International Journal of Pharmacy and Pharmaceutical Research (IJPPR)
Volume 32, Issue 6, June 2026 ijppr.humanjournals.com ISSN: 2349-7203

Formulation and Evaluation of Niacinamide and Zinc Oxide Anti-Acne Cream

Shruti Santosh Pokale, Prof Saurabh D. Gaikwad, Dr Megha T.Salve

Shivajirao Pawar College Of Pharmacy Pachegoan.Tel Newasa. Dist. Ahilyanagar, Maharashtra, India.

Received: 25 April 2026 Revised: 17 May 2026 Accepted: 27 May 2026

ABSTRACT

Acne vulgaris is a common inflammatory skin disorder affecting pilosebaceous units. The present study focuses on the formulation and evaluation of an anti-acne cream containing Niacinamide and Zinc Oxide. Niacinamide possesses anti-inflammatory, sebum-regulating, and skin-barrier-enhancing properties, while zinc oxide exhibits soothing, antimicrobial, and protective actions. An oil-in-water cream was prepared using standard emulsification techniques and evaluated for physical appearance, pH, viscosity, spreadability, washability, extrudability, stability, and antimicrobial activity. The formulation demonstrated acceptable physicochemical characteristics and showed potential effectiveness against acne-causing microorganisms. The study concludes that the combination of niacinamide and zinc oxide can serve as a safe and effective topical anti-acne preparation. Acne vulgaris is a common dermatological disorder affecting individuals of all age groups, especially adolescents and young adults. The present study aimed to formulate and evaluate an anti-acne cream containing niacinamide and zinc oxide as active pharmaceutical ingredients due to their anti-inflammatory, antimicrobial, and sebum-regulating properties. The cream was prepared using the oil-in-water (O/W) emulsion method with suitable excipients including emulsifying agents, humectants, preservatives, and stabilizers. Different formulations were developed by varying the concentrations of niacinamide and zinc oxide to obtain an optimized preparation with desirable physicochemical characteristics.

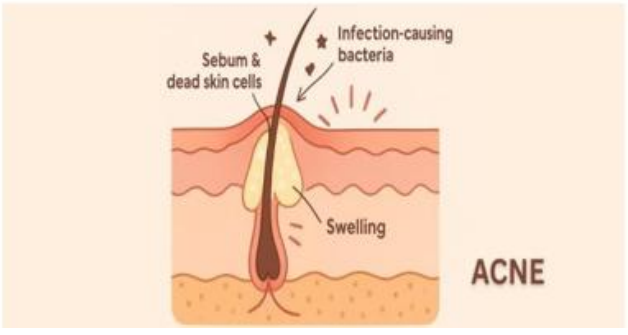
Keywords Antiacne, Niacinamide, Zinc oxide, Acne Vulgaris

INTRODUCTION

Acne Vulgaris

Acne Vulgaris is a chronic inflammatory disorder of the sebaceous glands characterized by pimples, papules, pustules, nodules, and comedones. It commonly affects adolescents and young adults.





Causes of Acne

- Excess sebum secretion
- Follicular hyperkeratinization
- Bacterial growth

- Hormonal imbalance
- Inflammation
- Cutibacterium acnes

Niacinamide

Niacinamide is a water-soluble form of Vitamin B3 used in dermatological preparations.

Niacinamide (also called nicotinamide) is a form of vitamin B3 used in skincare, nutrition, and medicine. It is different from niacin (nicotinic acid) because it does not usually cause "flushing."



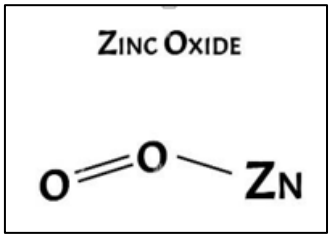
Uses

- Reduces inflammation
- Controls sebum production
- Improves skin barrier
- Minimizes acne marks
- Reduces redness and irritation

Zinc Oxide

Zinc oxide is widely used in topical formulations because of its protective and soothing effects.

Zinc Oxide is an inorganic compound commonly used in skincare, sunscreens, diaper rash creams, calamine lotions, and medicinal ointments. It appears as a white powder and is valued for its protective, soothing, and UV-blocking properties.

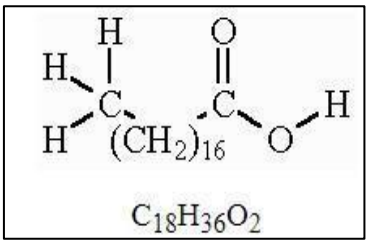


Benefits

- Mild antimicrobial activity
- Skin protection

- Oil control
- Anti-inflammatory action
- Reduction in irritation

Stearic Acid :



Stearic Acid is a saturated fatty acid naturally found in animal fats and many plant oils such as cocoa butter, shea butter, coconut oil, and palm oil. It is widely used in skincare, cosmetics, soaps, candles, and pharmaceutical products.

Cetyl alcohol :

Cetyl Alcohol is a fatty alcohol commonly used in skincare, haircare, and cosmetic products. Despite the word "alcohol," it is very different from drying alcohols like ethanol or isopropyl alcohol.

Cetyl alcohol is usually used to make products smoother, thicker, and more moisturizing.

Liquid paraffin :

Liquid Paraffin is a purified mineral oil derived from petroleum. It is widely used in skincare, pharmaceuticals, cosmetics, and medical products because of its moisturizing and protective properties.

Glycerine :

Glycerine (also known as glycerol) is a simple polyol compound widely used as a humectant, solvent, and emollient in skincare, cosmetics, and pharmaceuticals. Its ability to attract and retain moisture makes it essential in formulations designed to hydrate, protect, and soften the skin.

Triethanolamine:

Triethanolamine is an organic compound with the formula $N(CH_2CH_2OH)_3$. It is a viscous, colorless to pale-yellow liquid that combines the properties of amines and alcohols. Widely used in cosmetics, pharmaceuticals, and industrial products, it serves as a pH balancer, emulsifier, and surfactant.

Methyl paraben:

Methyl paraben (more precisely methylparaben) is a widely used chemical preservative found in many everyday product.

Methyl paraben belongs to a group of compounds called parabens, which are esters of parahydroxybenzoic acid. It appears as a white crystalline powder and is effective at preventing the growth of bacteria and fungi.

Propyl paraben :

Propylparaben, or propyl 4-hydroxybenzoate, is a synthetic paraben ester used as a broadspectrum antimicrobial preservative in cosmetics, pharmaceuticals, and some foods. It inhibits microbial growth to prevent spoilage and contamination, making it one of the most widely tested and commercially important preservatives in personal-care formulations.

International Journal of Pharmacy and Pharmaceutical Research (IJPPR)
Volume 32, Issue 6, June 2026 ijppr.humanjournals.com ISSN: 2349-7203

Aim and Objectives

Aim

To formulate and evaluate an anti-acne cream containing niacinamide and zinc oxide.

Objectives

1. To prepare an oil-in-water cream formulation.
2. To evaluate physicochemical properties.
3. To determine stability of the formulation.
4. To study antimicrobial activity against acne-causing organisms.
5. To assess suitability for topical application.

Materials and Methods

1 Materials Required

Ingredient	Function
Niacinamide	Anti-acne active
Zinc oxide	Protective and anti-inflammatory agent
Stearic acid	Emulsifier
Cetyl alcohol	Thickening agent
Liquid paraffin	Emollient
Glycerin	Humectant
Triethanolamine	pH adjuster
Methyl paraben	Preservative
Propyl paraben	Preservative
Purified water	Vehicle

2. Formula for 100 g Cream

Ingredient	Quantity
Niacinamide	4 g
Zinc oxide	2 g
Stearic acid	10 g
Cetyl alcohol	3 g
Liquid paraffin	5 g
Glycerin	5 g
Triethanolamine	1 g
Methyl paraben	0.18 g
Propyl paraben	0.02 g
Purified water	q.s. to 100 g

3. Method of Preparation

Step 1: Preparation of Oil Phase

Stearic acid, cetyl alcohol, and liquid paraffin were melted together at 70–75°C.

Step 2: Preparation of Aqueous Phase

Niacinamide, glycerin, preservatives, and triethanolamine were dissolved in purified water and heated to the same temperature.

Step 3: Addition of Zinc Oxide

Zinc oxide was dispersed uniformly in glycerin before incorporation.

Step 4: Emulsification

The oil phase was slowly added to the aqueous phase with continuous stirring.

Step 5: Cooling

The mixture was stirred continuously until cooling to obtain a homogeneous cream.

Step 6: Packaging

The prepared cream was filled into suitable airtight containers.

Evaluation of Cream

1 Physical Appearance

The cream was evaluated for:

- Color
- Odor
- Texture
- Homogeneity
- Consistency

2 pH Determination

The ideal pH for topical cream:

pH≈5.5−6.5pH \approx 5.5 - 6.5pH≈5.5−6.5

The pH was measured using a digital pH meter.

3 Viscosity

Viscosity was determined using a Brookfield viscometer.

4 Spreadability

Formula for spreadability:

$$S=M\times LTS = \frac{M \times L}{T}S=TM×L$$

Where:

- SSS = Spreadability
- MMM = Weight applied
- LLL = Length moved
- TTT = Time taken

5 Washability

The formulation was checked for ease of washing with water.

6 Extrudability

Extrudability was evaluated by measuring ease of extrusion from the tube.

7 Drug Content

Drug content was analyzed using UV spectrophotometry.

8 Stability Studies

The formulation was stored at:

- Room temperature
- Refrigerated temperature
- Accelerated conditions

The cream was observed for:

- Phase separation
- Color change
- pH changes
- Viscosity changes

9 Antimicrobial Activity

The anti-acne activity was tested using agar diffusion methods against acne-causing bacteria.

Results and Discussion

- The cream showed good homogeneity and smooth texture.
- pH was within the acceptable skin range.
- The formulation exhibited satisfactory spreadability and viscosity.
- No phase separation was observed during stability studies.
- Antimicrobial studies indicated inhibitory activity against acne-causing organisms.

- The combination of niacinamide and zinc oxide showed synergistic anti-inflammatory effects.

Conclusion

The present study successfully formulated and evaluated a niacinamide and zinc oxide antiacne cream. The formulation demonstrated acceptable physical stability, suitable pH, good spreadability, and promising antimicrobial activity. Therefore, the developed cream may be considered effective and safe for topical management of acne vulgaris.

REFERENCES

1. Draelos ZD. "The effect of 2% niacinamide on facial sebum production." Journal of Cosmetic and Laser Therapy.
2. Shalita AR, Smith JG, Parish LC, et al. "Topical nicotinamide compared with clindamycin gel in the treatment of inflammatory acne vulgaris." International Journal of Dermatology.
3. Bissett DL, Oblong JE, Berge CA. "Niacinamide: A B vitamin that improves aging facial skin appearance." Dermatologic Surgery.
4. Gupta M, Mahajan VK, Mehta KS, Chauhan PS. "Zinc therapy in dermatology: A review." Dermatology Research and Practice.
5. Dreno B, Thiboutot D, Gollnick H, et al. "Large-scale worldwide observational study of adherence with acne therapy." International Journal of Dermatology.
6. Kircik LH. "The role of topical niacinamide in acne treatment." Journal of Clinical and Aesthetic Dermatology.
7. Elsaie ML, Baumann LS, Elsaaiee LT. "Stratum corneum barrier function and topical therapies." Journal of Cosmetic Dermatology.

How to cite this article:
Shruti Santosh Pokale et al. Ijppr.Human, 2026; Vol. 32 (6):459-465.
Conflict of Interest Statement: All authors have nothing else to disclose.
This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.