Views of Pharmacy Students Regarding the Use of Tea Tree Oil, Aloe Vera, Lavender, and Calendula as Herbal Treatments for Acne

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Received: 17-03-2025; Revised: 10-04-2025; Accepted: 25-04-2025; Published: 22-05-2025

Abstract

When oil and dead skin clog the hair follicles, it causes skin acne. In this research, the effects of tea tree oil, aloe vera, lavender and calendula on acne were studied while exploring the opinions of pharmacy students about them. There were 5 questions that focused on knowledge and 5 on opinions, about natural ways to treat acne in the survey. Out of the 39 participants involved (10 males and 29 females), every person answered the demographic questions. However, 34 students (87%) filled out the section on knowledge and opinions. The success rate for knowledge-related questions was 75.9% and each question had an accuracy from 14.7% to 97.1%. Most respondents supported herbal treatments for acne and by a wide margin, agreeing that they do indeed provide relief. Remarkable is that over half of those surveyed strongly supported the benefits of lavender for unwinding and alleviating stress. As a result of this investigation, it is clear that including evidence-based complimentary approaches on acne management could be advantageous for both students and practitioners of pharmacy.

Keywords: ***Tea Tree Oil; Aloe Vera; Lavender; Calendula; Pharmacy Students; Knowledge; Perceptions; Natural Remedies; Complementary Medicine; Dermatology.***

1.Introduction

Exploring How Illnesses Affect the Body

Acne on the skin is a widespread condition globally caused by hair follicles becoming blocked by sebum and keratinized cells. Various biochemical pathways interact to cause the development of acne. This process revolves around the sebaceous gland which secretes sebum to lubricate the skin but causes trouble if too much is produced. The disorder is initiated by follicular hyperkeratinization, where excess keratin-producing cells gather and block the opening of the skin cells. Because of the obstruction, areas inside the pores become anaerobic and this allows Cutibacterium acnes (formerly Propionibacterium acnes) to spread.

The main reason behind the acne increase in teenagers is due to hormones such as androgens, making the sebaceous glands react in the skin. Once activated by the hormones, androgen receptors in sebocytes lead to more sebum production and make it contain a higher percentage of inflammatory lipids. Scientists state that both the level of sebum the oil glands create and the immune responses to microbes may be influenced by genetic factors which often appear as acne in members of the same family(1). Dietary items with a high-glycemic effect can alter the condition of acne, acting through insulin and IGF-1 which increase the activity of sebaceous glands.

Acne is also affected by the important inflammatory cascade in the body. Higher levels of linoleic acid affect monocytes, leading to the formation of inflammatory regions with a high number of neutrophils, more cytokines and damaged tissue. Recent studies now reveal that toll-like receptors (TLRs) recognize C. acnes and start the inflammatory process by turning on nuclear factor kappa B (NF-κB), causing the production of IL-1, IL-8 and TNF-α. They are responsible for the appearance of the main lesions seen in acne vulgaris, called inflammatory papules, pustules, nodules and cysts.

The best way to deal with acne is to reduce sebum, stop excessive thickening of hair follicles, keep bacteria in control and regulate how the body responds to inflammation. Still, this explains the general process of acne, but not every person responds the same, so customized care depending on the condition and individual details is required. Developments in learning about skin microbiomes and their barriers have opened up new approaches for treating and preventing acne.

Epidemiology and Effects on the Economy

Globally, acne vulgaris causes many problems for public health and for the economy. Reports indicate that around

two million teenagers and 200,000 adults aged 35 and above receive treatment from health professionals for acne each year. An estimated 650 million individuals are affected by the condition and it is the eighth most common disease globally. Each year, the cost to healthcare systems and patients directly caused by acne is more than $1 billion, along with another $100 million spent on over-the-counter products.

Nearly 85% of young people and teenagers get acne during their adolescence. It has long been believed that acne mainly happened during adolescence, though today, epidemiological research shows that many adults also have acne. It has been noticed that females often experience persistent and late-onset acne linked to the hormonal changes they encounter during their reproductive period(2).

Besides the obvious signs, acne can seriously affect the mood and emotions of those who suffer from it. Numerous studies in the medical field link the severity of acne with lower quality of life measures, like depression, anxiety, being socially isolated and low self-esteem. Among adolescents and young adults, these psychosocial outcomes seem more serious, since their looks greatly shape their relationships, how they see themselves and their development with others. Studies claim that the distress experienced by people with acne can influence their daily lives, school or work achievements, chances of having a job and being social. Many individuals who can see their acne often experience being stigmatized, discriminated against and labeled with negative stereotypes in public.

Because acne has many impacts, it should be treated promptly to control its effects on the skin and mental well-being. Acne occurs in various forms, so each case should be considered individually and treated with specific methods, not common methods. Because acne affects people quite seriously, more research is being done into various types of treatments, from traditional drugs to natural products with proven effects on the causes of acne.

Why Natural Products Are Explored

A rise in using natural remedies for acne is connected to an increased desire for natural wellness, concerns about antibiotic resistance in medicine and cases showing side effects from manufactured medicines. Such products may be safer for the body since they often affect fewer body systems and their rich mix of chemicals targets various health-related processes. Throughout history, remedies from plants have been used by traditional medicine systems around the world for treating the skin, serving as an important starting point for scientific studies.

According to the study, tea tree oil, aloe vera, lavender and calendula look promising to treat acne due to their preliminary findings of antibacterial, anti-inflammatory and sebum control properties. These items include components that can shape acne in many ways, making them a possible better option than drugs impacting just one mechanism. Moreover, research has proven that these herbal remedies cause few negative side effects, so they can be used to safely treat acne over the long run.

The success of natural remedies, as seen in many cases, requires extra research to ensure they are useful and can be applied in standard dermatology. To help unite modern and traditional medicine, it is vital to study the knowledge, beliefs and opinions of healthcare workers about natural products. Pharmacy students are expected to advise on the use of different treatments and teach patients about how to make the best choices when managing acne. Consequently, this investigation explores the benefits of popular natural products for acne and how well students understand these therapies. The results will support creating plans for acne that improve results and sync with patients' desire to use natural treatments

2. Review of Natural Therapeutic Agents for Acne Management

Tea Tree Oil: Extensive Guide to Its Medical Properties

TTO is one of the best-studied botanical agents in the field of dermatology because it is made by distilling the leaves and tips of the Melaleuca alternifolia plant. It has over 100 different types of terpene hydrocarbons, with terpinen-4-ol being the main agent giving tea tree oil its ability to fight infections. According to ISO 4730, the International Organization for Standardization, terpinen-4-ol must comprise at least 30% and 1,8-cineole no more than 15% to ensure the oil is suitable for therapy and causes little irritation.

Disinfectant terpenes in TTO are powerful enough to kill Cutibacterium acnes, Staphylococcus epidermidis and Staphylococcus aureus, the main bacteria linked to acne formation. According to studies, TTO attacks bacterial cell membranes, making them more vulnerable to substances and toxins and blocks the process of respiration in these cells. Consequently, bacteria lose their ability to survive and die off at very small amounts (usually less than 1%) of TTO. Interestingly, TTO is able to fight antibiotic-resistant bacteria such as MRSA which is important for people who have antibiotic-resistant acne(3).

As well as protecting against microbes, TTO is active in reducing inflammation related to the causes of acne. According to in vitro and in vivo research, the components of TTO curb the production of IL-1β, IL-8 and TNF-α, block neutrophils from migrating, suppress reactive oxygen species production and reduce mast cell histamine release. Due to its anti-inflammatory abilities, the profile helps manage the factors that result in acne lesions and their continued persistence.

There has been success using TTO in clinical trials for treating acne. A controlled double-blind study showed that 5% TTO gel was equally effective in reducing inflammatory lesions (by 44%) as 5% benzoyl peroxide (by 41%) and caused fewer negative effects. In another clinical trial, combining TTO (3%) with propolis (20%) and aloe vera (10%) in a cream worked better for moderate acne than erythromycin. Most up-to-date studies point out that a 2.5% concentration reduces the side effects of algae on sensitive skin.

Paying attention to formulation matters largely contributes to the effectiveness and stability of TTOs. Since its components are prone to instability, the best vehicles and stabilization methods should be chosen to stop oxidation and evaporation. Microuremsos, liposomes and nanostructured lipid carriers are useful in improving the absorption of products by skin and helping them be gradually released. Cleansers, spot treatments, moisturizers, masks and multifunctional preparations are all popular TTO products.

Aloe Vera: Suitable for numerous uses in dermatology

Aloe vera has been a well-used plant in medicine for over 4,000 years as part of the medicine systems in Egypt, Greece, Rome, China and India. There are more than 75 compounds in the gel from aloe vera succulent leaves, among them are polysaccharides, anthraquinones, lectins, sterols, vitamins enzymes, amino acids and minerals which play a role in its effectiveness for treating acne.

Aloe vera is mostly used for treating acne thanks to its anti-inflammatory benefits. Acemannan and likewise polysaccharides alter the output of cytokines from macrophages: they reduce IL-1β and TNF-α and boost production of IL-10 to enhance the process of downregulating inflammation. Certain aloe sterols, like lupeol, specifically obstruct COX-2 activity and therefore decrease the making of prostaglandins at spots of inflammation. The joint effect reduces redness, swelling and pain in lesions caused by inflamed acne(4).

In addition to reducing inflammation, aloe vera helps wounds heal faster by using several useful mechanisms for recovering from post-acne blemishes. It makes fibroblasts divide and migrate, supports the synthesis and linking of collagen, boosts blood vessel formation in the skin and regulates matrix metalloproteinases needed for good tissue regeneration and reduced scarring. The glycoprotein component of aloe vera, as well as aloesin in particular, prevent tyrosinase from releasing pigment-producing chemicals in the skin. As a result, less post-acne pigmentation may occur in people with darker phototypes.

Aloe vera prevents the skin from becoming dehydrated and receiving too much oil at the same time when used to treat acne. Since the skin is made up of more than 98% water and contains mucopolysaccharides, it has the ability to attract water molecules to the skin. Occlusive moisturizers can worsen acne, so aloe vera provides moisture without forming a barrier, letting the skin lose water it needs while it repairs its barrier, something acne creams can often destroy.

Combining treatment with aloe vera and commonly used therapies has been effective for managing acne. When tretinoin (0.05%) was compared to tretinoin and 50% aloe vera gel, a significant decrease in inflammatory lesions and improved tolerance were noticed for the group that received both medications at the same time. Combining aloe vera and tretinoin resulted in a decrease in redness, scaling and irritation which are issues that people using retinoids may experience.

Currently, modern approaches to formulation make aloe vera last longer and be easier for the body to use in acne preparations. By using specialized technologies, temperature-sensitive ingredients are preserved and including natural preservatives ensures the product is safe to consume because they are unirritating. Using aloe vera-carrying nanoparticles boosts the delivery of anti-inflammatory substances to the acne-affected part of the skin.

Lavender plays a role as an aromatic therapeutic agent.

Today, research is confirming that steam distillation of Lavandula angustifolia flowers forms Lavender oil, a traditional European remedy with numerous benefits for the skin. Many phytochemicals were found in the herb, but linalool (25-45%) and linalyl acetate (25-46%) made up the largest part, while others included borneol, camphor, 1,8-cineole, terpinen-4-ol and β-caryophyllene. The wealth of chemicals present in lavender aids in its action against various processes leading to acne.

3. Methods and Research Design

Read about the Background and Structure of the Education System

The investigation took place in the Drug Information course which was required for students and counted as 2 credits during their first year at Howard University College of Pharmacy. The course is set up to teach students both the research methods studied in the course and the practical ways to apply them. The method supports today's pharmacy education standards that focus on developing skilled professionals ready to use evidence to improve patient health.

It began with didactic lessons on subjects such as research design, survey methodology, types of sampling, making questionnaires and statistics. Students relied on those basics to guide them through the next phase of the research practicum. Using research methods in the curriculum is a unique way to help future pharmacists start learning skills needed to practice with scientific evidence(5).

Planning and Carrying Out the Research

Students participated in the study, carried out the research, provided their own input and filled out surveys, making the environment interactive and effective for reinforcing research methods. At first, each student was given a topic related to pharmaceutics and themes that matter in current practice. In this study, KB-S was given the role of finding out how natural products can aid in acne treatment.

Once the topic was assigned, the students researched essential literature to create the base for their projects. At this point, medical students were expected to assess earlier studies, understand where knowledge was still missing and propose research inquiries related to what clinicians need to know. Focusing on analyzing literature during the study design stage led to questionnaires that dealt with important and current topics.

In order to develop the survey instrument, a reliable framework was used and required the presence of two types of questions: questions on facts and questions on attitudes, beliefs and perceptions. Every category had five questions, so the assessment tool covered both factual knowledge and personal opinions on the subject. The fact-based section did not offer much room for debate, so the questions were each answered with true or false, while opinions were measured using a standard Likert scale.

As the questionnaire was developed, the faculty monitored it to make sure the technolgy was rigorous, the content was correct and suitable questions were used. All draft versions of the questionnaires were checked by experts for bias, poorly worded questions and for anything that might reduce the quality of the information. As a result of many rounds of reviews, the survey tools included the proper content, were clearly written and used standard methods. The careful study processes confirm that the research was done carefully, despite being conducted in an educational institution.

Methods for Collecting Data and Ethical Issues

Collecting responses was easier, thanks to using a digital platform that protected respondents' anonymity and offered a regular format for the survey. Distinguishing the cohort of the first-year pharmacy class helped ensure that all eligible students had an equal chance to join. The protocol made sure that the study aimed at teaching was clear from the beginning, participation was voluntary and participants submitted their answers without being identified.

Participants were informed collectively about completing the survey, responding by the deadlines and how to address any unclear questions. On the electronic system, there were designs to prevent submitting the same survey and enable saving partial survey answers for later. They considered both research methodology and what was needed for the participants while recruiting.

Since the project was designed for learning and participants remained confidential, as well as consenting to join voluntarily, it closely followed guidelines for approving educational research that does not actively impact the participants. While there is no information about how informed consent was handled in the paper, the student setting may have full ethical oversight as part of the program of study(6).

Modeling and Measuring

The research techniques chosen for analysis were suitable for both exploring the study and using the provided sample. The analysis of demographic data allowed me to explain participants' profiles using percentages for gender, age, place of residence, work background and schooling. They allowed us to make sense of the insights and opinions from the following research.

Knowledge assessment calculated the correct answers and then computed the mean, standard deviation and variance to show how centered and spread out the results were. Rather than just describing, the authors used Fisher's test to compare rates which represented a better method because the sample size was small and chi-square tests might give untrustworthy results.

Opinion questions were handled using a Likert scale system, with 4 meaning strongly agree, 3 for agree, 2 for disagree and 1 for strongly disagree. Thanks to this method, average scores for each item and the differences between them could be measured. By performing variance calculations, the approach became richer and revealed that participants held varying opinions.

All the opinion questions were summed to give an overall rating of opinions about natural remedies for acne management. Since the combined approach was used, both general attitudes and specific insights remained. This method helped in understanding each opinion individually as well as how they are related to each other.

Advantages and Disadvantages in Using a Method

With this method, researchers were able to include both educational and research goals, use the same survey design, give a broad overview of participants through demographics and use suitable statistical tools for the study. The combined approach of considering knowledge and opinions gave us a clear overview of how natural products may be used in healthcare by the future professionals.

The main concern in the study was that a small sample size of 39 participants meant that conclusions were limited in their statistical significance and could not be applied to everyone. The practice-based learning only involved first-year students at one university which limited this study's generalizability to other groups or schools. Since it focused solely on the participants' knowledge and beliefs at one particular time, the study did not consider how changes in their education would affect their views in the future.

Reporting was adequate and provided enough information to repeat the experiment, all in a manner that could be published in a journal. Combining the goals of education and research was a new approach, as it allowed researchers to observe the knowledge and attitudes of future healthcare professionals on combining modern and alternative medical practices.

4.Results

The Information About the Study Group

It was discovered in the analysis that the group consisted of participants from various backgrounds, reflecting different aspects of pharmaceutical learning and work. In the study, 29 female students participated compared to 10 male, reflecting a common finding that the majority of professional programs in pharmacy have female students making up most of their student base. The trend in gender in Canadian pharmacy faculties reflects what has occurred nationally: over the past 30 years, the number of women students has gone up, turning what was previously a male-dominated sector into one with many female participants(7).

Most of the participants (n=20, 51.3%) were under 25 years old and starting pharmacy education with a traditional-pathway background, after completing their undergraduate education. Thirty-eight point five percent of the secondary cohort (n=15) were in the 24-30 age range, meaning these students either had work experience or more schooling behind them before attending pharmacy school. Seven percent or 3 students, were 30-40 years old and nearly 3% comprised participants above 40 years, making the generation demographics in the study diverse. As the economy changes, more non-traditional students and career-changers are attracted to pharmacy education which is shown in the age distribution.

Nearly half of the participants were from Washington DC (16.4%), Maryland (43.0%), Virginia (3.0%) and other states (42.6%). The presence of many people from areas outside the institution means that Howard University College of Pharmacy has a strong national appeal and could foster more cultural diversity in the way complementary and alternative medicine is practiced. A participant did not supply location data, meaning the non-response rate for demographics was 2.6%.

Every participant answered all of the important questions about science, meaning the survey was trusted and the information collected is clear, minimizing any doubts about non-response bias. Through the demographic profile, we can properly understand the participants which allows us to interpret other results in the proper context.

Background in Professional Work and Level of Education

People who enrolled in pharmacy programs have had different amounts of work experience and have worked in many sectors. A majority had significant experience at work, where 41.0% (n=16) had five or more years in jobs, another 23.1% (n=9) had worked for 3-4 years and 30.8% (n=12) had only 1-2 years of professional work. This reflects that only 2 people (0.5% of the sample) had not ever worked before, so the majority of survey participants were past workers.

When examining the jobs held by the pharmacists, it was found that 54.1% (n=20) had done work related to pharmacy which involved dealing with drugs and various patients asking about alternatives to usual treatments. Eight other respondents (n=9) found employment in health careers that were not related to pharmacy, indicating they may have interacted with integrative medicine options. Eight respondents who did not have healthcare backgrounds can offer valuable experience and insight into how people make decisions about healthcare.

Those who took part demonstrated excellent academic achievement. 66.7% (n=26) of the respondents had completed their bachelor's degree (either BSc or BA). Seven participants (representing 17.9% of the study) held

master's degrees, suggesting that additional training was completed compared to what was required for the pharmacy degree. Only a few people reported having an associate degree (5.1%, n=2) or finished some college/pre-pharmacy courses (10.3%, n=4). It was important to note that not a single participant had earned a doctoral degree prior to entering a pharmacy program. Eighty-four percent of the participants had undergraduate or graduate degrees before they started their professional pharmacy coursework.

The information about individuals' work and education helps make sense of their beliefs and views. Since many of the participants had worked in healthcare and pharmacy, they may be familiar with various ways to treat dermatological problems, including some natural products. Since the educational background is so solid, we can assume the individual has access to relevant science topics and experience assessing evidence about botanical medicine(8).

Category	Detail/Metric	Result
Gender Distribution	Female	74.4% (n = 29)
	Male	25.6% (n = 10)
Age Range	18–24	51.3% (n = 20)
	25–30	38.5% (n = 15)
	30–40	7.7% (n = 3)
	>40	2.6% (n = 1)
Geographic Origin	Maryland	39.5% (n = 15)
	Other states	42.1% (n = 16)
Work Experience	>5 years	41.0% (n = 16)
	Pharmacy-related jobs	54.1% (n = 20)
	Health-related (non-pharmacy)	24.3% (n = 9)
Educational Background	Bachelor's degree (BSc/BA)	66.7% (n = 26)
	Master's degree	17.9% (n = 7)
Knowledge Assessment	Average correct responses	75.9%
	Correctly identified Melaleuca alternifolia as tea tree oil	14.7% (n = 5)
	Knew tea tree oil used for acne	97.1% (n = 33)
Opinion Score	Likert average (1–4 scale)	3.31 (SD = 0.58)

TABLE 1 Demographic, Professional, Educational, Knowledge, and Opinion Assessments

What exam candidates should achieve

Understanding varied throughout the different areas of natural remedies used for treating acne. Generally, participants correctly answered 75.9% of the botanical knowledge questions. Unfortunately, the results for each knowledge dimension were very different, ranging from 14.7% to 97.1%.

At the highest percentage, tea tree oil for acne (ranked first with 97.1%, n=33) and calendula flowers for herbal tea (ranked second with 97.1%, n=33) were correctly picked by participants. Everyone giving the right answers likely shows that these botanical agents are widely used and recognized because they are discussed in many health books and products.

There were slightly fewer correct responses for learning about the uses of aloe vera. Another skill tested in understanding is the ability to understand that the bright pigments in lavender can be used to dye fabrics and make food coloring (82.4%, n=28). According to the results, both salicylic and willow bark have established value as widely used botanical agents in skin care products.

Many people did not realize that only Melaleuca alternifolia yields true tea tree oil, as more than 85% (n=32) of them identified Camellia sinensis as the tea tree plant. Because of this mistake, individuals may lack the necessary knowledge needed for clinical counseling and selecting products, given it involves a serious misunderstanding of where herbs originate and how this relates to their healing benefits.

Fisher's Exact Test shows that tea tree's botanical origin score was significantly lower than all the other scores and indicates that this is an important area to focus on, rather than just a coincidental result. Similarly, there were no

notable discrepancies between the high-performing knowledge items, pointing to the same knowledge level in all of them ($p>0.05$).

Overall, the report reveals the group knows a lot about natural treatments for acne, except for one major topic. From this data, we see that the group understands well what general applications and therapies are, but may not classify plants as expertly. It follows what is common for early-stage pharmacy learners, who generally have some idea about natural products but lack proper training in their properties.

What I Have Learned

Attitudinal measures indicated that most people have very positive opinions about using botanical agents for managing acne. When looking at the entire Likert scale average, the opinion showed most people were close to "strongly agree" and far away from disagreement. All of the botanicals showed this optimistic attitude, suggesting that including natural products is an option for many treatment approaches to acne.

5.Conclusion and Future work

The results of this study have provided valuable insights into what future healthcare specialists understand about using natural therapies for acne, including tea tree oil, aloe vera, lavender and calendula. 76% of the 39 participants were able to answer the knowledge-based part of the test, demonstrating their understanding of how botanical agents are used or found. Nevertheless, since so few identified tea tree oil as Melaleuca alternifolia (only 14.7%), it is important to educate healthcare professionals about this plant so they avoid making mistakes that could harm patients.

Most of the study's participants strongly agreed that herbal remedies can help treat acne. All botanicals got high scores, with most comments about lavender agreeing that it helps anxiety by promoting a calm state of mind (everyone agreed). These positive views mean this generation of pharmacy workers might welcome helping patients by combining evidence-based natural approaches with regular acne treatment, satisfying patients' need for natural alternatives and still focusing on sound science.

This study's diversity of age, origin, career experience and education makes it likely that the findings come from a wide range of students, but since women account for almost three quarters of the sample, these results should consider this imbalance. Since 78.4% of participants had previous experience in healthcare, it is likely that their opinions reflected insights gained from clinical work which could improve the importance of their observations about applying botanical remedies for acne.

Though the data is very useful, some points must be considered before accepting it. Due to the small size of the study group (39 participants) and a single location, the results cannot be used as widely for other pharmacy students. Such a design looks only at present information and opinions without following the development of these views over time in a classroom. Also, the survey did not ask about specific cases or the ability to assess botanicals or their evidence for inclusion in clinical medicine.

The results show that pharmacy education and research can benefit from exploring several new paths. Those who develop curriculum should pay special attention to improving the teaching of botanical medicine by making sure students understand the basics of identifying and classifying plants for use as medicines. Other studies should look at the relationship between knowledge and views on natural cures for acne and the actual recommendations doctors give for various treatments. Moreover, investigation of how pharmacy students assess the quality of information on botanical preparations would add details about how well they judge scientific evidence for natural products.

To put it simply, this study suggests that students of pharmacy nowadays have positive knowledge and attitudes toward botanical remedies used for treating acne. With an interest in nature and proper education, future pharmacists are prepared to give reliable advice to people wanting to use both traditional and some natural remedies for acne.

Acknowledgement: Nil

Conflicts of interest

The authors have no conflicts of interest to declare

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