

Study on Use of Moisturizing Syndet Bars by Pediatricians
(For Nourishing Skin and Atopic Dermatitis)

By

Bhavna Verma

*Dissertation submitted for the partial fulfillment of the
MBA Pharmaceutical Management*

Academic year, 2016-2018



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TO WHOMSOEVER MAY CONCERN

This is to certify that **Bhavna Verma** student of MBA Pharmaceutical Management from The IIHMR University, Jaipur has undergone Dissertation training at **Delcure LifeSciences Ltd.**, Mumbai from 5th February to 4th May 2018

The Candidate has successfully carried out the study designated to him during internship training and his approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of the course requirements.

I wish him all success in all his future endeavors.



Dr.(Col) Ashok Kaushik



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The certificate is awarded to

Name: Bhavna Verma

In recognition of having successfully completed her
Internship/Dissertation on the project

**A STUDY ON USE OF MOISTURIZING SYNDET BARS
BY PEDIATRICIANS**

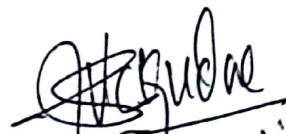
Date: 14.05.2018

Organization: Delcure LifeSciences Ltd

She comes across as a committed, sincere & diligent person who has a strong
drive and zeal for learning

We wish her all the best for future endeavors

Shirish Vankudre



GM - Human Resources

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CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled **“A study on use of moisturizing syndet bars by paediatricians”** and submitted by Ms. Bhavna Verma Enrolment No. **MBA-PM-0065** under the supervision of **Mr. Ajinkya Dalal** for award of MBA in Pharmaceutical Management of the University carried out during the period from **5th February 2018 to 5th May 2018** embodies my original work and has not formed the basis for the award of any degree, diploma associateship, fellowship, titles in this or any other institute or other similar institution of higher learning.


Signature

ABSTRACT:**Objectives:**

A study on usage of Moisturizing syndet to treat skin disorders in paediatrics.

Research design:

Primary data was collected from 77 Pediatricians in the Mumbai city. Convenience sampling method is used to collect data from doctor.

Methods:

Data was collected through structured questionnaire and filled in the excel format. Analysis was performed using **MS Excel** as analytical tool.

Results:

Majority of respondents preferred moisturizing syndet base the main soap for the skin diseases especially atopic dermatitis and eczema to the patients. Majority of patient suffer from atopic dermatitis and eczema followed by skin dryness, itchiness, irritation and inflammation symptoms.

Patient Compliance (40%) is the major factor behind preferred brand prescribing by doctor. Followed by availability (25%) and clinical evidences (20%). For any ideal syndet soap efficacy and safety is necessary in the formulations as per majority of responses because skin irritation and dryness is major challenge. While 86% Doctors prescribe alone syndet soaps whereas 14% prefer normal soaps for pedia population.

The main brands which are leaders in the market of syndet bases in mumbai are Tedibar (Curatio), Daffy bar (Dr. Reddy's Lab) among doctors.

Conclusion:

Study shows that majority of respondents (Pediatricians) are mostly prescribing syndet base due to its higher compatibility among pedia patients.

ACKNOWLEDGEMENT

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EXECUTIVE SUMMARY

Infant skin is not as resilient as adult skin, and its unique properties should be taken into account in order to maintain the integrity of the infant skin barrier. A number of studies have shown that moisturizing cleansing soaps are generally milder than soap-based products and help maintain the structural integrity and moisture of the stratum corneum. Clinical studies suggest that there is a remarkable improvement in the skin condition of infants after regular use of moisturizing syndets.

It has been mentioned that syndet bars are mild and cause less damage to baby skin. The pH of syndet bars are usually around 5.5, which is very similar to the natural pH of our skin. These bars are effective cleansers, cause minimal damage to skin layers, and do not have the harsh stripping effects. This leads to less dryness, less skin irritation, and better control of acne. It does not cause any type of destruction of the lipid mantle undermines the skin's barrier function.

The total value of moisturizing market is 498.37 crore .The total value of soap market is of 110.97crore, out of which moisturizing syndet market for paediatrics is of 54.03 crore that constitute 18% of the total moisturizing market. The market share of moisturizing syndet increases from 44%

A cross-sectional descriptive research design was used for this study. This design facilitates the study at a given point of time. The specialities covered were mainly paediatricians leading to a total sample size of 77.

Data collection involved both primary data and secondary data.

1. Primary data-Survey method was used to collect the primary data. Looking to the nature of study, a structured questionnaire was used.
2. Secondary data- It has been collected from reports, journals, articles and IMS data.

Different zones of Mumbai were covered for purpose of data collection, particularly, western (58%), central (20%), southern (10%) and harbour (12%).

Interpretation through analysis was as follows-

- 100% of the doctors said that they prescribe moisturizing syndet to paediatric patients with skin related problems.
- 42% of the doctors said that eczema is the most common skin disease common among the paediatric patients, followed by Dermatitis, Xerosis, Psoriasis, and Rosacea.
- Itching, allergic reactions, red rashes, dry skin, excoriation with redness, urticaria, fungal infection, superadded bacterial infection, scaly skin, hypopigmented and enzymatous skin

lesions, ichthyosis, scabies, pruritis, exanthem, roughness, red plaques, fines lines and cracks are some of the symptoms seen by doctors in patients with skin problem.

- According to Doctors, Tedibar, Daffy, Sebamed, Moisturex, Cetaphil are some the major syndets that are usually their first choice for prescription. Other brands include Dermadew, Nusoft, Lsdew, Kidglo, Aquasoft, Dermocalm, Ritch, Little, Himalaya and Olemessa.
- As per the data obtained from chemist shop, 51% of the chemist stated that 2-3 syndets were sold per week. They added that the sale of moisturizing syndet totally depend on the patient profile.
- 16% of the doctors said that the moisturizing syndet should be used for 2-3 months regularly. 13% doctors said that it should be continued for 3-4 months, while 5% of the doctors said that it should be used for 1-2 years of life to treat different skin related problems in pediatric patients.
- Ph balanced, trust on the company, medical representative approach, no shea butter used, mild soap, quality, safety, efficacy, effectiveness are some of the reasons stated by doctors for choosing a particular brand.
- According to the doctors, PH is the most preferred attribute which a doctor considered in a moisturizing syndet followed by Moisturizing effect, Tear free, Active ingredient, Cost effective, Non-irritant, Foam, Mild-surfactant, and Fragrance.
- Some of the other attributes that should be contributed to moisturizing syndet includes mildness, produce less foam, control sebum, remain in form for longer time. According to doctors, moisturizing syndet should be available in liquid form also.
- Some of the side effects noticed by doctors after using moisturizing syndet includes allergic reactions like rashes, acne occurs occasionally, however it is also noticed that syndet become hard after using it for some time, Ph of skin also changes on using syndet for longer time.
- According to the findings,
- ✓ The baby syndet should be formulated in such a way that it should be able to fill the current gaps. Other attributes which can be incorporated into the formulation include more sebum production, less foaming, mild in nature, remain in form for a longer time and hypoallergenic.
- ✓ As it is a baby care syndet, the packaging should include different shapes that makes it more attractive.
- ✓ In order to have a competitive differentiation/advantage in the market ,positioning should be done by coming up with a different formulation, it should be available in both solid as well as in liquid form.

INTRODUCTION:

Syndets in short stands for “synthetic detergent.” These cleansers typically contain less than 10% soap (**Soap without soap**) and are beneficial for those who have rosacea, eczema, psoriasis, sensitive skin, or dry skin (xerosis). Technically it refers to the binding that occurs between different detergents, also called surfactants or tensioactive agents. These detergents, which have an affinity for oils and repel water, surround dirt with small structures that are then removed by water. These soaps have been recommended by dermatologists for other skin conditions such as acne since regular soap can irritate the skin.

Moisturizing syndets are mild and cause less damage to our skin. The pH of these soaps is usually around 5.5, which is very similar to the natural pH of our skin. These soaps are effective cleansers, cause minimal damage to skin layers, and do not have the harsh stripping effects of regular soap. This leads to less dryness, less skin irritation, and better control of acne.

NEWBORN INFANT SKIN: PHYSIOLOGY, DEVELOPMENT AND CARE

The largest organ in the body, the skin consists of three main layers: the subcutis or inner-most fatty layer, the dermis and the epidermis or outer layer. The epidermis is continually regenerated as new skin cells or keratinocytes form in the stratum germinativum or basal layer. As the keratinocytes move towards the surface of the skin, they become flattened and gradually die. The dead cells are called corneocytes and make up the stratum corneum. This cornified or ‘horny’ layer on the surface of the skin is constantly shed and replenished, and acts as a barrier, preventing penetration by infectious agents, irritants and allergens, while regulating loss of water and nutrients from the body. The thinnest skin on a newborn is on the face and as a result this is where problems can first arise .

- **Skin barrier in infants:** Although full-term babies have a fully functioning skin barrier that prevents organ dehydration, their skin is not yet mature and continues to change and develop during the first year of life. As a result, infant skin is not as resilient as adult skin, and its unique properties should be taken into account in order to maintain the integrity of the infant skin barrier. The barrier properties of the skin depend greatly on the thickness and integrity of the stratum corneum. At birth the stratum corneum is 30% thinner in full-term infants than in adults. The stratum corneum continues to develop during the first year of life, when there are important changes in skin hydration, surface pH and permeability to water measured as trans epidermal water loss (TEWL). Full-term newborns have relatively dry skin, which becomes more hydrated than adult skin during the first four weeks of life . At the same time, although skin is more hydrated in infants than in newborns, it has greater TEWL and a lower concentration of natural moisturizing factors, surface lipids and sebum compared to the skin of newborns or adults. This means that a skin cleansing regimen for newborns must be able to remove unwanted material from the skin without inducing dryness, irritation, itch and barrier damage.

The acid mantle has multiple effects on the skin, including a role in normal skin shedding (desquamation), and maintenance of the permeability barrier and the integrity of the stratum corneum. Skin pH is also important because of its role in promoting the skin's microbiome, the diverse harmless or beneficial microorganisms that colonise the human skin surface. The microbiome is gradually acquired from birth, and is thought to be critical for the effectiveness of the skin's immune response against disease causing bacteria, and possibly for the development of a healthy skin barrier and systemic immune system. Infant skin differs from adult skin in its structure, function and composition, and needs appropriate, evidence-based care to maintain the integrity of the skin barrier. At the same time, cleansing must effectively remove unwanted substances from the skin to maintain good health and hygiene in infants.

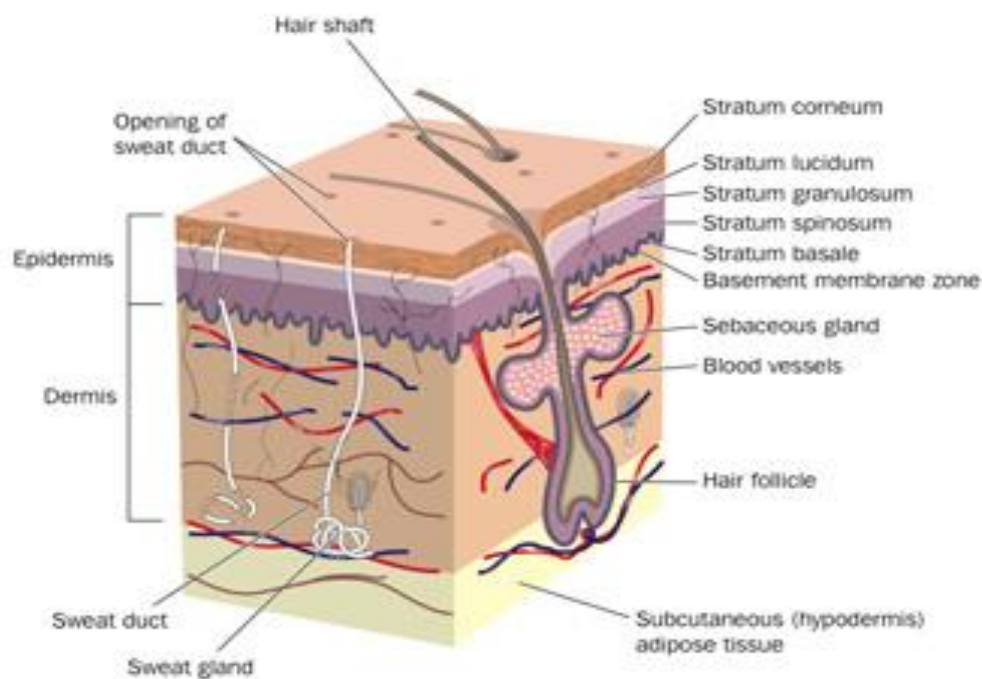


Diagram showing Structure of the skin

Infants weighing less than 1,000 g have approximately 65 mL/kg/d of trans epidermal water loss (TEWL),

And those weighing 1,750 to 2,000 g have about 30 mL/kg/d of TEWL.

This loss of water may affect thermal stability, hydration, and electrolyte balance.



Skin Structure	Premature newborn	Full-term newborn	Adults
Epidermis	Thinner cells, compressed fewer layers of stratum corneum, low melanin production.	Stratum corneum adherent, low melanin content.	Epidermis normal with resistance to penetration, normal melanin content.
Dermo-epidermal layer	Less cohesion between epidermis and dermis.	Less cohesion between epidermis and dermis.	Good cohesion between epidermis and dermis.
Dermis	Less elastic fibre, thinner.	Less elastic fibre, thinner.	Fully developed elastic fibres.

Table: Structural difference between newborn and adult skin.

KEY FACTS

- Tran epidermal water loss (TEWL) is the measurement of the amount of water diffused through the hydrated inner layers of the dermis and epidermis to the skin surface
- TEWL is regarded as one of the most important parameters for skin barrier function
- A high TEWL level suggests that skin barrier function is impaired
- A normal or reduced TEWL indicates that the skin barrier is intact or has recovered
- Full-term babies are born with a functioning skin barrier that continues to mature during the first year of life
- Infant skin differs from adult skin in its structure, composition and functions
- In newborns, the skin barrier is thinner than in adults, is more acidic and more easily loses water
- Infant skin needs special care to ensure that the health of the skin barrier is maintained

NEED FOR MILD CLEANSING SOAP:

In infants, effective cleansing is essential to remove harmful substances that may potentially cause irritation if left on the skin. The infant's overall health also depends on keeping the skin free of harmful bacteria that cause irritation and may lead to infection. The techniques and agents used to cleanse the skin have a role in maintaining and restoring the skin barrier. Cleansing may, however, have negative effects on the stratum corneum depending on the methods chosen .

Soap is an effective cleanser, but it also causes skin dryness and irritation. These negative effects are likely to be due to the effects of soap on skin lipids (fats) and pH, which in turn impair the integrity of the skin barrier. The lipids surrounding the cells of the stratum corneum play an essential role in preventing loss of water and essential blood minerals (electrolytes) through the skin barrier. Although any method of washing removes lipids from the outer layers of the skin, loss of lipids after washing with soap is greater than after using either water or mild, synthetic detergents (‘*Syndets*’) . The lipid content of the skin is gradually restored over time, but it is not recovered two hours after washing with soap and such changes in the lipid composition of the stratum corneum may reduce skin barrier function.

Soaps are typically alkaline, and have been shown to increase the pH of infant skin and disturb the acid mantle for up to 30 minutes. Infant skin takes longer than adult skin to restore the acid mantle and sustained pH increases, such as those caused by soap-based cleansers, have been shown to adversely affect barrier function in normal skin. There is a correlation between high TEWL and damage to the surface structure of the stratum corneum seen after washing with alkaline soap.

In contrast, ‘**Syndets**’ that are specifically formulated for use in infants minimally alter skin pH and deplete skin lipids, are associated with a lower rate of TEWL and are more able to maintain the barrier function of the skin. Since these substances are fat-soluble, they are held on the skin by surface tension and can only be removed by surfactants (‘surface-acting’ agents) that break them down into fine droplets that can then be easily rinsed away with water. **Syndets** (synthetic detergents) vary in composition and surfactant types (anionic, cationic, amphoteric, nonionic). These new skin cleansing products also contain preservatives, fragrances, and sometimes emollients, humectants and skin nutrients.

Water is also a skin irritant, causing itching and dryness. It is rapidly absorbed into the skin, especially through the still developing infant stratum corneum. This hydrates the skin, but the effect is only temporary since the added water quickly evaporates through TEWL, leaving the skin dryer than before. When it penetrates the skin, water may also increase the spaces between the corneocytes of the stratum corneum, impairing the integrity of the skin barrier and allowing pathogens and allergens through the skin. It is important to remember that tap water does not just consist of H₂O—i.e. two hydrogen atoms for every one oxygen atom. It also contains dissolved minerals such as calcium or magnesium that determine whether the water is hard or soft. This in turn influences the pH of water—i.e. whether it is acid, alkaline or neutral—but both hard and

soft tap water is relatively more alkaline than the acid surface pH of the skin. Rinsing with even slightly alkaline tap water can raise skin pH for several hours, reducing the function of the acid mantle and promoting breakdown of the skin barrier. Since the skin is the body's first line of defence against harmful irritants and allergens, impairment of the delicate newborn skin barrier has been identified as an important factor in placing susceptible infants at risk of skin problems such as atopic dermatitis (AD), also known as atopic eczema.

NEED TO FORMULATE MILD CLEANSING SOAP

- Soap is an effective cleanser, but increases trans epidermal water loss and causes skin dryness and irritation
- Water alone is not an effective skin cleanser and may also cause dryness and itching
- Impairment to the skin barrier may contribute to the development of atopic dermatitis in susceptible infants
- Mild, optimally formulated wash products that do not alter skin pH, cleanse infant skin effectively and maintain the skin barrier.

THE PH OF THE SKIN SURFACE AND ITS IMPACT ON THE BARRIER FUNCTION

The pH of any newborn cleansing regimen is another important consideration because of changes in the skin acidity or 'acid mantle' of newborns. At birth, the skin surface in full-term newborns has a neutral pH of 6.34-7.5. This falls in the first two weeks of life to become more acidic at pH 5.0, similar to the skin surface pH of 4.0-6.7 found in adults.



Diagram: The PH Scale showing acidic, neutral and alkaline range.

The skin pH is affected by a great number of endogenous factors, e.g. skin moisture, sweat, sebum, anatomic site, genetic predisposition and age. In addition, exogenous factors like detergents, application of cosmetic products, occlusive dressings as well as topical antibiotics may influence the skin pH. Changes in the pH are reported to play a role in the pathogenesis of

skin diseases like irritant contact dermatitis, atopic dermatitis, ichthyosis, acne vulgaris and *Candida albicans* infections. Therefore, the use of skin cleansing agents, especially synthetic detergents with a pH of about 5.5, may be of relevance in the prevention and treatment of those skin diseases.

Barrier Function: The formation of the stratum corneum barrier involves several pH-dependent enzymes, especially with respect to its lipophilic components and its destruction by desquamation. These hydrolases include glucocerebrosidase, acid sphingomyelinase, acid lipases, phosphatases and phospholipases. -Glucocerebrosidase with an optimum pH of 5.6 is involved in the synthesis of the most important ceramides. At the stratum granulosum/stratum compactum interface there is a release of acid hydrolases (contents of the lamellar bodies) into the extracellular space by differentiated keratinocytes. Together with those hydrolases, glucosylceramides and phospholipids play an important role in the lamellar arrangement of barrier lipids.

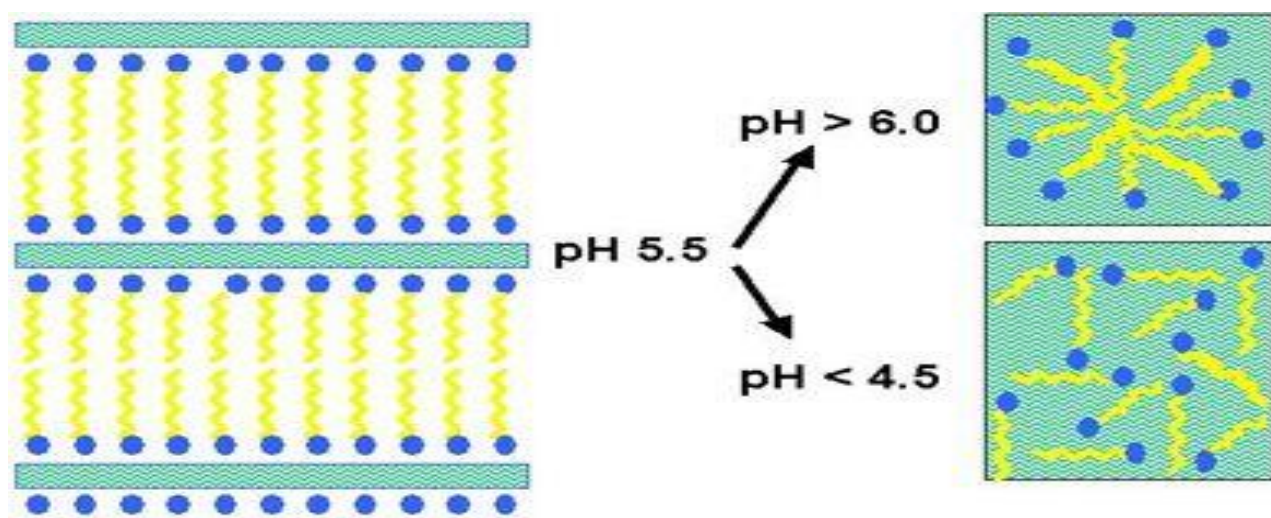
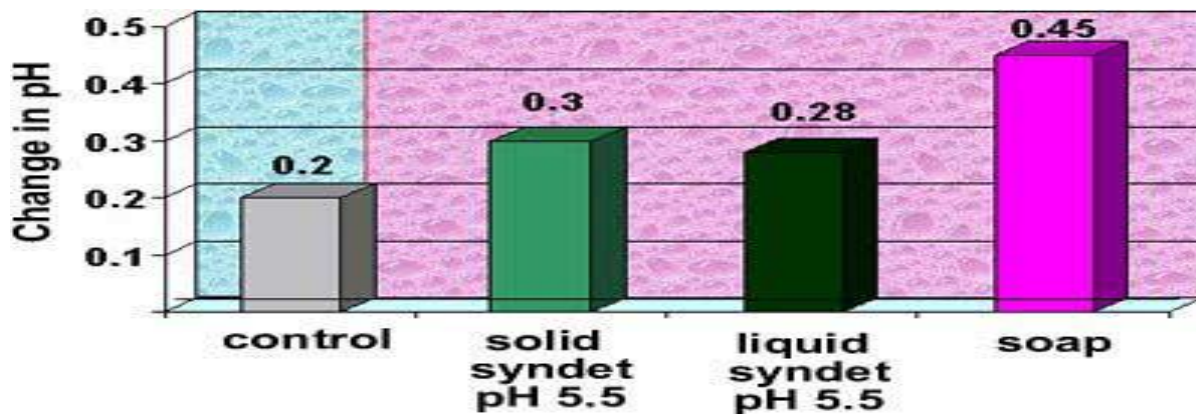


FIGURE: Influence of pH value on the configuration of horny layer (Stratum corneum) lipids .

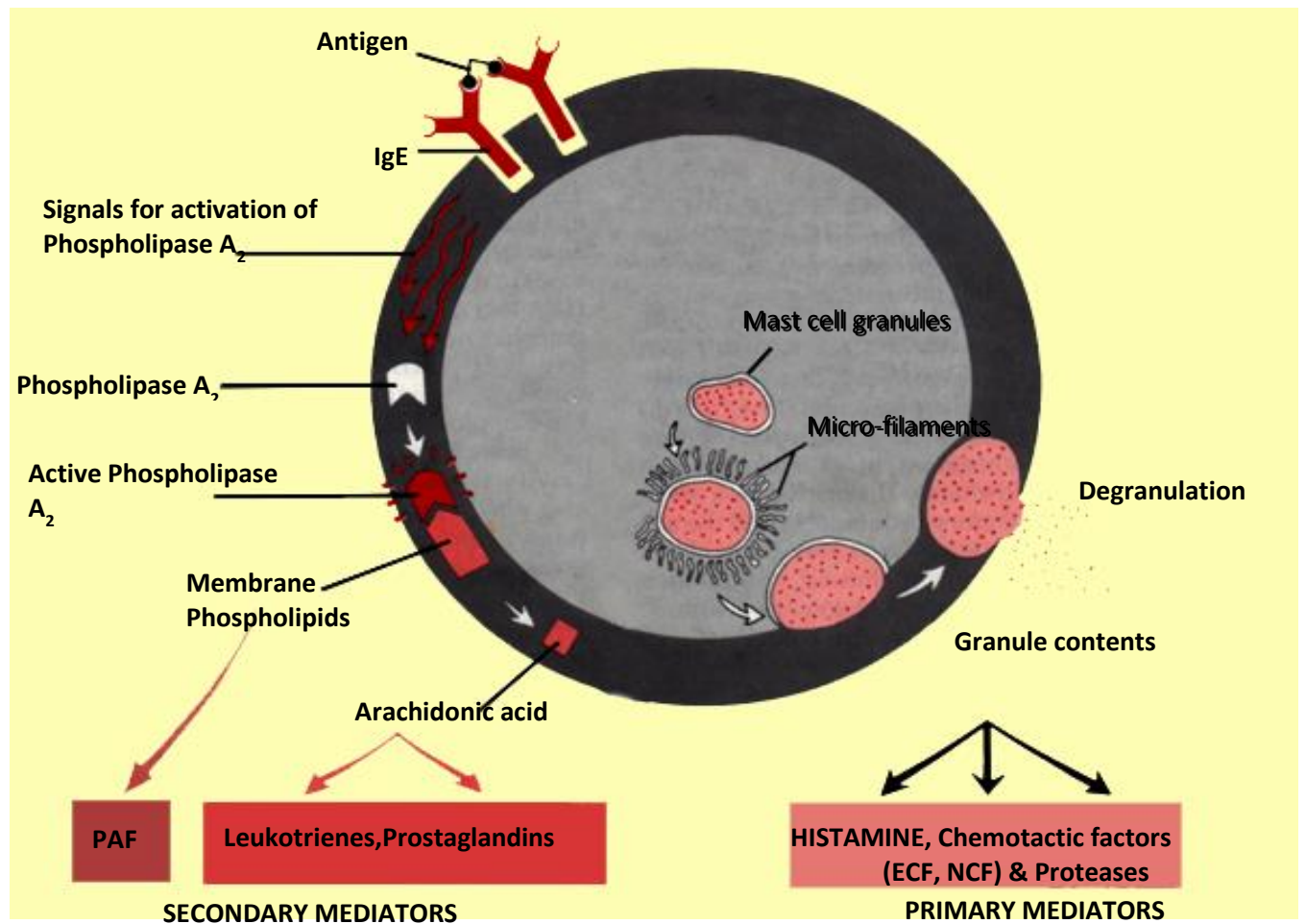
CLINICAL STUDY:

Hoeger and Enzmann (Scientist) assessed skin function parameters (skin surface pH, corneal layer hydration, epidermal desquamation, and surface roughness) prospectively in a cohort of 202 healthy term neonates. They found a decrease in surface pH by 0.3–1.1 units, while desquamation increased significantly during the observation period (12 weeks). In addition, stratum corneum hydration increased significantly, paralleled by a decrease in skin roughness on using moisturizing syndet (soap free soap).

GRAPH: Changes in pH of baby skin, 10 minutes after washing with soap and soap-free syndet preparations with pH 5.5.

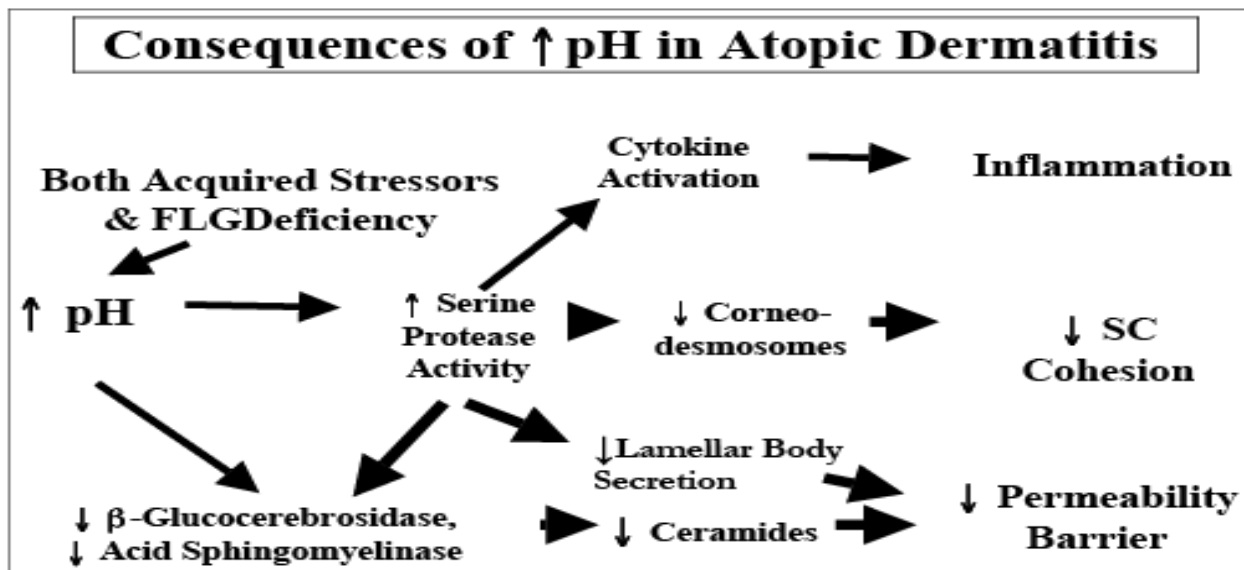


PRURITUS MEDIATOR-HISTAMINE



COMMON SKIN DISEASE AMONG THE INFANTS:

Atopic dermatitis (AD) Atopic dermatitis (AD) is an extremely common, chronic inflammatory skin condition that usually starts during the first months of life. The causes are complex, but AD is thought to be the result of an interaction between inherited predisposition and breakdown of the skin barrier due to adverse environmental effects. Several factors are associated with the development of AD, but increasing use of soap and detergents, especially with hard water, has been cited as one of the most important because of their effects on the stratum corneum. The stratum corneum is like a brick wall in which the bricks (the corneocytes) are surrounded by mortar (the lipid lamellae) and are supported by iron rods (proteins called corneodesmosomes). When an infant is genetically predisposed to AD, the corneodesmosomes break down prematurely below the skin surface. In infants with AD, the stratum corneum resembles a brick wall in which the supportive iron rods have rusted, leaving it more vulnerable to the effects of the external environment. When the stratum corneum is impaired—for example, through the effects of soap on skin lipids and pH—the skin barrier can no longer prevent allergens and infection from reaching the dermis, leading to the inflammation characteristic of AD. Conversely, preservation or restoration of a functional skin barrier may reduce the risk or possibly the severity of AD. As a result, appropriate care of newborn skin may have significant long-term implications for health and this highlights the need for suitable skin care regimens.



Acne: The goal of cleansing for acne or acne prone skin is to gently remove surface dirt, sweat, and excessive skin lipids without irritating or drying the skin. The ideal cleanser for acne skin should be:

- i. Non comedogenic, ii. non acnegenic, iii. non irritating, and iv. non allergenic.

- ii. Baby syndet bars are found to be effective in treating acne related problems.

Rosacea: The skin of baby patients with rosacea is extremely sensitive to chemical irritants. It is better to avoid classic soaps, cleansers containing alcohol, astringents, and abrasives in these patients. Ideally, only very mild cleansing agents like moisturizing baby soaps should be used in these patients. Therapeutic skin cleansers, containing sulfacetamide 10% and sulfur 5% in addition to a synthetic detergent, are approved for the treatment of rosacea.

Contact Dermatitis(Eczema): The basic requirements for an efficient skin cleanser to prevent this skin disease are its easy solubility in both hard and soft water, its ability to remove fats, oils, greasy materials without drying the skin, its free flow through the dispensers and a long shelf life without easy deterioration on storage. While synthetic detergents are generally perfectly adequate for cleansing hands at home.

Xerosis: Xerotic skin is seen in several dermatological disorders and also in the pediatric population as a part of natural aging due to decreased sebum production. Environmental factors, such as low humidity and wind may also exacerbate dryness. To rehydrate and soften xerotic skin, emollients, humectants, or keratin softening agents should be applied.

BIO-INSTRUMENTATION

- ✓ Trans-epidermal water loss (TEWL)
 - *DermaLab and Vapometer*
- ✓ Skin Hydration – *Corneometer 825*
 - *SNOVA DPM 9003, Skicon-200*
- ✓ Skin erythema – *ChromaMeter CR 300*
- ✓ Skin proteins swell markedly if the cleanser PH is highly alkaline(PH>8). **Optical coherence tomography(OCT)** is used to evaluate different pictures of stratum corneum after exposure to acidic,alkaline and neutral PH of baby skin.
- ✓ Protein-lipid ultrastructure of baby skin washed under exaggerated conditions with a syndet or a soap bar can be visualized using **environmental scanning electron microscopy**.

CHEMICALS USED TO PREVENT SKIN INFLAMMATION.

a) Tropical corticosteroids: Corticosteroids are hormones that can reduce inflammation (redness and swelling), suppress the immune system and narrow the blood vessels in the skin. Their main purpose is to reduce skin inflammation and irritation.

b) Tropical Calcineurin inhibitors: There are two types of topical calcineurin inhibitors called tacrolimus (Protopic 0.03% and 0.1%) and pimecrolimus (Elidel). They are classified as

immunomodulating agents; this means that they act on the immune system to reduce skin inflammation. Both tacrolimus and pimecrolimus block a chemical called calcineurin which activates inflammation in the skin causing redness and itching of the skin.

Tacrolimus ointment and pimecrolimus cream are for the treatment of atopic eczema in adults, and children over the age of 2. Tacrolimus comes in two strengths, 0.03% (weaker) and 0.1% (stronger); the weaker preparation should be used in children, between the ages of 2 and 16.

MOISTURIZING SYNDETS

Dermatologists and cosmetic scientists define “sensitive skin” as that which exhibits contact irritant or allergic reactions more readily than the average population .

- **Moisturizing syndets** are product designed for newborn skin care & hygiene. These are designed to make the stratum corneum more pliant by increasing its hydration resulting in smooth & healthier looking skin, Performs these functions by acting as HUMECTANTS, EMOLLIENTS & OCCLUSIVES

ADVANTAGE OF MOISTURIZING SYNET :

- A number of studies have shown that these moisturizing cleansing soaps are generally milder than soap-based products and help maintain the structural integrity and moisture of the SC
- The formulation of these soaps provides mild cleansing combined with moisture retention and clinically has been shown to be less irritating to skin than soap-based formulations
- Given the diminished irritant threshold in Atopic Dermatitis(AD) patients, the choice of baby syndets is an important component in the overall skin care regimen
- Soap based formulations can dry skin and may cause erythema and trans epidermal water loss, further exacerbating the skin dryness and itching of AD
- Syndets formulations, by minimally interacting with SC proteins and lipids, help maintain SC hydration and therefore are well suited to counter the dryness and latent secondary skin inflammation associated with eczematous lesions.

MAJOR INGREDIENTS USED IN THE FORMULATION OF SYNETS AND THEIR USES :

- **Sodium Lauryl Isethionate** (comprises 50 to 60% of the ingredient total) : a synthetic detergent, often chosen for its mildness, low irritant potential and dense lathering qualities.

- **Stearic Acid** (*comprises 25% of the ingredient total*): a waxy substance derived from beef tallow and/or pig lard; use as a plasticizer (for texture) and as a superfatting agent (for emollient qualities), this ingredient act as a rich white cream being elegantly poured from a glass pitcher into each bar, stearic acid is actually a flaky, offwhite powder.
- **Sodium Tallowate**: soap made from lye + beef tallow
- **Sodium Palmitate** :soap made from lye + palmitic acid
(usually made with tallow + plant sources, unless otherwise specified)
- **Lauric Acid**: adjusts pH, hardens the soap and creates a fluffy lather
- **Sodium Isethionate**: synthetic detergent, creates a dense lather
- **Sodium Stearate**: soap made from lye + stearic acid
- **Cocamidopropyl Betaine**: a synthetic detergent, enhances lather (known human immune system toxicant; skin sensitizer/allergen; may be contaminated with nitrosamines)
- **Sodium Cocoate**: soap made with lye + coconut oil
- **Sodium Palm Kernelate**: soap made with lye + palm kernel oil
- **Sodium Chloride**: common table salt, used in the the glycerin stripping process; this residual salt serves double duty as a thickener.
- **Tetrasodium EDTA**: used as a chelating agent, the term, "chelating" simply refers to this ingredient's ability to interact with metals, making it possible to use this soap in hard water (water with a high mineral content).
- **Tetrasodium Etidronate**: chelating agent, targeted toward preventing soap film
- **Maltol**: known in the industry as 3hydroxy2methyl4pyrone, Maltol is a naturally occurring organic compound that smells like caramelized sugar and is used as a fragrance and/or scent masker.
- **Titanium Dioxide**: makes the soap white and opaque.
- **Sodium gluconate**: a chelating agent, added to make the soap work in hard water.
- **White soft paraffin**: Soft white paraffin is also known as white petroleum jelly. It is an odorless jelly that is impervious to water. This makes it useful for many applications in which moisture needs to be sealed within the skin, or in which a water-resistant protective layer is required between the skin and external contaminants.
- **Paraben**: preservative
- **Olive oil**
- **Jojoba oil**
- **Tocopheryl acetate** (from soybeans)
- **Chamomile Flower Extract** (from chamomile flower heads)

CLINICAL STUDIES DATA

	STUDY(REF)	METHODOLOGY	OBSERVATION
1.	Beneficial use of moisturizing Soap as part of a daily skin care regimen for individuals with rosacea . Laquieze S (2007)	In the study, 20 individuals receiving twicedaily applications of metronidazole 0.75% gel for at least 15 days applied a gentle nonirritating moisturizing soap twice daily for 15 days on one half of the face; the other side remained treated with metronidazole only and served as the control.	It can thus be concluded that in the management of rosacea, basic skin care regimens, including daily use of a moisturizing soap, offer optimal benefits.
2.	Correlation between pH and irritant effect of cleansers marketed for dry skin. Baranda L(2002)	17 products marketed for dry skin and 12 common soaps used by the general population were studied. Fresh soap emulsions (8%) were applied to the volar side of the right forearm of 30 individuals with sensitive skin for 5 consecutive days using aluminum chambers. The appearance of irritation (erythema, scaling and fissures) was recorded, scored, and expressed in an Irritation index (IrIn). The pH of each solution was measured.	Most products recommended for sensitive skin have a considerable irritation effect, which is related to the pH of the product. Better regulation of advertisement specifications including the pH level and type of cleanser contained is necessary for the majority of soaps and cleansers.
3.	Effect of syndets on skin flora of preterm newborns. da Cunha ML(2005)	Randomized blinded clinical trial that enrolled 73 preterm newborns whose gestational age was between 28 and 35 weeks and birth weight between 800 and 1800 g. At the age of 3 days the infants were randomly assigned to a group that was given daily baths with moisturizing syndets and for 7 or more days. Antibiotic treatment delayed onset of the trial in some preterm infants. On the final day of bathing axillary bacterial cultures were obtained before and 30 minutes after bathing.	Bathing preterm newborns with syndets produces ample effects on skin colonization of a preterm neonate. They are effective to decrease the number of colonies of Grampositive and Gramnegative bacteria.
4.	Effects of soap and detergents on skin surface pH, stratum corneum hydration and fat content in infants. Gfatter R(1997)	Infants without skin disease, aged 2 weeks to 16 months, entered an open, controlled and randomized study. Ten infants each had skin washed with tap water (control group), liquid detergent (pH 5.5), synthetic detergent (pH 5.5) or alkaline soap (pH 9.5). The pH, fat content and hydration were measured before and 10 min after cleansing. Findings were statistically evaluated by parametric covariance analysis.	Each cleansing agent, influences the skin surface. The increase of the skin pH irritates the physiological protective 'acid mantle', changes the composition of the cutaneous bacterial flora and the activity of enzymes in the upper epidermis, which have an acid pH optimum. The dissolution of fat from the skin surface may influence the hydration status leading to a dry and squamous skin.
5.	Electrical measurement of	17 psoriasis patients were recruited. Their right leg was treated with the syndet twice daily for 6 weeks,	The degree of skin dryness at the applied area improved

	moisturizing effect of syndet on skin hydration and barrier function in psoriasis pediatric patients. Rim JH(2005)	while their left leg was used as the control site. For each patient, one psoriatic plaque on each leg was selected as the involved psoriatic lesion. The TEWL, electrical capacitance and conductance were measured, in order to evaluate the barrier function and hydration level of the stratum corneum. The clinical and biophysical data for each patient were recorded at the start of the study and after 2, 4 and 6 weeks.	progressively. Data suggest that electrical capacitance and TEWL may be useful in the evaluation of the moisturizing effect of syndet on the hydration status and barrier function of psoriatic skin.
6.	Safety and tolerability of a body wash syndet soap and when applied to infants and toddlers with a history of atopic dermatitis : results from an Openlabel study. Simpson E(2012)	This study evaluated the safety and tolerability of a body wash syndet soap for infants and toddlers with atopic dermatitis. This was an openlabel study involving 56 children (336 months old) with a history of atopic dermatitis. The skin care regimen was used at least once daily, but no more than twice daily, for 4 weeks. The primary variable of interest was the worst postbaseline scores for local tolerability using a 4point scale for each component (erythema, edema, scaling and dryness, rash, and signs of discomfort upon application). Assessments of moisture content of the stratum corneum and transepidermal water loss were also performed.	The body wash syndet soap regimen was safe and well tolerated and improved hydration and skin barrier function in infants and toddlers as young as 3 months of age with a history of atopic dermatitis.
7.	Skin xerosis . Clinical report on the effect of a moisturizing soap bar in pediatrics. Boccanfuso SM	A supervised clinical studies were conducted to determine the direct effect of a moisturizing soap bar on skin xerosis (dry skin). The study compared the moisturizing soap bar with a commercially available soap bar and used children upto age 5 years.	Washing twice daily with the moisturizing soap bar provided a lower level of skin flaking than the particular soap bar with which it was compared.
8.	Tolerance of baby cleansers(Sebam ed) in infants: a randomized controlled trial. Dizon MV(2010)	This randomized controlled trial was conducted to evaluate the tolerability of a new baby cleanser formulation on infantile skin. 180 healthy infants were enrolled , JTT Sebamed Baby cleanser (SM), and lukewarm tap water were used on the skin of the subjects as whole body cleansers twice a week for 2 weeks. Assessment was done at baseline, 1 week and 2 weeks clinically by dermatologist, instrumentally, and by the parents. Clinical assessment (erythema, edema, dryness and scaling); skin moisture content; skin surface pH; transepidermal water loss; skin oxyhemoglobin and deoxyhemoglobin; and consumer satisfaction were the outcome measures.	There was no significant erythema, edema, dryness, or scaling elicited by any of the test component. Parents did not report any sideeffects. All the studied interventions used as body cleansers were efficacious and well tolerated by infants.

MEDICAL RATIONALE :

1. Syndet bars are mild and cause less damage to baby skin. The pH of syndet bars are usually around 5.5, which is very similar to the natural pH of our skin. These bars are effective cleansers, cause minimal damage to skin layers, and do not have the harsh stripping effects. This leads to less dryness, less skin irritation, and better control of acne. It does not cause any type of destruction of the lipid mantle undermines the skin's barrier function.
Lipid mantle (The fact that our skin is mildly acidic is the result of the combination of lactic acid and lactate that make up sebum.)
2. Syndets are more efficient than soaps in removing dirt and bacteria from human skin. It has a strong emulsifying proper, act as humectants, and emollient as well as occlusive agent. They make the skin smooth as having strong water binding properties.
3. Syndets do not bind calcium and magnesium .This would otherwise lead to deposits which cause itch and then give rise to exacerbations in eczema prone patients.
4. Syndets can be acidified in particular it is possible to adjust the PH of 5.7 to 6.0 in order to protect the acid mantle of the skin. This also prevents the swelling of the epidermis.
5. They can be used in hard water. They do not form precipitate with the hard water. Thus chalk soaps do not result and neither the cleansing capacity nor the potential for foam production are debilitated.
6. The PH can be selected and the skin can be cleansed with a neutral or slightly acidic PH. Syndets are compatible with many additives .This make it possible to meet special requirements. These additives include brighteners, bleaching agents, fillers, builders, and perfumes and coloring agents.

MARKET ANALYSIS

Top selling Brands in Moisturizing syndet available are.,

BRANDS	ACTIVE INGREDIENT	COMPANY
Dermadew	Aloegel, Light liq.paraffin,White soft paraffin,Purified lanolin	Hegde &Hegde
Tedibar	Maltodextrin,Sodium cocosulphate,Cetearyl alcohol,Disodium lauryl sulphosuccinate,Potassium lauryl sulphate,Aqua, Sodium coccyll glycinate,Disodium etidronate,Phosphoric acid,NaCl,KCl	Curatio Healthcare
Cetaphil	Cetyl alcohol,Propylene glycol,Sodium lauryl sulphate,Stearyl alcohol, Methyl paraben, Propyl paraben	Galderma
Daffy	Maltodextrin,Sodium cocosulphate,Cetearyl alcohol,Disodium lauryl sulphosuccinate,Potassium lauryl sulphate,Aqua, Sodium coccyll glycinate,Disodium etidronate,Phosphoric acid,NaCl,KCl	Dr Reddy Labs
Lsdew	Palm and coconut,Oil soap noodles,Silver oxide,Triclosan,Phytic acid,Olive extract,Aloe vera extract,Shea butter,Glycerin,Wheat	Hegde & Hegde

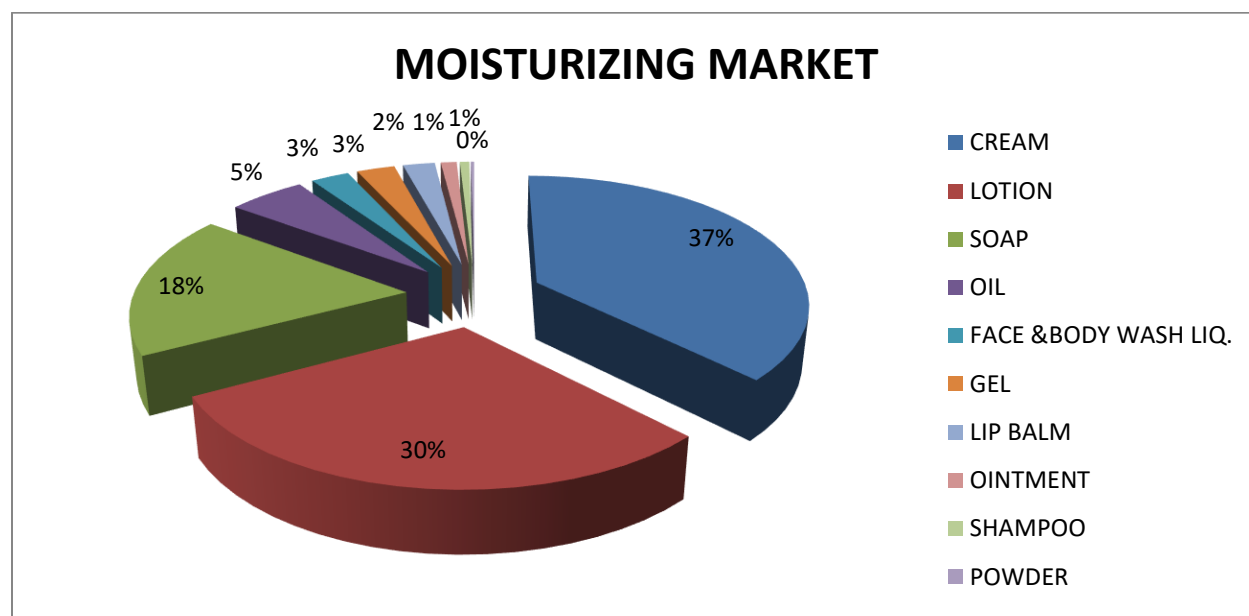
	protein ,Milk protein,Sodium palmate,Sodium palm kernelate,Aqua,Perfume,Barbadensis extract,Sodium chloride,Titanium dioxide,Disodium EDTA, Disodium etidronate,Butylated hydroxytoluene.	
Sebamed Baby	Disodium Lauryl Sulfosuccinate, Triticum vulgare starch, Palmitic Acid, Stearic Acid, Glyceryl Stearate, Cetearyl Alcohol, Talc, Sodium Lactate, Cera alba, Aqua, Lecithin, Sodium Lauroyl Sarcosinate, Cocamidopropyl Betaine, Panthenol, Inulin, Sodium Cocoyl Glutamate, Tocopheryl Acetate, Glycine, Magnesium Aspartate, Alanine, Lysine, Leucine, Benzophenone-4, Parfum, CI 47005, CI 61570, CI 77891.	USV
Moisturex	Urea ,Lactic acid, Propylene glycol, Light liq. Paraffin,Methyl paraben, Propyl paraben	Croslands
Aquasoft	Cetostearyl alcohol,Glycerin, Propylene alcohol,Cetyl alcohol,Isostearyl isostearate,Potassium cetyl phosphate,Cetyl phosphate,Cetyl stearate,Stearic acid,Shea butter, White soft paraffin,Sodium PCA, Squalene,Disodium edentate,Cetomacrogol 1000,Glyceryl monostearate,Dimethicone,Methyl paraben,Butylated hydroxytoluene.	Ajanta Pharma
Oilatum	Light liq.paraffin,White petrolatum,Butyrospermum parkii, Glycerol, Providone k29-32	GSK
Venusia	Purified water,Propylene glycol,Emulsifying wax,Glycerin,Cyclomethicone,Shea butter, Cocoa butter, Cetyl alcohol, Methyl paraben, Propyl paraben,Disodium etidronate, Zinc oxide.	Dr Reddy Labs
Johnson	Sodium tallowate,Water, Sodium cocoate,Sodium palm kernelate, Glycerin, Titanium dioxide, Tetrasodium etidronate.	Johnson & Johnson
Calapure	Calamine,Aloe vera, Light liq.paraffin,Calcium Magnesium hydroxide	Mankind
Calosoft	Calamine,Aloe vera gel,Light liq. Paraffin	Microlabs

MARKET SHARE OF MOISTURIZING SYNDET IN PEDRIATRICS

BRAND	COMPANY	MAT VAL (IN CR)		
		FEB 17	FEB 18	GR FEB 18 (%)
TEDIBAR	CURATIO	30.7	41.7	36.1
DERMADEW	HEGDE & HEGDE	27.7	26.8	-3.4
MOISTUREX SYNDET	RANBAXY	6.6	7.1	7.9
CETAPHIL	GALDERMA	4.6	4.5	-1.9
BABY (HIMALAYA)	HIMALAYA	4.3	2.3	-45.6
DEWSOFT	TORRENT	2.1	2.2	5.5
ZYNDET	CURATIO	2.1	2.6	25.8

AACTARIL	HIMALAYA	2.1	2.7	27.3
OILATUM	ELDER	1.9	4.1	109.9
ALOGRACE	MANKIND	1.6	1.8	17.5
AQUASOFT	AJANTA	1.5	0.3	-80.9
ELOVERA PLUS	GLENMARK	1.4	1.3	-10.5
NUSOFT	MICRO LABS	1.4	1.5	9.0
AQUADERM LIQUID	DR. REDDYS	1.3	1.4	7.2
GLYMED	MED MANOR	1.2	1.4	12.4
VENUSIA	DR. REDDYS	1.2	1.2	1.3
GLYAHA KOJ	MENARINI	1.2	0.9	-24.8
KIDGLO	GLENMARK	1.2	1.5	23.7
DEWDERM	MENARINI	1.0	1.0	2.7
HIDRATE	TORRENT	0.9	0.7	-29.2

(Source:AWACS Data)

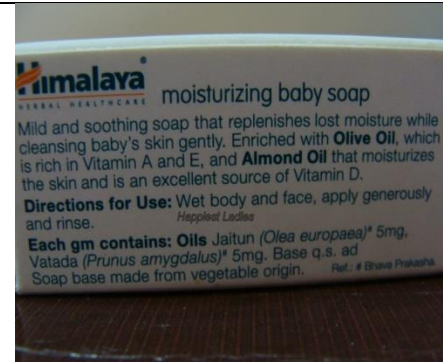


SNAPSHOTS OF MOISTURIZING SYNDET

SEBAMED



HIMALAYA



TEDIBAR



OILATUM



CETAPHIL



ELOVERA



DERMADEW



RESEARCH METHODOLOGY:

MAIN OBJECTIVE:

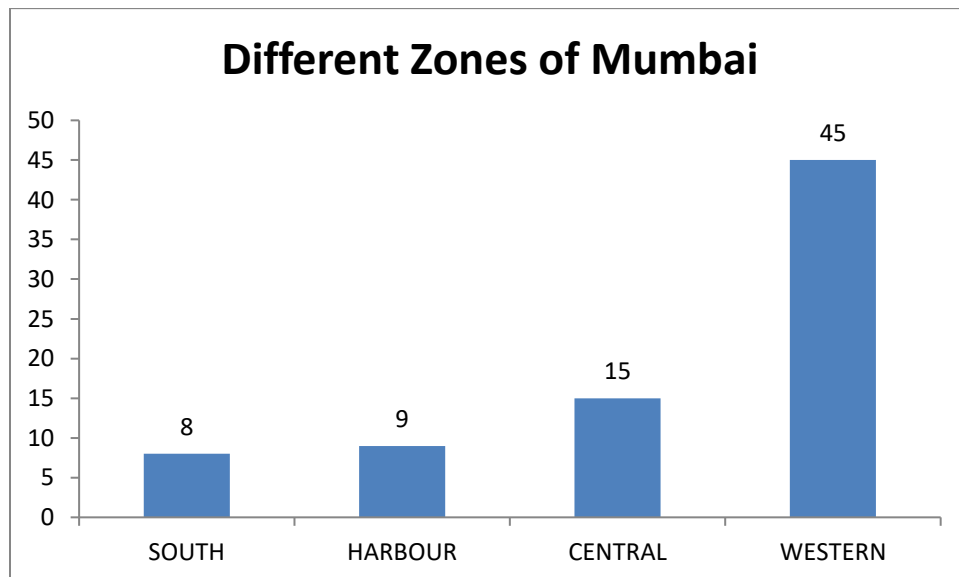
A study on usage of Moisturizing syndet to treat skin disorders in pediatrics.

SUB OBJECTIVE:

1. To study and analyze current competitors of moisturizing baby syndet in the market.
2. To study awareness of different brands of moisturizing syndets among the paediatrician
3. To study about the different attributes that are considered by the pediatrician before choosing a particular syndet.

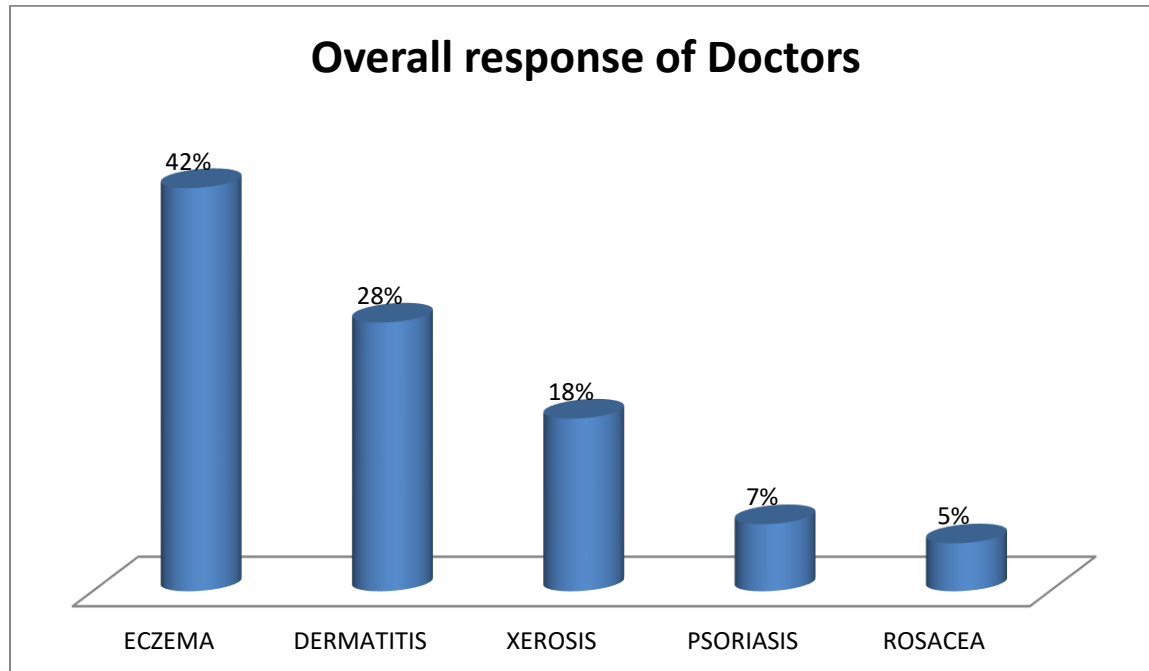
SR.NO	PARAMETERS	DESCRIPTION
1.	Research Type	Qualitative and Quantitative
2.	Data Collection	Primary and Secondary
3.	Measurement Technique	Structured questionnaire
4.	Geographical location	Mumbai
5.	Sample size	77
6.	Sample unit	Pediatrician
7.	Sampling technique	Cluster sampling
8.	Analysis technique	MS-Excel

AREA COVERED FOR PRIMARY DATA COLLECTION:



ANALYSIS OF COLLECTED DATA:

1. Which is the most common skin problem you come across in paediatrics?



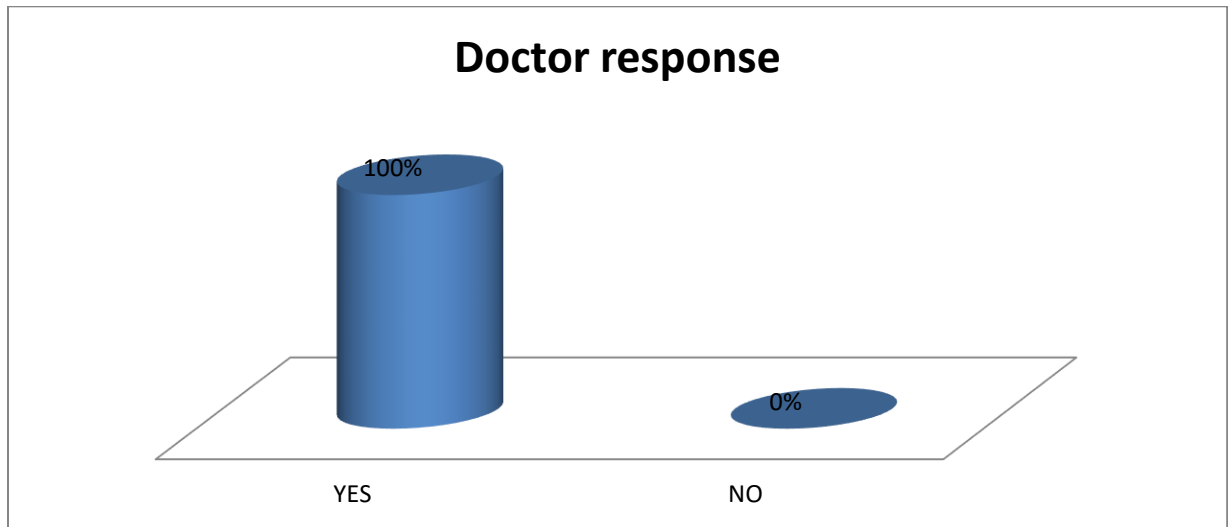
Interpretation:

- ✓ 42% of the doctors said that eczema is the most common skin disease prevalent among the pediatric patients, followed by Dermatitis, Xerosis, Psoriasis, and Rosacea.

2. Which are the common symptoms seen or noticed in patients with skin problem?

- Itching
- Allergic and red rashes
- Dry skin
- Excoriation with redness
- Urticaria
- Fungal infection
- Superadded bacterial infection
- Scaly skin
- Hypopigmented and enzymatous skin lesions
- Exanthem
- Roughness
- Red plaques
- Fine lines and cracks

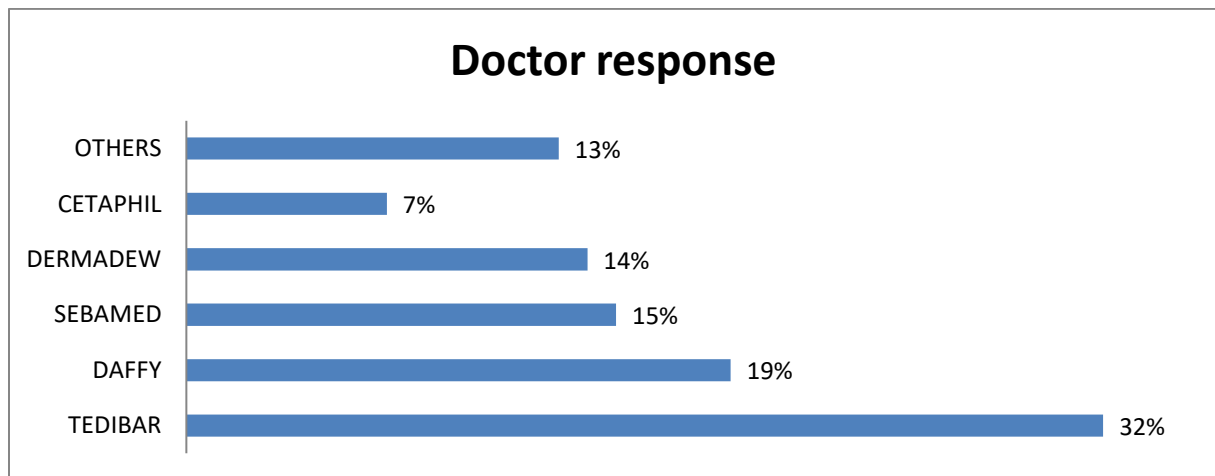
3. Do you prescribe MOISTURIZING SYNDET soaps to your patients who come up with skin diseases?



Interpretation:

✓ 100% of the doctors said that they do prescribe moisturizing syndet to patients with skin problems.

- **If yes, which are the brands of syndets you usually prescribe to pediatric patients?**

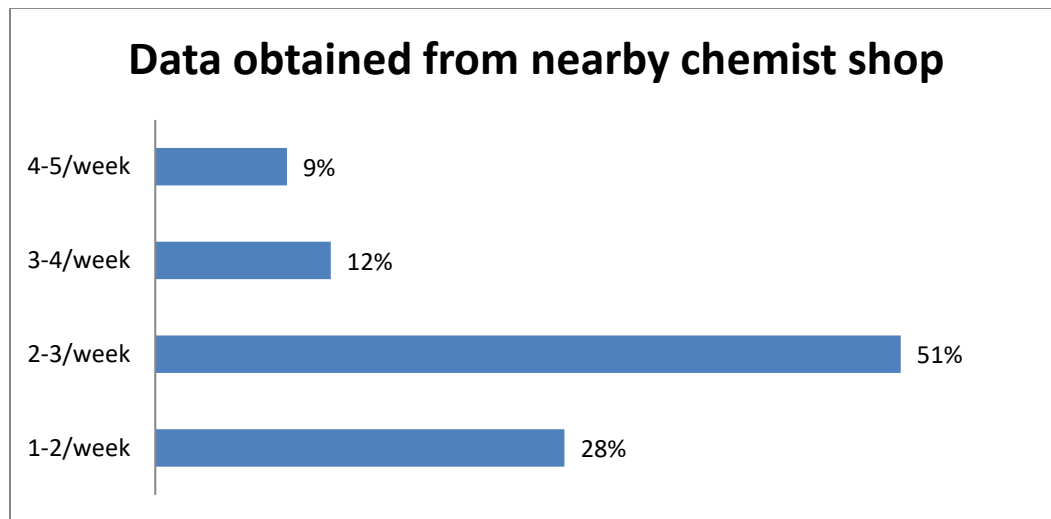


Others include: MOISTUREX, NUSOFT, LSDEW, KIDGLO, AQUASOFT, MOIST RICH, LITTLE, HIMALAYA, OLEMESSA, JOHNSON

Interpretation:

- ✓ 32% of doctors choose Tedibar syndet as their first option.
- ✓ Daffy, Sebamed, Moisturex and Cetaphil is also contributing in the market share of moisturizing syndet market.

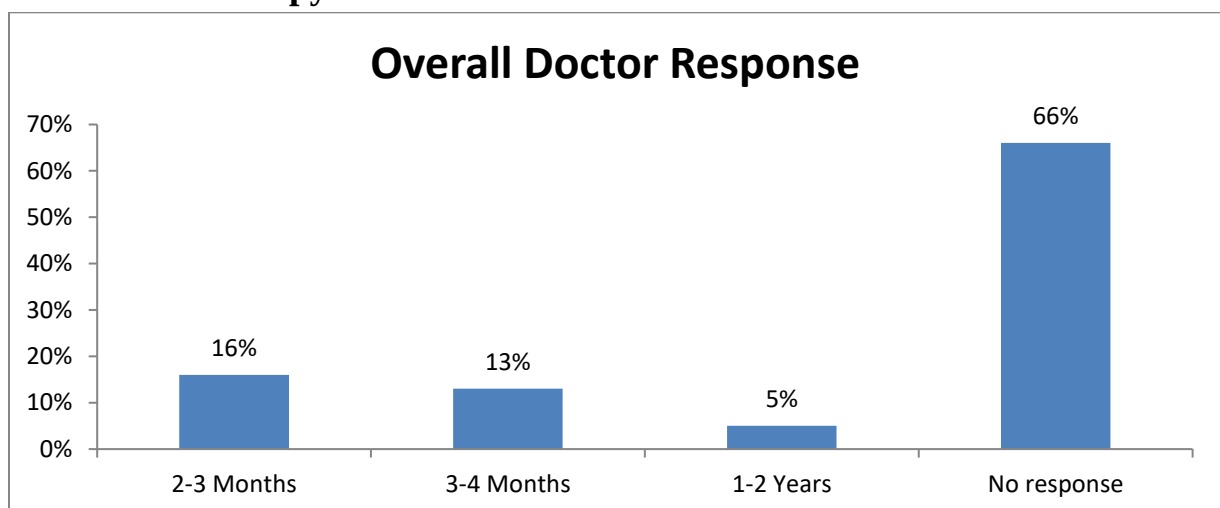
- **Units/Rx of moisturizing syndet sold per week.**



Interpretation:

- ✓ 51% of the chemist stated that 2-3 syndets were sold per week. They added that the sale of moisturizing syndet totally depend on the patient profile.

- **Duration of therapy.**



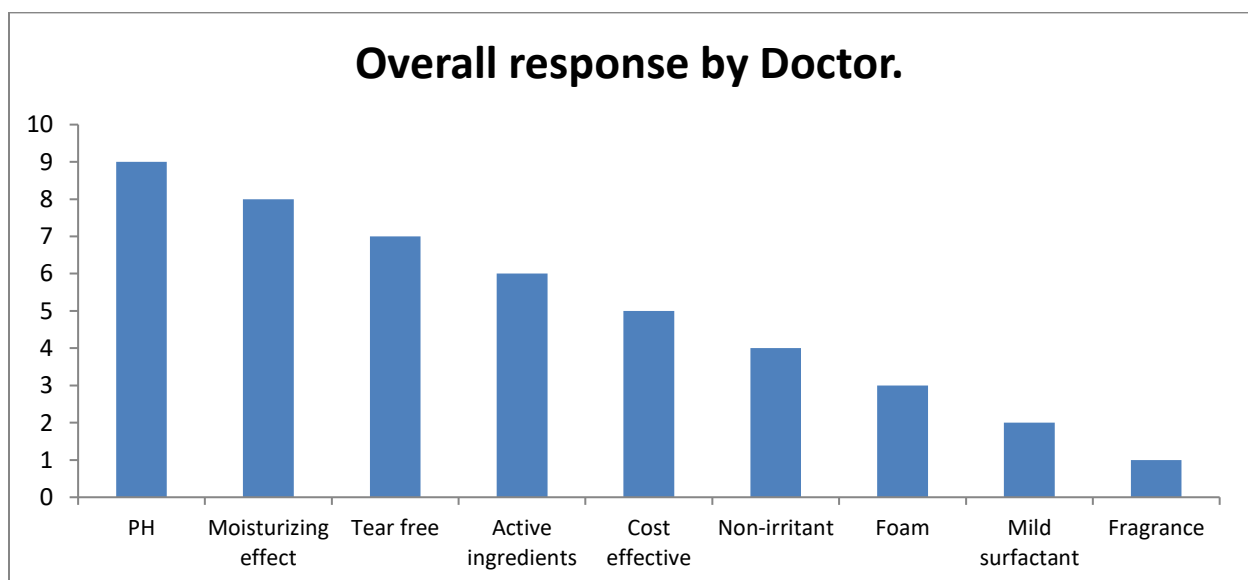
Interpretation:

- ✓ 16% of the doctors said that the moisturizing syndet should be used for 2-3 months regularly.
- ✓ 13% doctors said that it should be continued for 3-4 months, while 5% of the doctors said that it should be used for 1-2 years of life.

• Reason for choosing particular brands of moisturizing syndet

- PH balanced
- Trust on the company
- Like medical representative approach
- No shea butter used
- Mild soap
- Quality, safety, efficacy
- Effective

3. According to you, what are the attributes important while choosing the syndet? Kindly rank in order of preference.



Interpretation:

- ✓ It can be analyzed that pH is the most preferred feature which a doctor considered in a moisturizing syndet followed by Moisturizing effect, Tear free, Active ingredient, Cost effective, Non-irritant, Mild-surfactant, Foam and Fragrance.
- **Any other attributes you feel need to be considered in syndets? Please specify.**

- Should also be available in liquid form
- Remain in form for a longer time
- Sebum production
- Mild in nature
- Less foam
- Hypoallergenic

4. Do you notice any side effects or adverse reactions associated with the use of syndet? If yes, please specify.

- Allergic reactions occasionally
- Slowly syndet becomes hard, PH change in some cases.

RECOMMENDATION:

1. Product

CURRENT FORMULATION (MOISTUREX)	NEED BY THE PEDIATRICIAN	OTHERS ATTRIBUTES THAT CAN BE INCORPORATED
PH neutral, Moisturizing effect	Tear free, Non irritant , Mild surfactant	In liquid form,remain in form for a longer time, Sebum control, Mild in nature, Less foam(SLS Free), Hypoallergenic.

- ✓ It is recommended that the innovated product should contain all the major attributes that are discussed above. This will add more value to the product in the market.

2. Price

- ✓ The price of the moisturizing syndet should be in between Rs.125-150. However, reason behind choosing this range includes,
 - ☐ Innovative formulation,
 - ☐ Moisturex syndet have a strong brand equity in the market,
 - ☐ Concentrating on the price of top most brand.
- ✓ Top most brands in the market and their prices are listed below:

Brand	Company	Price(per unit)
Tedibar	Curatio healthcare	130
Daffy	Dr. Reddy Labs	124
Sebamed	USV	250
Dermadew	Hedge & Hedge	156

3. Formulation

- ✓ In order to have a competitive differentiation/advantage in the market , positioning should be done by coming up with a different formulation, it should be available in both solid as well as in liquid form that will be easy to handle and reduce wastage of material.

4. Packaging

- ✓ As it is a baby care product, the packaging should include different shapes that make it more attractive.

5. Communication

- ✓ Clinical trials data showing pH change on regular use of syndet should be distributed among the doctors.

QUESTIONNAIRE

Dr Name: _____

Date: _____

Phone no: _____

Area: _____

1. Which is the most common skin problem you come across in pediatrics? (Kindly tick)

a).Rosacea

b).Eczema

c).Xerosis

d).Psoriasis

e).Dermatitis

2. Which are the common symptoms seen or noticed in patients with skin problem?

3. Doctor, do you prescribe syndets to patients with skin problems.

A).If YES, please gives the details,

Brand Name	Units/Rx	Duration of therapy (in months)	Reason for choosing the brand

B).If NO, please specify the reasons,

4. According to you, what are the attributes important while choosing the syndets?
Kindly rank in order of preference.

ATTRIBUTES/FEATURES	PLEASE RANK IN ORDER OF PREFERENCES
PH	
TEAR FREE	
FRAGRANCE	
MILD-SURFACTANT	
MOISTURIZING EFFECT	
FOAM	
ACTIVE INGREDIENT	
COST EFFECTIVE	
NON-IRRITATING	

Any other attributes you feel need to be considered in syndets? Please specify...

- 5. Do you notice any side effects or adverse reactions associated with the use of syndets? If yes, please specify.**

REFERENCES

- Mayo Clinic: Moisturizers: Options for softer skin(<http://www.mayoclinic.com/health/moisturizers/SN00042>)December 16, 2010
- Coderch L, López O, de la Maza A, Parra JL (2003). "Ceramides and skin function". *American Journal of Clinical Dermatology* 4 (2): 107–29. doi:10.2165/0012807120030402000004.
- PMID 12553851.Dizon MV, Galzote C, Estanisalo R, et al. (2010) Tolerance of baby cleansers in infants: a randomised controlled trial. *Indian Pediatrics* 47: 959-63
- Bedwell C, Lavender T. (2012) Newborn skin care—a review of the evidence and practice. *Eur J Obstet Gynaecol* 7(Suppl 1): 18-21
- Blume-Peytavi U, Cork MJ, Faergemann J, et al. (2009) Bathing and cleansing in newborns from day 1 to first year of life: recommendations from a European round table meeting. *J Eur Acad Dermatol Venereol* 23: 751-9
- Feingold KR. (2007) The role of epidermal lipids in cutaneous permeability barrier homeostasis. *J Lipid Res* 48: 2531-46
- Fowler JF, Eichenfield LF, Elias PM, et al. (2013) The chemistry of skin cleansers: an overview for clinicians. *Semin Cutan Med Surg* 32(suppl 2): S25-27
- Dizon MV, Galzote C, Estanisalo R, et al. (2010) Tolerance of baby cleansers in infants: a randomised controlled trial. *Indian Pediatrics* 47: 959-63
- Ness MJ, Davis DMR, Carey WA. (2013) Neonatal skin care: a concise review. *Int J Dermatol* 52: 14-22
- Nikolovski J, Stamatias GN, Kollias N, et al. (2008) Barrier function and water-holding and transport properties of infant stratum corneum are different from adult and continue to develop during the first year of life. *J Invest Dermatol* 128: 1728-36
- Stamatias GN, Walters RM, Telofski LS. (2011) Keeping infant skin healthy through proper cleansing. In: Hayes SM (editor). *Skin care*. Hauppauge, New York: Nova Science Publishers 2011: 1-29
- Steen M, Macdonald S.(2008) A review of baby skin care. Midwives online (August/September): www.rcm.org.uk/midwives/in-depth-papers/a-review-of-baby-skin-care/.