Original article

Clinical profile of contact dermatitis due to Indian cultural practice of colored and perfumed hair oil application

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Abstract

Introduction: hair oil application is a very common practice in India. Hair oil market size in India is pegged at around Rs 8,000 crore with coconut-based oils accounting for 46 per cent, whereas non-coconut or perfumed oil segment, has a market size of Rs 4,283 crore. During last few years we have been receiving patients with dermatitis associated with colored and perfumed hair oils (CPHO), so we performed this study to analyze the details associated contact dermatitis.

Methods: this was a prospective observational cohort study.

Keywords: contact dermatitis; hair oil; fragrance; allergy

Introduction

Being a typical traditional habit, hair oil application is a very common practice in India, however actual population prevalence is difficult to determine. Hair oils are perceived to offer benefits of nourishment, strength, better growth to hairs. The Indian FMCG (fast moving consumer goods) industry represents nearly 2.5% of the country's GDP, and hair care products make up approximately 8% of total Indian FMCG market.[1] Hair oil market size in India is pegged at around Rs 8,000 crore with coconut-based oils accounting for 46 per cent. Non coconut or perfumed oil segment, has a market size of Rs 4,283 crore. Among all, light hair oil (non sticky) is the fastest growing segment with a CAGR of 25 per cent in the last 5 years whereas the overall hair oil market has grown by 19 per cent over the same period. Around 40 per cent of the light hair oil sale comes from the rural market.[2] FMCG market in India appears to be saturated with various brands and types of hair oils. Continuous media led propaganda has resulted in increased practice of application of various colored and perfumed hair oils (CPHO). Commercially available preparations of CPHO are usually a mixture of mineral oil, vegetable oils, essential oils and other additives. During last few years we have been receiving patients with dermatitis over face, neck, shoulder and arms; in these patients recovery occurs only after discontinuation of CPHO used by them. Thus we performed this prospective observational cohort study to analyze the details of CPHO associated contact dermatitis.

Objective

This study was performed to assess the clinical and demographic characteristics of CPHO associated contact dermatitis.

Material and Method

Study design: this is a prospective, observational, cohort study. the study protocol was approved by

Institutional Review Board at Mahatma Gandhi Memorial Medical College, Indore, India.

Setting: the participants were recruited from the outpatient facility of Department of Dermatology, Venereology and Leprosy of Mahatma Gandhi Memorial Medical College, Indore, India; during a period from January 2014 to June 2015. Data collection was performed through interview, where history of dermatitis, personal history, past history, medical history and drug history were recorded. Each participant was followed-up after 2- and 4-weeks following entry into the study. Various patterns of contact dermatitis have been recorded in each participant.

Participants: consecutive patients aged above 18 years with suspected contact dermatitis due to application of CPHO were screened; at least prior four weeks duration of suspected hair oil application was required for inclusion of subjects . Only those patients with complete recovery after stoppage of culprit hair oil, were included. Patients with definitive diagnosis of other specific types of dermatitis, or dermatitis arising out of massaging, or patient having history of consumption of any immunosuppressant during last six weeks, or patients with past history of similar CPHO unrelated complaints, or pregnant or lactating female, or known immunocompromised patients, or patients having systemic disease, or psychiatric illness were excluded from the study. Participants with history of concurrent usage of other hair styling products like hair serum, hair styling gel etc were also excluded. People using multiple CPHO were also excluded. However, participants were advised to continue the hair cleansing regimen as before.For their dermatitis participants were treated with topical mid-potency corticosteroids and systemic antihistamines.

Study Sample:an account of 310 participants have been presented here.

CPHO preparations: the CPHOs available in the market are the mixture of different oils, where concentration of mineral oils and vegetable oils can reach up to 80% and 40% in several preparations, respectively. Other components being essential oils (like eucalyptus extracts, rosemary oil, lemon oil, hibiscus oil, jasmine extracts, tea tree oil etc.), herbal extracts, vitamin E, camphor, menthol, preservatives, colors and anti-oxidants. Exact percentages of different CPHO ingredients is very difficult to obtained, however a brief overview of composition, based on internet search and product display has been tabulated here (Table 1)[3,4,5]. This is important to note that the brand names appears to be misnomer, as all these CPHOs are largely mineral oil based or vegetable oil based (mostly sesame oil, coconut oil, mustard oil, peanut oil, cotton-seed oil etc.).

Table 1: Class-wise compilation of ingredients in culprit CPHOs

Category	Ingredients (based on data collected from various brands of CPHO)
Almond oil	Mineral oil can range up to 77% Vegetable oil, perfume, sweet almond oil (ranging from 2% to 21.2%), vitamin E, coloring agents
Amla oil	Mineral oil can range up to 80% Vegetable oil like Sesame oil, palmolein oil, peanut oil,cotton-seed oil, mustard oil can range up to 35-40% Menthol, Camphor Canola Oil, Palm Glycerides, Emblica Officinals (Amla) Extract in Canola Oil Colors: D&C: Yellow No.10, Green No.6, Red No.17 Fragrance, t-Butyl Hydroquinone (TBHA; antioxidant),

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	butyl methoxy dibenzoyl methane (UV filter), butylated hydroxy toluene (antioxidant)
Jasmine oil	Mineral oil contents close to 80% Coconut oil 20% Fragrance containing jasmine extract
Herbal & "Cooling" oil	Main ingredient mineral oil (may reach up to a concentration of nearly 85% in some preparations) Vegetable oil including sesame oil (ranging from 20% to 80%) and coconut oil Lenoleic acid (up to 25%) Herbal and other extracts like lotus flower extracts, wheat germ oil, lemon extract, Menthol, Camphor, Thyme Leaves, Rosemary Oil, Musk Mallow, Ylang Ylang oil, Jequirity, Lata Kasturi, Kakoli, Brahmi, Sailaja, Kapoor Kachari, Gandhamatra, Gatella, Kunch, Muramansi, Gulab Phool, Benamul, Mustha, Kesut, Amla, Pudina Ka Tel, Surasar, neem extracts, yashtimadhu, jati, mandukparni, , bhringraj, nagarmotha, dhatura, bhringraj, manduka parni, gunja, cardamom, indigo, karanj, mahendi, rasot, trifala, akkar kara, vacha
Coconut-plus	Mineral oil Vegetable oils including coconut oil, tender coconut oil, sunflower oil, mustard oil Menthol Piper nigrum oil Carcum copiticum oil Malakangani extract Hibiscus extract Perfume Vitamin E Phytantriol (an alcohol used as anti-caking agent and conditioner), TBHQ, BHA, panthenyl triacetate (Vitamin B5)
Olive-plus oil	Vegetable oil including olive oil Herbal extracts like bhringraj, hibiscus extract, aloe vera extract Almond protein extract Fragrance, Vitamin E acetate, Avobenzone (UV filter) , t-Butyl Hydroquinone Coloring agents

Prepared according to references: 3,4,5.

Classification of patterns of dermatitis: Several patterns of contact dermatitis were observed, and has been recorded broadly into following categories : (a) non-specific dermatitis over scalp and/or face, (b) non-specific dermatitis over scalp, face, neck, and other body area, (c) seborrheic dermatitis like pattern, (d) folliculitis and acneform eruption, (e) photo-aggravated dermatitis, (f) pityriasis rosea-like pattern. Non-specific dermatitis would include cases with tiny vesiculo-papules on an erythematous background may or may not associated with itching. Seborrheic dermatitis like pattern was would include the cases with erythematous, scaly plaques over scalp. Photo-aggravated dermatitis category had participants with polumorphous light eruption-like, or photopigmented contact dermatitis-like, or photo-allergic, photo-irritant patterns. Pityriasis rosea like eruption were defined as erythematous round flat papules or plaques with bran like scaling over their surface, they were mostly observed over neck or forehead.

Statistical Method : Descriptive statistical methods have been majorly employed while presenting the results of this study. Statistical comparison of qualitative data were performed using Chi-square test, where as quantitative variables were compared using independent *t*-test.

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Results

A total of 746 patients have been screened, out of which 356 were recruited in the study; 46 participants did not show recovery of their dermatitis following discontinuation of CPHO, hence were omitted during data analysis. So an analysis of 310 participants have been performed during this study, there were 167 male and 143 female participants in this study; study population comprised of greater number of urban (52%) and literate (86%) participants. Characteristics of study population has been given in Table 2. We have found a decrease in incidences of CPHO mean duration of treatment was 1 week.

associated dermatitis with age. The coconut oil, almond oil, *amla* oil were more commonly associated with age group below 40 years, where olive oil induced dermatitis were exclusively found in age group between 18 to 25 years (Figure 1). Herbal & "cooling" oil and mustard oil were more commonly associated with 25 to 40 years. whereas no specific age predilection was seen with jasmine oil, . In our study, mean duration of CPHO use and application prior to appearance of dermatitis was 15 weeks, whereas

Figure 1: frequency of CPHO in individual age-groups n=310

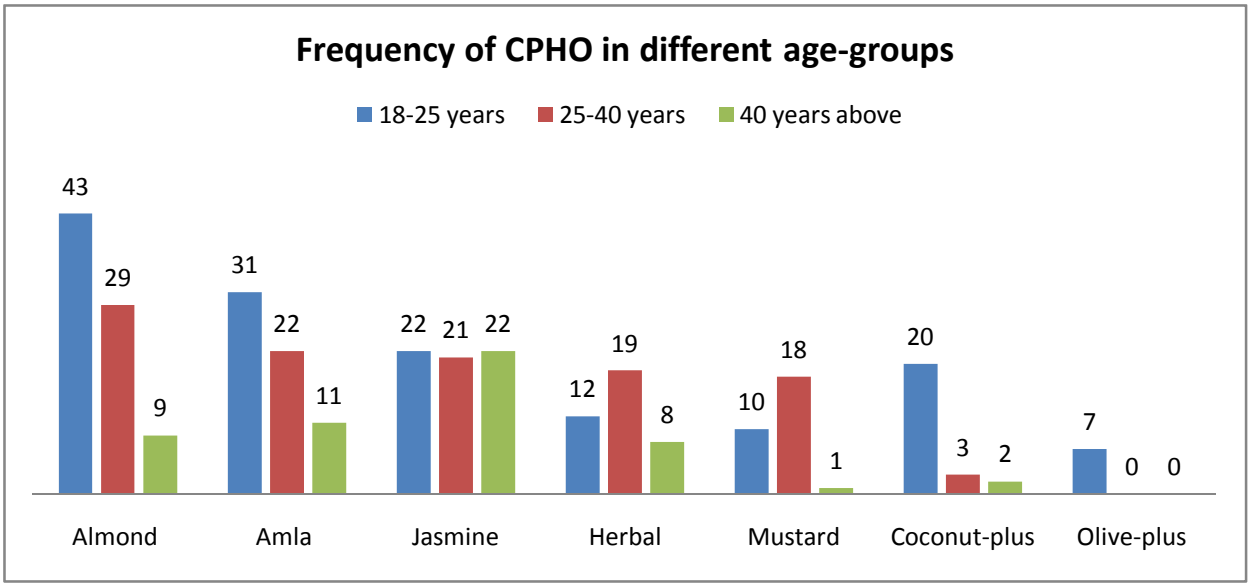

Table 2: baseline characteristics of study population

		Male	Female	Total
Age group	18-25 years	66	79	145
	25-40 years	70	42	112
	40 years above	31	22	53
Settlements	Urban	47%	49%	
	Rural	53%	51%	
Literacy	Literate	91%	81%	
	Illiterate	9%	19%	

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Observed types of culprit CPHO were classified as brands sold under the name of: amla oils, almond oils, jasmine oils, mustard oil, coconut-plus hair oil, herbal & "cooling" oils, olive-plus oil. Frequency of observed dermatitis patterns and associated category of hair oils have been presented in Table 3. Two patients who were not tabulated here, had generalized pruritus associated with jasmine hair oil. There are more number of dermatitis events than the total sample size, because of independent recording of different patterns of dermatitis observed in a single participant.

Table 3: Frequency of dermatitis patterns associated with different categories of hair oils n=308

Sr no.	Category of hair oil	Total no of subjects	Total noof events	Non-specific dermatitis over scalp &face	Non-specific dermatitis over scalp, face and proximate areas of neck and shoulder	Seborrheic dermatitis like pattern	Photo-aggravated dermatitis	Folliculitis &acneform eruption	pityriasis rosea-like pattern
1	*Almond oil*	**81**	**105**	39	32	14	20	0	0
2	*Amla oil*	**64**	**79**	26	34	7	11	0	1
3	*Jasmine oil*	**63**	**79**	21	37	3	12	1	5
4	*Herbal & "Cooling" oil*	**39**	**52**	8	15	1	24	3	1
5	*Mustard oil*	**29**	**41**	6	0	0	13	22	0
6	*Coconut-plus*	**25**	**25**	0	0	6	0	19	0
7	*Olive-plus oil*	**7**	**7**	0	0	3	0	4	0
Tot		**308**	**388**	**100**	**118**	**34**	**80**	**49**	**7**

In our study events related to brand sold under the name of *almond oils* have been most common comprising 27% of all dermatitis events recorded, followed by *amla* and *jasmine oils* (Figure 2). Mustard oil was found to be associated with folliculitis and acneform eruptions, whereas herbal & "cooling" oils were most commonly associated with photo-aggravated dermatitis. During our study period we could not find any dermatitis event associated with pure coconut oil or pure olive oil preparations, however coconut-plus oil were associated with seborrheic dermatitis-like and folliculitis/acneform eruptions; olive oils associated dermatitis were least common. In our study non-specific pattern of dermatitis were most commonly observed comprising 56% of total dermatitis events, followed by photo-aggravated, folliculitis/acneform eruptions, seborrheic dermatitis-like patterns and pityriasis rosea like pattern(Figure 3). We have observed that in about 38% cases (30% of total events) the CPHO associated dermatitis has extended beyond the scalp; i.e. extended to proximate areas beyond the actual site of application of culprit CPHO.

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Figure 2: Relative proportions of events in different categories of CPHO n=388

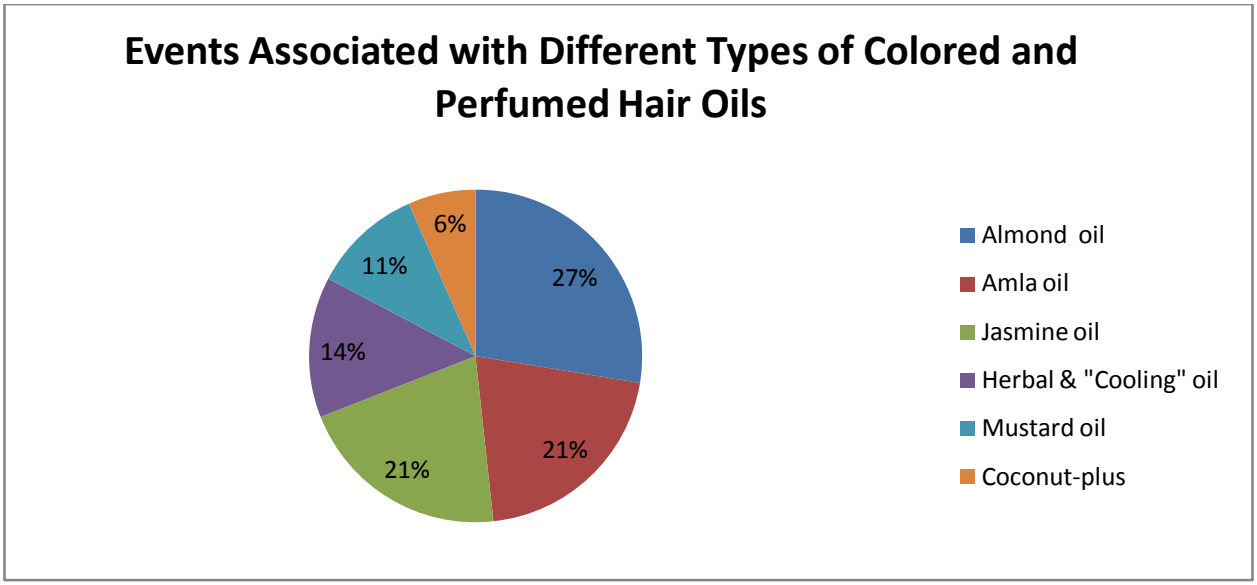
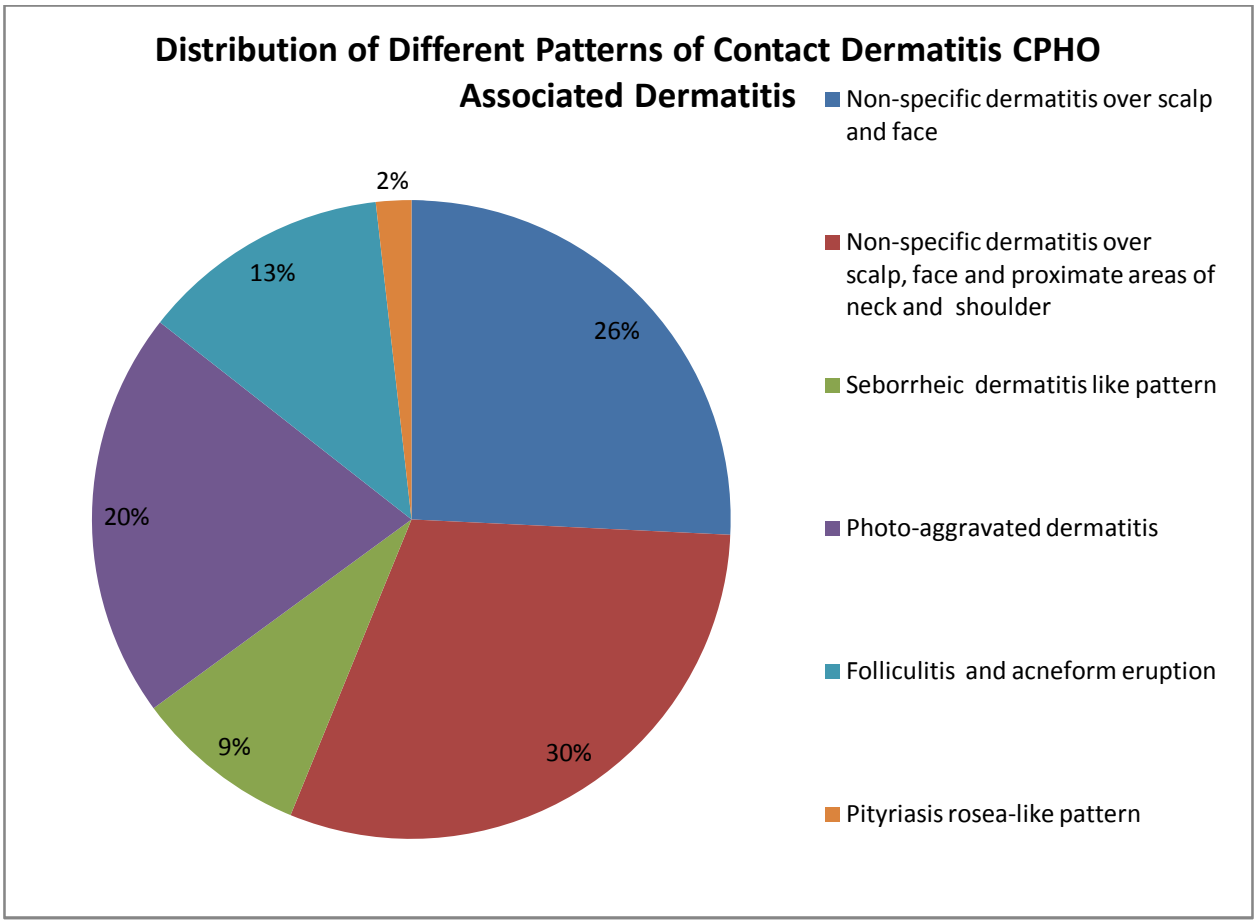


Figure 3: Relative proportions of events in different categories of CPHO Associated Contact Dermatitis n=388



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Discussion

To our knowledge this is first formal prospective study assessing contact dermatitis associated with colored and perfumed hair oils.Both beneficial and harmful skin effects have been ascribed to hair oil preperations. Coconut oil was shown to decrease colonization of *Staphylococcus aureus* in atopic skin.[6] Garg and Muller demonstrated that saturated and unsaturated fatty acids in mustard, coconut and amla oil inhibited the growth of dermatophytes. Amla oil had the maximum toxicity against *Microsporum canis*, *M. gypseum* and *Trichophyton rubrum*, while *Trichophyton mentagrophytes* was most susceptible to coconut oil. They attributed the low incidence of tinea capitis in India to the widespread use of hair oils.[7] Topical application of a polyherbal formulation containing the popular herb *Eclipta alba* ("*bhringraj*") on rat skin led to an increase in the number of anagen hair follicles and decrease in time required for complete hair growth.[8] Similarly Zizyphus jujuba essential oil, lotus extracts and Rosemary oil have shown hair growth promoting potential in few studies.[9-11] These CPHO preparations have a very high concentrations of mineral oils in them along with various essential oils and coloring agents. Large body of evidence is now available in the literature revealing sensitizing potential of various essential oils including tea tree oil, lemon grass oil, Ylang Ylang oil and rosemary oil.[12-14] Coloring agents used in cosmetics have also implicated in contact dermatitis.[15-17] Cutaneous sensitization and contact dermatitis to components of hair oils like almond oil, phytantriol and menthol have been reported.[18-20] Mineral oils are found as major constituents in several commonly used cosmetic products, reports of mineral oil associated dermatitis are not rare in literature.[21-23] CPHO being mixture of several of such components, increases the potential of contact sensitization and potential of subsequent contact dermatitis.Camphor and Ultraviolet filters like butyl methoxy dibenzoyl methane and avobenzone, and essential oils are known photosensitizes; which probably has been responsible for highest frequency of photo-aggravated dermatitis in our study.[24-26]

Hair oil use were significantly related to Seborrheic dermatitis in a study performed by Rucker Wright D et.al. [27]; our study seborrheic dermatitis like pattern was associated with all categories of CPHO, except mustard oil.Mustard oil has been implicated in causing pityriasis rosea-like eruption;[28] however in our study this kind of eruption was most commonly seen in jasmine oil category, followed by *amla* and herbal oil category, and none in mustard oil category, although herbal oils may contain mustard oil as one of the ingredients.We did not perform the patch testing nor did take the history of atopic diathesis in affected individuals, so it was difficult to assess whether the reaction patterns were allergic or irritant contact dermatitis, however association of dermatitis and CPHO was assessed on the basis of temporality and remission following discontinuation of suspected culprit agent. Our study results are also limited due to socio-economic status of study participants, as our tertiary care centre caters to low and middle socio-economic classes. So dermatitis associated with high value CPHO could not be assessed, this may have been a reason behind lower incidences of olive-plus associated dermatitis. Our study has suggested that CPHO associated dermatitis is more common in urban, literate male population. No significant seasonal variation could be observed with the hair oil dermatitis; although there were increased number of events during the months of January-February.

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Conclusion

Cultural beliefs influence our daily lives and have the potential to introduce health hazards, and in this era of globalization, cultural practices cut across geographical boundaries. As we have observed that the brand names are misleading, so the constituents of the products need to be put on the cover more prominently. Rigorous testing for safety of various chemicals being used or added in these cosmetic products should be strictly regulated.

Hair oil application is a traditional practice in India, CPHO associated dermatitis is not firmly established in medical literature, leading to deficient awareness in treating physicians as well as patients. Our study provides an evidence towards a possible association of application of colored and perfumed hair oils with contact dermatitis. With large proportion of population practicing the culture of hair oil application and with changing pattern towards the use of CPHO, the possibility of associated dermatitis should be seriously considered.

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