the body, readying them to respond the subsequent time the allergen occurs. When the person is exposed to the allergen again, it binds to these IgE antibodies and causes the mast cells to release histamine and other chemicals (Galli et al., 2008). This results in symptoms like itching, sneezing, wheezing, or skin redness. A few hours later, more immune cells arrive at the site and cause swelling and inflammation, which can last longer (Holgate, 2012). In severe cases, the allergic reaction can be systemic and lead to a life-threatening condition known as anaphylaxis (Tupper, J., & Visser, S. (2010). There are numerous forms of allergies, but the most prevalent are food, dust, and drug allergies (Syed et al., 2018). One of the most common forms is allergic rhinitis (hay fever), responsible for a runny or stuffy nose, sneezing, and watery eyes as a result of inhaled allergens such as pollen or dust (Kef, K., & Givven, S (2020). Food allergy is an immunologic reaction to foods such as peanuts, milk, or eggs and can lead to vomiting, diarrhea, or abdominal pain (Sichereret al, 2018). Skin allergies like atopic dermatitis are triggered by allergens such as foods, metals, or cosmetics, and they result in itching, swelling, and rashes (Weidingeret al, 2016). Other allergic reactions occur immediately after exposure, whereas others are evident after hours. Immediate reactions, such as in anaphylaxis or allergic rhinitis, may begin after 1–6 hours, whereas delayed reactions like dermatitis might take longer than 6 hours to manifest (Jeimy et al., 2024).

Allergic symptoms vary according to the allergen, route of entry into the body, and

the individual's immune system. The organs most involved are the skin, lungs, stomach, and eyes. Respiratory symptoms such as sneezing, coughing, wheezing, and runny nose occur very frequently, particularly asthma and allergic rhinitis (Bousquet et al., 2008). Skin allergies tend to bring about dryness, itching, redness, and rash, particularly in children (Nutten et al., 2015). The symptoms of allergies can range from mild discomfort to life-threatening reactions (Sicherer et al., 2010). Previous studies have shown that allergies are common among children and young adults, with 50% of children and young people having one or more allergies within the first 18 years of life (Journal of Clinical & Experimental Allergy, 2009). Eye allergies, also referred to as allergic conjunctivitis, result in red, watery, and itchy eyes (Leonard et al., 2015). Allergies also impact an individual's sleep, school or work efficiency, and mental health, resulting in anxiety or depression (Silverberg et al., 2019).

Allergies are increasingly prevalent globally. Approximately 30–40% of the world's population is estimated to have at least one type of allergic disorder (Pawankar et al., 2013). The most prevalent is allergic rhinitis, occurring in 10–30% of people (Brożek et al., 2017). Food allergies occur in approximately 6–8% of children and 3–4% of adults, primarily in developed nations (Gupta et al., 2009). Allergic conjunctivitis is also prevalent, primarily in children (Nutten et al., 2015). In Pakistan, it is estimated that approximately 19.2% of individuals experience allergic conjunctivitis (Akhtar et al., 2020). In the UAE, around 27% of university students presented with symptoms of allergies, where respiratory symptoms were the most prevalent (Al-Maskari et al., 2020). Urbanization, air pollution, and dietary changes raise allergy risks. Other risk factors include history, exposure to allergens such as dust and pollen, and even blood group, which could influence the immune response (Ibrahim et al., 2019).

Getting an accurate diagnosis of an allergy is necessary to prevent complications and under treatment. Physicians often begin with a patient's history and symptoms (Gould and Sutton, 2008). Common tests used to diagnose are the Skin Prick Test (SPT), in which a little allergen is applied on the skin to determine whether a reaction occurs. It is quick and inexpensive (Nelson et al., 2016). The blood test to detect specific IgE antibodies is another test that aids in the identification of allergens (Hamilton et al., 2010). In asthma, spirometry tests evaluate lung function and airway obstruction (GINA, 2023). In food allergy, physicians can request patients to record the foods they have eaten using a food diary or an elimination diet, and occasionally give an oral food challenge, which is the best test (Sicherer & Sampson, 2014). Advanced tests, known as Component-Resolved Diagnostics (CRD), are able to determine specific proteins responsible for allergic reactions (Matricardi et al., 2016). For cutaneous allergies such as atopic dermatitis, physicians apply criteria such as the Hanifin and Rajka criteria, which consider symptoms, sites involved, and frequency (Eichenfield et al., 2014). Treatment of allergies involves avoiding allergens and minimizing overreaction of the immune system. The initial action involves evading items causing allergic reactions. Medications such as nasal sprays, inhalers, and steroids alleviate symptoms. In other situations, immunotherapy (tablets or allergy shots) is employed to gradually teach the immune system not to respond to allergens (Akdis et al., 2011). Current allergy therapies aim at immune mechanisms with anti-cytokine therapies, Toll-like Receptors (TLR)-based strategies, anti-IgE agents, immunomodulators, and novel antihistamines. (El-Qutob López, 2011). Oral immunotherapy is a method to reduce immune responses for selected food allergies (Sicherer & Sampson, 2018). For individuals with life-threatening allergies such as anaphylaxis, having an epinephrine auto-injector with them can be a matter of life and death. Follow-up visits with healthcare providers and education on prevention are equally significant components of treatment (Syed et al., 2018). Allergies constitute an increasing world health issue, sample research is still lacking in most regions of the world—particularly in low- and middle-income countries such as Gilgit-Baltistan, Pakistan. In places such as Gilgit, there is not much data about the frequency of

allergies, which allergens are most to blame, how symptoms vary by age or environment, and how individual scope with their allergic conditions. Most allergic illnesses in such regions remain undiagnosed or uncontrolled owing to poor access to allergy experts, appropriate diagnostic facilities, and public education. This research results of preventive measures, ineffective treatment, and increased health burdens on individuals and healthcare systems. Completing this gap will help enhance healthcare planning, increase public awareness, and ensure improved diagnosis, treatment, and prevention options for allergy patients in understudied regions. 1.2 Objectives

The objectives of this study are to:

To identify, which types of allergy is common in Gilgit, including pollen, dust, food, and seasonal allergy.

To investigate the causes, symptoms and environmental risk factors that contributing to allergies, such as pollution, climate change, family history and lifestyle habits.

Expected Outcomes

This study aims to provide insights into the prevalence and impact of allergies among university students, informing strategies for prevention, diagnosis, and treatment. The expected outcomes include:

Identification of the prevalence and characteristics of allergic diseases among population.

Insights into the common allergies and symptoms of allergic reactions among population.

Recommendations for strategies to prevent, diagnose, and treat allergies among population.

Research Questions.

What are the most common allergens affecting population?

What are the symptoms and severity of allergic reactions among population?

Are there any differences in allergy prevalence and characteristics between different demographic groups (age, gender, area)?

What are the most common management strategies used by individuals with allergies (medication, vaccination)?

What are the impacts of allergies on students' quality of life, academic performance, and healthcare utilization?

Significance of the Study:

This research is significant because it will offer new knowledge regarding allergies in the Gilgit area, where little or no data are known to exist. By recognizing the prevalent allergens, symptoms, and groups affected, the research will assist medical professionals, public health practitioners, and the community in preventing and managing allergies more effectively. The results will also facilitate the planning of health programs and educating the public.

Problem Statement:

Allergies are on the rise globally, but we lack comprehensive data on how they impact individuals in various parts of the world, particularly in regions such as Gilgit. A majority of allergy incidents remain unreported or underdocumented due to a lack of facilities and awareness. This renders it challenging for the healthcare system to deal with the issue. It is challenging to plan interventions, raise awareness, and formulate health policies without adequate data. This research seeks to bridge that gap by offering concise information about the prevalence of common allergies in Gilgit and what needs to be done to rectify it.

LITERATURE REVIEW:

Allergic diseases are complex disorders caused by an impaired immune system (Wang et al., 2023). Allergic reactions are when the immune system overreacts to harmless substances and mounts an overactive immune response (Sicherer & Sampson, 2018). Allergic illnesses like allergic rhinitis, asthma, atopic dermatitis, and food allergy are multifactorial, chronic diseases determined by genetic, environmental, microbial, and immunological factors. Systemic disorders characterized by immune dysregulation and frequent recurrence (Wang et al., 2023). Important pathological features are cell immune infiltration and the activation of Th2 and Tfh cells, which enhance IgE production and eosinophilic inflammation (Sharma et al., (2024). IgE-mediated activation of basophils and mast cells results in the production of inflammatory mediators and immediate symptoms of allergy (MSD Manual, 2024). The late-phase allergic reaction includes inflammation lasting longer and airway remodeling, particularly in asthma (Wang et al., (2023). Atopic dermatitis includes skin barrier disruption and changed microbiota, with genetic predisposition and environmental exposures further influencing allergy risk (MSD Manual, 2024). The symptoms depend on the type of allergen and route of exposure (Kelso, 2022). The most common symptoms of allergy are itching, sneezing, nasal congestion or runny nose, watery eyes, and rashes over the skin (Pawankar et al., 2013). Respiratory symptoms like cough, wheezing, and breathlessness are commonly seen in allergic asthma or inhalant allergies such as pollen or animal dander (Global Initiative for Asthma [GINA], 2023). Cutaneous allergic reactions tend to manifest as rashes, urticaria, edema, erythema, and chronic pruritus (Leung et al., 2004). Gastrointestinal manifestations like nausea, vomiting, abdominal pain, and diarrhea are particularly common in food allergies (Sampson, 2014).

Allergic rhinitis (hay fever) most often results in mucous membrane irritation, sneezing, nasal stuffiness, and itchy, watery eyes, particularly in pollen seasons (Greiner et al., 2011). Atopic dermatitis presents as scaly, dry, itchy, red skin and tends to be chronic with some periods of flare-ups (Weidinger & Novak, 2016). Food allergy may lead to the quick onset of symptoms like swelling of the throat, tongue, or lips, hives, vomiting, and, in the most severe cases, anaphylaxis with airway obstruction and cardiovascular collapse (Sampson et al., 2006). Local swelling and pruritus are typically caused by insect sting allergy, with systemic reactions such as anaphylaxis in individuals who are sensitized (Golden et al., 2011). Drug allergy can cause rashes, itching, swelling, breathing difficulties, and even life-threatening anaphylaxis (Joint Task Force on Practice Parameters, 2010). Dust mite and cockroach allergies usually produce year-round symptoms such as coughing, sneezing, nasal congestion, and wheezing (Arlian, 2002). Allergic asthma is defined by allergen-induced airway inflammation, bronchoconstriction, and difficulty in breathing (GINA, 2023).

Allergy symptoms vary in severity from mild, like localized rash or itching, to severe, like anaphylaxis that needs emergency attention (Lieberman et al., 2015). Mild reactions may consist of congestion or skin irritation, while moderate cases exhibit widespread hives and shortness of breath (Pawankar et al., 2013). Anaphylaxis most often occurs with the sudden onset of several symptoms like swelling of the throat or tongue, respiratory distress, lightheadedness, and shock (Simons et al., 2011). Symptoms in children usually are sneezing, nasal congestion, watery eyes or ears, hives, and coughing or wheezing resembling asthma (Boyce et al., 2010). The duration and timing of symptoms vary with exposure, some reactions occurring within minutes, whereas others are delayed (Sicherer & Sampson, 2018). Avoidance of the allergen is the first-line prevention, while the therapies are antihistamines, corticosteroids, and immunotherapy for chronic therapy (Canonica et al., 2019).

Food allergy is a rapidly increasing global health issue, especially in children, and there is no established cure except allergen avoidance (PMC, 2025). Oral

immunotherapy (OIT) is a new approach to induce desensitization by giving progressively larger amounts of the food allergen to develop immune tolerance (PubMed, 2014). OIT is, however, hampered by constant allergic reactions and patient variable adherence (Wiley Online Library, 2025).

Adjunct treatments like omalizumab, a monoclonal antibody anti-IgE, have been suggested to improve the safety and efficacy of OIT through decreased allergic reactions and enhanced speed of desensitization (Cureus, 2025). Meta-analyses and systematic reviews have established that the addition of omalizumab with OIT greatly enhances the rate of desensitization and maximizes the dose of allergen tolerated compared to OIT treatment alone (PubMed, 2025). Moreover, omalizumab has been linked to fewer side effects like anaphylaxis and better treatment compliance, although its long-term ability to induce tolerance after discontinuation is questionable (Biologics Review, PubMed, 2025).

OIT has been extensively investigated in typical food allergies such as peanut and cow's milk allergy, with meta-analyses reporting substantial increases in tolerance levels and reductions in allergen-specific IgE with therapy (Frontiers in Immunology, 2025). However, OIT is not without risk, including local and systemic allergic responses and infrequent but potentially serious complications such as eosinophilic esophagitis, necessitating close patient observation (PMC, 2025). The immunologic response to OIT involves decreased skin prick test reactivity and elevated allergen-specific IgG4 levels, reflecting a move towards immune tolerance (PubMed, 2014). Families and patients have enhanced quality of life with decreased anxiety and fewer dietary limitations after successful OIT (Wiley Online Library, 2025). Yet, full cost-effectiveness analyses of combining biologics such as omalizumab with OIT are absent and require further research (Cureus, 2025).

Multi-food OIT protocols supported by omalizumab were found to be effective in the management of multiple food allergies, with the percentage of children tolerating several allergens higher after treatment (PubMed, 2025). The method is highly useful in pediatric patients, as the condition is very common among children and there is a demand for more efficient, broad-spectrum treatments (PMC, 2025)

House dust mites (HDMs) were known as one of the most common indoor allergens and a major cause of allergic diseases such as asthma, rhinitis, and eczema around the world. (Shafque et al. 2018) Genetic and environmental factors can influence the allergy risk.(Candice et al, 2020). The other study shown the family history, urban living were found to be contributing factors for allergy diseases (Ibrahim et al., 2012). The blood group antigen may also influence allergic diseases (Abid, 2015). In Pakistan it's estimated that 23 million people were suffer from asthma (Abbas et al. 2012). Epigenetic studies have shown that changes in DNA methylation and histone modification play a crucial role in the pathogenesis of allergic diseases. (Wang et al, 2023). The study shown that allergic Rhinitis that is common types of allergy. It impacts approximately 400 million individuals worldwide, a greater incidence in Africa and Latin America.(Khan et Al 2024). Genetics play role in allergy development but environmental factor like diet, Lifestyle also influence allergy risk Prenatal and passive tobacco smoke exposure increase the risk of asthma.(Candice et al, 2020). Researchers found that 78.4% of 236 patients tested positive for this type of allergy. Dust and pollen were the most common allergens, with many patients (61.5%)(Akhtar et al, 2024).The most common allergic symptom were sneezing, and the most common triggering factor was house dust.(Kef & Güven, 2020). In Pakistan, allergic conditions were prevalent with regional and seasonal variability. Allergic rhinitis (24.62%) and urticaria (24.04%) were reported as the most prevalent allergies in a 2007 study conducted with skin prick tests (Ahmad, 2011). family history of atopy and indoor smoke exposure had a significant impact on allergy risk. The findings are in line with trends worldwide associating genetic and environmental determinants with the prevalence of allergy (Asher et al., 2006). Geographic

distribution revealed allergic rhinitis to be prevalent in Islamabad, Khyber Pakhtunkhwa, and Sindh, whereas urticaria was more prevalent in Rawalpindi and Baluchistan. Mixed respiratory allergies prevailed in Punjab and Khyber Pakhtunkhwa. Common aeroallergens were pollen, dust, paper mulberry, thresher, and raw cotton. The highest number of allergy cases was reported in Punjab, which reached its peak in August, showing seasonal patterns (Ahmad, 2011). In children, allergic rhinitis (28.5%), asthma (15.8%), and eczema (21.8%) were reported in a 2007 Karachi study (Khan et al., 2009). A retrospective study of 65,067 patients admitted at Islamabad's Allergy Centre showed that 68.6% were positive to aeroallergens, with mixed pollen, cotton-related allergens showing strong associations with asthma, allergic rhinitis, urticaria, and conjunctivitis (Ahmad, 2011). The prevalence of recurrent allergies among university students differs regionally but has similar patterns. In the UAE, in the state of Ajman, 40.8% of students reported allergic conjunctivitis, 34.9% reported allergic dermatitis, and 14.9% reported eczema, more so among females and with strong associations with family history (Jenny et al., 2014). The allergies had a negative impact on the school life and daily activities of the students. In Saudi Arabia's University of Hail, allergic rhinitis was reported by 51% of students with more frequent occurrence among males (Alqahtani et al., 2020), and 21% had rhino conjunctivitis diagnosed. In Anatolia, 16% of the students were found to have allergic rhinitis, each contributed by genetic and environmental factors in determining prevalence (Kara et al., 2018). Overall, allergic conjunctivitis, dermatitis, eczema, and rhinitis are common among students at rates normally between 15% and over 50%.

The prevalence and causative factors of allergic conditions among 200 university students in Dasuya, Punjab, India. Results showed high prevalence of allergy at a rate of 63.5%, with dust (24%) as the most frequently reported allergen, followed by sunlight (17%) and cosmetics (11%). Food, pollen, climate, synthetic fiber, and detergents were other reported allergens. The most frequent common symptoms were sneezing (19%), rhinorrhoea (18%), and pruritus (16%), with unpredictable durations of the symptoms. The research emphasized that allergies significantly influenced the daily life and routines of students (Mathta, et al., 2015).

Supporting evidence from Vadodara, India, reported a prevalence of allergic rhinitis in 19.22% of college students and its strong impact on academic performance (Chauhan et al., 2022). Most of the students knew they had an allergy, but very few of them had formal testing done or seen a physician. Nasal congestion and sneezing were frequently linked with asthma and decreased quality of life (Chauhan et al., 2022). Furthermore, more extensive national statistics highlight that allergic rhinitis is an increasing issue in India, influenced by urbanization and environmental exposure (International Journal of Otorhinolaryngology and Head and Neck Surgery, 2016).

Allergic conjunctivitis (AC) is an eye allergy that is prevalent in children and adolescents in Pakistan with a prevalence rate of 18–19% (Jandan et al., (2022). The 19.2% school children affected were found in one Karachi study, with rates slightly higher in boys, whereas in a Nawabshah study, similar rates were reported (Jandan et al., 2022). Diagnosis is mostly clinical, depending on symptoms such as redness, itching, and papillae (Khan et al., 2010).

Blood group B showed the highest allergy risk, A and O had similar levels, and AB was the most protected in the study population (Abid, 2015) Females and individuals with asthma were more likely confirmed allergies or allergic rhinitis than males ratio.((Kef & Güven, 2020).

House dust mites (HDMs) were recognized as major indoor allergens that lived in warm, humid environments and caused asthma, allergic rhinitis, and dermatitis (Valero & Serrano, 2004) Accurate species identification was difficult due to morphological similarities, so molecular techniques like ITS2 sequencing were used (Wei et al., 2011). In Pakistan, allergies and asthma had been increasing (Abbas et al.,

2012), .

A recent study among King Abdulaziz University medical students and interns in Jeddah, Saudi Arabia, estimated a 36.2% prevalence of diagnosed allergic diseases, with skin allergy (33.8%) and respiratory allergy (29.5%) being the most prevalent (Ibrahim et al., 2019). Family history and female gender were noted to be the main risk factors, with house dust (45.6%) and smoke (30.4%) as the predominant triggers. Allergies affected students' daily lives, including class absence (16.1%) and sleep disturbances (28.6%) (Ibrahim et al., 2019). Improved detection, awareness, and prevention programs are suggested by the study in order to mitigate allergy-related issues in this group of people. To support this, Almalki et al. (2023) identified a 39.9% incidence of allergic rhinitis in Saudi medical students, having a great impact on academic performance and quality of life. AR students had lower GPAs and higher rates of class absence. Dust mites and pollen were the most frequent common allergens, and symptoms were highest during winter and early spring. Symptoms in the nasal area were more correlated with academic problems than other allergy symptoms (Almalki et al., 2023).

Diagnostic testing for allergies is critical for determining allergic states accurately and making appropriate treatment. An up-to-date clinical history is necessary according to the current guidelines for choosing useful tests (Bernstein et al., 2015). Skin prick testing is still the gold standard for immediate hypersensitivity detection because of its very high specificity and rapid turnaround time, whereas in vitro methods such as specific IgE assays are useful alternatives when SPT is not possible. Organ challenge tests are reserved for the more difficult cases.

The guideline also cautions against unvalidated diagnostic procedures and the importance of relating test results to clinical signs to prevent misdiagnosis. It makes suggestions for diagnosing drug allergies, allergic contact dermatitis, and cell-mediated responses. Standardized test procedures and regional allergen considerations are advocated for enhanced diagnostic efficacy (Bernstein et al., 2015).

Skin prick test (SPT) was carried out by skilled technologists with allergen extracts pollen, mold, and food. The forearm was prepared, and pricked with a sterile lancet, appearance of red skin was taken as positive (Inam et al., 2016). PCR-RFLP of the ITS2 region was used to confirm the identification of *D. farinae* and *D. pteronyssinus* for house dust mild sampling (Beroiz et al. 2014). Restriction enzymes *HinfI* and *TaqI*, were used for extraction, after DNA was extracted using the QIAamp DNA Micro Kit, pursuant to modified. (Shafique et al. 2014). Emerging developments in prevention and treatment of allergies are aimed at enhancing outcomes and quality of life by employing approaches such as immunotherapy, biologics, early introduction of allergens, and precision medicine (Zadoo & Davis, 2025). Comprehension of the function of the epithelial barrier, immune system, and environment has also defined emerging practices (Science, 2023). Immunotherapy is ongoing, with subcutaneous immunotherapy (SCIT) still effective for frequent allergens. Newer therapies such as sublingual (SLIT), epicutaneous (EPIT), and short-course pre-seasonal immunotherapy are yielding encouraging findings (Abcam, 2025; Allergy Month in Review: February 2025, 2025). Intervening early, particularly in youngsters under four, is lowering the development of allergies, specifically peanut allergy (Schroer et al., 2025). Biologic agents like omalizumab (anti-IgE), dupilumab (anti-IL4R α), and tezepelumab (anti-TSLP) address inflammatory mechanisms and are showing promise for severe asthma and chronic rhinosinusitis with nasal polyps (Allergy Month in Review: January, 2025). Prevention programs now focus on early exposure to allergens and prevention of irritant exposures to decrease the potential for allergy and advancement of the atopic march (Zadoo & Davis, 2025).

New technologies such as digital health instruments, AI, nanomedicine, and CRISPR-Cas9 are investigated to make personalized allergy control possible, increase the efficacy of treatment delivery, and alter genetic inclinations (Abcam, 2025).

Moreover, microbiome modulation by probiotics and prebiotics has potential in enhancing immune reactions to allergens (Allergy Month in Review: January 2025, 2025). In total, these technologies look toward more preventive, effective, and personalized care in the management of allergic disease (Zadoo & Davis, 2025).

MATERIALS AND METHODS

Study Design

This study employed across-sectional descriptive research design to assess the prevalence and types of common allergies among students and staff of Karakoram International University (KIU), Gilgit-Baltistan. Cross-sectional studies are widely used in epidemiology for measuring the prevalence of health conditions and associated factors at a specific point in time (Setia, 2016).

Study area

The study was conducted at Karakoram International University (KIU), located in Gilgit, Gilgit-Baltistan, Pakistan. The target population included both academic and non-academic staff, as well as enrolled undergraduate and postgraduate students. Gilgit-Baltistan has a distinct geography, being nestled in the mountain ranges of the Karakoram, Himalayas, and Hindu Kush. The unique climate, high elevation, and environmental conditions of the region introduce a unique profile of allergens from the rest of Pakistan. The university receives students from all districts in Gilgit-Baltistan, with a representative and diverse population for investigating the prevalence of allergies. The large mountain air, seasonal fluctuations, and the contrasting degrees of urbanization in the surrounding environment provide a fascinating backdrop for a study of environmental and genetic factors—like ABO blood groups—on patterns of allergy.

Inclusion and exclusion criteria

The university students and employees, aged 18 years and above, who are enrolled or working at the university and are willing to give informed consent will be included in the study. Participants should be capable of answering the questionnaire. Both subjects having medically diagnosed or self-reported allergies (e.g., dust, pollen, food, skin, or drug allergies) and those with no history of allergies will be enrolled. Exclusion factors include participants who were below 18 years of age, visiting students, or those who can give incomplete or inconsistent questionnaire data and did not provide consent were not included in study.

Sampling Technique and Sample Size

A simple random sampling method was used to ensure equal representation of both male and female populations. Based on the total estimated population of KIU (approximately 8,000 individuals), the sample size was calculated using Cochran's formula, assuming a 95% confidence interval and a 5% margin of error, resulting in a sample of approximately 368 participants (Cochran, 1977). Using the given formula the sample size was calculated as follows $n = (Z^2 * p * (1 - p)) / E^2$ $n = n_0 / (1 + ((n_0 - 1) / N))$ For greater accuracy of results and reliable data analysis, a sample of (380-400) participants were selected from the total KIU population.

Data Collection Tool:

Data were collected using a structured, self-administered questionnaire adapted from previously validated instruments used in allergy prevalence studies (Kef & Güven, 2020; Sultana et al., 2022). The questionnaire consisted of the following sections: 1. Demographic information (age, gender, residence, etc.) 2. Personal history of allergic conditions (e.g., allergic rhinitis, food allergies, skin allergies) 3. Triggers and symptoms of allergies 4. Family history of allergic diseases 5. Seasonal or

environmental associations The questionnaire was reviewed and modified by two local public health experts for face validity

Data Collection Procedure

The data were collected during March–May 2025. Participants were approached in various departments, hostels, and university offices. After obtaining informed consent, they were given the questionnaire to fill out anonymously. Ethical approval was obtained from the Institutional Research Ethics Committee of Karakoram International University.

Data Analysis

Data were analyzed using IBM SPSS Version 23. Descriptive statistics (graphs, tables, , percentages, means) were used to summarize the prevalence and distribution of various types of allergies. Inferential statistics, such as chi-square tests, were applied to assess associations between allergic conditions and demographic variables, with a significance level set at $p < 0.05$.

Limitations of study

This study had some limitations. Firstly, since the data were gathered through self-completed questionnaires, there was a possibility of recall bias and inaccuracies in the reporting of allergy symptoms and diagnoses. Additionally, the absence of clinical confirmation through diagnostic procedures such as skin prick tests or IgE assessments meant that the presence of allergies was not medically verified. The sample was limited to KIU students and staff, which might have introduced selection bias and affected the representativeness of the sample. The research was conducted in a single geographical region, the findings might not be generalizable to populations in other areas with different environmental exposures and cultural lifestyles.

RESULTS

This research was conducted to determine the prevalence of allergy among university students and staff through a questionnaire. There were 1200 participants, of whom 390 were detected with positive symptoms of allergy such as dust, pollen, skin, or food reactions. The information was examined to investigate the correlation between allergy frequency and variables such as age, gender, blood type, vaccination, family history, and diagnosis region. The outcomes assist in the identification of prevalent allergy trends within an educational environment and potential risk factors among this group.

Student and staff.

	Frequency	Percent	Valid Percent	Cumulative Percent
staff	52	13.3	13.3	13.3
students	338	86.7	86.7	100.0
Total	390	100.0	100.0	

Description:

The table and graphs present the number of participants per category. Among 390 participants, 52 (13.3%) were staff, and 338 (86.7%) were students.

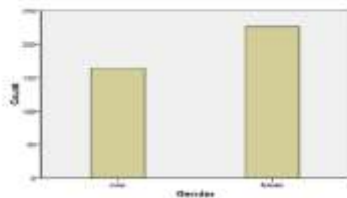


Gender.

	Frequency	Percent	Valid Percent	Cumulative Percent
male	164	42.1	42.1	42.1
female	226	57.9	57.9	100.0
Total	390	100.0	100.0	

Description.

Out of the total, 164 individuals (42.1%) were male, while 226 (57.9%) were female. This showed that females were more affected by allergies than males.



Age Groups.

	Frequency	Percent	Valid Percent	Cumulative Percent
20–25	330	84.6	84.6	84.6
26–30	11	2.8	2.8	87.4
31–35	2	0.5	0.5	87.9
36–40	18	4.6	4.6	92.6
41–45	12	3.1	3.1	95.6
46–50	16	4.1	4.1	99.7
56–60	1	0.3	0.3	100.0
Total	390	100.0	100.0	

Description

The largest number, 330 people (84.6%), fell in the 20–25 age category, and it was clear that the majority of participants were young adults—presumably students. Smaller percentages were noted in higher age ranges: 11 members (2.8%) were 26–30 years old, 18 (4.6%) were 36–40 years old, 12 (3.1%) were 41–45 years old, 16 (4.1%) were 46–50 years old, and only 1 member (0.3%) was in the 56–60-year-old group.

of participants were young
 ranges: 11 members (2.8%
 years old, 16 (4.1%) were 4



Allergy types.

	Frequency	Percent	Valid Percent	Cumulative Percent
dermatitis	111	28.5	28.5	28.5
conjunctivitis	52	13.3	13.3	41.8
rhinitis	94	24.1	24.1	65.9
seasonal	81	20.8	20.8	86.7
food	20	5.1	5.1	91.8
any other	32	8.2	8.2	100.0
Total	390	100.0	100.0	

Description.

The table shows that the most prevalent allergy was dermatitis (28.5%), followed by rhinitis (24.1%), seasonal allergies (20.8%), and conjunctivitis (13.3%). Fewer participants experienced food allergies (20 participants, 5.1%).

(24.1%), seasonal allergies (20.8
allergies (20 participants, 5.1%)



Allergens

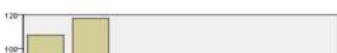
	Frequency	Percent	Valid Percent	Cumulative Percent
sunlight	108	27.7	27.7	27.7
dust	118	30.3	30.3	57.9
pollen	80	20.5	20.5	78.5
jewellery	13	3.3	3.3	81.8
soap, water, perfumes	9	2.3	2.3	84.1
egg	15	3.8	3.8	87.9
others	47	12.1	12.1	100.0
Total	390	100.0	100.0	

Description.

The most frequently reported allergen was dust (30.3% of the participants). Sunlight and pollen were also common, and 27.7% and 20.5% reported them, respectively. The less frequently reported allergens were egg (3.8%), jewellery (3.3%), and soap, water, or perfumes (2.3%).

Description.

The most frequent reported allergen was dust (30.3% of the participants). Sunlight and pollen were also common, and 27.7% and 20.5% reported them, respectively. The less frequently reported allergens were egg (3.8%), jewellery (3.3%), and soap, water, or perfumes (2.3%).



Diagnosis and Family History

Family history

	Frequency	Percent	Valid Percent	Cumulative Percent
YES	129	33.1	33.1	33.3
NO	260	66.7	66.7	100.0

Total	390	100.0	100.0	
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Diagnose

	Frequency	Percent	Valid Percent	Cumulative Percent
YES	118	30.3	30.3	30.3
NO	271	69.5	69.5	100.0
Total	390	100.0	100.0	

Description.

The table shows that 30.3% had a diagnosis of allergy, and 69.5% did not. Likewise, 33.1% had a history of allergy in their family, and 66.7% did not.

Vaccination.

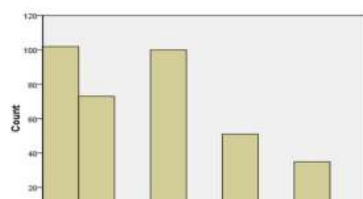
From the total participants, 25.4% said that they were vaccinated, while 74.1% of participants did not report being vaccinated, as shown in the given graph.

Description

From total participant (25.4%) said vaccinated as shown in given graph



Blood groups



Description.

The most prevalent blood groups were B+ (25.6%), A+ (18.7%), and O+ (9.0%). The least frequent were AB- (1.5%), B- (1.8%), and A- (1.8%). The positive blood groups were more frequently reported among participants with allergies than negative groups.

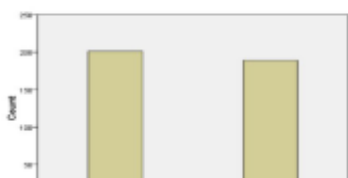
Area.

	Frequency	Percent	Valid Percent	Cumulative Percent
Gilgit	212	54.4	54.4	54.4
Astore	25	6.4	6.4	60.8
Hunza	31	7.9	7.9	68.7
Skardu	16	4.1	4.1	72.8
Diamer	10	2.6	2.6	75.4
Ghizer	42	10.8	10.8	86.2
Nagar	46	11.8	11.8	97.9
others	8	2.1	2.1	100.0
Total	390	100.0	100.0	

Description.

The table shows that the majority of people were from Gilgit (54.4%), followed by Nagar (11.8%), Ghizer (10.8%), and Hunza (7.9%). There were fewer participants from Astore, Skardu, Diamer, and other areas. The respondents were mostly from Gilgit.

Pollution and Diet.



Description.

The graph shows that, out of the total participants, 51.5% claimed to follow a balanced diet and 48.5% did not. Regarding pollution, 34.6% were exposed, while 65.4% claimed no exposure, indicating that diet and pollution may also contribute to the occurrence of allergies.

DISCUSSION

This research examined the prevalence and risk factors of allergic diseases among Karakoram International University (KIU) students and employees, Gilgit-Baltistan.

Prevalence and Demographic Patterns

From 1200 participants, 390 (32.5%) were identified as having allergic symptoms, establishing that allergy is a prevalent health issue in the population. This rate of prevalence correlates with worldwide statistics, which indicate that allergic illnesses like rhinitis, dermatitis, and asthma are on the rise globally. Khan et al. (2024) indicated that allergic rhinitis occurs in about 400 million individuals worldwide, and approximately 23 million people in Pakistan alone have asthma (Abbas et al., 2022). Women respondents (57.9%) were more commonly affected compared with men (42.1%), which resonates with observations by Kef & Güven (2020), who reported that females and asthma patients have a higher allergy incidence rate.

Types of Allergies and Triggering Factors

The prevalent types of allergy observed in our study were dermatitis (28.5%), rhinitis (24.1%), and seasonal allergy (20.8%). This is consistent with the literature, which identifies rhinitis and dermatitis as frequent presentations of allergic illness (Khan et al., 2024). The environmental allergens were the main causal agents for these allergic reactions, with dust (30.3%) being the most common, followed by sunlight (27.7%) and pollen (20.5%). These results were consistent with international research that has indicated dust mites and pollen as prominent indoor and outdoor allergens (Akhtar et al., 2024).

Genetic and Familial Associations

A considerable percentage of the participants (33.1%) had a family history of allergy, which supports the literature's contention that an individual's genetic makeup plays a role in determining allergy risk (Candice et al., 2020). Another epigenetic process involving DNA methylation and histone modification, as described by Wang et al. (2023), could be responsible for this family susceptibility.

Blood Group Correlation

Allergic reactions were most often linked to blood group B+ (25.6%), according to the study. This is supported by Abid (2015), who found that patients of blood group B were more at risk of allergy. Our findings that positive Rh factor blood groups (B+, A+, O+) were affected more commonly than negative groups provide additional information to regional literature on the immunohematological association with allergic sensitivity.

Diagnosis, Awareness, and Vaccination

Just 30.3% of the involved participants received a formal diagnosis, confirming a lack of allergy awareness and consulting a doctor. This confirms the underdiagnosis of

allergic diseases in Pakistan as highlighted by Inam et al. (2016). Furthermore, just 25.4% of participants were vaccinated, implying a lack of awareness of available immunotherapy or limited access to allergy-specific vaccinations.

Environmental and Lifestyle Influences

Environmental pollution and food habits were also taken into account in this research. Around 34.6% of the participants were exposed to pollution, and 51.5% consumed a healthy diet. These dietary habits have been related to allergic development in previous studies. Candice et al. (2020) reported diet, lifestyle, and tobacco smoke as causative environmental factors in allergy pathogenesis.

Geographic Distribution

Participants were mostly from Gilgit (54.4%), followed by lesser proportions from Hunza, Nagar, and other areas. High levels of pollution, an unbalanced diet, and higher population density may increase the risk of allergy in comparison with other regions (Candice et al., 2020).

Finally, findings from the present study validate trends found in the literature in addition to providing novel regional insights into allergy prevalence and determinants. Results highlight the importance of raised awareness, early diagnosis, and region-specific public health action aimed at reducing the allergic disease burden among university students.

CONCLUSION

Allergic diseases are multifaceted immune diseases that continue to increase worldwide, having a significant effect on quality of life and the healthcare system. The most prevalent allergies found were dermatitis, allergic rhinitis, and seasonal allergies, triggered primarily by dust, sunlight, and pollen. Major risk factors were female gender, the 20–25 years age group, positive blood groups (particularly B+ and A+), family history, pollution, improper diet, and not being vaccinated. Management of allergies through education, changes in lifestyle, and improved access to healthcare can diminish the burden of allergic diseases and enhance the quality of life in the university population. Early diagnosis, awareness, and improved management strategies are essential to reduce the burden of allergic diseases in the region.

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