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Patterns and Predictors of Complementary Medicine Use for Allergic Conditions Among University Students: A Cross-sectional Study.

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Abstract

Background: Complementary and alternative medicine (CAM) is widely used for the management of chronic health conditions, including allergic diseases. However, data regarding CAM use among university students with allergic conditions in Palestine remain limited. This study aimed to assess the prevalence, patterns, motivations, and predictors of CAM use among Palestinian university students with allergic diseases or allergy-related symptoms.

Methods: A cross-sectional study was conducted among Palestinian university students, Palestine, between February and April 2026. Data were collected using an online and paper-based questionnaire assessing sociodemographic characteristics, allergy-related factors, conventional treatment use, CAM practices, motivations for CAM use, and lifestyle factors. Descriptive statistics were used to summarize the data. Bivariate analyses were performed using chi-square and Mann–Whitney U tests. Multivariable logistic regression analysis was conducted to identify independent predictors of CAM use.

Results: A total of 404 students participated, with a median age of 21 years (IQR: 20–22). Overall, 34.4% (n=139) reported using CAM for their allergic condition. Herbal remedies, honey, vitamin supplementation, and dietary modifications were the most frequently used therapies. CAM use was commonly multimodal, with 94.2% of users reporting the use of three or more CAM categories. The leading motivations for CAM use were lower cost compared with conventional treatment (46.8%), perceptions of safety and naturalness (44.6%), and trust in CAM effectiveness (40.3%). In multivariable analysis, greater allergy-related impact on daily life (adjusted odds ratio [aOR] 1.44, 95% CI 1.19–1.76, $p<0.001$), postgraduate education (aOR 3.17, 95% CI 1.14–8.85, $p=0.027$), and comorbid allergic asthma (aOR 2.12, 95% CI 1.04–4.32, $p=0.039$) were independently associated with CAM use. Female sex was associated with lower odds of CAM use (aOR 0.53, 95% CI 0.32–0.87, $p=0.013$).

Conclusions: CAM use is common among Palestinian university students with allergic conditions and is predominantly used alongside conventional therapy. Greater disease burden and allergic asthma were significant predictors of CAM use. Healthcare professionals should proactively discuss CAM practices with patients and provide evidence-based guidance regarding their potential benefits, risks, and interactions.

Keywords: Complementary and alternative medicine, Allergic diseases, University students, Allergic Rhinitis, Herbal Medicine.

Background

Allergic diseases pose a significant global health burden, with approximately 10-30% of the general population affected by at least one type of allergic disease (1). Although preschoolers comprise the majority of the affected population, allergic diseases remain a major concern for the quality of life of the adult population. In 2019, for instance, there were 262 million cases of asthma and 171 million cases of atopic dermatitis. This reflects the large burden of allergic diseases. Allergic diseases can interfere with sleep, school performance, mental health and social life for university students who often experience stress, environmental triggers and irregular lifestyles (2).

Allergic diseases are usually managed with medications like antihistamines, corticosteroids, bronchodilators and immunotherapy (3). These treatments may help control the symptoms of allergic diseases, yet many people are not completely satisfied with them. This dissatisfaction can be attributed to the costs of the medication and the difficulty to use with other drugs (4). Because of this, many people tend to look for alternatives to manage their symptoms like complementary medicine. This can be evidenced by an American study that revealed that 42% of people use complementary medicine because they feel that conventional medications are not effective (5).

Complementary and alternative medicine is a group of healthcare practices and products that are not part of traditional medicine (6). Some examples of alternative medicine that people use for allergic conditions include herbal remedies, honey, dietary changes, vitamins, cupping therapy, acupuncture, breathing exercises, relaxation techniques and spiritual practices (7, 8). Even though complementary and alternative medicine is becoming more popular among adults, there is not a lot of research on how university students in Middle Eastern countries, like Palestine, use complementary and alternative medicine for allergic conditions (9).

In Palestine, allergic diseases remain an important public health concern due to multiple contributing factors, including smoking, air pollution, dust exposure, seasonal environmental changes, and psychological stress (10). Traditional remedies, such as herbal medicine, honey, and cupping therapy, are commonly used by Palestinian families to manage chronic conditions, including allergic diseases (11). However, there is limited scientific evidence regarding the prevalence, patterns, effectiveness, and potential side effects of CAM use for allergic conditions among Palestinian university students (9).

Previous studies have shown that the use of alternative medicine may be associated with many factors such as level of education, chronic disease, and dissatisfaction with conventional treatment (12). It is also important to note that some people who use alternative medicine may not disclose such information to their healthcare professionals, which may increase the risk of drug interactions or inappropriate treatment choices (5).

Therefore, this study aims to investigate the use of complementary medicine among university students with allergic diseases or allergy symptoms. Specifically, the study seeks to assess the prevalence of CAM use, identify the most commonly used therapies, evaluate perceived effectiveness and possible side effects, explore the relationship between CAM and conventional medication use, and determine factors associated with CAM utilization. The findings of this study may contribute to increasing awareness regarding CAM practices and support the development of safer and more evidence-based healthcare strategies for university students with allergic diseases.

Methodology

Study design and Population

A cross-sectional study was conducted among Palestinian university students from multiple universities across the West Bank via surveys that were distributed online and in person. The study took place between February 2026 to April 2026. The study included Palestinian university students from multiple universities across the West Bank. The study targeted all Palestinian university students of different age groups who suffered from at least mild allergic signs and symptoms triggered by various allergens including dust, certain medications, food, and pets. Students who were diagnosed with chronic allergic diseases such as asthma (which is IgE-mediated type 1 hypersensitivity reaction), rhinitis (a symptomatic disorder of the nose induced after allergen exposure by an immunoglobulin E (IgE)-mediated inflammation of the membranes lining the nose), urticaria (a condition characterized by the development of wheals/ hives, angioedema, or both), and dermatitis (chronic inflammatory skin disease that is characterised by intense itching and recurrent eczematous lesions) were included in the study (3, 13-15). Moreover, Palestinian university students without at least any allergic signs and symptoms during the study time period were ineligible to particpate.

A convenience sampling technique was used to collect the required sample, where all university students who met the aforementioned criteria were eligible to participate. Participants were recruited until the required sample was achieved. A total of 404 participants filled the questionnaire, of which none were excluded. Participants were approached via online distribution of the questionnaire, and by in-person recruitment in the university campus.

Sample size and Calculation

The sample size was calculated via Raosoft, which is based on the population of university students in Palestine (136,477) (16). With a 95% confidence interval, 5% margin of error, and 50% response distribution, a minimum sample of 385 participants was required. 404 participants were recruited to participate in the study.

Data collection and instruments

An online Google Form CAM allergy questionnaire was used to collect the data and two major techniques were followed, one of which includes in person approaches at different universities where students scanned a QR code linked to the form in order to gain access to the survey filling it out. The other technique was by sharing the online form across different social media platforms. Furthermore, the questionnaire consisted of 7 sections:

- Section 1 was about Demographical factors including age, gender, academic level, field of study, year of study and residency.
- Section 2 assessed the following: the allergic status of the participants (including any diagnosis), type of allergic condition, duration of the allergy, symptoms severity during the past three months and the impact of allergy on the student's academic performance / daily life
- Section 3 focused on the Conventional Treatment used by students including the current use of allergy medications, type of medication used and the level of adherence to the prescribed medical therapy
- Section 4 discussed the Use of Complementary Medicine for Allergic Diseases asking about the student's status of using any previous complementary /alternative medicine to relieve allergy symptoms, this section was divided into 4 further subtitles:
    - Subtitle 1 was about Biologically based therapies focusing on the student's status of using vitamins, honey, diet therapy (dietary modifications) and herbal remedies.

- Subtitle 2 was about Body-Based / Manual Methods which asked about the student's status of getting massage therapy and physical therapy
- Subtitle 3 was about Mind-Body Medicine which included any use of meditation, breathing exercises, cupping therapy, walking, prayer….etc
- Subtitle 4 was about Alternative Medical Systems focusing on the participant's status use of Acupuncture, reflexology and homeopathy

Further questions were asked about the student's source of information, side effects, cost of alternative medicine and the degree of any improvements in sleep after using complementary medicine

- Section 5 assessed the determinants and motivation regarding the use of complementary medicine among the students using the Likert Scale including beliefs about cost, effectiveness, safety, any concerns about medical treatment side effects and insufficient improvement from medical treatment alone in relieving symptoms
- Section 6 discussed the student's lifestyle and environmental factors where it asked about the participant's status of any frequent exposure to allergens, smoking and whether or not the allergy symptoms worsen during examination period or stress
- Section 7 was an optional field where it consisted of a single open-ended question asking about any observation or experience the student would like to share with us concerning the use of complementary medicine in allergy treatment.

Data and Statistical Analysis

The data was entered and analyzed via IBM Statistical Package for Social Sciences (SPSS) version 27. Descriptive statistics, including frequencies, percentages, medians and interquartile ranges were used to present the demographic and clinical variables. Bivariate analyses using chi-square test for categorical variables and Mann-Whitney U test for continuous variables were used to examine the association between the studied variables and the use of complementary medicine. Multivariable logistic regression analysis was conducted to identify the predictors of complementary medicine use. Odds ratios (ORs) and adjusted odds ratios (aORs) with 95% confidence intervals (CIs) were reported. A p-value of <0.05 was considered statistically significant. The study was reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.

Ethical Approval

All aspects of the study protocol were authorised by the Institutional Review Board (IRB) (Protocol Number Med.Jan.2026/36) before initiation of this study. The participants were informed about the purpose of the study and oral consent was obtained before their participation in the study. Confidentiality and privacy were maintained throughout the whole study process, with access to the data being limited to the research team.

Results

Study Population and CAM Prevalence

A total of 404 university students participated in this study. The majority were female (72.0%, n = 290), held a bachelor's degree (89.9%, n = 363), and resided with their families (80.4%, n = 325). The median age was 21.0 years (IQR: 20.0–22.0). More than half were enrolled in medical-related programs (53.7%, n = 217), and (72.5%, n = 293) had been formally diagnosed with an allergic condition by a healthcare professional. The most common allergic conditions were seasonal allergy (45.8%, n = 185), allergic rhinitis (36.6%, n = 148), eczema/atopic dermatitis (20.3%, n = 82), food allergy (13.4%, n = 54), and allergic asthma (10.6%, n = 43). Sociodemographic and clinical characteristics are presented in Table 1 (Appendix 1).
Overall, 139 participants (34.4%) reported using at least one form of complementary and alternative medicine (CAM) specifically for managing their allergic condition.
Insert Table 1

Patterns of CAM Use

Among the 139 CAM users, biologically-based therapies were the most prevalent modality category (Figure 1). Herbal remedies were the most frequently used, with sage (*Salvia fruticosa*) (60.4%), mint (*Mentha spicata*) (57.6%), and ginger (*Zingiber officinale*) (30.9%) being the most common. Honey was used by 55.4% of users and dietary modification by 38.1%. Vitamin supplementation was also prevalent, most commonly omega-3 (43.2%) and vitamin D (43.2%). Among mind-body therapies, supplication (Du'aa) (46.0%) and breathing exercises (45.3%) were most frequently reported, followed by Ruqya (faith healing) (38.8%) and walking (35.3%). Manipulative therapies including massage (24.5%) and physiotherapy (17.3%) were less common, as were alternative medical systems such as homeopathy (20.9%), reflexology (15.1%), and acupuncture (10.1%). Full patterns are detailed in Figure 1.

Insert Figure 1

CAM use was highly multi-modal. The mean number of CAM categories employed per user was 4.58, with a median of 4 (IQR: 3–5.5). The majority of users employed multiple modalities simultaneously: 94.2% used three or more categories and 41.7% used five or more, indicating a pattern of concurrent multi-modal use rather than reliance on a single remedy (Table 2).

Table 2. Multi-modality CAM use among users

Multi-modality metric	Value
Mean number of CAM categories	4.58
Median (IQR)	4 (3-5.5)
Using >=1 categories, n (%)	138 (99.3%)
Using >=3 categories, n (%)	131 (94.2%)
Using >=5 categories, n (%)	58 (41.7%)
Using >=7 categories, n (%)	22 (15.8%)

Sources of CAM Information

The most commonly cited source of CAM information was physicians (61.9%, n = 86), followed by family members (55.4%, n = 77), social media (35.3%, n = 49), pharmacists (33.8%, n = 47), and the internet (32.4%, n = 45). Overall, 73.4% of users cited at least one professional source (physician or pharmacist), while an equal proportion cited at least one informal source (family, friends, internet, or social media) (Supplementary Table 1).

Concurrent Symptoms During CAM Use

Participants were asked about effects noticed during CAM use. The majority of users (85.6%, n = 119) reported at least one concurrent symptom. Fatigue was the most frequently reported (53.2%, n = 74), followed by headache (45.3%, n = 63), thirst (33.8%, n = 47), dizziness (27.3%, n = 38), insomnia (22.3%, n = 31), nausea (20.1%, n = 28), abdominal pain (15.8%, n = 22), and skin rash (15.1%, n = 21). Only 3.6% (n = 5) of users reported no symptoms. It should be noted that the questionnaire item assessed concurrent effects in general rather than specifically attributing adverse events to CAM; reported symptoms may therefore reflect the underlying allergic disease activity rather than direct CAM-attributable adverse effects (Supplementary Table 1).

Reasons for CAM Use

The five-item reasons scale demonstrated acceptable internal consistency (Cronbach's $\alpha = 0.759$). The most commonly endorsed reason for CAM use was lower cost relative to conventional treatment (46.8% agree or strongly agree, mean 3.40 ± 1.15), followed by the belief that CAM is natural and safe (44.6%, mean 3.36 ± 1.20), trust in CAM efficacy (40.3%, mean 3.20 ± 1.17), and fear of conventional medication side effects (39.6%, mean 3.12 ± 1.21). The least endorsed reason was insufficient benefit from conventional treatment alone (32.4%, mean 2.95 ± 1.22). Notably, more than two-thirds of users (67.6%) did not report conventional treatment insufficiency as a primary driver, suggesting that CAM is predominantly used as a complement to rather than a substitute for standard allergy therapy. Reasons are summarized in Table 3.

Table 3. Reasons for CAM use among users

Reason	N	Mean (SD)	Median (IQR)	Agree %	Neutral %	Disagree %
Lower cost than conventional treatment	139	3.4 (1.15)	3 (3-4)	46.8	32.4	20.9
CAM is natural and safe	139	3.36 (1.2)	3 (3-4)	44.6	31.7	23.7
Trust in CAM efficacy	139	3.2 (1.17)	3 (2-4)	40.3	33.8	25.9
Fear of conventional medication side effects	139	3.12 (1.21)	3 (2-4)	39.6	29.5	30.9
Conventional treatment is insufficient	139	2.95 (1.22)	3 (2-4)	32.4	30.2	37.4

Cronbach's alpha = 0.759 (5 items).

Bivariate Associations with CAM Use

Several sociodemographic and clinical variables were significantly associated with CAM use in bivariate analysis (Table 1). CAM users were slightly older than non-users (median 21.0 vs. 20.0 years, $p = 0.037$). Females were less represented among users compared with non-users (63.3% vs. 76.2%, $p = 0.009$), while medical students were more frequently represented (61.9% vs. 49.4%, $p = 0.023$). University dorm residents were more likely to be CAM users (18.0% vs. 9.1%), and postgraduate students were more frequently represented among users (8.6% vs. 3.0%), both reaching statistical significance ($p = 0.026$ for both). Clinically, CAM users reported significantly greater daily-life impact from their allergy (median 3.0 vs. 2.0, $p < 0.001$) and

higher symptom severity (p = 0.001). Current conventional medication use was more common among users (61.2% vs. 43.4%, p = 0.001), as was frequent allergen exposure (86.3% vs. 75.5%, p = 0.015). Among allergy subtypes, only allergic asthma differed significantly between groups (16.5% vs. 7.5%, p = 0.009). Effect sizes were small across all variables, with the largest observed for daily-life impact (rank-biserial r = 0.308) (Supplementary Table 2).

Univariable Logistic Regression

Univariable logistic regression identified twelve variables as candidates for the multivariable model based on p < 0.20 (Table 4). Female sex was associated with reduced odds of CAM use (OR 0.54, 95% CI 0.34–0.84, p = 0.006). Positive associations were observed for medical major (OR 1.66, 95% CI 1.09–2.52, p = 0.018), postgraduate education (OR 3.04, 95% CI 1.21–7.61, p = 0.018), university dorm residence (OR 2.21, 95% CI 1.21–4.06, p = 0.010), greater daily-life impact (OR 1.50, 95% CI 1.28–1.76, p < 0.001), conventional medication use (OR 2.05, 95% CI 1.35–3.12, p < 0.001), frequent allergen exposure (OR 2.05, 95% CI 1.17–3.59, p = 0.012), stress-related symptom worsening (OR 1.59, 95% CI 1.01–2.50, p = 0.044), and allergic asthma (OR 2.43, 95% CI 1.28–4.60, p = 0.006).

Table 4. Univariable logistic regression

Variable	OR (95% CI)	p-value
Age, per year	1.00 (0.96-1.05)	0.841
Female vs male	0.54 (0.34-0.84)	0.006
Medical vs non-medical major	1.66 (1.09-2.52)	0.018
Postgraduate vs undergraduate	3.04 (1.21-7.61)	0.018
2nd year vs 1st year	0.97 (0.46-2.01)	0.930
3rd year vs 1st year	1.53 (0.77-3.04)	0.227
4th year vs 1st year	1.52 (0.73-3.14)	0.260
5th+ year vs 1st year	0.94 (0.37-2.38)	0.892
University dorm vs with family	2.21 (1.21-4.06)	0.010
Private housing vs with family	0.85 (0.36-1.99)	0.709
Formally diagnosed allergy	1.01 (0.64-1.60)	0.964
Allergy 1-3 years vs <1 year	1.55 (0.83-2.88)	0.171

Variable	OR (95% CI)	p-value
Allergy >3 years vs <1 year	1.76 (1.07-2.89)	0.025
Symptom severity, per 1-point	1.33 (1.12-1.57)	<0.001
Daily-life impact, per 1-point	1.50 (1.28-1.76)	<0.001
Currently using conventional medication	2.05 (1.35-3.12)	<0.001
Medication adherence, per 1-point	1.28 (1.11-1.49)	<0.001
Frequent allergen exposure	2.05 (1.17-3.59)	0.012
Smoking/passive smoking	1.48 (0.98-2.24)	0.060
Symptoms worsen with stress	1.59 (1.01-2.50)	0.044
Allergic rhinitis	1.27 (0.83-1.94)	0.270
Seasonal allergy	1.32 (0.88-2.00)	0.182
Eczema/atopic dermatitis	0.99 (0.59-1.64)	0.956
Food allergy	0.86 (0.46-1.59)	0.627
Allergic asthma	2.43 (1.28-4.60)	0.006
Drug allergy	0.62 (0.26-1.49)	0.281

Multivariable Logistic Regression

The multivariable model included twelve predictors selected by purposeful selection, with the following pre-specified exclusions: age (univariable p = 0.841, no clinical rationale); symptom severity (collinear with daily-life impact, confirmed by variance inflation factor pre-check); and medication adherence (collinear with conventional medication use). Education was entered as a collapsed binary variable (undergraduate vs. postgraduate) to avoid complete separation arising from the sparse PhD subgroup (n = 6, five of whom were CAM users). No multicollinearity was detected in the final model (all $GVIF^{1/2Df} < 1.20$).

Four predictors were independently associated with CAM use in the final model (Table 5; Figure 2). Female sex was inversely associated with CAM use (aOR 0.53, 95% CI 0.32–0.87, p = 0.013). Postgraduate education was associated with higher odds (aOR 3.17, 95% CI 1.14–8.85, p = 0.027), though this finding should be interpreted with caution given the small postgraduate subgroup (n = 20, 5% of the sample) and the correspondingly wide confidence interval. Greater daily-life impact was the strongest predictor (aOR 1.44 per 1-point increase,

95% CI 1.19–1.76, p < 0.001), and comorbid allergic asthma was independently associated with more than twice the odds of CAM use (aOR 2.12, 95% CI 1.04–4.32, p = 0.039). Medical major showed a borderline association (aOR 1.60, 95% CI 1.00–2.57, p = 0.052). The model demonstrated good calibration (Hosmer–Lemeshow p = 0.698) and acceptable discrimination (AUC = 0.721, 95% CI 0.668–0.773; Nagelkerke R^2 = 0.189) (Supplementary Figure 1).

Table 5. Multivariable logistic regression

Variable	aOR (95% CI)	p-value
Female vs male	0.53 (0.32-0.87)	0.013
Medical vs non-medical major	1.60 (1.00-2.57)	0.052
Postgraduate vs undergraduate	3.17 (1.14-8.85)	0.027
University dorm vs with family	1.91 (0.95-3.84)	0.069
Private housing vs with family	0.48 (0.19-1.25)	0.134
Allergy 1-3 years vs <1 year	1.30 (0.65-2.60)	0.463
Allergy >3 years vs <1 year	0.95 (0.52-1.74)	0.878
Daily-life impact, per 1-point	1.44 (1.19-1.76)	<0.001
Currently using conventional medication	1.18 (0.72-1.93)	0.520
Frequent allergen exposure	1.39 (0.72-2.70)	0.332
Smoking/passive smoking	1.05 (0.65-1.71)	0.833
Symptoms worsen with stress	1.20 (0.72-2.01)	0.482
Seasonal allergy	1.03 (0.64-1.64)	0.915
Allergic asthma	2.12 (1.04-4.32)	0.039

Sensitivity and Stratified Analyses

In a sensitivity analysis restricted to undergraduate students (n = 383), the three primary significant predictors retained their direction and statistical significance: female sex (aOR 0.50, 95% CI 0.30–0.84, p = 0.008), greater daily-life impact (aOR 1.40, 95% CI 1.15–1.71, p < 0.001), and allergic asthma (aOR 2.12, 95% CI 1.02–4.40, p = 0.045), confirming the robustness of these findings independent of the postgraduate subgroup (Supplementary Table 3).

Stratified multivariable analysis by academic major revealed clinically meaningful subgroup differences (Table 6). Among medical students (n = 216), greater daily-life impact was the only significant independent predictor of CAM use (aOR 1.53, 95% CI 1.17–2.01, p = 0.002), while allergic asthma was not significant (aOR 1.57, p = 0.413). Among non-medical students (n = 186), allergic asthma emerged as the strongest predictor (aOR 3.12, 95% CI 1.16–8.40, p = 0.024), and the inverse association with female sex was more pronounced (aOR 0.40, 95% CI 0.17–0.93, p = 0.033). Daily-life impact showed a borderline association in non-medical students (aOR 1.31, p = 0.076).

Table 6. Stratified multivariable analysis by major

Variable	aOR (95% CI) Medical	p-value Medical	aOR (95% CI) Non-medical	p-value Non-medical
Allergic asthma	1.57 (0.53-4.60)	0.413	3.12 (1.16-8.40)	0.024
Allergy >3 years vs <1 year	0.69 (0.31-1.53)	0.358	1.63 (0.60-4.40)	0.334
Allergy 1-3 years vs <1 year	0.90 (0.35-2.31)	0.835	2.03 (0.67-6.20)	0.213
Currently using conventional medication	1.09 (0.56-2.12)	0.806	1.30 (0.60-2.83)	0.501
Daily-life impact, per 1-point	1.53 (1.17-2.01)	0.002	1.31 (0.97-1.76)	0.076
Female vs male	0.62 (0.32-1.18)	0.142	0.40 (0.17-0.93)	0.033
Frequent allergen exposure	1.02 (0.43-2.39)	0.969	1.84 (0.52-6.56)	0.346
Postgraduate vs undergraduate	3.13 (0.53-18.56)	0.210	3.95 (0.98-15.94)	0.054
Private housing vs with family	0.58 (0.17-1.97)	0.381	0.41 (0.08-2.01)	0.273
Seasonal allergy	1.46 (0.77-2.79)	0.250	0.64 (0.30-1.36)	0.246
Smoking/passive smoking	1.17 (0.62-2.22)	0.630	0.92 (0.43-1.98)	0.833
Symptoms worsen with stress	1.17 (0.59-2.32)	0.651	1.18 (0.51-2.75)	0.695
University dorm vs with family	1.90 (0.89-4.05)	0.098	1.98 (0.29-13.32)	0.483

Separate multivariable models fitted for Medical (n = 216) and Non-medical (n = 186) students.

Discussion

This study investigated the prevalence, patterns, and determinants of CAM use among Palestinian university students with allergic diseases. The study demonstrated the common use of CAM as a health behavior among young adults with chronic allergic conditions, as one-third (34.4%) of participants reported its usage. This proportion is lower than reported rates in several other Palestinian studies; for example, Zyoud et al. reported popular CAM use among Palestinians with chronic conditions particularly those on hemodialysis; with prevalence estimates ranging from 64% to 73% (9). This discrepancy may be explained by the younger age and overall healthier status of university students compared with patients with chronic end-organ disease. On the other hand, this proportion aligns with international and regional studies demonstrating CAM usage rates of 30% - 62.1% among patients with allergic and chronic respiratory conditions (1, 17, 18). Moreover, several factors including dust exposure, air pollution, seasonal environmental changes, and psychological stress may encourage patients to seek additional symptom-relief options beyond conventional medicine (19).

The predominant CAM modality used by the participants was biologically based therapies, particularly herbal remedies and honey. The frequent use of sage (Salvia fruticosa), mint (Mentha spicata), and ginger (Zingiber officinale) is consistent with their widespread use in traditional Arabic-Palestinian herbal medicine for respiratory symptoms and inflammatory conditions (20). The accessibility, affordability, and long-standing social acceptance of herbal medicine make it deeply integrated into Palestinian tradition. Honey, used by 55.4% of CAM users, is recognized as a therapeutic agent in Islamic tradition (20). Furthermore, the "safe and natural" description of CAM products has been identified as a major driver of use in previous literature, despite limited scientific evidence regarding their efficacy and safety (6, 21). The increasing use of vitamins, particularly vitamin D and omega-3, highlights a growing awareness of nutritional approaches to immune modulation and allergy management.

Nearly half of CAM users reported using supplication (Du'aa), reflecting the spiritual and religious orientation of the study population and consistent with findings from other Muslim-majority populations in the region (22). Breathing exercises, reported by 45.3% of participants, reflect awareness of their role in managing respiratory symptoms (7). The multi-modal pattern of CAM use, with 94.2% of participants employing three or more modalities, demonstrates an integrated

combination of approaches rather than reliance on a single isolated therapy. This aligns with the literature suggesting that CAM users tend to combine multiple therapies simultaneously (21). However, this pattern of use increases the risk of herb–drug interactions, particularly among patients already receiving pharmacological allergy treatment (23).

The most commonly endorsed reason for CAM use in this study was cost: 46.8% of participants agreed that CAM is more affordable than conventional treatment. This finding is consistent with prior literature indicating that economic factors are primary drivers of CAM use, particularly in low- and middle-income settings (24, 25). The unstable economic situation in Palestine affects treatment-seeking behavior, as limited healthcare access and reduced medication affordability are well-documented challenges (20, 26). The second most commonly endorsed reason was the perception of safety (44.6%), followed by fear of conventional medication side effects (39.6%). This parallels findings from studies in other settings that link CAM use with dissatisfaction with or concerns about conventional medicine (6). Importantly, 67.6% of participants did not cite insufficient efficacy of conventional treatment as a primary reason, suggesting that CAM is used predominantly as a complement to standard therapy rather than a substitute for it (27).

Interestingly, 61.9% of CAM users mentioned physicians as a source of information about CAM, followed by 55.4% who cited family members. These findings contrast with other studies in which social media was identified as the predominant information source (21). This discrepancy may be explained by the high proportion of medical students in the study population and their greater interaction with healthcare professionals. Patients using CAM without healthcare professional counselling face an increased risk of drug interactions and inappropriate treatment choices (23, 28). Therefore, healthcare professionals should proactively inquire about CAM use and provide evidence-based counselling to their patients (6, 7).

A high proportion of CAM users reported experiencing concurrent symptoms, including fatigue, headache, thirst, and dizziness. These findings should be interpreted with caution, as such symptoms may reflect the underlying allergic disease rather than adverse effects of CAM per se. Nevertheless, they remain clinically important: previous studies have documented adverse effects associated with herbal products, including hepatotoxicity, allergic reactions, and drug interactions (23).

The inverse association between female sex and CAM use (aOR 0.54) contrasts with prior literature reporting higher CAM usage among females (9). This finding may be explained by cultural factors, gender-specific attitudes toward self-treatment, and differences in healthcare-seeking behavior. Notably, this inverse association was stronger among non-medical students, suggesting that educational background may modify the relationship between gender and CAM use.

Allergy-related daily-life impact showed a strong positive association with CAM use (aOR 1.44), suggesting that symptom burden and functional impairment are key motivators for seeking additional symptom-management options. This aligns with the literature indicating that patients with poorer health status and higher symptom burden are more likely to explore complementary approaches (27). Patients with allergic asthma were more than twice as likely to use CAM compared with individuals with other allergic conditions (aOR 2.12), which may be explained by the greater disease burden and lifestyle limitations associated with asthma, as well as the difficulty of achieving complete symptom control (7).

The stratified analyses by academic major provided clinically meaningful insights. Among medical students, allergy-related daily-life impact was the sole significant independent predictor of CAM use, whereas among non-medical students, allergic asthma was the strongest predictor. These findings suggest that medical education may shape attitudes toward CAM, risk perception, and healthcare decision-making (8). Postgraduate students showed markedly higher odds of CAM use (aOR 3.17), though this finding should be interpreted with caution given the small subgroup size (n = 20). Universities and healthcare institutions should consider implementing evidence-based educational initiatives regarding CAM use and potential herb-drug interactions.

Strengths and Limitations

Being among the first studies to investigate CAM use for allergic conditions among Palestinian university students is a notable strength of this study. In addition, the study assessed prevalence, modalities, motivations, associated factors, and symptom experiences related to CAM use. The use of multivariable regression, sensitivity analysis, and stratified analysis enhanced the robustness and interpretability of the findings.

However, several limitations should be acknowledged when interpreting these findings. First, the cross-sectional design precludes inference of causal relationships between predictors and CAM use. Second, recall bias and social desirability bias may have affected self-reported CAM use. Third, the safety of CAM cannot be assessed from this design, since symptoms reported during CAM use cannot be definitively attributed to CAM itself. Fourth, female participants constituted 72% of the sample, which may limit the generalizability of the findings. Finally, the postgraduate subgroup was small, warranting cautious interpretation of the associated findings.

Conclusion

CAM use is prevalent among Palestinian university students with allergic conditions and is characterized by widespread adoption of biologically based therapies and mind-body practices. CAM is predominantly used as a complement to conventional therapy, driven by cost considerations, perceptions of safety, and the desire to achieve better symptom control. This study highlights the need for improving patient–physician communication regarding CAM use and for the promotion of evidence-based education about the potential benefits, risks, and interactions associated with CAM therapies. Future longitudinal and qualitative research is warranted to further elucidate the motivations, experiences, and outcomes associated with CAM use in this population.

Declarations

Ethics Approval and Consent to Participate: Ethical approval was obtained from the Institutional Review Board of An-Najah National University (Protocol No. Med.Jan.2026/36). All participants provided informed consent before participation. The study was conducted in accordance with relevant institutional and international ethical guidelines and regulations

Consent for Publication: Not Applicable

Availability of Data and Materials: The data used and analyzed during the current study are available from the corresponding author upon reasonable request.

Competing Interests: The authors declare that they have no competing interests.

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Author's Contribution: HK and MA contributed to the study conception and design. TH, SJ, IH, and HA participated in data collection and the first draft of the manuscript. DH performed the statistical analysis and interpreted the data. MA and HK drafted the final draft of the manuscript

and completed the final review. All authors critically reviewed the manuscript, approved the final version, and agree to be accountable for all aspects of the work.

Abbreviations

CAM - Complementary and Alternative Medicine

IQR - Interquartile Range

NCCAM - National Center for Complementary and Alternative Medicine

IgE - Immunoglobulin E

SPSS - Statistical Package for Social Sciences

IRB - Institutional Review Board

OR - Odds Ratio

aOR - Adjusted Odds Ratio

CI - Confidence Interval

AUC - Area Under the Curve

ROC - Receiver Operating Characteristic

SD - Standard Deviation

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Figure Lengends:

Figure 1: Patterns of CAM use among users, organized by CAM category (n = 139). Horizontal bar chart displaying the prevalence of 23 individual CAM modalities among the 139 CAM users, grouped by NCCAM category: biologically-based therapies (blue), mind-body practices (green), manipulative and body-based therapies (orange), and alternative medical systems (red). Values on the x-axis represent the percentage of CAM users reporting each modality. Within biologically-based therapies, sage (*Salvia fruticosa*, 60.4%), mint (*Mentha spicata*, 57.6%), and honey (55.4%) were the most frequently used agents. Among mind-body practices, supplication (Du'aa, 46.0%) and breathing exercises (45.3%) predominated. Homeopathy (20.9%) was the most common alternative medical system. The majority of users employed modalities across multiple categories simultaneously (94.2% used ≥3 categories; mean number of categories per user = 4.58).

Figure 2. Forest plot of adjusted odds ratios for independent predictors of CAM use (primary multivariable logistic regression model, N = 404). Adjusted odds ratios (aORs) with

95% confidence intervals are displayed on a log scale. Red circles indicate predictors reaching statistical significance ($p < 0.05$); blue circles indicate non-significant predictors ($p \geq 0.05$). The vertical dashed line at aOR = 1.0 represents the null hypothesis of no association. Four independent predictors were statistically significant: female sex (aOR 0.53, 95% CI 0.32–0.87, $p = 0.013$), postgraduate versus undergraduate education (aOR 3.17, 95% CI 1.14–8.85, $p = 0.027$), allergy-related daily-life impact per 1-point increase on a 1–5 scale (aOR 1.44, 95% CI 1.19–1.76, $p < 0.001$), and comorbid allergic asthma (aOR 2.12, 95% CI 1.04–4.32, $p = 0.039$). The model demonstrated acceptable discrimination (AUC = 0.721, 95% CI 0.668–0.773) and good calibration (Hosmer–Lemeshow $p = 0.698$). aOR, adjusted odds ratio; CI, confidence interval; AUC, area under the curve.

Supplementary Figure 1. Receiver operating characteristic (ROC) curve for the primary multivariable logistic regression model predicting CAM use (N = 404). The blue curve represents the trade-off between sensitivity and 1 − specificity across all classification thresholds for model-predicted probabilities of CAM use. The dashed diagonal line represents chance discrimination (AUC = 0.50). The model achieved an AUC of 0.721 (95% CI: 0.668–0.773), indicating acceptable discriminative ability. AUC, area under the curve; CI, confidence interval; ROC, receiver operating characteristic.

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Appendices:

Appendix 1:

Table 1. Sociodemographic and clinical characteristics by CAM use

Variable	Overall N = 404[1]	Non-user N = 265[1]	User N = 139[1]	p-value[2]
Age, years	21.0 (20.0, 22.0)	20.0 (20.0, 22.0)	21.0 (20.0, 22.0)	0.037
Female	290 (72%)	202 (76%)	88 (63%)	0.009
Education level (detailed)				0.029
Diploma	21 (5.2%)	16 (6.0%)	5 (3.6%)	
Bachelor	363 (90%)	241 (91%)	122 (88%)	
Master	14 (3.5%)	7 (2.6%)	7 (5.0%)	
PhD	6 (1.5%)	1 (0.4%)	5 (3.6%)	
Education level (collapsed)				0.026
Undergraduate	384 (95%)	257 (97%)	127 (91%)	
Postgraduate	20 (5.0%)	8 (3.0%)	12 (8.6%)	
Medical major	217 (54%)	131 (49%)	86 (62%)	0.023
Year of study				0.4
1st	55 (14%)	39 (15%)	16 (12%)	
2nd	95 (24%)	68 (26%)	27 (20%)	
3rd	122 (31%)	75 (29%)	47 (35%)	
4th	86 (22%)	53 (20%)	33 (25%)	
5th+	36 (9.1%)	26 (10.0%)	10 (7.5%)	
Residence				0.026
With family	325 (81%)	221 (83%)	104 (76%)	
University dorm	49 (12%)	24 (9.1%)	25 (18%)	
Private housing	28 (7.0%)	20 (7.5%)	8 (5.8%)	
Formally diagnosed allergy	293 (73%)	192 (72%)	101 (73%)	>0.9
Duration of allergy				0.077
<1 year	118 (29%)	87 (33%)	31 (22%)	

Variable	Overall N = 404[1]	Non-user N = 265[1]	User N = 139[1]	p-value[2]
1-3 years	76 (19%)	49 (18%)	27 (19%)	
>3 years	210 (52%)	129 (49%)	81 (58%)	
Symptom severity (1-5)	3.0 (2.0, 4.0)	3.0 (2.0, 3.0)	3.0 (2.0, 4.0)	0.001
Daily-life impact (1-5)	3.0 (1.0, 4.0)	2.0 (1.0, 3.0)	3.0 (2.0, 4.0)	<0.001
Using conventional medication	200 (50%)	115 (43%)	85 (61%)	0.001
Medication adherence (1-5)	3.0 (1.0, 4.0)	2.0 (1.0, 3.0)	3.0 (2.0, 4.0)	<0.001
Frequent allergen exposure	320 (79%)	200 (75%)	120 (86%)	0.015
Smoking/passive smoking	189 (47%)	115 (43%)	74 (53%)	0.075
Symptoms worsen with stress	270 (67%)	168 (63%)	102 (73%)	0.056
Allergic rhinitis	148 (37%)	92 (35%)	56 (40%)	0.3
Seasonal allergy	185 (46%)	115 (43%)	70 (50%)	0.2
Eczema/atopic dermatitis	82 (20%)	54 (20%)	28 (20%)	>0.9
Food allergy	54 (13%)	37 (14%)	17 (12%)	0.7
Allergic asthma	43 (11%)	20 (7.5%)	23 (17%)	0.009
Drug allergy	28 (6.9%)	21 (7.9%)	7 (5.0%)	0.4

[1]Median (Q1, Q3); n (%)

[2]Wilcoxon rank sum test; Pearson's Chi-squared test

Figures

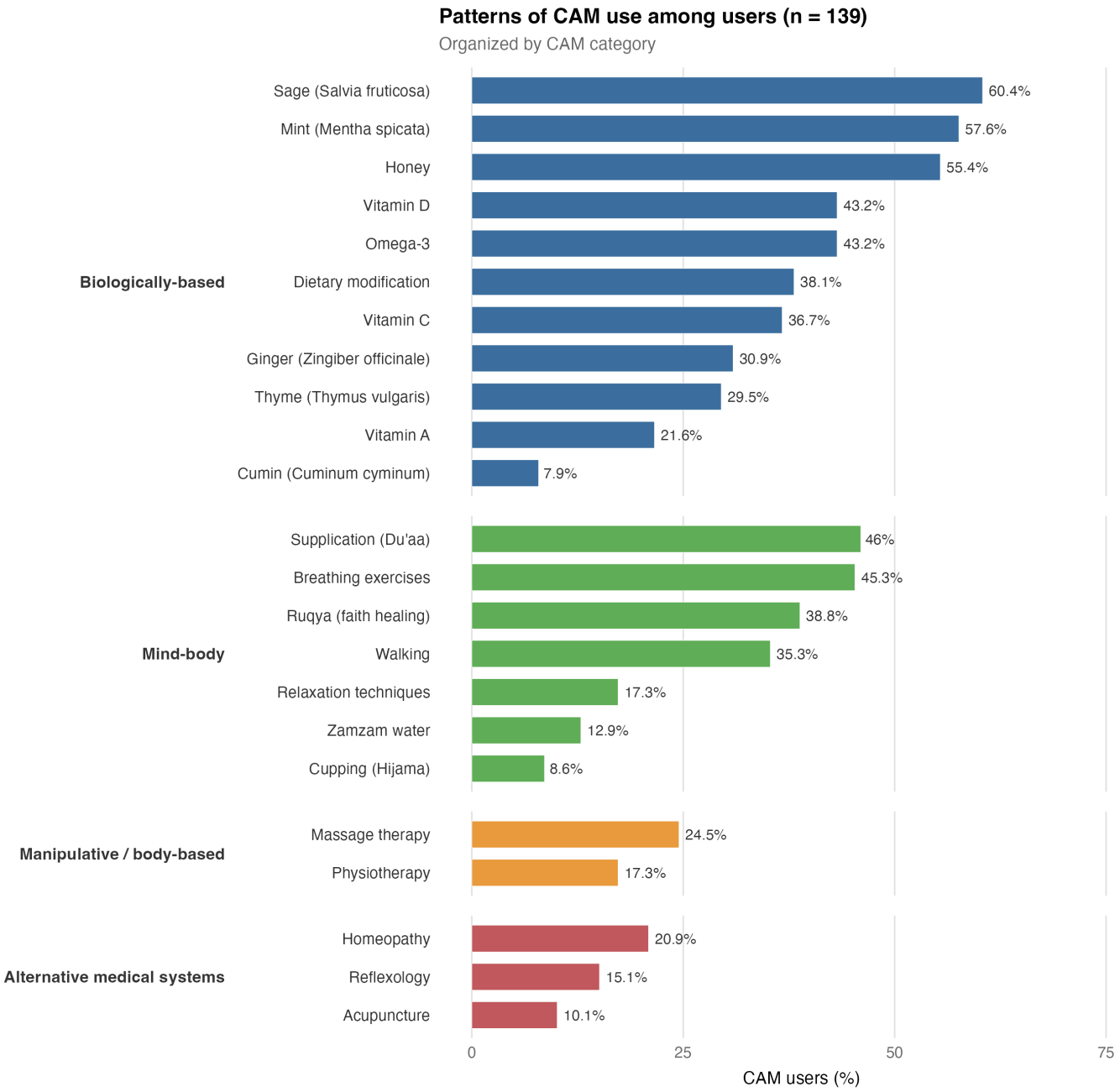


Figure 1

Patterns of CAM use among users, organized by CAM category (n = 139). Horizontal bar chart displaying the prevalence of 23 individual CAM modalities among the 139 CAM users, grouped by NCCAM category: biologically-based therapies (blue), mind-body practices (green), manipulative and body-based therapies (orange), and alternative medical systems (red). Values on the x-axis represent the percentage of CAM users reporting each modality. Within biologically-based therapies, sage (*Salvia fruticosa*, 60.4%), mint (*Mentha spicata*, 57.6%), and honey (55.4%) were the most frequently used agents. Among mind-body practices, supplication (Du'aa, 46.0%) and breathing exercises (45.3%)

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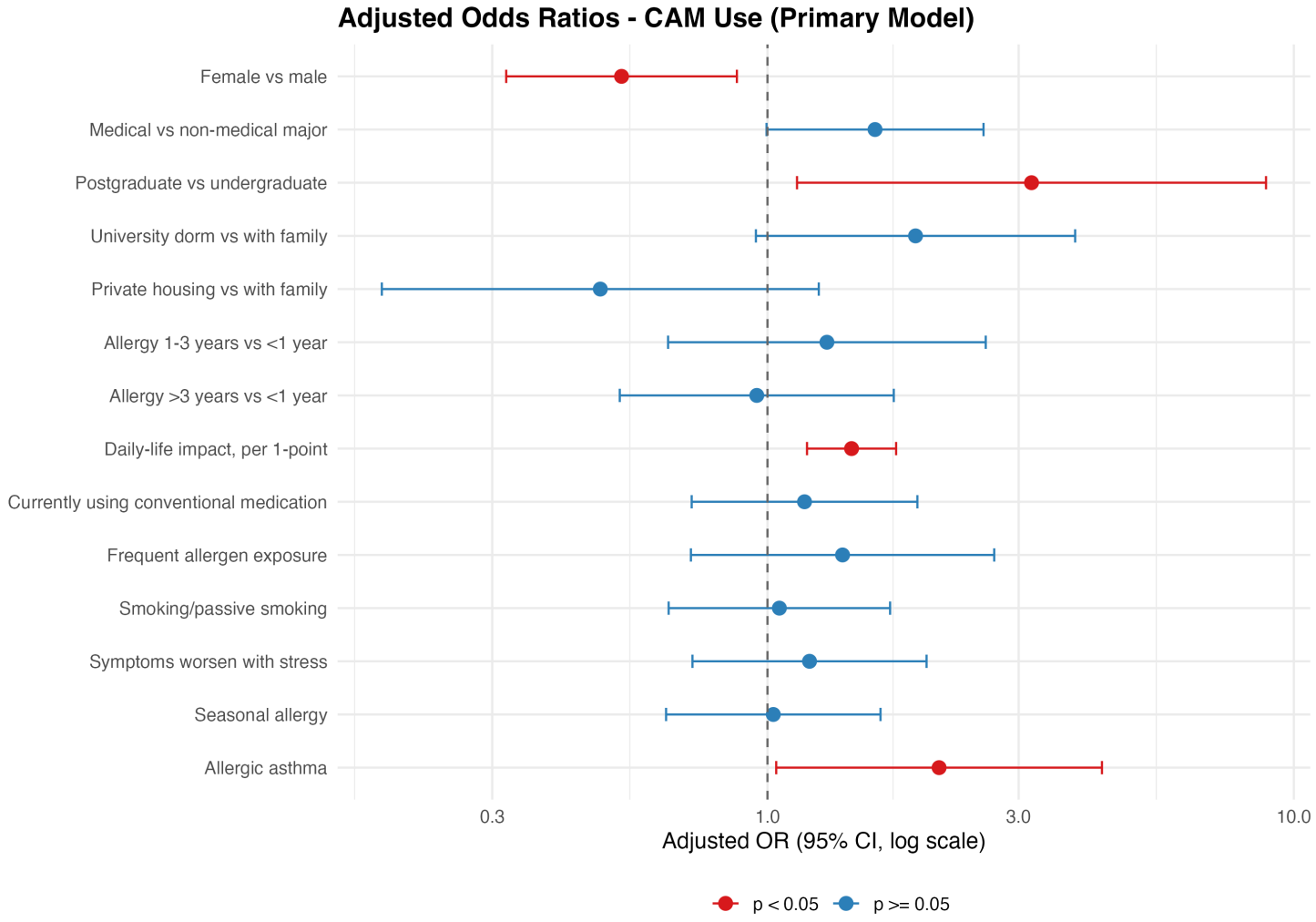


Figure 2

Forest plot of adjusted odds ratios for independent predictors of CAM use (primary multivariable logistic regression model, N = 404). Adjusted odds ratios (aORs) with 95% confidence intervals are displayed on a log scale. Red circles indicate predictors reaching statistical significance ($p < 0.05$); blue circles indicate non-significant predictors ($p \geq 0.05$). The vertical dashed line at aOR = 1.0 represents the null hypothesis of no association. Four independent predictors were statistically significant: female sex (aOR 0.53, 95% CI 0.32–0.87, p = 0.013), postgraduate versus undergraduate education (aOR 3.17, 95% CI 1.14–8.85, p = 0.027), allergy-related daily-life impact per 1-point increase on a 1–5 scale (aOR 1.44, 95% CI 1.19–1.76, p < 0.001), and comorbid allergic asthma (aOR 2.12, 95% CI 1.04–4.32, p = 0.039). The model demonstrated acceptable discrimination (AUC = 0.721, 95% CI 0.668–0.773) and good calibration (Hosmer–Lemeshow p = 0.698). aOR, adjusted odds ratio; CI, confidence interval; AUC, area under the curve.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplementaryTable1CAMAllergy.docx
- SupplementaryTable3CAMAllergy.docx
- SupplementaryTable2CAMAllergy.docx
- ROCcurve1.png