(RESEARCH ARTICLE)

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Acne treatment using tea tree oil, aloe vera, lavender, and calendula: The perception of pharmacy students

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Abstract

Skin acne is a common skin condition that occurs when hair follicles become clogged with oil and dead skin cells. In this paper, the use tea tree oil, aloe vera, lavender, and calendula for skin acne is reviewed along with a survey of the views of first-year pharmacy students on these products. The survey included 5 knowledge-based and 5 opinion-based questions, focusing on skin acne remedies. The survey enrolled 10 male and 29 female participants. The response rate for the demographic questions was 100%. In the knowledge-based and opinion survey questions, 34 participated for a response rate of about 87%. For the knowledge-based questions, the correct average response rate was 75.9%, with one question scoring 14.7% correct rate. The highest correct response rate was 97.1%. Opinion-based questions revealed a positive attitude towards herbal skin acne remedies with approximately 37.4% expressing strong agreement. On average, over 93% of the respondents agreed with the positive aspects of the products. Nearly 53% strongly believed that lavender has therapeutic properties such as promoting relaxation and reducing stress. This survey provided valuable pharmacy students' insights into the potential of herbal remedies for skin acne properties.

Keywords: Tea Tree Oil; Aloe Vera; Lavender; Calendula; Pharmacy students; Knowledge; Opinions

1. Introduction

Disease Mechanism: Skin acne is a common skin condition resulting from hair follicles clogged with oil and dead skin cells. It is primarily associated with the sebaceous glands, responsible for producing sebum. The exact mechanisms behind acne development are complex and multifactorial. The simplified overview of the process includes excess sebum production due to the stimulation of sebaceous glands by hormones, particularly androgens (e.g., testosterone). Several factors contribute to acne, including genetics, hormonal changes, diet, stress, and certain medications [1-4]. The types of acne lesions include inflammatory papules, pustules, nodules, and cysts. An increase in linoleic acid in the body is believed to affect the regulation of monocyte differentiation and thereby leading to the formation of inflammatory foci [5]. Effective pores management involves reducing sebum production, preventing clogged pores, and controlling inflammation. While this simplified mechanism explains acne development, individual cases vary, necessitating tailored treatment plans and dermatological consultation. Understanding additional factors like the skin barrier and microbiome can enhance disease comprehension and treatment strategies [1].

1.1 Prevalence and Impact

Annually, about two million teenagers and 0.2 million patients over 35 years of age visit physicians seeking treatment for acne. The disease affects 650 million people globally and ranks eighth in the frequency of common diseases world-wide. The direct cost is estimated to be over $1 billion, and $100 million is spent on over-the-counter acne products [4]. Acne is a prevalent global skin condition affecting people of various ages, genders, and geographic locations.

Approximately 85% of teenagers and young adults experience acne during their teenage years. It can persist into adulthood, affecting individuals in their 20s, 30s, 40s, and beyond. The psychological and emotional impact is significant, leading to low self-esteem, depression, anxiety, and reduced quality of life. Social and psychological consequences are pronounced in teenagers and young adults, impacting daily life, self-consciousness, clothing choices, and social activities. Not all acne cases are the same, requiring early intervention and appropriate treatment to minimize impact and prevent scarring [3].

2.   Review of Products

2.1   Tea Tree Oil

Tea tree oil (TTO), obtained by steam distillation of leaves and twigs of the plant *Melaleuca alternifolia* has high bactericidal and fungicidal properties [6]. The oil is incorporated into various products, such as soaps, cream, toothpastes, mouthwashes, balms, and acne serums. Its broad spectrum of activities includes applications in skin diseases such as acne vulgaris, dandruff, psoriasis, seborrheic dermatitis, diaper rash, eczema, corns mycoses and nail infections. It shows antibacterial effect even at low concentrations. The use of the oil in treating acne arises from its antibacterial and anti-inflammatory properties. A cream prepared by mixing TTO (3%), propolis (20%), and Alo vera (10%) has been shown to be more effective in the treatment of acne compared to erythromycin [5].

2.2   Aloe Vera

Aloe vera, a plant-based remedy, is known for its soothing and anti-inflammatory properties. It alleviates acne symptoms, promotes healthier skin, and reduces redness and inflammation. Aloe vera gel, when applied to inflamed acne lesions, can soothe the skin. It acts as a natural moisturizer, hydrating the skin without clogging pores, and can contribute to the healing of acne scars and blemishes [3]. A 50% Aloe vera gel combined with tretinoin was shown to be more effective compared to tretinoin alone in the treatment of mild-moderate acne [4].

2.3   Lavender

Lavender oil, a popular essential oil, is used in skincare for its potential benefits in managing acne. It is believed to possess anti-inflammatory and antimicrobial properties, reducing redness, and preventing acne-causing bacterial growth. Lavender oil may help regulate sebum production, contributing to balanced skin [6]. Lavender oil is obtained by distillation of the flowers of the plant *Lavendula augustifolia*. The oil has antibacterial and antifungal properties making it a commonly used oil for the treatment of skin conditions such as acne, eczema, and psoriasis. Linalool, a constituent of the oil, is believed to be the main antibacterial constituent responsible for its activity against *Cutibacterium acnes* (*C. acnes*) [4].

2.4   Calendula

Calendula officinalis, commonly known as calendula and marigold, is a popular herb used for various skin conditions, including acne. Topical calendula creams or ointments, with anti-inflammatory properties, may reduce redness and inflammation associated with acne [7]. Compounds like flavonoids and triterpenoids contribute to these anti-inflammatory properties. Alkaloids, flavonoids, glycosides and terpenoids found in the plant may be responsible for the anti-acne activity [8].

2.5   Health Care Professionals' Knowledge & Opinions

Healthcare professionals prioritize evidence-based practices and medically proven treatments for acne. While herbal remedies are of interest to some, caution is advised due to potential skin irritation or allergic reactions. Herbal products lack pharmaceutical-level regulation, leading to variations in quality and purity. Healthcare professionals emphasize the importance of using reputable products [1].

2.6   Literature Gap, Study Objective, and Impact

Much literature exists on skin acne, but several gaps remain, including acne in diverse populations, holistic treatment, and long-term effects. A relative lack of research on the psychological and emotional impact of acne leaves room for investigation. Understanding the psychosocial impact can inform initiatives to reduce stigma and improve mental health support for individuals with acne [3].

3. Methods

This survey was conducted as part of the Drug Information course, which is a mandatory 2-credit-hour class for first-year professional pharmacy students at Howard University College of Pharmacy. In the course, students received instructions on research methodology and survey administration. Students were assigned a topic and tasked with crafting an introduction and developing two sets of survey questions. The first set comprised 5 knowledge-based questions, while the second set contained 5 opinion-based questions. These questions were incorporated into an online survey, and students were invited to participate in answering them. A descriptive statistical data analysis was conducted and after which the findings were distributed to the students. Students were then asked to integrate these results into their research papers, to complete the abstract, discussion, and conclusion sections. In the current survey, the task was assigned to the primary author of this paper, KB-S. A Likert scale was used to score responses for the opinion-based statements: 4=strongly agree; 3=agree; 2=disagree; 1=strongly disagree. Mean, standard deviation, and variance were computed for each of the responses and for the cumulative response. A 2-tailed Fisher Exact test was used to compare correct responses for the knowledge-based questions.

4. Results

Demographics: Table 1 shows data on the gender, age distribution, and geographical backgrounds of the survey participants. About 26% were male and 74% female. Most respondents (51.3%) fell in the 18 to 24 age range, and 38.5% were between 24 to 30 years of age. Smaller percentages were in the age ranges 30 to 40 (7.7%) and over 40 (2.6%) in the above 40 (3.3%) age range.

Regarding the states where respondents lived before joining the Howard University Pharmacy Program, the data indicates diverse origins, with 15.8% from Washington DC, 39.5% from Maryland, 2.6% from Virginia, and the largest contingent, 42.1%, coming from other states.

Table 1 Demographic characteristics of participants (n = 39) *

		n (%)
Gender	Male	10 (25.6)
	Female	29 (74.4)
Age (years)	18-24	20 (51.3)
	24-30	15 (38.5)
	30-40	3 (7.7)
	Above 40	1 (2.6)
State you lived in before coming to Howard Pharmacy Program*	Washington DC	6 (15.8)
	Maryland	15 (39.5)
	Virginia	1 (2.6)
	Other States	16 (42.1)

*One participant did not disclose residence

4.1 Participants' work and educational background

Table 2 Work and Educational Background of the participants

Questions	Responses	*n* (%)
How many years have you had a paying job before joining the Pharmacy program at Howard?	Never worked	2 (5.1)
	1-2 years	12 (30.8)
	3-4 years	9 (23.1)
	5 or more	16 (41.0)

What kind of work have you had?	Pharmacy Related work	20 (54.1)
	Non-Pharmacy but other health related work	9 (24.3)
	Non-Health Related	8 (21.6)
What is the highest educational level you have achieved before joining the pharmacy program at Howard?	Pre-Pharmacy or some college work	4 (10.3)
	Associate degree	2 (5.1)
	BSc or BA	26 (66.7)
	MSc	7 (17.9)
	PhD or Doctoral Degree	0 (0.0)

Table 2 provides insights into the work experience and educational backgrounds before joining the Pharmacy program at Howard University. About 54% of respondents had jobs related to pharmacy, while 24.3% worked in non-pharmacy, but health-related areas, and the rest 21.6% worked in non-health-related jobs. Regarding the highest educational level attained before joining the pharmacy program, the majority held a Bachelor of Science (BSc) or Bachelor of Arts (BA) degree (n =26; 66.7%). Seven (17.9%) had a Master of Science (MSc) degree, four (10.3%) had completed some pre-pharmacy or college work, and two (5.1%) had an associate degree.

4.2   Knowledge-based questions

Table 3 shows questions related to various skin care topics, along with the percentage of responses categorized as "True" and "False." It also includes the mean, standard deviation, and variance for answers to each question.

On average, about 76% answered the questions correctly. However, most respondents failed to recognize the difference between the tea tree *Melaleuca alternifolia* which produces oil, and the tea tree *Camelia sinensis* which is the source of the tea beverage. Both plants appear to share the same common name Tea Tree. For the rest of the questions, the correct answer rate fell between 82.4% and 97.1%. The rates of the correct answers were, in turn, significantly high, compared with the answer that scored the lowest ($p<0.0001$). However, there was no statistical difference between the rates of the high scoring responses ($p>0.05$).

Table 3 Results of knowledge-based questions (n=34)

#	Questions	Correct Answer	Participants with Correct answers	True (n)	False (n)	Mean correct answer rate (± SD)	Variance
1	Tea tree oil is commonly used as a natural remedy for treating acne	True	33 (97.1)	33	1	0.9706±0.1690	0.0285
2	Tea tree oil is derived from the leaves of the tea plant, *Camellia sinensis*	False	5 (14.7)	29	5	0.1471±0.3542	0.1254
3	Aloe Vera is known for its soothing and healing properties and is commonly used in skincare properties	True	30 (88.2)	30	4	0.8824±0.3222	0.1038
4	The vibrant pigments in lavender can be used as a natural dye for fabrics and food colouring	True	28 (82.4)	28	6	0.8235±0.3812	0.1453

5	Calendula flowers can be used to make herbal teas known for their mild, earthy flavor and potential health benefits	True	33 (97.1)	33	1	0.9706±0.1690	0.0285
	Average Correct answer		75.9%			0.7588±0.2791	0.0863

4.3 Opinion-based questions

Table 4 shows the summary of the data for the opinion-based questions. Many respondents in this survey expressed positive agreement with the potential of herbal remedies to contribute to bettering skin acne properties. All respondents (100%) strongly agree or agree that lavender has therapeutic properties for promoting relaxation and reducing stress. About 94% strongly agree or agree that calendula has anti-inflammatory and healing properties that can be used for skin irritations, burns, rashes and insect bites. A total of over 94% believe that Aloe vera can serve as a natural remedy for soothing sunburn and has effective moisturizing and soothing properties.

On the other hand, the percentage of those who strongly disagreed or disagreed with these statements was notably lower, ranging from 0% to about 12%, indicating a prevailing inclination toward positive agreement regarding the benefits of these herbal remedies for skin acne properties.

Table 4 Opinion- based survey statements (*n*=34 for 1,3 & 4 and *n*=33 for 2 & 5**)**

#	Statements	SA (*n*, %)	Agree (*n*, %)	DA (*n*, %)	SDA (*n*, %)	Mean LK±SD	Variance
1.	I believe that lavender has therapeutic properties such as promoting relaxation and reducing stress	18 (53)	16 (47)	0 (0.0)	0 (0.0)	3.5294±0.5066	0.2567
2.	I believe that calendula has anti-inflammatory and healing properties and can be used as skin irritations like burns, rashes and insect bites	10 (30.3)	21 (63.6)	2 (6.1)	0 (0.0)	3.2424±0.5607	0.3144
3.	I believe that aloe vera can serve as a natural remedy for soothing sunburn and has effective moisturizing and soothing properties	13 (38.2)	19 (55.9)	2 (5.9)	0 (0.0)	3.3235±0.5888	0.3467
4.	I believe that tea tree oil can be used to soothe skin conditions like psoriasis and eczema due to its anti-inflammatory properties	11 (32.4)	20 (58.8)	3 (8.8)	0 (0.0)	3.2353±0.6060	0.3672
5.	I believe that tea tree oil's antibacterial properties can help reduce acne breakouts	11(33.3)	18 (54.6)	4 (12.1)	0 (0.0)	3.2121±0.6499	0.4223
	Average	37.4%	56.0%	6.6%		3.3085±0.5828	0.3415

5. Discussion

For the knowledge survey questions, most participants (82.4% to 97.1%) provided correct answers. However, the statement, tea tree oil is derived from the leaves of the tea plant, *Camellia sinensis* was tricky and scored a low correct response rate of 14.7%. Tea tree oil is obtained by steam distillation of the leaves and twigs of the plant *Melaleuca alternifolia* [6], and not from *Camellia sinensis* which is the source of the beverage tea. The knowledge level of survey participants (75.9%) in this study is comparable to similar results obtained in our two previous surveys [9,10], but higher than results we reported in another survey [11].

The survey data on opinion-based questions revealed a prevalent positive attitude towards the potential benefits of herbal remedies for skin acne. A total average of over 93% of the respondents expressed agreement on the positive properties and usefulness of the survey natural products, with only about 6% showing disagreement. The percentage of those disagreeing was notably lower, ranging from 0 to 12.1%, indicating a prevailing inclination towards positive agreement regarding the benefits of these remedies for skin acne. The highest Likert score (3.5294) is close to the strongly agreement score of 4, while the lowest 3.2121 is close to the agreement score of 3. When the average total is computed, the Likert score value of 3.3085 represents about an average of 93% agreement rate.

6. Conclusion

In this survey involving 39 participants, nearly 76% answered the five knowledge-based questions correctly. In the opinion part of the survey which included five statements, the participants demonstrated a notably positive attitude toward herbal remedies for skin acne properties, with over 93% strongly agreeing or agreeing with their potential benefits. A widespread inclination toward positive agreement regarding the positive benefits of these natural remedies was noted among the survey participants. This study has several limitations. The sample size of 39 participants is relatively small and lacks diversity, thereby limiting the generalizability of findings. Exploring factors beyond knowledge and attitudes, such as cultural influences and marketing strategies, could enhance a future research landscape.

Compliance with ethical standards

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Disclosure of conflict of interest

There is no conflict of interest.

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