



## Allergic-Atopic Diseases with Personality and/or Psychological Factors Association: A New Approach on Integrative Science

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### ABSTRACT

Currently, allergic-atopic diseases have become a public health problem, although their existence dates back to remote times, today they have become one of the most common pathologies worldwide. With rapid growth in the incidence of this disease, it can be estimated that 50% of the inhabitants of industrialized and/or developed countries will be affected by it. On the other hand, the term personality is defined as "the individual difference that constitutes a person and distinguishes it from another". It represents structural and dynamic characteristics of individuals, which intervene in responses to different environmental situations. Just as allergies in the present era, psychological pathologies reached their peak in the last decade, which is related to the busy contemporary life that governs society. This has generated scientific interest, where it has been postulated that psychological factors (personality types), could make a person more prone to suffer from allergic symptoms. With this background this present review arises, "personalities would be able to influence the immune system, modifying the susceptibility to develop an allergy." A retrospective study was carried out through a systematic quantitative bibliographic data and/or meta-analysis, where 71 articles were analyzed, through different website search engines. Finally, this research wants to determine, through a bibliographic review, if there is a real relationship between allergic diseases with personality types. Using the obtained results as a diagnostic reference, will provide an integral view over a patient, thus achieving a comprehensive vision of the pathologies and its relationship that are developing nowadays.

**Key words:** Immunology; Allergy; Personality; Pathologies

### INTRODUCTION

Allergic-atopic diseases such as rhinitis, asthma, atopic dermatitis and conjunctivitis, are an exaggerated manifestation of the immune system against normally innocuous substances, called allergens (of protein nature), which are capable of inducing an immune response. Then, they are referred as disorders of the immune system that present

hypersensitivity reactions causing tissue inflammation among other clinical symptoms. These disorders are conditioned by environmental factors and the genetic predisposition of each individual.

Hypersensitivity reactions are divided into 4 types (I, II, III and IV), being type I the most typical allergic diseases. This type of hypersensitivity is an immediate manifestation, mediated by IgE antibodies, that underlies many allergic and/or atopic

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disorders such as rhinitis, dermatitis, asthma, among others. They are triggered when allergens cross-react with receptor-bound IgE in mast cells, basophils and eosinophils. When activated, these cells induce inflammatory reactions that cause release and synthesis of different chemical mediators, which are responsible for the symptoms that accompany this type of hypersensitivity [1].

### Physiology of Type I Hypersensitivity Reaction

When an allergic person take contact with allergens, generally by inhalation or ingestion, an immune system response occurs undergoing two processes, one of sensitization and the other of re-exposure known as hypersensitivity. Then, this type of hypersensitivity corresponds to an immediate reaction, which takes place within the first 15 minutes, from the interaction of the allergen with the corresponding IgE (preformed); in people previously sensitized to that allergen [2].

The first thing that might happen, to have a reaction, is the entry of the allergen, generally through the skin or the mucous membranes, of the respiratory tract or the gastrointestinal tract. Once admitted, it is recognized as foreigner by antigen presenting cells, which induce T helper cells type 2 response (Th2) which secrete a pattern of cytokines, that stimulate B lymphocytes to produce IgE antibodies, which finally bind to high affinity receptors on the membrane of mast cells, basophils and eosinophils. This first stage is known as allergen sensitization and in this first contact, the individual does not present allergy symptoms, since they are being sensitized and therefore, don't have the immunoglobulins required. It will be in the second contact when symptoms occur.

When a person is newly exposed to the same allergen, binding to the specific IgE bound to the membrane of the already sensitized mast cells, basophils and eosinophils occurs, which leads to the activation and subsequent degranulation of these cells. This results in the release of vasoactive and inflammatory mediators (histamines, chemotactic factors, leukotrienes, platelet activating factor) that cause vasodilation, increased capillary permeability, glandular hypersecretion, smooth muscle spasm and tissue infiltration by eosinophils and Th2 lymphocytes among other inflammatory cells that modulate the actions of this type of hypersensitivity [3].

### Relationship between the Immune System and the Nervous System

Classical data about allergic-atopic diseases, suggests that an asthmatic-allergic crisis can be triggered by various stimuli or environmental factors that vary from person to person. In this sense, studies have shown that psychological processes, such as stress, suppress immune function and therefore could be involved in the origin, permanence or aggravation of certain pathologies such as those described above. This relationship would be explained by the complex communication between the nervous system and the immune system, which is given by chemical messengers secreted by nerve cells, endocrine organs and cells of the immune system. Therefore, the link

between these systems is based on the exchange of information that occurs between them that means they share a molecular type of language where neurotransmitters, hormones, cytokines and receptors are shared by both systems [4]. Then, a communication homeostasis is maintained through the hypothalamic-pituitary axis. If this balance is lost, alterations could occur in some section of this complex communication network, which would promote increase in the susceptibility or inhibition of a disease.

### Personality and Psychoneuroimmunology

On the other hand, the term personality, a word derived from "person", was used in ancient Greece to refer to the mask used by theater actors during their performances. Actually, personality describe the apparent characteristics of each individual, until reaching the current concept that defines the royal academy of language as "the individual difference that constitutes a person and distinguishes it from another". In effect, personality represents the structural and dynamic properties of individuals, which intervene in responses to different environmental situations. These personality characteristics have carried to numerous approaches that, based on their features, different personality types that characterize a disease can be determined. It is important to note that the use of the term "personality type" refers to a behavioral pattern in an amplified sense, as a form of simplify the complexity of individual human behavior.

In this way, various authors such as Friedman and Rosenman describe different types of personalities or behavior patterns (A, B, C and D). Each personality pattern is different from the other. Type A is aggressive, type B is positive, type C is repressed and insecure and type D is negative. Similarly, they postulate that these characteristics or personality traits are modifiable, so that the interaction of the individual with the environmental and social variables that surround him could alter him, making him more vulnerable or resistant to situations of health risk [5].

When type A personality is described, we mean an irascible, tense, irritable, problematic, dominant, hostile, authoritarian, ambitious, stubborn, energetic, impulsive, competitive, self-centered, insecure and cold person, who tends to hide his own deficiencies by blaming to other people. Faced with the most minimal situation, it can provoke in him an exaggerated aggressiveness, which is generally expressed in behaviors such as distorting the success of others, discrediting their ideas or denying them help. Repressed anger, irascibility and bad mood are associated with a series of cardiovascular and neuroendocrine responses that can contribute to the development of hypertension and coronary heart disease; reason why type A pattern is a risk factor that acts together with others, such as smoking, hypertension, anxiety or high level of LDL cholesterol, increasing the chances of developing angina or myocardium heart attack. Type B personality is characterized by being relaxed, calm, satisfied person, who feels comfortable with himself, so he has no need to compete or feel superior to others, is empathetic, warm and confident of himself; becoming the ideal personality to maintain health

and avoid disease, that is, this could act as a protective factor against stress and anxiety disorders.

In the type C personality, we referred to a subject who is emotionally inhibited, not assertive, who can control expressions of hostility and everything that may entail conflict with others. He is a person who tends to submission, is passive, introverted, obsessive, conformist, complacent and insecure; it has been described that it could be associated with infectious diseases, allergies, skin conditions and cancer [6].

Finally, the type D personality, who represents a socially inhibited person, who keeps himself apart from others, feels tense and insecure in the presence of others, has little assertiveness, poor social skills, is pessimistic, depressive, is always worried about something, distraught, in a bad mood, easily irritated, negative and has a negative view of himself; reason why the illnesses that are predisposed to suffer are depression and anxiety.

The branch of psychoimmunology is the discipline that tries to elucidate the possible correlation between body and mind, since it is based on the interrelation of the psychological characteristics of each person (behavior, personality, cognition, emotion, mood, memory and intellect) and the responses of the organism, with their respective clinical implications. Various authors reveal that factors such as personality may be capable of producing a change in the neuroendocrine system that could mediate an alteration in the immune system. Therefore, it is postulated that the personality with the disease would be linked, being a manifestation of the same causal agent. Then our working hypothesis is that personality can modulate the immune response, modifying the susceptibility to develop an allergy in humans.

## MATERIALS AND METHODS

This retrospective study was carried out through a quantitative systematic bibliographic data and/or meta-analysis. This scientific study technique is closely related to evidence-based medicine, which in turn aims to rely on the best scientific information available to apply to clinical practice. So, understanding and interpreting the scientific evidence implies knowing systematic reviews and/or meta-analyses of clinical trials. A review of this type is based on the collection of relevant information, in order to obtain a concise demonstration in solving a specific problem; its quality depends on two stages, the acquisition of evidence and its synthesis [7].

### Systematic Search in Biomedical Websites

To carry out this study, articles were analyzed, considering inclusion and exclusion criteria to validate this research. A methodical and exhaustive search of relevant biomedical scientific studies in the association between personality and allergy was carried out, through different search engines of websites such as Research Gate, Redalyc, Medline, PubMed

and Google Scholar. For this, key words such as allergy, association, personality and personality types were used.

### Articles Selection

From the identified articles, a screening of those that were relevant was carried out. There must be a balance between precision (number of relevant studies detected over the total of existing studies) and sensitivity (number of relevant studies detected over the total of existing relevant studies). Based on this same principle, a rigorous analysis of the articles was made using explicit exclusion and inclusion criteria, completely reviewing the studies that contained information relevant to this research, in order to reduce biases, irrelevant or low quality data [8].

#### Inclusion criteria:

- Articles with associative information between personality and allergy.
- Articles involving similar molecular methods and techniques.
- Research carried out between 2000 and 2019. Since 2000 incidence of allergy has had a constant growth.
- Also, studies with overlapping populations (different publications from the same series of patients) must be taken into account. The study with the largest size, the longest follow-up time and/or the one with the best experimental design will be included.

#### Exclusion criteria:

- Articles with non-associative information between personality and allergy.
- Research with a date less than 2000.

### Statistical Analysis and Information Synthesis

In this review, an accurate, meticulous and orderly compilation of all information presented in each published article was made.

A database was created that worked as a method to systematize all important parameters that were compared. The data necessary to summarize the included studies was extracted, the biases of each study were evaluated, identifying the quality of the available evidence and finally, tables synthesized the evidence.

From each selected publication, a history of the prevalence of each personality was obtained, which was included in the study along with other important references from the cohort such as: Demographic history, sample size, number of patients excluded or lost to follow-up, personality of each patient, development or not of an allergy, among others.

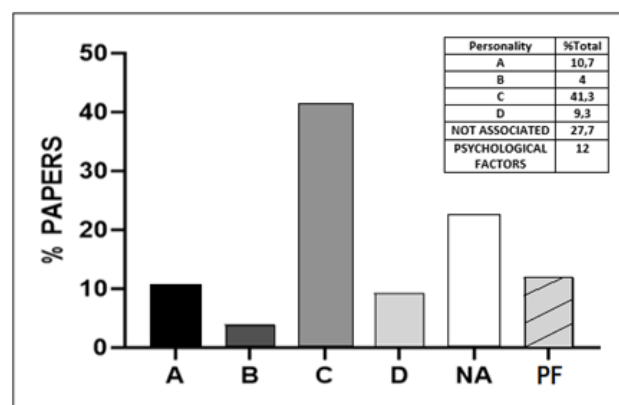
Data were analyzed qualitatively using descriptive statistics and quantitatively using inferential statistics. For the first, the number of articles and patients was classified as a percentage according to the type of personality and then graphed. In the second case, the quantitative data on prevalence were obtained from the sample universe of patients from each publication. After collecting this information, data were

subjected to statistical tests (one-way ANOVA), to finally graph the results and thus demonstrate the associations between personality types and the appearance of allergy. For this purpose, graphpad prism software, version 6.0 (La Jolla, San Diego, CA, USA) was used, where values such as: Mean ( $\bar{x}$ ), p value (p) and Standard Error of the Mean are shown (SEM), establishing the level of statistical significance at  $p < 0.05$  [9].

It should be noted that the results of the selected studies were combined, which measured the same variables, obtaining weighted means. Thus, it is possible to have a broader vision, considering both the variability of an individual study and between studies, in order to improve the validity of the conclusions. Therefore, using this method allowed studies with greater variability or a smaller sample size to have less influence on the results.

## RESULTS

A total of 71 articles selected using the aforementioned exclusion and inclusion criteria were analyzed. From these studies it was obtained that 10.7% significantly associated allergy with type A personality, 4% with type B personality, 41.3% with type C personality and 9.3% with type D personality (Figure 1). Furthermore, 12% of the articles analyzed failed to associate the development of an allergy with a specific personality, but they did associate psychological factors that are shared in the descriptions of the personality types already mentioned. Finally, in 22.7% of the articles, no significant association was found between allergy and a specific type of personality.



**Figure 1:** Association between allergy and personality types (A, B, C and D). Data expressed as % of publications. NA: Not Associated, FS: Psychological Factors.

Of the 71 articles analyzed, 34 of them were associated with a specific personality type; in descending order we have the type C personality with 47.1% (16/34), then the type A personality with 23.5% (8/34), followed by the type D personality with 20.6% (7/34), to finish with type B personality, which covers 8.8% (3/34) (Table 1). Likewise, the number of patients or cohorts of these articles with the different personality types was analyzed and quantified, estimating that 54.2% of them presented a type C personality, 20.3% were type D personality, 17.9% type A personality, while only 7.6% corresponded to type B personality.

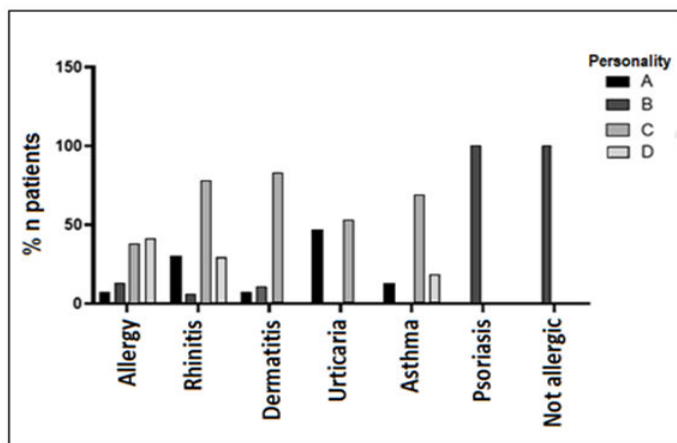
**Table 1:** Number of articles and allergy patients associated with different personality types.

Personality types	N° papers	% Associated articles	N° patients	% Patients
A	8	23.5	234	17.9
B	3	8.8	99	7.6
C	16	47.1	709	54.2
D	7	20.6	266	20.3
Total	34	100	1,308	100

According to the different types of allergic diseases, it was obtained that type C personality had an outstanding participation among allergy types, standing out from the rest of the other personalities described (Figure 1). In common allergy, the highest prevalence was of the type D personality (41%) together with the type C personality (38.2%), but without significant differences between them [10]. The same occurs in urticaria, which although the highest percentage was in personality C (53%), there was no significant difference between it and type A personality (46.9%) (Figure 2). On the other hand, in rhinitis, atopic dermatitis and asthma, the personality that presented more predominant significance

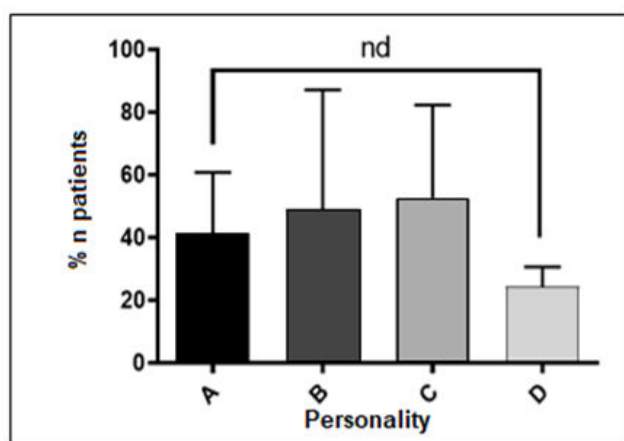
over the others was the type C personality (77.9%, 83% and 68.6% respectively). On the contrary, in common allergy, atopic dermatitis and asthma, the type of personality less prevalent was type A (13.4%, 10.1% and 12.7% respectively), while in rhinitis the least prevalent was type B personality (6.1%). It is also observed that in patients with psoriasis and in non-allergic people, the prevailing personality is type B.





**Figure 2:** Comparison between prevalence of each personality in the different types of allergies and/or atopy. Data expressed as % of n° patients.

The one-way ANOVA statistical analysis of the quantitative type, used to analyze the data of the 34 studies that were associated with a specific personality type, showed that although the prevalence of type C personality in allergies was a percentage higher than in other personalities, this is not significant according to the calculation of  $p=0.1704$ ,  $SEM=7.455$  and  $\bar{x}=52.5\%$ ; neither were any of the other personalities (A, B and D), if they were compared to each other (A  $SEM=6,863$ ,  $\bar{x}=41.36\%$ ; B  $SEM=22,016$ ,  $\bar{x}=48.96$ ; D  $SEM=2.385$ ,  $\bar{x}=24.29$ ) (Figure 3). It is important to note that personality D is the one with the least standard error, so this is the most reliable data as a result.



**Figure 3:** Quantification of allergy development results according to personality type. Data expressed as % of n° patients. ANOVA one-way statistical test for unpaired data.  $n=34$ ;  $p=0.1704$ ;  $na$ =not significant.

## DISCUSSION

This study revealed the existence of an interaction between both analyzed parameters, attributing an implication of personality in allergies, which is externalized in an important number of articles associating both variables with significance, for which a real value to this type of psychological aspects in the development of the immune

response [11]. According to the obtained results, 65.3% of total of the articles analyzed presented an association with a personality type (A, B, C or D). This would be explained by the close connection between body and mind that is reflected in the interaction between central nervous system, endocrine system, immune system and the brain (mind/behavior) that is in charge of integrating the three systems indicated, directing its action to the maintenance of homeostasis. On the other hand, emotions govern all systems of an organism, translated into chemical substances called neurotransmitters that might trigger internal reactions optimizing or weakening our functional state. Furthermore, if the expression of emotions is repressed, we also repress organic functions that long term translates into discomfort or illness. Likewise, emotional attitude has a direct relationship with the immune system since it reacts better if you have positive behavior than a negative attitude. Furthermore, a person who normally expresses happiness (good humor, love, friendship, joy and positivity) is less likely to contract a serious illness than someone who is angry, sad, fearful, depressed or apprehensive; in fact, when we face moods such as anger, fear or hopelessness, cortisol levels rise and this hinders the functioning of the immune system [12]. These last mentions are the descriptive characteristics that govern the different types of personalities (A, B, C and D) and those that are associated with allergic symptoms.

As the predominant personality, among the 71 articles analyzed, the participation of the type C personality in the development of allergic processes stands out, with a percentage of 41.3% that translates into a difference three times greater if compared to the second most high corresponding to type A personality with 10.7%. Furthermore, if it is used as a parameter, the number of articles that presented a personality involved in their studies (34 of 71), those that found a type C personality corresponds to a total of 16 (47.1%), this value being the double the type A personality that follows in descending order with a total of 8 (23.5%) related studies. One explanation for this phenomenon is that there is an impact of personality on the immune system not only because of the neurochemical communication of the systems involved, but also because the emotional factor that personalities express; particularly in type C there is an emotional withdrawal that is based on the suppression of emotions and an inability to express their feelings. This biologically influences the immune system since these people have high production of stress hormones such as cortisol, in addition to brain chemicals that have an analgesic effect, which block and reduce the immune response, resulting in increased susceptibility and hypersensitivity response to allergens that under conditions of adequate sensitivity do not produce a pathological response. Moreover, this imbalance is enhanced if the person has a genetic predisposition or has a family history of allergic disease.

Regarding type A personality, which continues in order of importance with respect to the analyzed data, both in the association between allergy and personality types and in the number of articles with allergy associated with the different types of personality, it follows that these results may be due

to the characteristics that identify type A personality, which in summary speaks of a person who has a constant sense of urgency, aggressive behavior, is always angry, little tolerance to frustration, extremely hard-working and demanding who commit to several activities at the same time and that therefore generate constant tension in their body. These conditions favor that the regulatory mechanism (neuroendocrine), concentrates its actions on maintaining an alert attitude and optimizing the resources of energy expenditure, partially deactivating the systems that consume most energy, such as the immune system, so that the individual is more exposed to allergic-type reactions and in this way the manifestation of the second place of type A personality in the types of personality described.

Regarding different allergic diseases that were considered in this study and their prevalence with the different personality types, results suggest that type C prevails above the others described, which reaffirms what is detailed above where it is shown that emotional inhibition, the main characteristic of type C personality, significantly influences the proper functioning of the immune system. However, when interpreting the resolution of psoriasis and non-allergy patients, it is type B personality that stands out (protective factor of health). This is explained, since the former has a genetic influence independent of the personality types that the person may possess, that is, that it is of a personality type neither favors nor prevents the development of this pathology; while in non-allergy sufferers the same type B personality would explain why they do not appear with an allergy. These individuals would present a better way of responding to stressful situations, using adaptive strategies specific to this personality, which has a positive impact on their state of health, also resulting in a protective factor against the disease.

On the other hand, as can be seen in the one-way statistical analysis ANOVA (detail of the percentage of n patients who were associated with a personality type in each paper), non significant results were achieved, although it remained the predominance pattern of type C personality. It is believed that this was due to various causal agents such as, for example, that the study population was very large, existence of different types of allergies and/or atopies with different levels of tolerance (chronic, acute, seasonal, among others) that make it difficult to measure allergic population, so a homogeneous sample to be compared was not obtained. Furthermore, the analyzed studies had different designs, different sample sizes (n) and random allergy determination (with and/or without medical references), where even the methods used to determine the different personality types (A, B, C and D) were not the same in the articles analyzed, due to the large amount of psychological tests available to assess the psychological aspects of each personality. Therefore, this could also mean that some personalities were not valued in the same ways in each article. Likewise, most publications used skin tests to detect allergic patients, but they did not use any more reliable quantitative method, such as the determination of the IgE concentration for example, to rule out non-allergic (false allergic) individuals thus delivering a

more accurate result. Consequently, multiple restrictions emerged that increased the random error, the p value and the SEM that the statistical test used, altering the significance of the study.

An important point that should be mentioned is that in the last two decades there has been a worldwide increase in people suffering from allergies; many of these without a specific cause, so their treatment and recovery are not completely effective. This was the main reason why the study was conducted, which seeks to fill a gap in knowledge, inquiring into other aspects that are generally not considered when evaluating a patient. Focusing the study on psychological variables such as personality and thus being able to give a more comprehensive overview of the condition today. Based on these antecedents, a bibliographic search was carried out to demonstrate whether personality, being an important psychological aspect of how people behave physically, mentally and emotionally, was a substantial variable within the appearance of an allergy. Studies like this may be of great importance for the future in the area of biomedicine, dermatology and motivate collaborative and interdisciplinary basic-clinical research with the area of clinical psychology. Thus, when considering the relevance that the influence of personality has on the development and chronicity of allergies, it could provide an invaluable contribution in early diagnosis, adequate treatment, recovery and prevention of this kind of pathologies. It is also important to be able to relate these findings with other diseases, to know the mechanisms of how the organism works in health, mental, emotional or psychological being able to understand the patient, then giving him a better quality of life.

As mentioned above, the importance of personality is not only focused on allergies, but could also have an implication, in immune and non-immune pathologies. Several prestigious authors in the area of personality, suggest that there is a close relationship between type C personality with cancer, mainly breast cancer, but it has also been linked to lung, cervical and prostate cancer. Various approaches to the subject have proposed this as a causal relationship, establishing personality C as a predictive pattern of cancer.

Other authors have proposed that type A personality has been related to cardiovascular diseases in middle and old adults, pointing out that type A personality is a continuous feature in these pathologies, but this is not categorical. Alternatively, research correlates type A personality with high plasma triglycerides and cholesterol levels, hyperinsulinemia, reduced clotting times, high plasma cortisol levels and low growth hormone levels, so this parameter could be considered in this type of patients.

Similarly, it has been exposed that the presence of type D personality is a vulnerability factor to suffer general anguish, being able to produce depression and/or anxiety, affecting the state of mental and physical health. It is also associated with disease promotion mechanisms, which can range from a simple flu to more complex pathologies, in individuals who were apparently healthy [13].

From this studies, psychoimmunology emerges as a field of research, on a possible relationship between psychological factors and/or personality with physiological diseases and its implication, based on this link, with the permanence or inhibition of a disease. Relationship between personality and psychological, biological and neurological states of the individual has given rise to different approaches to the state of health, establishing, for example, correlations of this with cardiovascular activity or immunological function. From this perspective, personality and disease would be apparent manifestations of the same origin.

### Limitations of the Study

- Classification according to personality type is poorly standardized in the field of psychology, this could have an impact on our analysis as a bias in the independent variable sample (personality type). Using standardized tests, the classification criteria can be unified, allowing a better correlation between allergy status and personality type in these patients.
- Not all studies specify the use of IgE tests or quantification methods for allergy diagnosis, so a comparison can be made between IgE levels and standard personality.

### Projections

The main projection of this research is to carry out an experimental study, based on the information currently obtained, using laboratory serological methods to quantify IgE, cortisol and other biomarkers of stress and allergy. In this way, we can determine the effects at a physiological level of the personality type on the modulation of the immune response, which allows us to obtain more precise results to be able to correlate type I hypersensitivity reaction with the personality type, according to a standardized parameter. In addition, this study could be one of the first steps for several future investigations on the subject, encouraging researchers and health professionals to internalize it, to improve health care and quality of life of patients not only allergic, but also with other important pathologies, which could have personality as an influential factor for their development [14].

## CONCLUSION

Based on results, it is established the association between allergic diseases with a specific personality type, being type C the personality more frequently associated with the appearance of atopic allergy. Type D personality is also associated but less frequently. Most frequent non-allergic reactions, such as psoriasis, occurs with a higher incidence in individuals with type B personality.

It's important to remark the necessity of more standardized studies in this area given the difficulty of these topics and the lack of knowledge in all possible factors and interactions that could affect this kind of study.

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