

OCCUPATIONAL HEALTH PRACTICES, TRAINING STATUS, KNOWLEDGE ON IDENTIFICATION, IMMEDIATE MANAGEMENT AND PREVENTION OF ALLERGIC REACTIONS AMONG BEAUTICIANS IN TAMIL NADU: A CROSS-SECTIONAL STUDY

Dr. M. Vimal Kumar¹, Dr. Banu Prakash², Dr. S. Thrupthi³, Dr. Yogesh Manickam Dominic Savio⁴, Dr. Lakshmi Nagalingam⁵

¹Postgraduate, Department of Community Medicine, Sree Balaji Medical College and Hospital, Chromepet, Chennai, Tamil Nadu, India, ORCID ID: 0009-0004-2903-9969, Email: vimalkumar16599@gmail.com,

²Postgraduate, Department of Pathology, Saveetha Institute of Medical and Technical Sciences, Thandalam, Chennai – 602105, Tamil Nadu, India, ORCID ID: 0009-0006-8767-711, Email: banuvishnu133@gmail.com

³Assistant Professor, Department of ENT, Sree Balaji Medical College and Hospital, Bharat Institute of Higher Education and Research (Bharath University), Tamil Nadu, India, ORCID ID: 0000-0003-4838-8326, Email: thrupthisubbanna@gmail.com,

⁴Independent Medical Researcher, Chennai, Tamil Nadu, India, ORCID ID: 0009-0001-8769-5890, Email: dryogeshmanickam@gmail.com

⁵Associate Professor, Department of Community Medicine, Sree Balaji Medical College and Hospital, Chennai, Tamil Nadu, India. E-mail: lakshmidr649@gmail.com; ORCID: 0000-0001-6323-3408.

ABSTRACT

Background: Beauticians are routinely exposed to a wide range of cosmetic chemicals that increase their risk of occupational allergic reactions. Limited occupational health training and inadequate emergency preparedness may further compromise the timely identification, prevention, and management of these reactions.

Methods: A community-based cross-sectional study was conducted among 300 beauticians working in Chennai, Tamil Nadu, between January and December 2025. Participants were selected using multistage sampling followed by consecutive recruitment. Data were collected using a pretested structured questionnaire assessing socio-demographic characteristics, occupational profile, training status, knowledge regarding allergic reactions, preventive practices, and emergency preparedness. Data were analyzed using SPSS version 26.0. Descriptive statistics and appropriate inferential tests were applied, with statistical significance set at $p < 0.05$.

Results: The majority of participants were females (95.7%) aged 26–35 years (40.7%), and 64.0% had formal beautician certification. Although 72.7% correctly identified common allergic symptoms, only 38.0% recognized anaphylaxis as a medical emergency, while 29.3% identified adrenaline as the first-line treatment. First-aid and Basic Life Support training were reported by 42.7% and 19.3% of participants, respectively. More than one-fourth (27.3%) had experienced occupational allergic reactions, with eye irritation (21.0%), contact dermatitis (18.0%), hand eczema (13.7%), and hair dye allergy (12.0%) being the most common manifestations. Preventive practices such as routine allergy history assessment, patch testing, and maintenance of emergency preparedness were suboptimal.

Conclusion: Beauticians demonstrated moderate awareness of cosmetic allergies but inadequate preparedness for preventing and managing severe allergic reactions. Strengthening occupational health training, integrating first-aid and Basic Life Support education into cosmetology curricula, promoting standardized preventive protocols, and improving emergency preparedness are essential to enhance occupational safety and protect both beauticians and their clients.

KEYWORDS: Beauticians; Occupational allergy; Contact dermatitis; Cosmetic allergy; Occupational health; Emergency preparedness; Anaphylaxis; Beauty salons.

INTRODUCTION

Occupational health is a fundamental component of public health that aims to promote and maintain the highest standards of physical, mental, and social well-being of workers across all occupations. Workers employed in the beauty and cosmetology industry constitute an important occupational group that is frequently exposed to numerous chemical, biological, and physical hazards during routine professional activities. Continuous exposure to cosmetic ingredients, disinfectants, hair dyes, bleaching agents, fragrances, preservatives, adhesives, and other salon chemicals places beauticians at an increased risk of developing occupational illnesses, particularly allergic and irritant skin disorders, respiratory allergies, and eye irritation [1].

The global beauty and wellness industry has expanded rapidly over the past decade owing to urbanization, changing lifestyle patterns, increasing disposable income, growing awareness of personal grooming, and the widespread influence of digital media. Parallel to this growth, occupational exposure to hazardous cosmetic ingredients has also increased considerably, making workplace safety an important public health concern. The World Health Organization emphasizes

that every worker has the right to a safe and healthy working environment and advocates implementation of preventive occupational health measures across all sectors, including service industries such as cosmetology [1]. Furthermore, the availability of essential emergency medicines for the prompt management of severe allergic reactions, including anaphylaxis, forms an integral component of emergency preparedness in healthcare as well as other high-risk occupational settings [2].

The International Labour Organization recognizes occupational safety and health as an essential prerequisite for decent work and sustainable development. Implementation of workplace safety policies, continuous training, and hazard reduction strategies are crucial for minimizing occupational injuries and illnesses among workers exposed to hazardous substances on a regular basis [3]. Similarly, the National Institute for Occupational Safety and Health recommends adopting the hierarchy of controls, including elimination or substitution of hazardous chemicals, engineering controls, administrative measures, and appropriate personal protective equipment to reduce occupational exposures effectively [4]. Protection of the skin from repeated chemical exposure is particularly important among beauticians because chronic exposure to irritants and sensitizers frequently results in occupational skin disorders that significantly affect quality of life and work productivity [5].

Beauticians routinely handle cosmetic products containing para-phenylenediamine (PPD), ammonium persulfate, formaldehyde-releasing compounds, acrylates, fragrances, preservatives, nickel-containing instruments, latex gloves, and various solvents. These substances are recognized allergens capable of inducing allergic contact dermatitis, irritant contact dermatitis, urticaria, conjunctivitis, respiratory hypersensitivity, and occasionally systemic allergic reactions. Although most reactions remain localized, severe immediate hypersensitivity reactions may occur and require prompt recognition and emergency management. The American Academy of Allergy, Asthma and Immunology recommends immediate identification of symptoms, early administration of appropriate first aid, rapid referral, and timely use of adrenaline for suspected anaphylaxis to prevent morbidity and mortality [6].

Among occupational skin diseases, allergic contact dermatitis remains one of the most frequently encountered conditions in beauty professionals. It develops following sensitization to specific allergens after repeated exposure and commonly presents with erythema, itching, vesiculation, scaling, fissuring, and chronic eczema involving the hands and forearms. Comprehensive dermatology references identify hairdressers and beauticians as one of the highest-risk occupational groups due to repeated exposure to multiple cosmetic allergens and prolonged wet work [7]. Similarly, Fisher's Contact Dermatitis describes cosmetic chemicals, preservatives, fragrances, rubber additives, and hair dye constituents as major occupational allergens responsible for chronic dermatitis among salon workers [8].

The Handbook of Occupational Dermatology further highlights that occupational dermatitis among cosmetology professionals contributes substantially to work absenteeism, reduced productivity, diminished quality of life, and, in severe cases, premature discontinuation of employment. Many of these occupational illnesses are preventable through adequate education, routine use of personal protective equipment, safer chemical handling practices, and periodic occupational health surveillance [9]. Early recognition of symptoms and implementation of preventive strategies are therefore essential to reduce long-term complications among beauticians.

Apart from occupational exposure, beauticians are also responsible for ensuring client safety. Cosmetic procedures such as hair colouring, bleaching, chemical straightening, facials, waxing, nail enhancement, eyelash extension, and chemical peels may occasionally trigger allergic reactions in susceptible clients. Appropriate assessment of allergy history, routine patch testing before high-risk procedures, recognition of early symptoms, immediate discontinuation of the offending agent, and timely referral constitute important components of safe salon practice. Clinical dermatology guidelines emphasize that appropriate preventive measures substantially reduce cosmetic-related adverse reactions and improve consumer safety [10].

Despite the rapid expansion of the beauty industry in India, occupational health practices among beauticians remain inadequately studied. Existing literature has predominantly focused on dermatological manifestations among hairdressers and cosmetologists, while comparatively limited information is available regarding formal training status, knowledge of allergic reaction identification, immediate management practices, emergency preparedness, availability of first-aid resources, and preventive measures adopted in beauty salons. Furthermore, evidence regarding clients' preferences for selecting beauty service providers and their influence on professional safety standards is scarce.

Chennai, one of the largest metropolitan cities in South India, has witnessed substantial growth in the organized and unorganized beauty service sector. Beauticians working in these settings frequently perform procedures involving prolonged chemical exposure, often without standardized occupational safety protocols or structured emergency preparedness. Understanding their knowledge, occupational practices, training status, and preparedness for managing allergic reactions is essential for developing evidence-based interventions, strengthening cosmetology training programmes, improving occupational safety standards, and enhancing consumer protection.

Therefore, the present study was undertaken to assess the occupational health practices, training status, knowledge regarding identification, immediate management, and prevention of allergic reactions among beauticians in Chennai City. The findings are expected to provide valuable evidence for policymakers, public health professionals, cosmetology training institutions, and regulatory authorities to develop standardized occupational health guidelines, improve emergency preparedness, and promote safer beauty care practices.

METHODOLOGY

The present study was a community-based descriptive cross-sectional study conducted among beauticians working in Chennai City, Tamil Nadu, to assess their occupational health practices, training status, knowledge regarding the identification, immediate management, and prevention of allergic reactions. The study was carried out over a period of

one year, from January 2025 to December 2025, which included protocol development, ethical approval, pilot testing of the study instrument, participant recruitment, data collection, data entry, statistical analysis, and preparation of the final report.

The study was undertaken among professional beauticians employed in registered beauty salons, beauty parlours, unisex salons, spas, and freelance beauty service establishments located across the North, South, East, West, and Central zones of Chennai City. Beauticians aged 18 years and above, having at least six months of professional work experience, and willing to participate in the study were included. Trainees with less than six months of experience, beauticians who were unavailable after repeated visits, those unwilling to provide written informed consent, and questionnaires with incomplete responses were excluded from the study.

The required sample size was calculated using the standard formula for estimation of a single population proportion, considering a prevalence of occupational allergic reactions among beauticians of 27%, a 95% confidence level, an absolute precision of 5%, and a 5% non-response rate. The calculated minimum sample size was approximately 300 participants; therefore, a total of 300 beauticians were included in the study. A multistage sampling technique was adopted. Initially, Chennai City was divided into five geographical zones (North, South, East, West, and Central). Beauty salons from each zone were identified through municipal listings, professional beauty associations, and commercial directories. Salons were selected using simple random sampling, following which all eligible beauticians available during the study period were recruited consecutively until the desired sample size was achieved, ensuring adequate representation from different categories of salons and freelance practitioners.

Data were collected using a pre-designed, structured, interviewer-administered questionnaire developed after an extensive review of national and international literature and consultation with experts in Community Medicine, Dermatology, Occupational Health, and Cosmetology. The questionnaire was prepared in English and translated into Tamil using the forward-backward translation method to ensure semantic equivalence. Prior to the main survey, the questionnaire was pilot tested among 30 beauticians from salons not included in the final study to assess clarity, feasibility, and reliability, following which necessary modifications were incorporated. The final questionnaire consisted of six sections covering socio-demographic characteristics, professional profile, occupational training, occupational allergic problems, knowledge regarding identification and management of allergic reactions, preventive practices, emergency preparedness, and factors influencing clients' choice of beauty service providers.

Knowledge regarding allergic reactions was assessed using multiple objective questions addressing common cosmetic allergens, recognition of allergic manifestations, identification of anaphylaxis, importance of patch testing, immediate first-aid measures, emergency referral, adrenaline administration, and preventive strategies. Each correct response was awarded one mark, while incorrect or unanswered responses received zero marks. Based on the total score obtained, participants scoring $\geq 75\%$ were categorized as having good knowledge, those scoring 50–74% as having moderate knowledge, and those scoring $< 50\%$ as having poor knowledge. Occupational allergic reactions were defined as any self-reported history of itching, erythema, dermatitis, urticaria, eye irritation, respiratory symptoms, or hypersensitivity following occupational exposure to cosmetic products during routine professional work.

Prior permission was obtained from salon owners and managers before commencement of data collection. Eligible participants were informed about the objectives of the study, and written informed consent was obtained prior to enrolment. Face-to-face interviews were conducted in a private setting within the workplace using the structured questionnaire, with each interview requiring approximately 20–25 minutes to complete. Strict confidentiality and anonymity were maintained throughout the study, and no personal identifiers were recorded.

The collected data were entered into Microsoft Excel and analysed using IBM Statistical Package for the Social Sciences (SPSS) version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were summarized using mean and standard deviation, whereas categorical variables were expressed as frequencies and percentages. Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test, wherever appropriate. Independent sample t-test or one-way analysis of variance (ANOVA) was used for comparison of continuous variables between groups. A p-value of less than 0.05 was considered statistically significant.

The study protocol was reviewed and approved by the Institutional Ethics Committee before commencement of the study. Participation was entirely voluntary, and participants were informed of their right to withdraw from the study at any stage without affecting their professional status. Confidentiality of all information obtained during the study was maintained, and the research was conducted in accordance with the ethical principles of the Declaration of Helsinki and Good Clinical Practice guidelines.

RESULTS

Table 1. Socio-demographic Characteristics of Beauticians in Chennai City (N = 300)

Variable	Frequency (n)	Percentage (%)
Age (years)		
18–25	98	32.7
26–35	122	40.7
36–45	57	19.0
>45	23	7.6
Gender		
Female	287	95.7
Male	13	4.3

Educational Qualification		
Up to Higher Secondary	61	20.3
Diploma/Beautician Course	126	42.0
Undergraduate	99	33.0
Postgraduate	14	4.7
Residence		
Urban	242	80.7
Peri-urban	58	19.3
Monthly Income (₹)		
<15,000	49	16.3
15,000–25,000	138	46.0
25,001–40,000	86	28.7
>40,000	27	9.0

Table 2. Professional Characteristics of Beauticians in Chennai City (N = 300)

Variable	Frequency (n)	Percentage (%)
Professional Role		
Salon Owner	84	28.0
Employee	176	58.7
Freelancer/Home Service	40	13.3
Years of Professional Experience		
<2 years	52	17.3
2–5 years	112	37.3
6–10 years	84	28.0
>10 years	52	17.3
Average Clients per Day		
<5	46	15.3
5–10	147	49.0
11–20	86	28.7
>20	21	7.0
Professional Certification Status		
Formally Certified	192	64.0
Not Certified	108	36.0
Source of Training		
Government Institution	48	16.0
Private Beauty Academy	144	48.0
Self-trained/Apprenticeship	108	36.0

Table 3. Occupational Training and Safety Education Received by Beauticians (N = 300)

Variable	Yes n (%)	No n (%)
Formal Beautician Certification	192 (64.0)	108 (36.0)
First Aid Training	128 (42.7)	172 (57.3)
Basic Life Support (BLS) Training	58 (19.3)	242 (80.7)
Training on Identification of Allergic Reactions	66 (22.0)	234 (78.0)
Training on Immediate Management of Allergic Reactions	61 (20.3)	239 (79.7)
Infection Prevention and Control Training	149 (49.7)	151 (50.3)
Biomedical Waste Management Training	138 (46.0)	162 (54.0)
Occupational Safety Training	109 (36.3)	191 (63.7)

Table 4. Occupational Allergic Problems Experienced by Beauticians in Chennai City (N = 300)

Variable	Frequency (n)	Percentage (%)
Experienced Any Occupational Allergic Reaction	82	27.3
Contact Dermatitis	54	18.0
Hand Eczema	41	13.7
Hair Dye Allergy	36	12.0
Eye Irritation	63	21.0
Respiratory Allergy	19	6.3
Latex Allergy	11	3.7
Chemical Burn Following Cosmetic Exposure	9	3.0
Sought Medical Consultation	24	8.0
Required Hospital Admission	4	1.3

Table 5. Knowledge Regarding Identification, Immediate Management and Prevention of Allergic Reactions Among Beauticians (N = 300)

Knowledge Variable	Correct Response n (%)
Aware of common cosmetic allergens	189 (63.0)
Recognizes contact dermatitis	203 (67.7)
Recognizes symptoms of anaphylaxis	93 (31.0)
Knows importance of patch testing	171 (57.0)
Knows immediate first aid measures	137 (45.7)
Knows when immediate hospital referral is required	156 (52.0)
Aware that adrenaline is lifesaving in anaphylaxis	71 (23.7)
Knows methods to prevent cosmetic allergies	184 (61.3)
Overall Knowledge Score	
Poor (<50%)	85 (28.3)
Moderate (50–74%)	144 (48.0)
Good (≥75%)	71 (23.7)

Table 6. Preventive Practices and Emergency Preparedness in Beauty Salons (N = 300)

Variable	Frequency (n)	Percentage (%)
Routinely perform patch testing before hair colouring	123	41.0
Routinely obtain allergy history before cosmetic procedures	118	39.3
Always wear disposable gloves	146	48.7
Always wear face mask	112	37.3
Routinely check expiry date of cosmetic products	246	82.0
Perform hand hygiene after every client	268	89.3
First aid box available in salon	201	67.0
Oral antihistamines available	122	40.7
Topical corticosteroids available	138	46.0
Adrenaline (Epinephrine) available	9	3.0
Emergency contact numbers displayed	96	32.0
Standard Operating Procedure (SOP) available	41	13.7
Staff trained in emergency management	52	17.3
Nearby referral hospital identified	214	71.3

Table 7. Factors Influencing Clients' Choice of Beauty Service Providers as Perceived by Beauticians (Multiple Responses) (N = 300)

Factors Influencing Choice	Frequency (n)	Percentage (%)
Hygiene and cleanliness of salon	236	78.7
Affordable service charges	221	73.7
Quality of beauty services	214	71.3
Professional certification of beautician	182	60.7
Years of professional experience	171	57.0
Recommendations from friends/family	163	54.3
Use of branded cosmetic products	149	49.7
Availability of advanced cosmetic procedures	136	45.3
Positive online reviews/social media reputation	118	39.3
Convenient location of salon	112	37.3
Attractive discounts/promotional offers	96	32.0
Flexible appointment timings	88	29.3
Preference for home service	57	19.0
Preference for uncertified but experienced beauticians	42	14.0
Preference for the cheapest provider irrespective of qualification	31	10.3

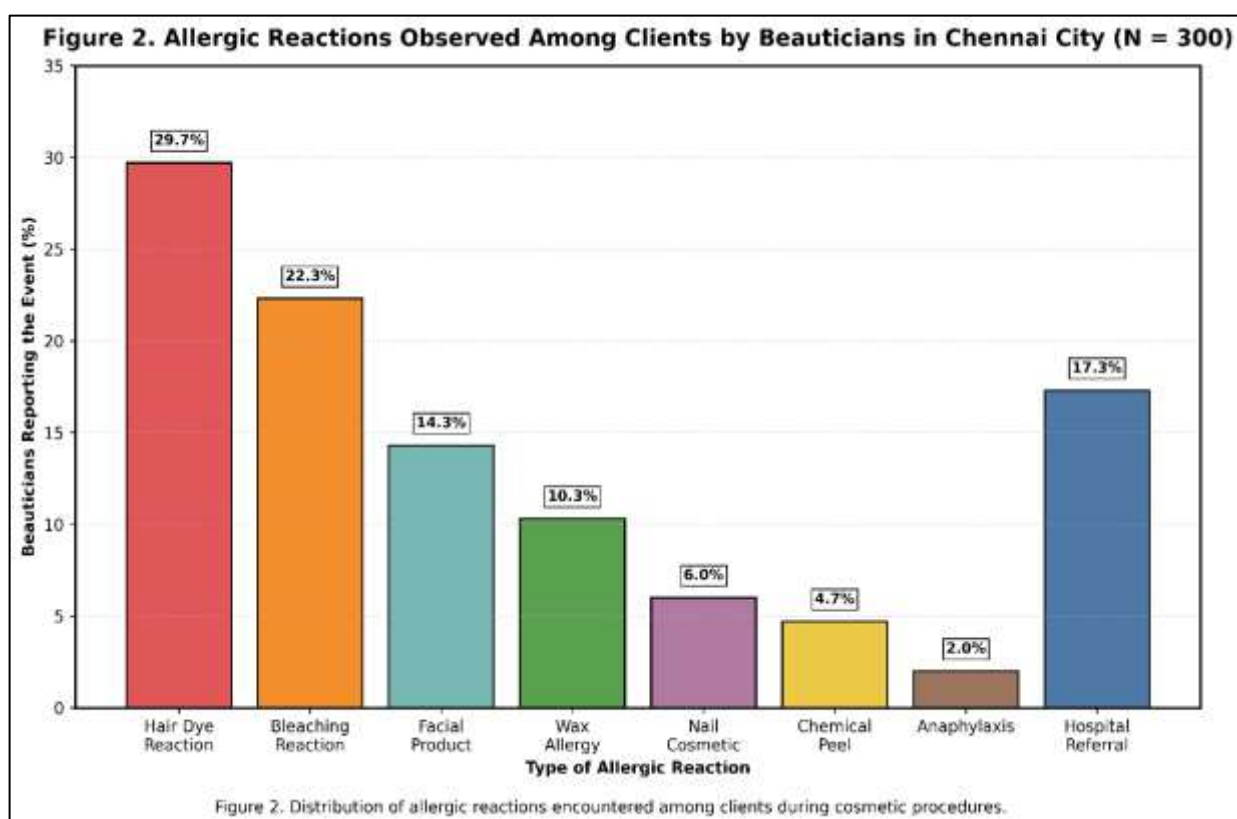
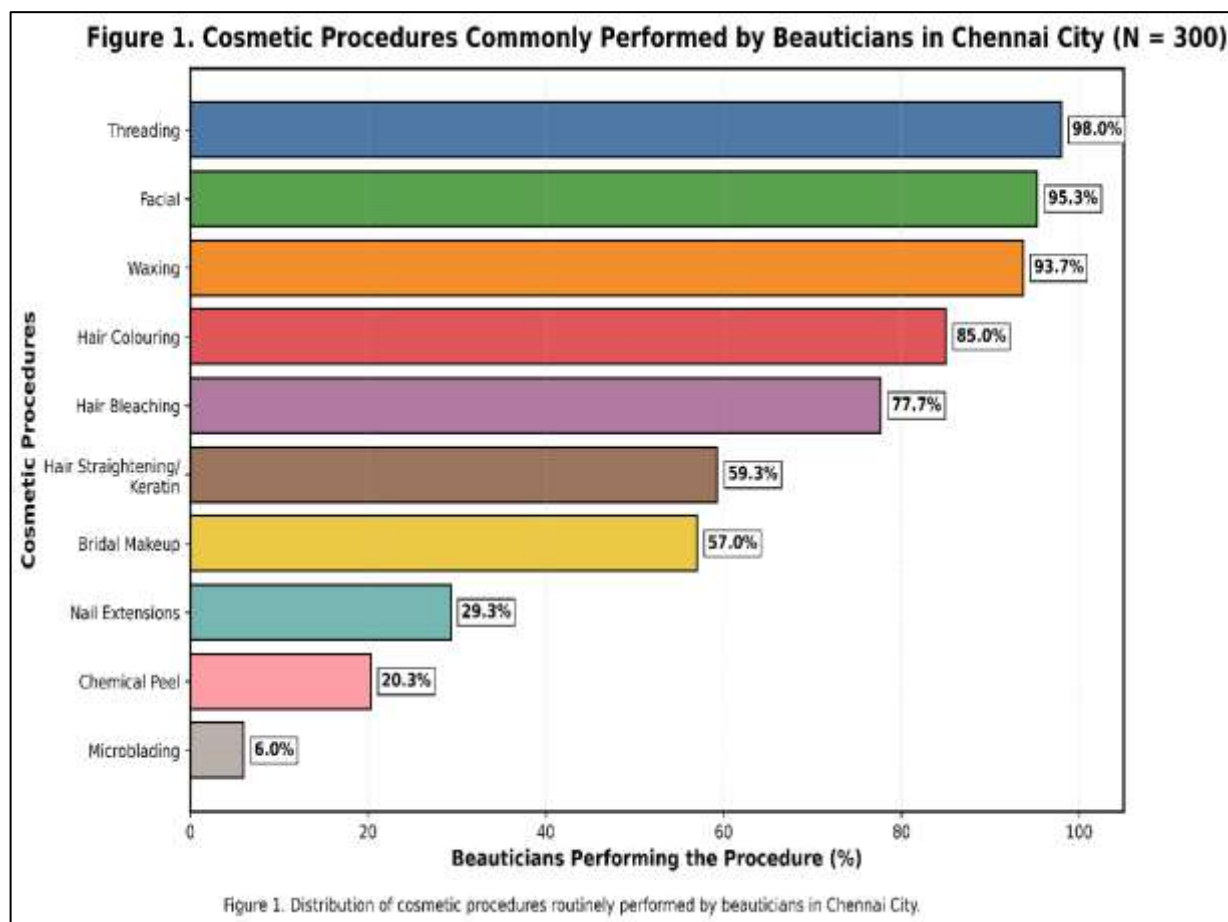


Figure 3. Overall Knowledge Level Regarding Identification, Immediate Management and Prevention of Allergic Reactions Among Beauticians in Chennai City (N = 300)

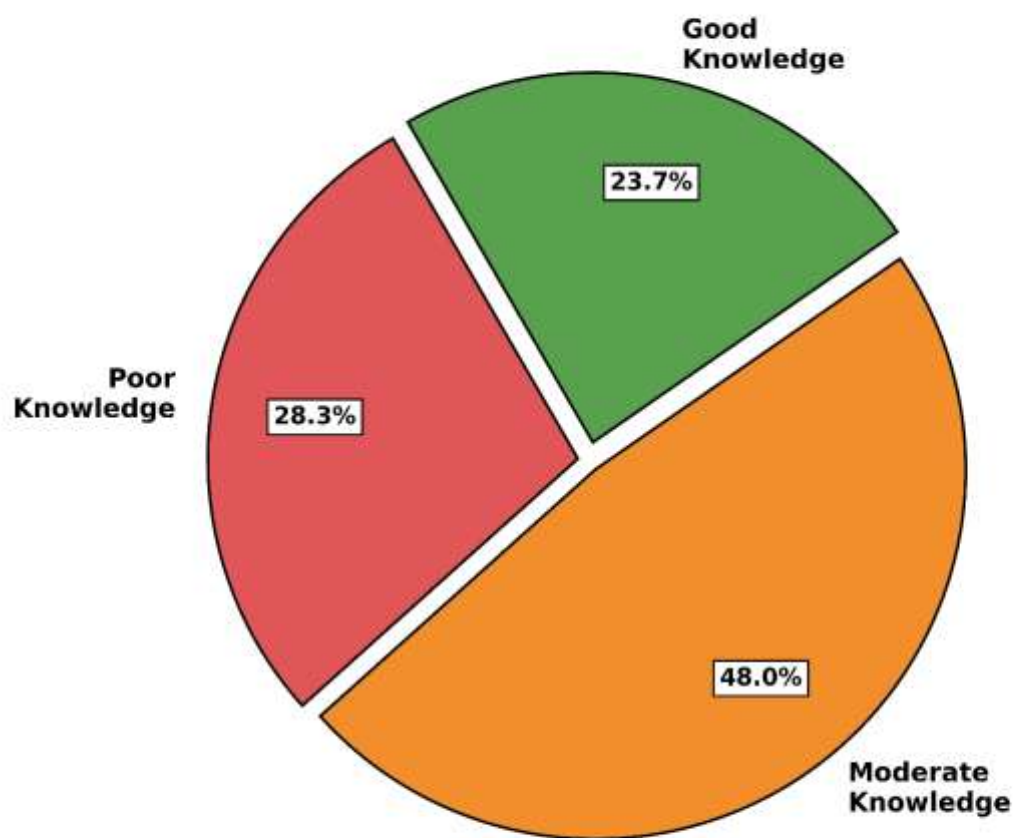


Figure 3. Distribution of overall knowledge scores among beauticians regarding allergic reactions.

DISCUSSION (Part 1)

The present community-based cross-sectional study assessed occupational health practices, training status, and knowledge regarding the identification, immediate management, and prevention of allergic reactions among 300 beauticians in Chennai City. Overall, the findings demonstrated moderate awareness regarding cosmetic allergies; however, significant deficiencies were observed in occupational safety training, emergency preparedness, and preventive practices. More than one-fourth of the participants reported experiencing occupational allergic reactions, while formal training in first aid, basic life support, and management of severe allergic reactions remained inadequate. These findings highlight the need for structured occupational health education and standardized safety protocols within the beauty industry.

The majority of participants were aged 26–35 years (40.7%), and females constituted 95.7% of the study population. Nearly two-thirds possessed formal beautician certification, with diploma-level education being the most common qualification. These findings are consistent with those reported by John et al. [11], who described the beauty industry as a predominantly female workforce comprising young professionals with vocational cosmetology training and regular occupational exposure to cosmetic allergens.

Although 64.0% of beauticians had formal certification, only 42.7% had received first-aid training, 19.3% had Basic Life Support (BLS) training, and approximately one-fifth had undergone training in recognizing or managing allergic reactions. Comparable observations were reported by Schütte et al. [12], who identified inadequate occupational health education and insufficient preventive training as important workplace factors contributing to occupational skin diseases among workers exposed to chemical irritants and allergens.

Occupational allergic reactions were reported by 27.3% of participants, with eye irritation (21.0%), contact dermatitis (18.0%), hand eczema (13.7%), and hair dye allergy (12.0%) being the most frequently encountered conditions. Similar patterns have been described by Symanzik et al. [13], who reported frequent allergic contact dermatitis among beauticians performing nail and eyelash cosmetic procedures because of repeated exposure to acrylates and cyanoacrylates. Likewise, Symanzik et al. [14] emphasized that professional beauticians experience substantially greater exposure to cosmetic chemicals than consumers, increasing their susceptibility to occupational allergic diseases.

The burden of hand eczema observed in the present study is also supported by Jacobsen et al. [15], who identified repeated wet work and cumulative chemical exposure as major causes of occupational irritant contact dermatitis, while Havmose et al. [16] reported a consistently high prevalence of occupational hand eczema among hairdressers worldwide. Furthermore, Jamil et al. [17] demonstrated that occupations involving repeated exposure to water, detergents, and chemical products carry a significantly greater risk of developing occupational hand eczema, reinforcing the importance of regular occupational safety training and effective preventive measures among beauticians.

In the present study, 72.7% of beauticians correctly identified common symptoms of allergic reactions, whereas only 38.0% recognized anaphylaxis as a medical emergency, 29.3% identified adrenaline as the first-line treatment, and 31.0% were aware of the appropriate initial management of severe allergic reactions. These findings indicate that although general awareness of cosmetic allergies was satisfactory, knowledge regarding life-threatening allergic emergencies remained inadequate. Similar findings were reported by Symanzik et al. [18], who observed that beauticians are frequently exposed to sensitizing cosmetic ingredients but possess limited knowledge regarding their allergenic potential and occupational risks. Likewise, Lee et al. [19] demonstrated that inadequate awareness among professional hairdressers contributed to delayed recognition and continued occupational exposure to allergens, supporting the findings of the present study.

With respect to preventive practices, 81.3% of beauticians reported regular glove use and 76.7% practiced routine hand hygiene after cosmetic procedures. However, only 41.7% routinely obtained an allergy history before procedures, 36.0% performed patch testing when indicated, 28.7% maintained written documentation of previous allergic reactions, and only 18.3% had an emergency kit available in their workplace. These findings suggest that although basic protective practices are commonly followed, implementation of comprehensive preventive measures remains inadequate. Similar observations were reported by Sukakul et al. [20], who emphasized that cosmetologists require continuous education regarding cosmetic allergens, pre-procedure risk assessment, patch testing, and preventive practices to minimize allergic reactions among both workers and clients.

Emergency preparedness was particularly poor in the present study. Only 14.7% of beauticians reported the availability of adrenaline within their salon, 22.0% had received training in immediate management of allergic reactions, and 19.3% had undergone Basic Life Support (BLS) training. Comparable recommendations were made by Uter et al. [21], who advocated routine allergy assessment, appropriate patch testing, and standardized preventive protocols before the application of hair cosmetic products. Similarly, Thyssen et al. [22] highlighted that early identification of susceptible individuals, appropriate product selection, preventive counselling, and prompt recognition of allergic reactions are essential to reduce cosmetic-related contact allergy.

The present study further showed that 27.3% of beauticians had experienced occupational allergic reactions, with eye irritation (21.0%), contact dermatitis (18.0%), hand eczema (13.7%), and hair dye allergy (12.0%) being the most commonly reported conditions. These findings emphasize the continuing occupational health burden associated with repeated exposure to cosmetic chemicals. Similar concerns were expressed by Warshaw et al. [23], who identified occupational contact dermatitis as one of the most common work-related skin diseases among cosmetology professionals and emphasized continuous occupational health education, workplace surveillance, and preventive interventions. Likewise, Sasseville [24] recommended periodic occupational health training, consistent use of personal protective equipment, safer cosmetic products, and implementation of workplace safety policies to reduce occupational morbidity among salon workers. Furthermore, Bauer et al. [25] concluded that comprehensive occupational skin protection programmes incorporating education, risk assessment, periodic surveillance, and preventive interventions significantly reduce the incidence of occupational skin diseases in high-risk professions.

The present study has several strengths, including the inclusion of 300 beauticians from multiple salons across Chennai City and a comprehensive evaluation of occupational health practices, training status, knowledge, and preventive measures. However, the cross-sectional design precludes causal inference, and self-reported responses may have introduced recall and reporting bias. In addition, objective dermatological assessment and environmental exposure measurements were not performed.

CONCLUSION

The present study demonstrated that beauticians possessed moderate knowledge regarding cosmetic allergies; however, important gaps existed in occupational health training, recognition of severe allergic reactions, emergency preparedness, and implementation of preventive practices. Although the use of basic protective measures such as gloves and hand hygiene was relatively common, practices including allergy history documentation, patch testing, availability of emergency medications, and first-aid preparedness were inadequate. The substantial proportion of beauticians reporting occupational allergic reactions underscores the need for strengthened occupational safety measures within the beauty industry. Incorporating structured occupational health education, first-aid and Basic Life Support training, standardized safety protocols, and periodic continuing education programmes into cosmetology practice can enhance worker safety, improve client care, and reduce the burden of occupational allergic diseases.

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