COMPARATIVE ASSESSMENT OF THE ORAL IMMUNE BARRIER IN PATIENTS WITH ALLERGIC BACKGROUND UNDERGOING PROSTHETIC TREATMENT WITH PLASTIC VS. CERAMIC CROWNS

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Abstract The high prevalence of allergic diseases (AD), which continues to rise annually, has become a major public health concern worldwide in recent decades. This issue is the focus of numerous regional and international epidemiological, immunological, and clinical studies.

Keywords: Allergic diseases, allergic rhinitis, plastic prosthetics.

Allergic diseases are increasingly attracting attention across medical specialties. Despite being known for over 2,500 years, challenges in diagnosing, treating, and preventing allergic pathologies remain highly relevant.

According to the World Health Organization (WHO), the 21st century will be the "era of allergies," as the prevalence of allergic diseases doubles every 10 years, reaching epidemic proportions. Currently, allergies rank among the six most common human diseases.

In highly developed countries, the percentage of allergy sufferers—particularly among young populations—is significantly higher than in developing nations. Contributing factors include industrial pollution, adverse social conditions, increased medication use, widespread disinfectants, pesticides, genetically modified foods, and dietary changes. Statistical data from Germany, England, France, and others indicate that 10–30% of urban and rural populations in economically advanced regions suffer from allergies.

The economic burden of allergies is substantial, encompassing both direct treatment costs and expenses for managing allergy-related complications. Given that allergies predominantly affect young, working-age individuals, they lead to significant productivity losses and socioeconomic strain.

Theories Explaining the Allergy Epidemic:

Hygiene hypothesis: Proposed by David Strachan in 1989, this theory posits that excessive hygiene reduces exposure to antigens, leading to immune system overreactions to harmless substances. Epidemiological data support this: allergic and autoimmune diseases are less common in developing countries, and immigrants to developed nations show increased susceptibility over time. Antibiotic use in infancy,

antibacterial products, and cesarean sections correlate with higher asthma rates (though causality remains unproven).

Definition and types of allergic diseases

Allergy is a chronic condition caused by an inappropriate, undesirable, and unexpected immune response to substances that are typically harmless to humans, such as foods, medications, plant pollen, insect venom, and other agents.

Allergic reactions occur when these substances come into contact with body tissues, triggering symptoms localized to those tissues (e.g., skin, digestive system, respiratory tract, etc.) [86].

Historical background: the term "allergy" was coined by the Viennese pediatrician Clemens von Pirquet in 1906. He observed that symptoms in some patients could be provoked by specific environmental substances (allergens), such as dust, pollen, or certain foods. For decades, hypersensitivity was thought to arise from dysfunctional immunoglobulin E (IgE). However, subsequent research revealed that multiple mechanisms involving diverse chemical mediators underlie the wide range of symptoms previously categorized as "allergy".

ETIOLOGY OF ALLERGY

The etiology of allergy involves four key components:

1. Extraordinary Irritant (Antigens)
2. Environmental Conditions
3. Entry Routes
4. Host Reactivity

CLASSIFICATION OF ANTIGENS

1. Extraordinary Irritant (Allergens)

- Endogenous vs. Exogenous
- Non-infectious vs. Infectious

Exogenous allergens include:

- Medications: Penicillin, sulfonamides, iodine.
- Household: Dust mites, animal dander, mold spores.
- Plant-based: Pollen (flowers, grasses), insect venom, plant sap.
- Food: Cow’s milk, egg proteins, fish, citrus fruits, nuts, meat, coffee, honey.
- Industrial: Dyes, latex, metals.

Key allergens:

- Penicillin, household dust, pollen, insect venom, cow’s milk, egg proteins, fish, citrus fruits, nuts, fungi, synthetic dyes, bacterial fragments.

2. Environmental Conditions

Factors exacerbating allergic reactions:

- Physical: Extreme temperatures, ionizing radiation, UV exposure, electromagnetic fields.
- Chemical: Ozone, nitrogen oxides.
- Dietary: Excessive carbohydrate or protein intake.

3. Entry Routes

- Respiratory: Inhalation of allergens (e.g., pollen, dust) triggers cough, asthma.
- Gastrointestinal: Ingestion (e.g., food allergens) causes inflammation.
- Parenteral: Blood exposure (e.g., insect venom, medications) may lead to anaphylactic shock.
- Cutaneous: Skin contact (e.g., latex, cosmetics) results in dermatitis, eczema.

4. Host Reactivity

Allergic predisposition is influenced by:

A. Nervous System

- Neurotic tendencies and parasympathetic nervous system (PSNS) activation (via cholinergic pathways: cholinesterase → Ca^{2+} → cGMP) increase hypersensitivity to allergens.

B. Endocrine System

- Pro-allergic hormones: Growth hormone (GH), thyroxine, mineralocorticoids, thyroid-stimulating hormone (TSH).
- Anti-allergic hormones: Adrenocorticotropic hormone (ACTH), glucocorticoids, sex hormones.

C. Immune Response System

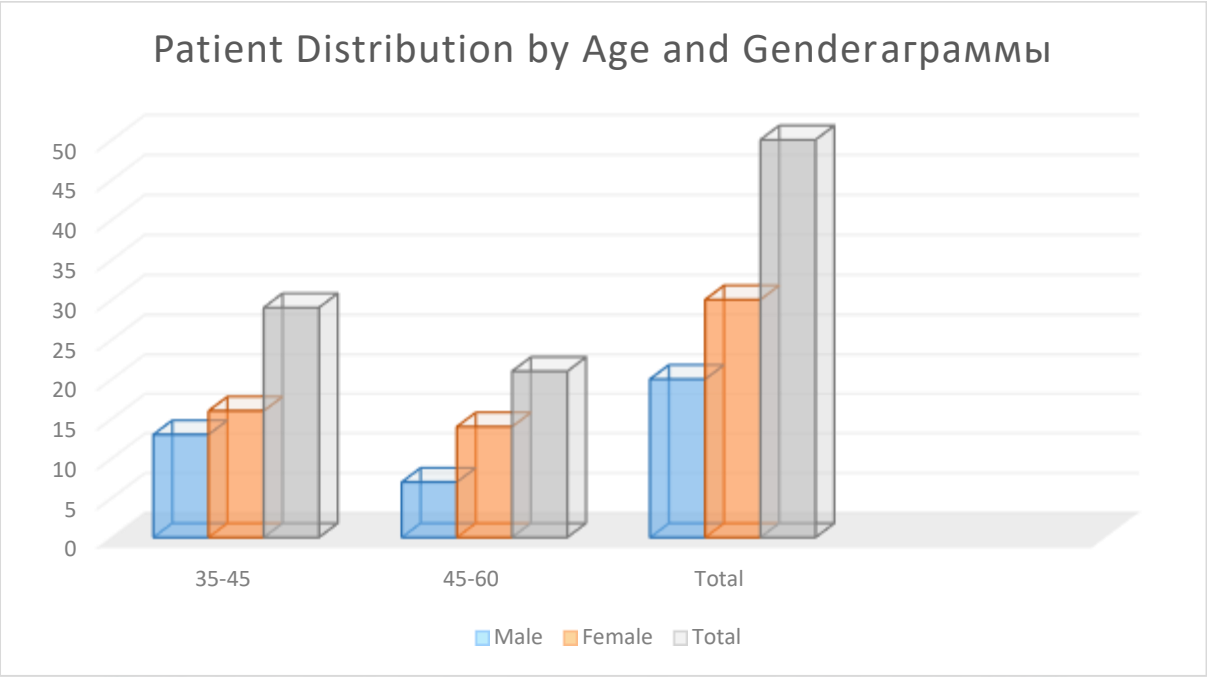
- Genetic mutations in HLA genes (chromosome 6) disrupt immune regulation. These genes control:
- Immune response (Ir): Determines T-helper (Th) cell sensitivity.
- Immune suppression (Is): Regulates T-suppressor (Ts) cell activity.
- Mutations primarily impair Ts function, leading to hyperreactivity and immune dysregulation.

Age-Related Reactivity

- 0–3 years: Food allergies dominate (e.g., exudative diathesis, dermatitis).
- 3–7 years: Respiratory allergies emerge (e.g., allergic bronchitis, asthma).
- Adulthood (>30 years): Recurrence or exacerbation of respiratory or cutaneous allergies.

Research Material

The study included 50 patients (20 males, 30 females; aged 35–60) with allergic backgrounds. Participants received 25 plastic and 25 metal-ceramic crowns for anterior/posterior teeth. Mean age: 39.7 ± 3.2 years. Distribution by age and gender:



Patient Examination Methods

Oral hygiene status was assessed using the Silness-Löe Index (Silness J., Löe H., 1962), which evaluates plaque accumulation in the gingival area. Plaque quantity was measured around each tooth neck using a probe inserted slightly into the gingival sulcus. Hygiene levels were scored as:

- 0: No plaque on the probe tip.
- 1: Minimal plaque on the probe.
- 2: Visible thin plaque layer near the tooth neck; significant plaque on the probe.
- 3: Abundant plaque and food debris in the gingival area.

Scores were summed and divided by the number of teeth examined.Gingival bleeding was evaluated using the Mühlemann Index (Mühlemann H.R., Son S., 1971), modified by Cowell (Cowell I. et al., 1975). A periodontal probe was gently moved along the gingival sulcus wall. Bleeding intensity was scored as:

- 0: No bleeding.
- 1: Bleeding after 30 seconds.
- 2: Immediate bleeding (within 30 seconds).
- 3: Bleeding during eating or brushing (patient-reported).

The index value was calculated by dividing the total score by the number of teeth examined.

Periodontal tissue inflammation was assessed using the PMA Index (Parma C., 1960).

Radiographic evaluation of teeth and periapical tissues, root dimensions, and topography was performed using targeted X-rays obtained with the *Image X* dental unit (Satelec, Finland).

Diagnostic plaster models of the jaws were analyzed to study occlusion, dental arch relationships during articulation phases, and to plan preparatory measures for prosthetic treatment.

Follow-up period: Patients were monitored for 1 year, with check-ups at 3, 6, and 12 months to detect complications.

Prosthetic treatment outcomes were assessed through:

- Patient-reported subjective sensations.
- Visual inspection of crown integrity and surface condition (color, gloss).
- Probing of marginal fit.

Saliva Analysis

Saliva serves as a valuable non-invasive method for assessing systemic and oral health. Collection is simple, painless, and safe for both patients and medical staff, with minimal infection risk compared to blood sampling.

Study material: Saliva from 60 individuals (aged 35–60 years) with an allergic background and no salivary gland pathologies was analyzed. Participants were divided into three groups:

1. Control group: 10 individuals.
2. Plastic crown group: 25 individuals.
3. Metal-ceramic crown group: 25 individuals.

Saliva was collected 1, 3, and 6 months post-prosthetics.

Collection protocol:

- Fasting morning collection (8:00–9:00 AM).
- Pre-rinse with 100 mL of warm, pale-yellow furacillin solution.
- Passive drooling into a sterile tube (≈10 mL) over 10–15 minutes.
- Patients were advised to discontinue immunomodulatory drugs several days prior to sampling.

Modern protein analysis technologies enabled the measurement of immune biomarkers and their biological activity in saliva, even at minimal concentrations.

RESULTS

According to the retrospective analysis (2019–2020), 18,477 patients aged 35–60 years sought care at the Republican Scientific Specialized Allergy Center in Uzbekistan, including 10,908 women and 7,569 men**, indicating a significant burden of allergic diseases in this population.

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