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Research Article

An Online Survey to Assess the Relationship Between Hypersensitivity Symptoms and Quality of Life Among a sample of 208 Libyan Residents

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ABSTRACT

Background:
Hypersensitivity symptoms are increasingly reported worldwide and are influenced by environmental, behavioral, and climatic factors. In Libya, harsh environmental conditions such as dust storms, air pollution, and widespread exposure to chemical irritants may contribute to a substantial burden of hypersensitivity-related symptoms, yet population-based data remain limited.
Objective:
This study aimed to identify common hypersensitivity triggers among Libyan residents, assess their impact on daily life, and examine the association between selected demographic and clinical factors and the severity of hypersensitivity-related impairment.
Methods:
A descriptive cross-sectional online survey was conducted between October and December 2024 among 208 participants residing in different regions of Libya. Data on demographic characteristics, self-reported hypersensitivity symptoms, triggers, treatment practices, and daily life impact were collected using a structured questionnaire. Descriptive statistics and multiple linear regression analysis were performed using Minitab 17 and Python-based tools. Daily life impact was assessed as a composite score reflecting functional and psychosocial consequences.
Results:
Dust and perfumes were the most frequently reported hypersensitivity triggers, while respiratory symptoms particularly sneezing and breathing difficulties were the most common clinical manifestations. More than half of participants reported not receiving any form of medical treatment. Multiple linear regression analysis showed that Type I hypersensitivity and medication use were significantly associated with greater daily life impact ($p < 0.001$), whereas demographic and geographic factors were not significant predictors. The regression model explained 8.2% of the variance in daily life impact ($R^2 = 0.082$).
Conclusion:
This study suggests that self-reported hypersensitivity symptoms are common and burdensome among the surveyed Libyan population, affecting physical, psychological, and social aspects of daily life. Although the findings are limited by self-reporting and convenience sampling, they highlight the need for improved public health awareness, better access to diagnostic and therapeutic services, and strengthened allergy management strategies in Libya.

1. INTRODUCTION

Allergies and hypersensitivity conditions represent chronic inflammatory states resulting from exaggerated immune responses to otherwise harmless environmental substances. These triggers include chemicals used in dyes and fragrances, certain foods such as peanuts and eggs, and airborne particles such as pollen and dust mites. Clinical manifestations range from mild discomfort to severe and potentially life-threatening reactions, including asthma and anaphylaxis. In recent decades, environmental changes, increasing pollution levels, and lifestyle modifications have contributed significantly to the rising incidence of these conditions worldwide [1,2], including in North Africa and Libya [3].

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In immunological terminology, hypersensitivity refers broadly to exaggerated immune responses encompassing both IgE-mediated and non-IgE-mediated mechanisms [5,6] In contrast, allergy is more specifically used to describe IgE-mediated type I hypersensitivity reactions [4,7] This distinction is particularly relevant in population-based surveys, as many reported triggers such as perfumes, detergents, and chemical cleaning agents may provoke irritant or non-allergic hypersensitivity reactions rather than true IgE-mediated allergy [7,8]. Accordingly, the present study focuses on self-reported hypersensitivity symptoms rather than clinically confirmed allergic disease.

Hypersensitivity disorders constitute a major global public health burden, negatively affecting physical health, psychological well-being, work productivity, and healthcare expenditure. Allergic rhinitis, for example, has been shown to significantly reduce workplace efficiency in Middle Eastern populations, with productivity losses of up to 27% attributed mainly to nasal congestion and sneezing (8). Additionally, prolonged exposure to environmental pollutants particularly vehicular air pollution has been associated with increased sensitization and worsening of atopic diseases [9]. Regional health assessments in Libya further emphasize the interaction between environmental factors and chronic health outcomes [3].

Libya is characterized by extreme environmental conditions, including frequent dust storms, prolonged dry seasons, and high ambient temperatures, all of which may exacerbate hypersensitivity symptoms. Commonly reported triggers in the region include dust, strong perfumes, cleaning agents, and certain foods. Despite this apparent burden, systematic research focusing on the prevalence, triggers, and daily impact of hypersensitivity conditions in Libya remains limited. Previous regional surveys have highlighted the need for questionnaire-based studies to estimate the burden of chronic diseases and their societal impact [10,11], yet data on allergy-related quality of life and healthcare-seeking behavior remain scarce.

The burden of hypersensitivity varies according to symptom severity, age, and the number of triggering agents involved. Individuals with multiple triggers or more severe symptoms often experience greater impairment in quality of life and may also suffer from associated psychological conditions such as anxiety, depression, and social withdrawal [12,13]. Although emerging technologies such as computational allergen-prediction systems offer promising research tools, their application in routine clinical practice within North African healthcare systems remains limited due to resource constraints.

This study aims to address existing knowledge gaps by investigating the prevalence, triggers, severity, and impact of self-reported hypersensitivity symptoms among Libyan residents using a systematic survey-based approach. By examining patterns of symptoms, treatment practices, and psychosocial effects, this research seeks to provide evidence to support improved clinical management and public health strategies for hypersensitivity conditions in Libya.

2. METHODOLOGY

A descriptive cross-sectional online survey was distributed between October and December 2024 through social media platforms. Convenience sampling was employed due to limited access to population-based sampling frameworks, wide geographic dispersion of residents, and reliance on internet-based participation. In this study, hypersensitivity refers broadly to immunological reactions, including IgE-mediated allergic responses (Type I) as well as delayed-type mechanisms (Type IV). It is acknowledged that exposures such as perfumes and soaps may induce non-allergic irritant reactions; therefore, the findings reflect self-reported hypersensitivity symptoms rather than clinically confirmed IgE-mediated allergy.

The questionnaire was developed by the authors based on common environmental exposures relevant to the Libyan context. Content validity was ensured through expert review by two clinical immunologists. Internal consistency reliability was assessed using Cronbach's alpha ($\alpha = 0.68$), indicating acceptable reliability for exploratory research. Data were collected using a structured questionnaire capturing participants' demographic characteristics, reported hypersensitivity reactions, suspected allergens, treatment practices, and indicators related to daily life functioning and well-being. The questionnaire was distributed electronically via online platforms and social media, allowing respondents from different regions to participate easily. The survey targeted individuals across all age groups during the study period from October 2024 to December 2024.

Data analysis was performed using Minitab version 17 and Python-based statistical tools. Descriptive statistics were used to summarize participant characteristics. Multiple linear regression analysis was conducted to identify predictive factors associated with the impact of hypersensitivity, with independent variables including age, gender, presence of domestic animals, type of hypersensitivity, and medication use. The dependent variable, daily life impact, was operationalized as a composite score reflecting functional and psychosocial consequences such as sleep disturbance, stress, absenteeism, and social discomfort rather than a standardized quality-of-life measurement scale. Results were presented using tables and figures for clarity and visualization. Ethical approval was obtained prior to data collection from an institutional ethics committee composed of faculty members. The study adhered to the ethical principles of the Declaration of Helsinki, and all participants provided informed consent electronically before participation.

3. RESULTS

A total of 208 respondents reporting hypersensitivity symptoms participated in the study. The sample was predominantly female, with most participants belonging to young and middle-aged adult groups. Responses were obtained from all major regions of Libya, ensuring geographic diversity. The results indicate a high self-reported prevalence of hypersensitivity symptoms, predominantly respiratory and dermatological in nature. Dust and perfumes were the most frequently reported triggers. Although most participants experienced mild to moderate symptoms, a considerable proportion reported notable functional and psychosocial impacts on daily life. Importantly, more than half of respondents did not report receiving regular medical treatment. Regression analysis identified Type I hypersensitivity and medication use as the strongest predictors of daily life impact.

Figure 1 illustrates the demographic distribution of the study participants by gender and age group. The gender distribution shows a clear predominance of female respondents, who constituted 78.4% of the sample, compared with 21.6% males. This imbalance may reflect greater awareness or concern among females regarding hypersensitivity and its health consequences, as well as a higher tendency to participate in health-related online surveys within the Libyan context. Additionally, previous studies have reported a higher prevalence of certain allergic and hypersensitivity conditions particularly skin and respiratory manifestations among females. This overrepresentation should therefore be taken into account when interpreting gender-related differences in symptom patterns and psychosocial impact.

With regard to age distribution, most participants were young to middle-aged adults, with the highest representation observed in the 21–30 and 31–40 age groups, followed by individuals aged 41–50 years. Lower participation was noted among older age groups, which may be attributed to reduced engagement with online survey platforms or a lower likelihood of reporting hypersensitivity symptoms. Overall, the age distribution indicates that hypersensitivity affects a broad range of age groups but is particularly prominent among adults between 21 and 50 years, likely due to increased environmental exposure related to occupational, social, and urban activities.

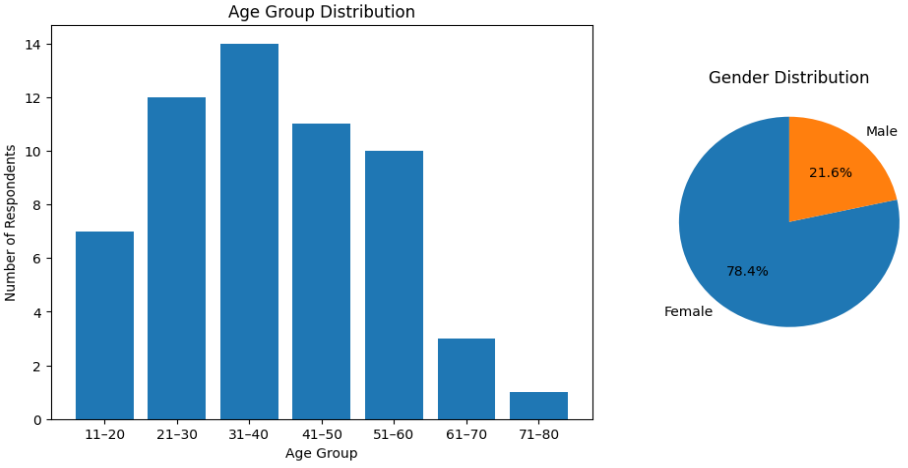

Fig. 1. Demographic distribution of the study participants.

Figure 2 presents the major self-reported allergens and the most common hypersensitivity symptoms among the study participants. Environmental factors were the predominant triggers, with dust being the most frequently reported allergen (10.6%), followed by perfumes and scents (9.1%), food-related allergens (5.8%), and cleaning products (3.8%). Less commonly reported triggers included unknown sources (2.4%) and animal exposure (1.4%). This distribution highlights the strong influence of environmental and lifestyle-related exposures on hypersensitivity manifestations in the Libyan population, particularly those related to air quality and chemical irritants.

Regarding clinical presentation, respiratory symptoms predominated, with sneezing reported most frequently (32.5%), followed by breathing difficulties (22.3%) and itching (19.4%). Dermatological manifestations such as swelling (15.0%) and skin rash (6.3%) were also commonly reported, whereas cough was less frequent (4.4%). The predominance of upper respiratory symptoms underscores the significant role of airborne allergens, especially dust and scented products, in triggering hypersensitivity reactions. Overall, these findings demonstrate a clear overlap between dominant environmental allergens and respiratory symptomatology, reinforcing the need for improved environmental control strategies and increased public health awareness aimed at reducing exposure to common hypersensitivity triggers.

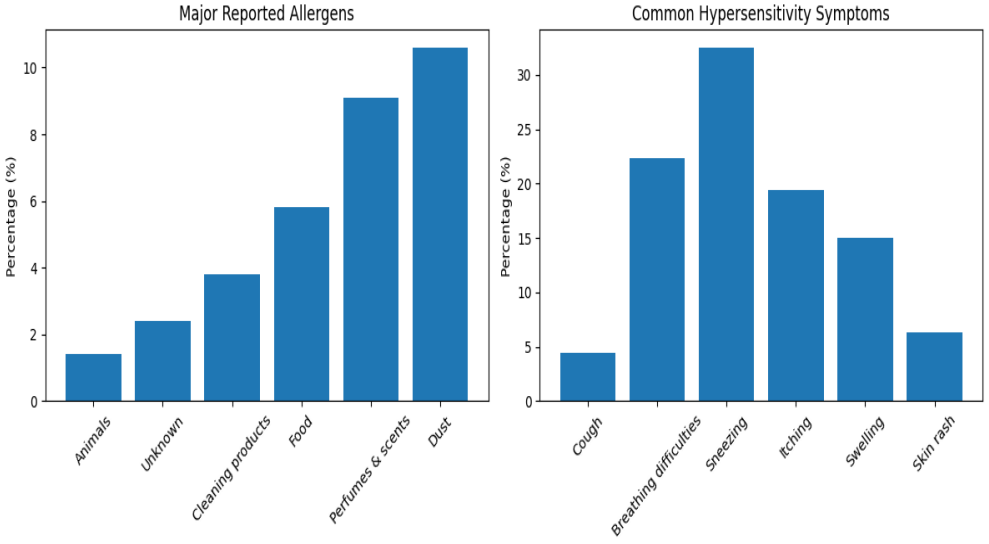

Fig. 2. Major reported allergens and common hypersensitivity symptoms expressed as percentages.

Table I summarizes the regional distribution, clinical characteristics, management practices, and daily life impact of hypersensitivity among the study participants. Most respondents were from western Libya (48.4%), followed by eastern (27.4%) and southern regions (24.2%). A high proportion of participants (87.5%) reported having at least one type of hypersensitivity. Both delayed-type (Type IV) and immediate (Type I) hypersensitivity reactions were commonly reported, with a slight predominance of delayed-type reactions (54.8%). Regarding symptom severity, most participants experienced mild to moderate symptoms (44.3%), while a notable proportion reported severe or very severe manifestations (25,9%). Despite the reported symptom burden, more than half of the participants (59.6%) did not use any form of medical treatment. Among those receiving treatment, inhalers and antihistamines were the most commonly reported therapies. Hypersensitivity symptoms had varying effects on daily life, with 55.8% of participants reporting some degree of functional or psychosocial impact, including sleep disturbance, stress, social embarrassment, and absenteeism.

TABLE I. CLINICAL AND MANAGEMENT CHARACTERISTICS OF PARTICIPANTS

Domain	Category	Percentage (%)
Geographic region	Western Libya	48.4
	Eastern Libya	27.4
	Southern Libya	24.2
Self-reported allergy status	Yes	87.5
	No	13.5
Type of hypersensitivity	Delayed-type (Type IV)	54.8
	Immediate / rapid (Type I)	45.2
Symptom severity	Very mild	20.7
	Mild	23.6
	Moderate	29.8
	Severe	16.8
	Very severe	9.1
Use of treatment	Yes	40.4
	No	59.6
Medication type	Inhalers	4.8
	Antihistamines	3.4
	Creams and lotions	2.9
	Pain relievers	2.4
	No medication	2.4
	Steroids	1.4
	Natural remedies	1.0
Impact on daily life	Limited impact	44.2
	Difficulty sleeping	23.1

Domain	Category	Percentage (%)
	Nervousness and stress	17.8
	Social embarrassment	9.6
	Absence from work/school	5.3

A multiple linear regression analysis was conducted to identify the key factors influencing the daily life impact of individuals with allergies. The dependent variable "Impact on Daily Life" was derived by summing up responses related to: difficulty sleeping, absenteeism from work/school, stress or nervousness, and embarrassment about appearance. Several independent variables were tested to assess their predictive value. The association between daily life impact and Type I hypersensitivity, as well as medication use, is presented in Table II and detailed in the regression analysis section.

TABLE II. MULTIPLE LINEAR REGRESSION ANALYSIS OF FACTORS ASSOCIATED WITH DAILY LIFE IMPACT

Independent Variable	Standardized Coefficient (β)	P-value	Interpretation
Gender (Male = 1)	− 0.089	0.497	Not significant; weak negative association
Type of hypersensitivity	0.587	0.001	Highly significant; moderate positive association
Use of medications	0.472	0.001	Highly significant; moderate positive association
Presence of pets	− 0.049	0.667	Not significant; weak negative association
Region (South)	− 0.047	0.829	Not significant; weak negative association
Region (East)	0.148	0.352	Not significant; weak positive association
Region (West)	0.177	0.237	Not significant; weak positive association

This Table II presents the results of a multiple linear regression analysis conducted on data from 208 participations, aiming to identify the factors influencing the impact of hypersensitivity on daily life. The independent variables included gender, type of hypersensitivity, medication use, pet ownership, and geographic region. This analysis helped clarify the extent to which each factor contributed to the variation in daily life impact among individuals. The model yielded an R-squared value of 0.082, indicating that approximately 8.2% of the variance in daily life impact could be explained by the included variables. Of the predictors, quick hypersensitivity (Type I) was strongly and highly positively associated with daily life impairment ($\beta = 0.5866$, $p < 0.001$), indicating that people with this allergy type were likely to experience more limitations. Moreover, use of medications was also positively and significantly related to more impact scores ($\beta = 0.4715$, $p < 0.001$) perhaps as a sign of higher symptom burden among treated individuals. In contrast, gender ($\beta = -0.0890$, $p = 0.4973$), pet ownership ($\beta = -0.0487$, $p = 0.6673$), and living in southern ($\beta = -0.0471$, $p = 0.8286$), eastern ($\beta = 0.1484$, $p = 0.3515$), or western Libya ($\beta = 0.1773$, $p = 0.2366$) were not significantly associated with impact, and all exhibited weak effect sizes. These findings suggest that clinical interventions and public health strategies should prioritize individuals with rapid-type allergies and those requiring regular medication, as these subgroups are more likely to experience pronounced disruptions to their daily functioning.

4. DISCUSSION

The present study highlights a substantial burden of self-reported hypersensitivity symptoms among the surveyed Libyan population. A large proportion of participants (86.5%) reported experiencing at least one hypersensitivity reaction. This figure should be interpreted with caution, as the use of an online, convenience-based sampling strategy likely resulted in the overrepresentation of symptomatic individuals. Consequently, the findings should not be considered reflective of national prevalence but rather indicative of the magnitude and impact of hypersensitivity symptoms within the study sample.

From an immunological perspective, it is important to contextualize these findings within the broader concept of hypersensitivity. Historically, the term "allergy" was introduced by Clemens von Pirquet in 1906 to describe altered immune reactivity to specific antigens (4). Subsequent advances, particularly the Gell and Coombs classification, differentiated hypersensitivity reactions into four main types, with type I hypersensitivity being IgE-mediated and responsible for immediate allergic reactions (5,6). In contrast, non-IgE-mediated mechanisms such as irritant-induced or delayed hypersensitivity responses may account for many symptoms triggered by chemicals, perfumes, and cleaning agents (7). This distinction is particularly relevant to the present study, as the reliance on self-reported symptoms does not allow differentiation between true IgE-mediated allergy and non-allergic hypersensitivity. Nonetheless, both mechanisms can impose comparable burdens on daily functioning and quality of life [2,13].

The predominance of respiratory symptoms, including sneezing (67 participants) and breathing difficulties (46 participants), observed in this study aligns with findings from regional and international research. Abdulrahman et al. (8) reported that persistent nasal symptoms significantly impair daily activities and work productivity in Middle Eastern populations, with estimated efficiency losses of up to 27%. The high frequency of such symptoms among Libyan participants may be attributed to the country's environmental conditions, including frequent dust storms, prolonged dry

seasons, high temperatures, and increasing air pollution. These factors are well known to aggravate both allergic and non-allergic airway inflammation, thereby intensifying hypersensitivity manifestations.

The psychological impact of hypersensitivity was also evident in the present findings. A notable proportion of respondents reported sleep disturbances (23.1%) and nervousness or stress (17.8%). These observations are consistent with previous studies demonstrating associations between chronic allergic or hypersensitivity conditions and mental health outcomes such as anxiety, depression, and social withdrawal [13]. Similar psychosocial burdens have been reported in Libyan patients suffering from other chronic diseases, suggesting that prolonged symptom burden regardless of disease category can negatively affect mental well-being and social participation [14].

Symptom severity varied across participants, with 29.8% reporting moderate symptoms, 16.8% severe symptoms, and 9.1% very severe manifestations. This gradient mirrors observations by Antolín-Amérigo et al. (2), who demonstrated that increased symptom severity and multiple triggers are associated with greater impairment in quality of life. Such findings underscore the need for stratified management approaches that account for symptom intensity and individual exposure profiles [15].

Treatment-seeking behavior revealed significant gaps in hypersensitivity management among the surveyed population. More than half of respondents (59.6%) reported not using any form of medication or therapeutic intervention, while only small proportions relied on inhalers (4.8%), antihistamines (3.4%), topical treatments (2.9%), or analgesics (2.4%). This pattern resembles findings from other low- and middle-income settings, where limited access to specialized care and reliance on self-management are common [16,17]. The lack of medical supervision raises concerns, as inappropriate or inconsistent treatment may contribute to persistent symptoms and preventable complications.

Comparisons with studies from neighboring and international contexts further highlight the magnitude of the hypersensitivity burden observed in the present study. In Brazil, Mosquim et al. [15] reported that 69.9% of respondents experienced low-frequency hypersensitivity symptoms, with 80.5% not seeking any form of treatment and only 19% using desensitizing products. These figures are notably lower than the proportion observed in the present surveyed sample (86.5%), suggesting contextual differences in environmental exposure and healthcare-seeking behavior.

In Tunisia, population-based studies reported considerably lower prevalence estimates, with current asthma affecting 6.5% of participants and allergic rhinitis reported in 11.7% of children and 13.4% of individuals aged 15 years and older, while approximately 50% of asthmatic patients had comorbid rhinitis compared to 13.4% in the general population [18]. Similarly, the SNAPSHOT program documented allergic rhinitis prevalence rates of 3.6% in Egypt and 6.4% in both Turkey and Gulf countries, with 55% of cases classified as moderate to severe and 33% described as uncontrolled, leading to significant impairment in quality of life, sleep, and daily activities [19].

The markedly higher burden observed in the present study is therefore unlikely to reflect true epidemiological differences alone and may instead be explained by methodological factors, environmental conditions, and healthcare access. Libya's harsh climate, characterized by frequent dust storms, high temperatures, and increased air pollution, along with differences in public awareness and access to specialized allergy care, likely plays a substantial role in shaping the observed hypersensitivity burden. These comparisons underscore the importance of interpreting prevalence figures cautiously while reinforcing the need for context-specific public health strategies.

5. LIMITATIONS

This study has several limitations. First, hypersensitivity and allergy were assessed through self-reported symptoms without clinical testing; therefore, irritant reactions, especially those related to perfumes or detergents, may have been misclassified as allergy. Second, the questionnaire used was not a standardized validated tool such as ISAAC or ECRHS, limiting international comparability. Third, the sample was obtained through online convenience sampling, which resulted in over-representation of females and younger adults and may introduce selection bias. These factors limit the generalizability of the findings. Future studies should employ population-based sampling and clinical diagnostic procedures, including IgE testing, skin-prick tests, or validated allergy instruments.

6. CONCLUSION

This study suggests that hypersensitivity symptoms are common among the surveyed Libyan population and are associated with notable physical, emotional, and social impacts on daily life. The findings highlight the importance of increasing public awareness of allergy triggers, symptoms, and available treatment options. Similar to reports from other regions, environmental allergens and psychological effects were prominent; however, limited use of professional healthcare services appears to characterize the studied sample in Libya. Efforts should therefore focus on strengthening health education and outreach programs. Future studies incorporating clinical evaluations and larger, population-based samples are needed to better understand hypersensitivity patterns and inform effective intervention strategies in the region.

7. RECOMMENDATIONS

Raising public awareness is essential for reducing the burden of hypersensitivity conditions. Awareness campaigns can help improve understanding of common triggers and preventive measures, while encouraging early medical consultation and appropriate use of diagnostic and treatment services.

Supporting healthcare professionals is equally important, particularly in addressing the psychological aspects of hypersensitivity. Training medical staff in evidence-based management approaches and integrating psychological support can help alleviate stress, sleep disturbances, and social withdrawal associated with chronic symptoms. Finally, investment in research and collaboration between health and environmental authorities are essential for developing effective, evidence-based policies to address hypersensitivity conditions.

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Conflicts of Interest:

The authors declare that there are no conflicts of interest in this study.

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