

Semester Project 03

Alora

Lactation Massager

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Declaration

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Abstract

Breastfeeding is considered as one of the most pious and selfless practices throughout different cultures and beliefs. It not only endorses mother-child bond and nutrition but also encourages sustainable living and long-term health benefits. Over the years, mother and child care facilities have enforced better development and nourishment of both mother and child. There are several products in the market promoting breastfeeding and natal care. However, there is a niche market for post-partum care products as the later stages of Post-partum are still not thrown light on to. One of such issues is the breast engorgements, clogged milk ducts or mastitis. The concern is severe and not well addressed. Newly mothers unaware of the pain and guidance tend to suffer, especially mothers who don't have assistance. The product helps assist the mother in lactation, by providing massage and comfort for better flow of milk and resolve the discomfort caused due to engorgement or mastitis.

Acknowledgment

This endeavour would have not been possible without the support of my family, friends & peers. This project involves intense user study and understanding for which I am grateful to the women who participated in my study and extended their love and insights.

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Chapter 01 : Introduction to Breastfeeding

Introduction :Breastfeeding

Significance of Breastfeeding

One of the most effective practices is breastfeeding, which should begin within an hour of delivery, be done exclusively for six months, and then be continued for up to two years or longer with the addition of safe and suitable supplementary meals. to support the wellness and survival of children.

Breastfeeding gives all children the healthiest start in life. It stimulates brain development and protects women's health. Breastmilk acts as a baby's first vaccine and breastfeeding leads to lower health care costs, healthier families and a smarter workforce. When mothers breastfeed, everyone benefits.

Breastfeeding helps protects babies from many serious health problems. And it keeps on offering protection as they get older. Breastfed babies have: A lower risk for SIDS (sudden infant death syndrome) than babies who are not breastfed. A lower risk of getting asthma and skin problems related to allergies. Formula-fed babies are more likely to have milk allergies. Less diarrhea and a lowered chance of getting some digestive conditions. Formula can actually change healthy bacteria in a baby's intestines. The bacteria help with digestion and fighting disease. A lower risk of developing leukemia. Fewer long-term health problems as they grow up. These include diabetes and obesity.

Women who breastfeed also get many health benefits. If you breastfeed, you are more likely to lose the weight you gained during pregnancy. You are also less likely to get breast and ovarian cancer and diabetes later in life.

Reference
<https://www.globalbreastfeedingcollective.org>. UNICEF_Breastfeeding_A_Mothers_Gift_for_Every_Child.pdf



Fig. 01:Breastfeeding mother & infant
Source: www.independent.co.uk

Evolution of Breastfeeding

In all of human history, breastfeeding has been essential for the survival and sustenance of children. It is a natural and old practice. Even though its precise beginnings are uncertain, nursing has been practiced for a very long time.

Infant feeding throughout prehistoric times is thought to have mostly included breastfeeding. Early people may have shown nursing moms and understood the need of breastfeeding for baby survival, according to cave paintings and artefacts. Breastfeeding was common in ancient civilizations including Mesopotamia, Egypt, Greece, and Rome, and wet nurses were occasionally used when mothers were unable to nurse their own babies.

Mediaeval and Renaissance Periods: In the middle ages, wet breastfeeding spread among the aristocracy. In order to continue their social and home responsibilities, wealthy ladies frequently hired wet nurses to breastfeed their infants. But among lower socioeconomic categories, nursing remained the most common way to feed infants

Image Source :<https://www.google.com/>



Fig. 02: Breastfeeding Wet Nurses in late 1800's

, the Industrial Revolution brought significant changes to infant feeding practices. With the rise of factories and urbanization, many women left their homes to work in factories, which made breastfeeding challenging. Wet nursing and the use of animal milk, such as cow's milk or milk-based concoctions, became more common, particularly among the urban poor. However, these substitutes often led to high infant mortality rates and malnutrition.

With the emergence of modern medical knowledge and advancements, the importance of breastfeeding for infant health and nutrition was gradually recognized. In the early 20th century, formula feeding gained popularity due to the development and marketing of infant formulas. However, breastfeeding rates declined significantly during this period.



Fig. 03: Milk formula advertisement in 1920's

Evolution of Breastfeeding

Due to increased understanding of its advantages, breastfeeding had a resurgence of interest in the second half of the 20th century. Breastfeeding was emphasized as the best infant feeding technique by the World Health Organization (WHO) and other medical associations. In 1991, the Baby-Friendly Hospital Initiative (BFHI) was established to encourage and support breastfeeding in medical settings. To offer information, tools, and support for breastfeeding mothers, numerous advocacy and support groups have developed.

Given all of the advantages breastfeeding has for moms and babies, it is now widely accepted as the best baby feeding technique. Breastfeeding is still promoted and supported by governments, healthcare organizations, and communities all around the world through initiatives that are favorable to breastfeeding, legislation, and workplace practices.

It's critical to remember that social norms, historical developments, and regional variations in breastfeeding practices can all be influenced by cultural norms, society attitudes, and individual situations. Breaking down taboos surrounding breastfeeding requires a collective effort from individuals, communities, healthcare providers, policymakers, and society as a whole. By creating a supportive and accepting environment, breastfeeding can be embraced as a normal and celebrated aspect of motherhood, benefiting the health and well-being of both mothers and babies.



Fig. 04: Australian Senator Larissa Waters breastfeeding her infant in parliament

Image Source :<https://www.google.com>

Understanding the milk : Types

Breast milk has three different and distinct stages: colostrum, transitional milk, and mature milk.

Colostrum is high in protein, fat-soluble vitamins, minerals, and immunoglobulins. Immunoglobulins are antibodies that pass from the mother to the baby and provide passive immunity for the baby. Passive immunity protects the baby from a wide variety of bacterial and viral illnesses. Two to four days after birth, colostrum will be replaced by transitional milk.

Transitional milk occurs after colostrum and lasts for approximately two weeks. The content of transitional milk includes high levels of fat, lactose, and water-soluble vitamins. It contains more calories than colostrum.

Mature milk is the final milk that is produced. 90% of it is water, which is necessary to keep your infant hydrated. The other 10% is comprised of carbohydrates, proteins, and fats which are necessary for both growth and energy. There are two types of mature milk:

Fore-milk: This type of milk is found during the beginning of the feeding and contains water, vitamins, and protein.

Hind-milk: This type of milk occurs after the initial release of milk. It contains higher levels of fat and is necessary for weight gain.

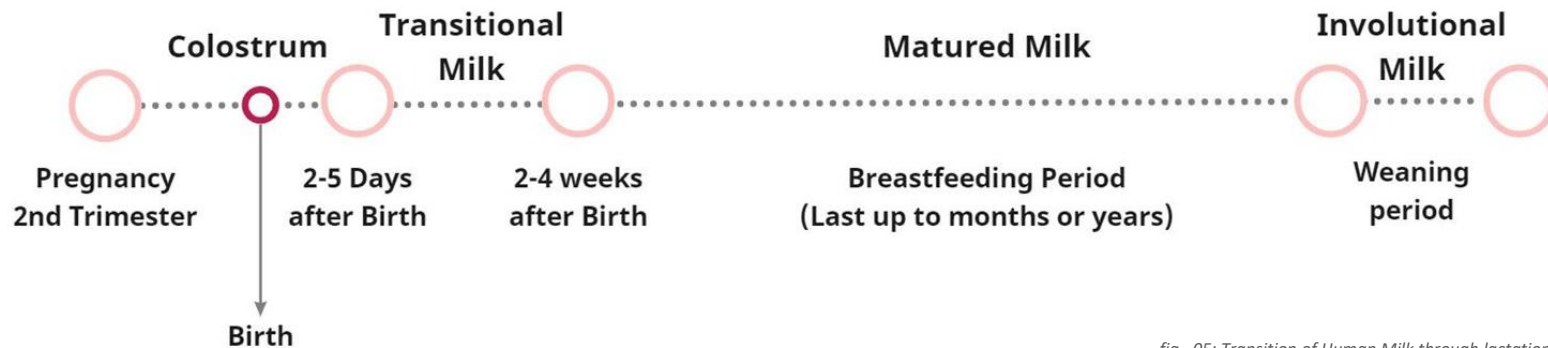


fig.. 05: Transition of Human Milk through lactation period

Image Source :Author

Composition of Human Milk

The nutritional components of human milk derive from three sources: Some of the nutrients of milk originate by synthesis in the lactocyte, some are dietary in origin, and some originate from maternal stores. Overall, the nutritional quality of human milk is highly conserved, but attention to maternal diet is important for some vitamins and the fatty acid composition of human milk

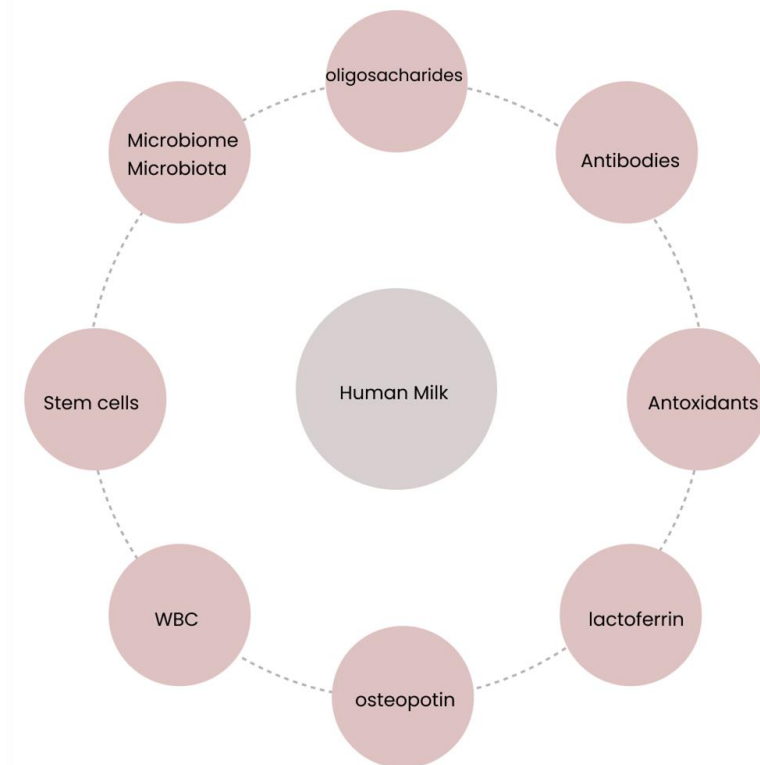


Fig 06: Components of Human milk
Source : Author

The **Microbiome** is the collection of all microbes, such as bacteria, fungi, viruses, and their genes, that naturally live on our bodies and inside us. Although microbes are so small that they require a microscope to see them, they contribute in big ways to human health and wellness. They protect us against pathogens, help our immune system develop, and enable us to digest food to produce energy.

The human breast milk has 2 types of carbohydrates: lactose and oligosaccharides. Lactose, a major component of human breast milk, has a high nutrition value. **Human milk oligosaccharides** (HMOs) are the third most abundant component of breast milk, after lactose and lipids. HMOs in the human breast milk are a complex mixture of more than 200 non-digestible and non-nutritional carbohydrates . Among the various compositional differences between human breast milk and cow milk, one of the major differences is the presence of HMOs in human milk, which are virtually absent in cow milk and infant formula

Several studies have reported the beneficial effects of HMOs that include modification of the intestinal microbiota, anti-adhesive effect against pathogens, modulation of the intestinal epithelial cell response, and development of the immune system. We will discuss each of these effects further. HMOs are intrinsic components that affect the gut microbiota by providing an energy source for the beneficial intestinal bacteria. Additionally, HMOs affect the health of the host by serving as a decoy receptor for the opportunistic pathogens in the mucosal surface

Reference:
<https://www.niehs.nih.gov/>, <https://www.ncbi.nlm.nih.gov/>

Composition of Human Milk

Mother's milk contains **Stem cells**, which are able to cross the gut and migrate into the blood of the nursed offspring. From the blood, they travel to various organs including the brain, where they turn into functioning cells. This breastmilk stem cell transfer from mother to offspring appears to be more than just a random event, potentially contributing important developmental attributes

Breast milk stem cells generally exist in lower numbers in a healthy mammary gland when in a resting state, but during pregnancy and breastfeeding, they are produced in increased numbers. In mammary tissue, they can differentiate into alveolar, ductal, and myoepithelial cells.

Osteopontin (OPN), a multifunctional protein, is present abundantly in human milk, but not in bovine milk and infant formulas. A recent randomized clinical trial showed that supplementing infant formula with bovine milk OPN (bOPN) resulted in better immune outcomes

Lactoferrin is an important component of innate immunity. Acquired immunity is specific (i.e., dependent on recognized antigens), develops throughout life and allows for a precise response to emerging threats. It is known that the immune system of infants is immature; in contrast to innate immunity, acquired immunity of infants needs to be developed. During the maturation of the immune system, children are supported by their mother's antibodies.

Immunoglobulins are antibodies. They're proteins that are made by your immune system after exposure to an antigen (something harmful to your body that causes an immune response). Immunoglobulins fight off germs, illness, and disease. They circulate throughout the body and can be found in blood, sweat, saliva, and breast milk. IgA is important because it coats and seals your baby's respiratory and intestinal tract to prevent germs from entering their body and bloodstream. The IgA antibodies can protect your child from a variety of illnesses including those caused by bacteria, viruses, fungi, and parasites.

Human milk has **Antioxidant** properties. It contains vitamin C and E and enzymes, including superoxide dismutase, catalase, and glutathione peroxidase. These are known to protect against the potentially-harmful effects of oxidative stress. Apart from its role in maintaining the viability and texture of human tissue cells, it also modulates immune-mediated mechanisms in the body for a healthy survival. The role of antioxidants has also been depicted in the first window of infectivity, gingival and periodontal diseases, oral infections, and tissue morphogenesis. Hence, antioxidants form an important part of diet and, together with intracellular antioxidant enzyme systems, prevent various diseases

Chapter 02 : Understanding the practice

Expression of milk

Expressing breast milk by hand is an important skill for lactating women to learn, especially in case of an emergency. Hand expression can be helpful in emergency situations when you may not have access to a breast pump, electricity for a breast pump or if you are away from your baby unexpectedly

Expressing milk by hand:

- May be more comfortable for some parents who experience pain when using a breast pump.
- Does not require equipment, water, or electricity.
- Can relieve engorgement (by releasing some milk to soften your breasts) and help your baby to latch on more easily
- Encourages milk production early in lactation.
Is a safe and effective way to express milk during emergency or natural disaster situations.

A lactation support provider can help you to learn how to hand express. Hand expression gets easier with practice and you can experiment to find what works best for you. Practicing in the shower or other private space can be a good way to learn.

Consistent and effective milk removal is crucial for maintaining milk supply when expressing milk. Establishing a regular pumping routine, including pumping sessions similar to the baby's feeding schedule, can help support milk production.

Ref: <https://www.cdc.gov/nutrition/emergencies-infant-feeding/hand-expression.html>



1. Position your thumb above the nipple and your fingers below the nipple about 1-2 inches behind your nipple. Your thumb and fingers will make the letter "C" shape.



2. Press your fingers and thumb back toward your chest.



3. Gently compress your fingers and thumb together



4. Release and then repeat in a rhythmic pattern: Press, Compress, Release. Continue until the milk stops and then switch to the other breast.

Fig 07: Steps for expression of milk

Latching

Latch refers to how the baby fastens onto the breast while breastfeeding.

A good latch promotes high milk flow and minimizes nipple discomfort for the mother, whereas poor latch results in poor milk transfer to the baby and can quickly lead to sore and cracked nipples.

In a good latch, both the nipple and a large portion of the areola are in the baby's mouth.

A poor breastfeeding latch can give you sore nipples. It may also mean your baby can't drain your breast effectively, leading to poor weight gain, reducing your milk supply, and putting you at increased risk of blocked milk ducts and mastitis

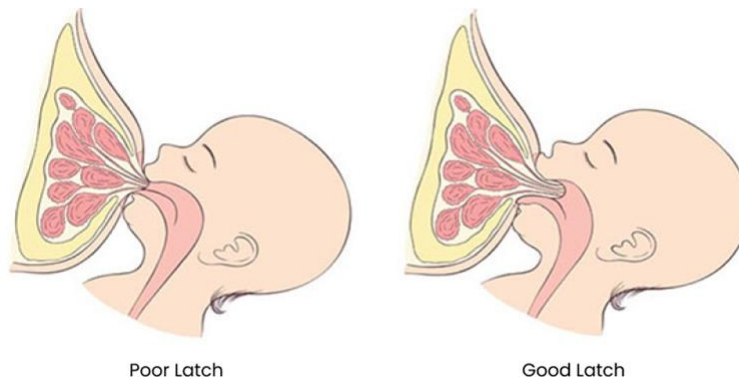


Fig 08: Latching
Source :

Issues with expression

While expressing milk can be a valuable tool for many breastfeeding mothers, it can sometimes come with challenges or issues. For the first 2 to 5 days after the baby is born, women will make a small amount of colostrum, which is all a healthy term baby needs. Colostrum is a thick, rich milk that is high in nutrients. Around day 3 through 5, your milk will come in. Here are some things that may cause a delay of the milk coming in:

- Severe stress
- Cesarean (surgical) delivery
- Preterm delivery
- Bleeding after birth
- Obesity
- Infection or illness with fever
- Diabetes
- Thyroid conditions
- Strict or prolonged bed rest during pregnancy

Understanding the practice

Issues faced Post partum

A woman makes physical and emotional adjustments during the postpartum period after giving birth as she recovers from pregnancy and childbirth. Although it is a happy time, many mothers also face a number of difficulties at this time.

Physical Recuperation: After giving birth, the physical recovery process can be taxing. Vaginal tearing or wounds from caesarean sections may cause mothers to feel pain, soreness, or require sutures. Changes in body form, muscle pain, and fatigue are also frequent. The body needs time to recover and get back to how it was before being pregnant.

Breastfeeding : Difficulties might include problems latching, uncomfortable nipples, engorgement, and worries about the amount of milk the mother will provide. Some women may get mastitis-like breast infections. In order to overcome these difficulties, seeing lactation consultants or joining nursing support groups may be useful.

Hormonal Changes: Postpartum hormone variations can lead to mood swings, irritability, and feelings of sadness or the "baby blues." **Postpartum depression** is a more severe and enduring type of emotional anguish that some women may experience. If you continue to experience melancholy, anxiety, or depression, it's crucial to get professional assistance.



Understanding the practice

Issues faced Post partum

Sleep Deprivation: Taking care of a baby frequently disturbs sleep patterns, leaving moms sleep deprived. It might be exhausting to frequently feed a baby at night, to calm a crying infant, and to get used to a new sleep routine. It's crucial for women to prioritize their rest and ask their partners or other support networks for assistance in getting enough sleep.

Emotional Adjustment: Having children can result in a variety of emotions. In addition to sentiments of happiness, excitement, and love, mothers may sometimes feel overwhelmed, uncertain of their parenting skills, or anxious. For emotional assistance, whether from family members, medical professionals, or support organizations, mothers must reach out.

Body Image Issues: Following childbirth, many women struggle with their body image. Feelings of insecurity and lowered self-esteem can be exacerbated by weight fluctuations, stretch marks, and the urge to "bounce back" to one's pre-pregnancy figure. Understanding and appreciating the body's journey during pregnancy and labor is crucial.

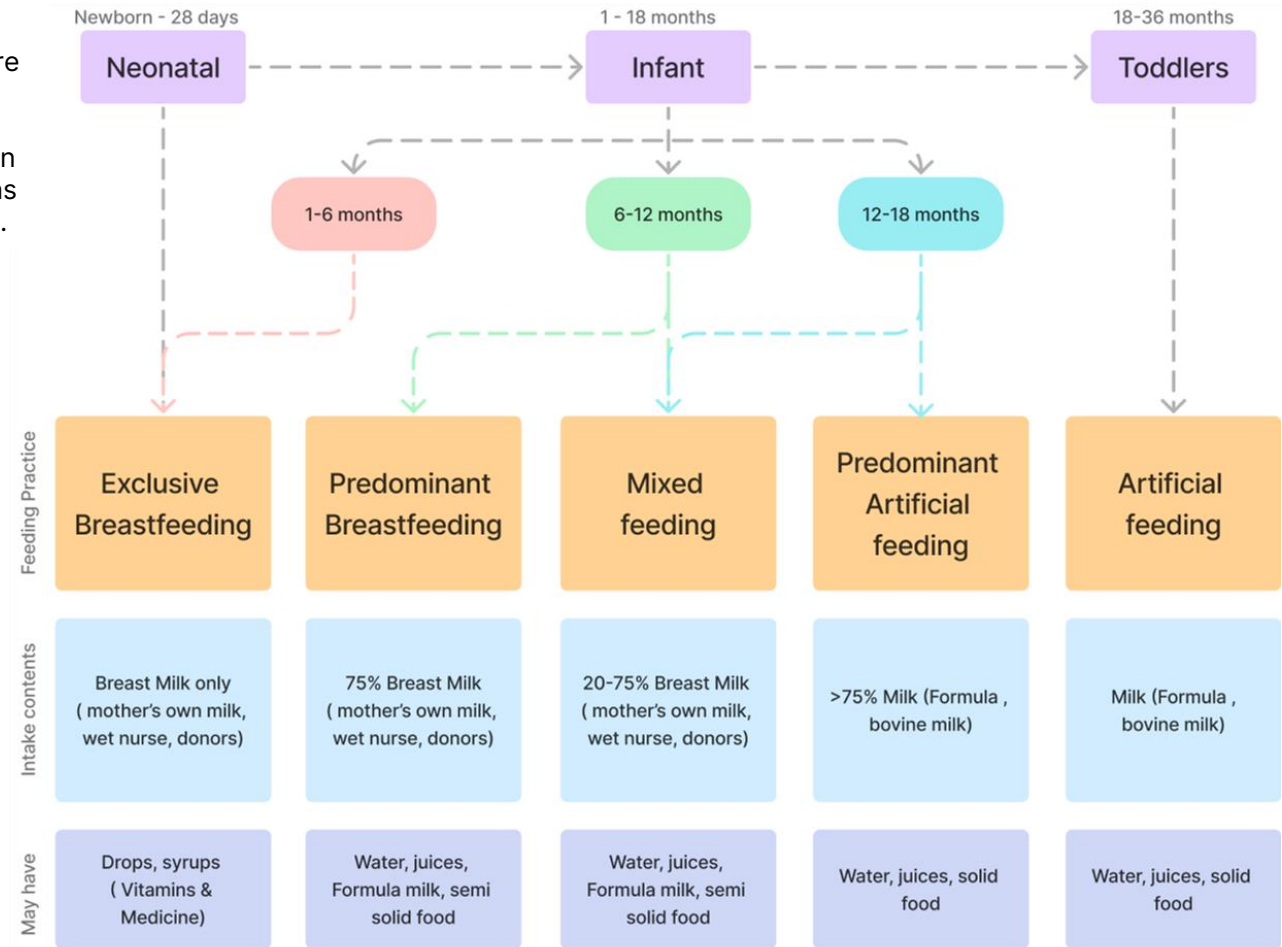
Relationship Changes: The birth of a child might affect how you interact with your partner, family, and friends. Finding a balance between parenting and keeping up relationships, as well as adjusting to new roles and duties, can be difficult. Family support and open communication are essential throughout this period.



Understanding the practice

Nourishment pattern

Breastfeeding is one of the most effective ways to ensure child health and survival. However, contrary to WHO recommendations, fewer than half of infants under 6 months old are exclusively breastfed.



Suggested by WHO:
Thulier D. Breast and bottle feeding definition for research JOGNN 2010/ VOL. 96

Fig 9:Types of feeding pattern
Source : Author

Types of feeding

1. Exclusive Breastfeeding

Exclusive breastfeeding refers to the practice of feeding a newborn baby only breast milk, without the addition of any other liquids or solid foods, for the first six months of life. It is recommended by major health organizations. The exclusive breastfeeding period typically lasts for the first six months of the baby's life. During this time, breast milk provides all the necessary nutrients, antibodies, and fluids to support the baby's growth and development.

Neonatal exclusive breastfeeding is widely encouraged as it offers numerous health benefits to both the baby and the mother. However, it's important to note that individual circumstances may vary, and some infants may have specific medical or nutritional needs that require additional guidance and support from healthcare professionals.

2. Predominant Breastfeeding

Predominant breastfeeding refers to a feeding practice where breast milk is the primary source of nutrition for an infant, with limited or no supplementation of other foods or liquids. While predominant breastfeeding shares similarities with exclusive breastfeeding, there are slight differences in terms of additional fluids or foods introduced alongside breast milk. Supplementation may include the use of expressed breast milk, donor milk, or medically prescribed formula when needed.

3. Mixed Feeding

Mixed feeding, also known as combination feeding or partial breastfeeding, refers to the practice of feeding

infants a combination of breast milk and infant formula or other complementary foods. In mixed feeding, both breast milk and other sources of nutrition are introduced to meet the baby's dietary needs. As the baby grows and reaches the appropriate developmental stage (around six months of age), complementary foods are gradually introduced alongside breast milk and formula. This expands the variety and nutrients in the baby's diet while continuing to provide breast milk or formula as part of their nutrition

4. Predominant Artificial feeding

The transition from exclusive breast milk or formula to solid foods is a gradual process. Initially, solid foods are introduced in small quantities, usually as purees or soft, mashed textures. As the toddler grows, their diet becomes more varied, including a range of fruits, vegetables, grains, proteins, and dairy products, as recommended by healthcare professionals.

4. Artificial feeding

As infants transition into toddlerhood, their nutritional needs change, and the introduction of solid foods becomes an important part of their diet. Artificial feeding typically refers to the use of infant formula as the primary source of nutrition, while solid feeding refers to the introduction of solid foods alongside breast milk or formula. Solid feeding plays crucial roles in meeting the nutritional requirements of toddlers. Breast milk or formula continues to provide essential nutrients, while solid foods contribute to the expansion of their diet, introducing new tastes, textures, and nutrients like iron, zinc, and vitamins

Understanding the practice

Holding Positions for Breastfeeding



Cradle hold



Cross-Cradle hold



Football hold



Laid Back hold



Twin Football hold



Side lying feeding



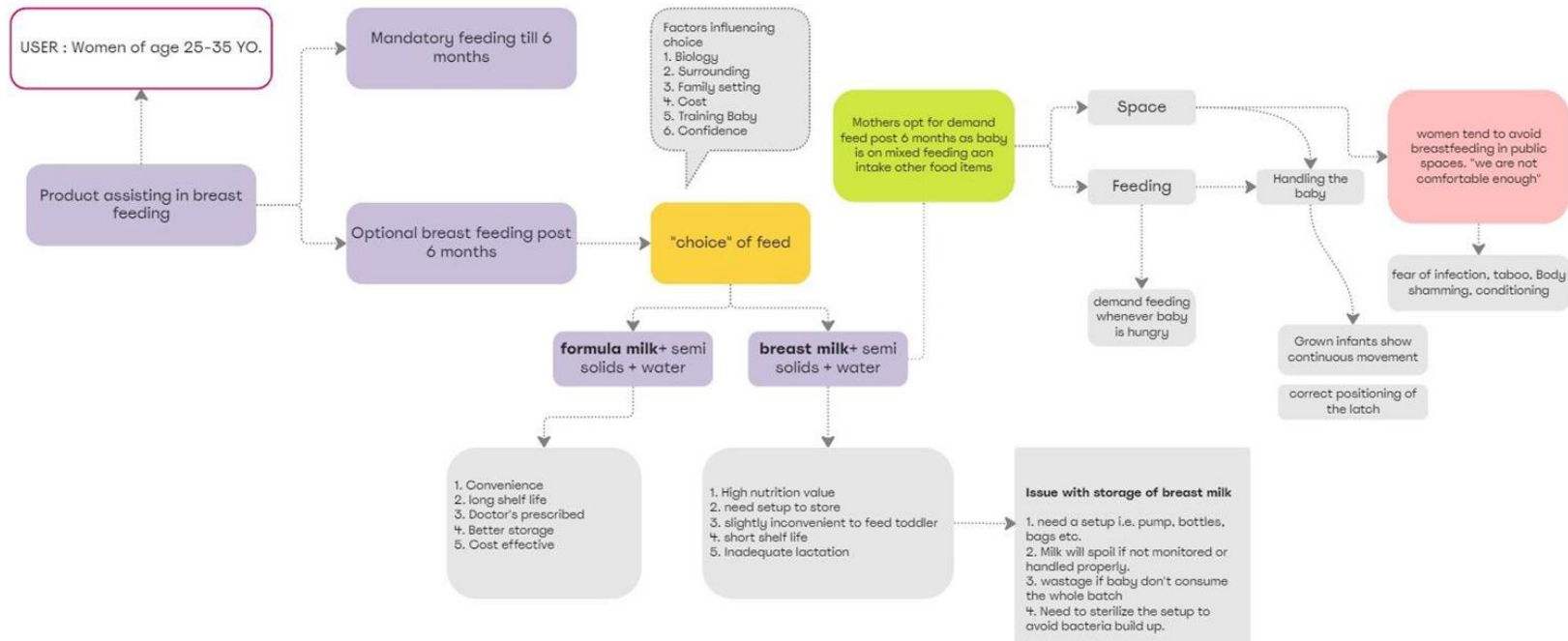
Upright breastfeeding



Dangle Feeding

Fig 10:Types of Holding positions
Source : <https://www.healthline.com/>

Breastfeeding preference



Cultural and community practices can influence breastfeeding attitudes and behaviors. By engaging cultural leaders, community organizations, and religious institutions, it is possible to challenge and change cultural norms and traditions that hinder breastfeeding acceptance. Encouraging dialogue, sharing success stories, and fostering inclusive discussions help promote a positive cultural shift.

It's important to note that a woman's preference on breastfeeding can change over time, and each woman's decision should be respected. Healthcare providers play a crucial role in providing accurate information, support, and guidance to help women make informed decisions about infant feeding. Ultimately, the well-being of the mother and the baby should be prioritized, regardless of the feeding method chosen.

Fig 11: Mind Mapping for Breastfeeding preference
Source :Author

Breastfeeding preference

Breast Pump

Women can express milk with breast pumps and store it for later use, giving them flexibility and convenience. Working women can take advantage of this by continuing to breastfeed their infants even when they are away. By allowing spouses or other carers to share the baby's feeding duties, pumping also makes it possible.

Maintaining milk supply requires timely and efficient milk removal. Even if direct breastfeeding is not an option, breast pumps can assist increase milk production and guarantee that milk is routinely and adequately withdrawn from the breasts. This is crucial for moms who must be away from their infant for an extended amount of time or who experience difficulties latching or nursing.

Breast pumps can help to relieve engorgement, which happens when the breasts are too full with milk. By lowering breast fullness and avoiding issues like clogged ducts or mastitis, breast pumping can offer comfort and relief.

Breast pumps can assist in the transition from breastfeeding to bottle feeding. This can be helpful for mothers who want to gradually introduce bottle feeding or wean their baby from breastfeeding. Pumping allows the baby to continue receiving breast milk while becoming accustomed to the bottle. Direct breastfeeding may be difficult or painful for certain women due to underlying physical or medical issues. In these situations, a breast pump might be a good substitute to make sure the infant obtains breast milk while attending to any particular requirements or concerns.



Fig 12: Breast pump Fig 13: expression using breast pump
Source :<https://www.google.com>

Understanding the practice

Breastfeeding preference

Human Milk Donation

Milk donation is typically done by lactating women who have an abundant milk supply and wish to share their excess breast milk with infants in need. While specific eligibility criteria may vary depending on the milk bank or donation program.

Donors are usually required to be in good overall health, free from contagious diseases or conditions that could potentially be transmitted through breast milk. This may involve completing a health screening questionnaire and, in some cases, providing medical clearance from a healthcare provider.

Additionally, some milk banks prioritize donor milk for medically fragile or premature infants who have specific nutritional or medical needs. Therefore, the availability of donor milk may vary based on the demand and the specific policies of the milk bank or donation program.



Fig 14: women donating breast milk

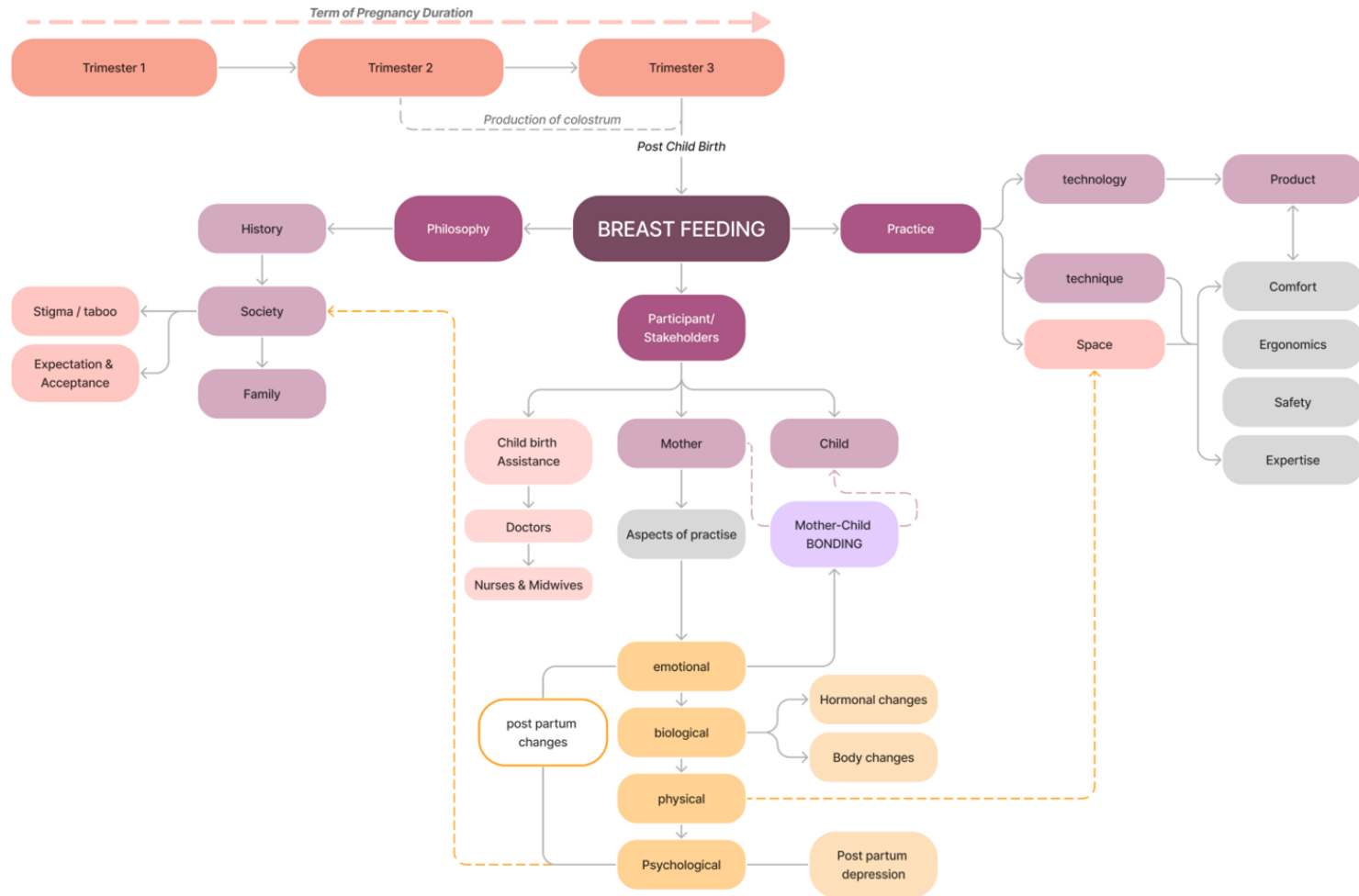


Fig 15: Breast Milk preservation pouches

Ref: <https://www.outlookindia.com/>

Chapter 03 : Defining the scope

Stakeholder mapping



Initial design brief

Breastfeeding is the recommended method of feeding for infants, and lactation is the natural process of producing breastmilk. However, some women may experience difficulties with lactation, including low milk production and engorgement.

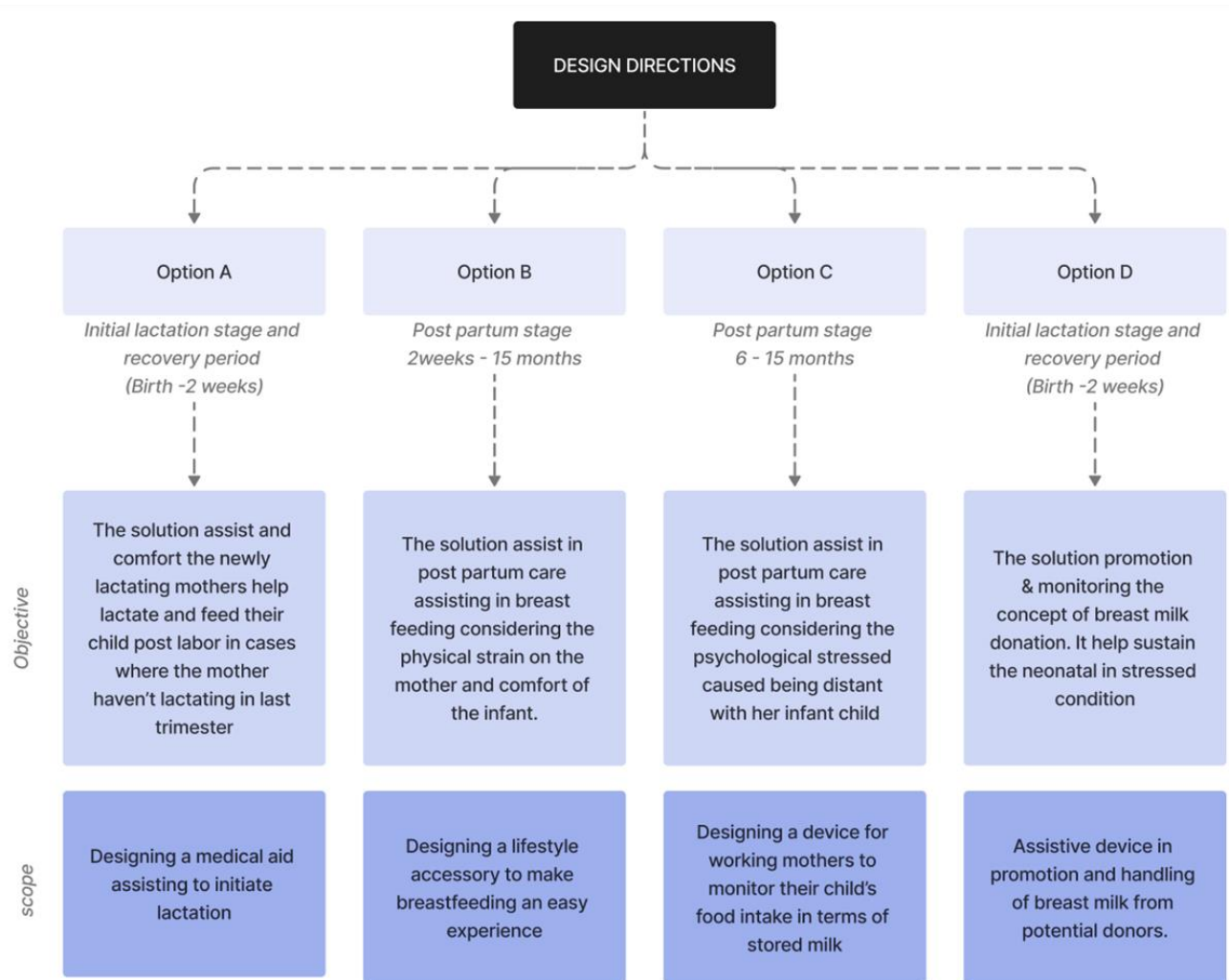
Apart from biological distress there are certain psychological and social concerns needed to be addressed for women to practice breastfeeding with confidence. Over the period of time the different attributes of breastfeeding are brought to limelight making the practice more socially accepted and encouraged; Yet there are few aspects to be addressed.



Fig 16: Breastfeeding mother

Understanding the Scope of Design

Design direction



Initial design brief

Direction A

The solution assist and comfort the newly lactating mothers help lactate and feed their child post labor in cases where the mother haven't lactating in last trimester. The mother faced difficulty in difficulty in expression. In the given scenario a manual pump or electronic pump is used to initiate lactation.

Whereas, in the marginal or government hospitals the devices are either unavailable or makeshift devices are used to conduct the process. The focus is to design a device assisting in lactation on a single use and low cost module to be administered in mass marginal groups and government hospitals

Direction B

The solution assist in post partum care & breast feeding considering the physical strain on the mother and comfort of the infant. Lactation causes strain on the breast and added load of the body and baby strain the spinal cord. this cause spine related issues in nearing future. Apart from this breast feeding in public areas can demotivated the mother from performing. In the places where there lack of baby support system in placed, the product helping the mother to fed her baby with ease and without being nervous in public spaces.

Direction C

Generally about 6months post delivery women resumes to work. For working women has to assert trust on fer family and support system for well being of her baby. The practice of storing the breast milk and using it to feed the child on demand is mostly the use case. but the maintenance of the milk is crucial. Also, monitoring the feeding and the nutrition factors are also the reason for the working others stress. A design solution assisting in monitoring the storage and consumption of the pumped breast milk can ease the process.

Direction D

India is one of the top 10 nations contributing to the preterm birth fatality. Apart from the inadequate medical help, essential nutrition is the reason for these fatalities, ~15 Million preterm babies die annually. Survival rate is generally 1 out of 10. Most of lives could be saved by proper nutrition after neonatal resuscitation. In such scenarios mothers own milk is not available for the child as she underwent stress and surgery. The medical practice of wet nurse is now taken to a system level by establishing the Breast milk banks. Where other lactating women donate their surplus milk for the neonatal. But not many people of aware of it also, many of the establishments and not at the comfort of the women. The agenda is to understand and device the assist for the donors to promote and participate in breast milk donation from comfort of their home without compromising the quality & nutrients of the donated milk.

Chapter 04 : Understanding the User

Introduction

The primary user study is conducted with qualitative approach. The user reviews are recorded and attested for affinity mapping to derive design scope. The study is conducted in 3 stages as follows

Stage 01:

Interviewing the women in age group of 25-35 years old. All the women interviewed have experienced their first pregnancies and their children are not more than 2 years. Interviewing and observing the user preference. The semi-formatted questionnaire focusing on the lifestyle, pregnancy histories, preferred method of breastfeeding. It helped to understand the user pattern.

Stage 02:

Affinity mapping.
The reviews of the users are clustered and summarized to get insights, these insights define the issues.

Stage 03:

Deriving the issues for intervention and product design scope. This further is considered constraint and requirement for design brief.

User Interview

Megha
Age 30 yo,
Post Partum : 16 months
Currently working

- Full term pregnancy
- Uncomfortable about pregnancy body issues
- **Delivered the baby during COVID quarantine**
- Traumatizing childbirth
- Not able lactate due to stress and low weight
- Low self esteem
- Breastfeed whenever possible as working
- Due low milk production , Baby was formula fed

Charu
Age 28 yo,
Post Partum : 27 days
Currently on leave

- Baby is **lactose intolerant.**
- Baby is formula fed
- Lost significant weight
- Preterm delivery due to **Polyhydramnios**
- Gestational diabetes
- Constant lower back pain (recovery period)
- Hard to express milk due to soreness
- Haven't breastfed the baby
- Emotionally drained due to not able to feed her baby
- Difficulty in expression of milk

Sakshi
Age 34 yo,
Post Partum : 19 months
Currently working

- Preterm delivery due to **Olygohydramnios**
- Baby is exclusively breastfed
- Donated Breastmilk post 6 months
- Breastfeed baby every 2-3 hours for 1 year
- Chronic pain in neck and lumbar region
- **Post Partum depression**
- Medication for lactation
- Self doubt as not able to feed baby for first few weeks
- Baby was fed on donors milk

Radha
Age 29 yo,
Post Partum : 11 months
Preferred Housewife

- Full term pregnancy- Natural birth
- Natural lactation
- Active breastfeeding
- Painful expression of milk for first few months
- Sore breast post feeding session.
- Uncomfortable to breastfeed in public spaces.
- Severe body image issues
- Constant fatigue and lack of confidence

***All the names are changes for Privacy concerns*

User Interview

Akshaya
Age 30 yo,
Post Partum : 6 months
Currently WFH

- Full term pregnancy (c-section)
- Uncomfortable about pregnancy body issues
- Active breastfeeding

Jaya
Age 30 yo,
Post Partum : 18 months
Currently WFH

- Full term pregnancy (c-section)
- Almost dry milk glands, did not lactate more than a week
- Baby is completely formula fed
- **Post partum depression**
- Induced lactation as have small glands
- Carry formula milk as cannot breastfeed.
- Lack of confidence and emotional disparity due not able to breastfeed.
- Inadequate guidance and support

Kirti
Age 26 yo,
Post Partum : 4 months
Preferred Housewife

- Full term pregnancy (c-section)
- Uncomfortable about pregnancy body issues
- Active breastfeeding
- Co-operative parents and emotional support
- Natural lactation
- Uses breast ump to express milk when baby is not able to latch
- Lower back pain (recovery period)
- Difficulty in expression of milk as constant soreness in breast

Maya
Age 32 yo,
Post Partum : 4 months
Currently working

- Full term pregnancy- Natural birth
- Natural lactation
- Active breastfeeding
- Starting working recently
- Uses Electric breast pump to express and store breast milk.
- Chronic backpain and inadequate recovery period

***All the names are changes for Privacy concerns*

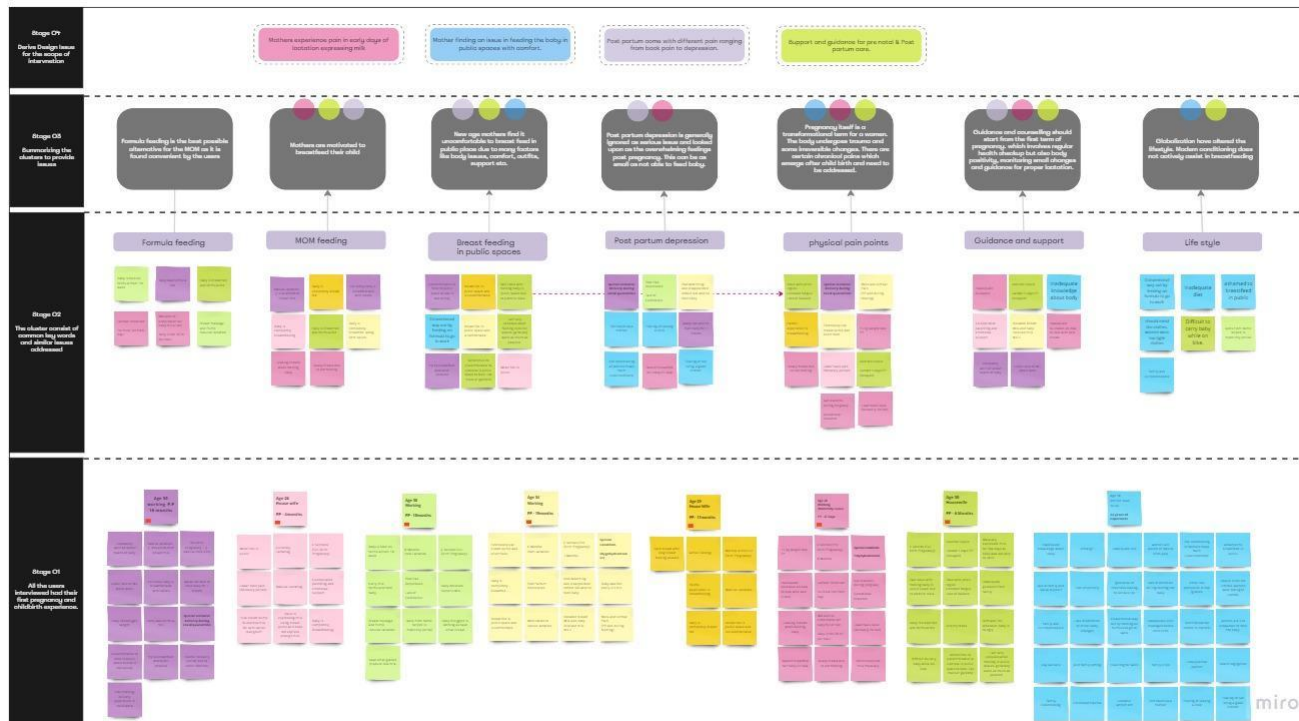
Affinity Mapping

The affinity map caters to the insights received from the primary users and categorized the concerns w.r.t to the subjects.

Stage 01: The cluster form as per every user interviews, consisting of 7 primary users(lactating mothers) and one nursing practitioner.

Stage 02: The cluster consisting of similar concerns and form collection of keywords deriving summary from the keywords.

Stage 03: Derivation of problem from the abstract summary.



scan the QR for Miro board

Chapter 05 : Understanding the Market trends

Product market trends

Baby care products are designed to be mild and non-irritating, or they include compounds that have these qualities. Soap, shampoos, powders, creams & lotions, infant oils, toiletries, and many more are the baby care items that are easily available in the market. The primary goal of these items is to keep the infant comfortable and clean. In addition to this, the use of infant care products is growing increasingly popular throughout the world as it simplifies and eases the lives of parents.

Baby care products are specifically designed to cater to the special needs of children. Infants or newborn babies need unique care items given the sensitivity of their hair, skin, and body parts. Since babies are easily susceptible to infections, or allergic reactions, it is imperative to use tried and tested baby care products and in some cases use products prescribed by pediatricians.

With modernization and the large-scale availability of jobs, there has been a significant rise in the standard of living amongst the general population. Because of the steady rise in income, parents across the globe are armed with better spending capabilities for their newborns. The rise in per capita income in several parts of the world is anticipated to propel the global baby care product market forward. Digitalization has led to mass awareness amongst consumer groups. The presence of the internet in the remotest places has assisted in better product accessibility along with providing multiple options for buyers to choose from. These reasons are anticipated to aid the global market growth during the projection period

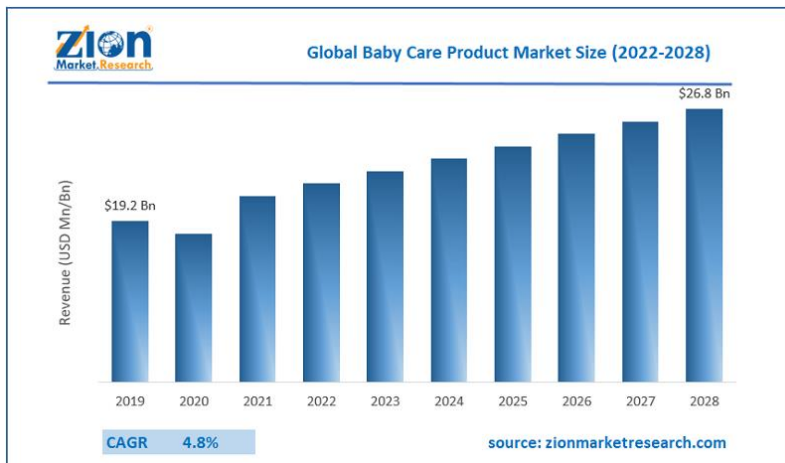
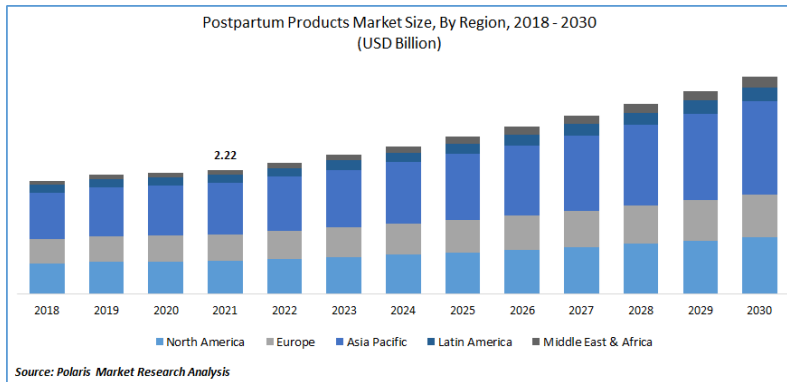


Fig 17: Global baby care product trends

Ref: <https://www.zionmarketresearch.com/>

Product market trends

The global postpartum products market was valued at USD 2.22 billion in 2021 and is expected to grow at a CAGR of 6.5% during the forecast period. The growth in the market is being driven by the rise in the number of working women around the world. As per the International Labour Organization, the current global female labor force participation rate is close to 49%. It's 75 % for men. That's a 26-percentage-point gap, with some places experiencing a margin of more than 50-percentage-points



In addition, women are becoming more self-sufficient and financially independent as they become more involved in the global workforce. As a result, women choose high-quality healthcare and medical items for themselves and their children. This trend is having a favorable impact on postpartum products sale.

The postpartum products market has observed extensive developments in the last few decades supported by various factors such as the growing burden of problems during pregnancy and rising healthcare expenditure by governmental institutions.

For instance, according to the Center for Disease Control and Prevention (CDC) data, pregnancy difficulties can be caused by pre-existing conditions or conditions that emerge during pregnancy. Because pregnancy problems include a broad spectrum of illnesses with various degrees of severity, estimating the impact of pregnancy complications on mother and newborn outcomes is difficult. The hypertensive disorders in pregnancy include gestational hypertension, pre-eclampsia, and eclampsia, among others.

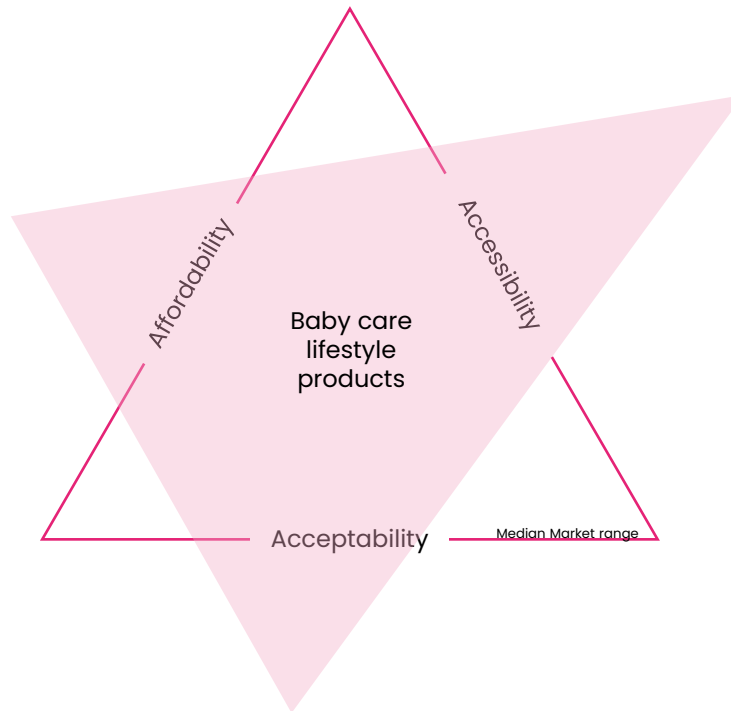
The maternal-infant relationship can also be harmed by postpartum depression. This is the first time a medication has been approved expressly for the treatment of postpartum depression (PPD), opening up a valuable new treatment option. It may include symptoms such as cognitive impairment, guilt, or suicidal tendencies, as with other forms of depression. Thus, the major players focus on the treatment for postpartum depression, and their approval by the government is driving the growth of the market in the region.

Fig 18: Global post partum care product trends

Ref: <https://www.polarismarketresearch.com/>

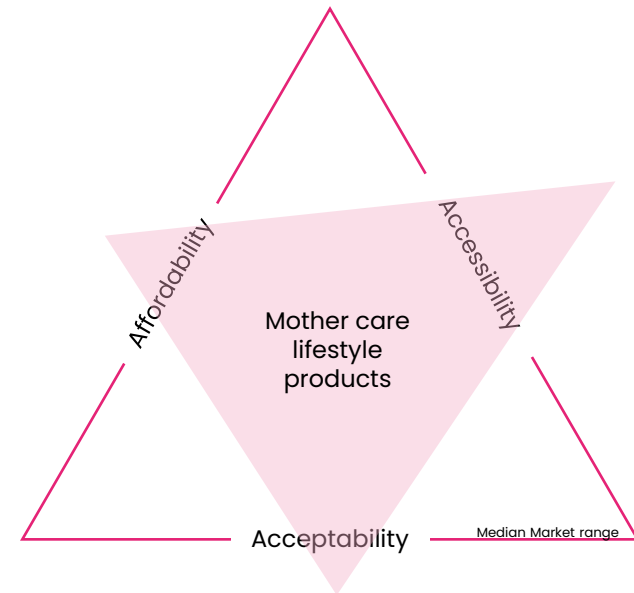
Product market trends Inference

The product success depends on three factors i.e. Affordability, Accessibility and Adaptability



Baby care products trends are rising over the years due to lifestyle upgrade and underlying parental paranoia for the well being of the baby. The products are easily available from a very nominal range to premium prices through out various ecommerce and retail platforms. Over the years the products have received high demand and easy accessibility makes them boom the market.

Fig 19: Baby care product market analysis
Source : Author

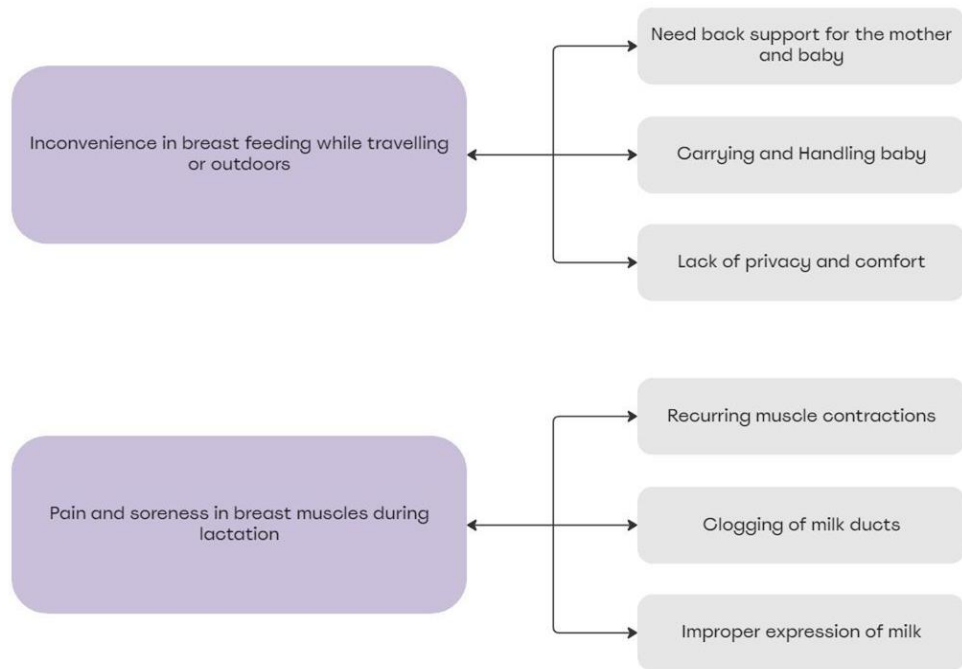


Apart from post partum medical care products, not much products are trending in market. The major reason is the lack of awareness and adaptability. The simple products are available high range makes them no essential and low in affordability. There are various e commerce platform for this products but not all are accessible and available.

Fig 20: Mother care product market analysis
Source : Author

Defining the Scope to Design

Defining the scope design with respect to the market trends, user interviews and scope of innovation. The product has to be introduced the stakeholders with considering the context of the use and user. The product development brief can be derived with user pattern and design gap in existing products after analyzing the user reviews.



Design Brief 01 :


To design an ergonomic nursing cover that provides comfort and support for both the mother and the child during breastfeeding. The nursing cover should be easy to use, adjustable, and promote a healthy posture for the mother, while ensuring privacy and comfort for the baby

Design Brief 02 :

There is a need for a breast massager that is specifically designed to support lactation by providing gentle and effective massage to the breasts, promoting milk flow and relieving engorgement.


Understanding the Market trends

Comparative Analysis




Massager Roller

Type : Manual Handheld
Brand : LaVie
Price : 1999INR




Lactation Massager

Type : Electric Handheld
Brand : Generic
Price : 3500INR



Lactation Massager

Type : Electric Handheld
Brand : LaVie
Price : 4000INR



Warming Lactation Massager

Type : Electric Handsfree
Brand : LaVie
Price : 8000INR



Fig 21,22,23,24: Lactation massager
Source :Amazon.com

Product reviews



Lauren M.

★★★★★ **Super great to help you empty your boobs when you are breastfeeding or pumping!**

Reviewed in the United States on 9 June 2021

Verified Purchase

For my second time around breastfeeding I knew I needed some help to **fully empty my breast**. I didn't have anything to help with the first time I was breastfeeding, also LaVie is pretty new to the market. As soon as I saw this I knew I had to buy it! I also have several items from the same brand that I really love and can't do without. You can also take apart the wheel so that **you can use it without the stick**. 10/10 i would recommend



martiniz ellwood

★★★★☆ **Depends**

Reviewed in the United States on 10 April 2022

Verified Purchase

It really **depends** on the mother, but I bought this thinking it would help massage my breast to loosen my milk, but really I found that using **my hands was better**. I wouldn't waste my money buying, but it is a durable product, looks just like the picture, and **it is easy to use**.



Kyra Delgadillo

★★★★★ **Get it!**

Reviewed in the United States on 16 January 2021

Verified Purchase

I love it! I have been using this for 2 days. I also ordered the lactation massagers. While those were charging, I went ahead and used the roller for my pumping session and I saw an immediate increase in how much milk I was able to get out. It's **easier and faster and more effective than a hand massage**. When I use it with the lactation massagers, I get 1-1.5oz more than I was getting before. Both products are doing a lot to help empty my breasts and make the most out of limited pumping sessions!

If the lactation massagers are **too pricey (they are expensive but in my opinion it was worth it)** I definitely think getting this roller is a **great alternative**. It works very well and is small enough for my pumping bag.

Ref: www.amazon.in



Ksharan Chander

★★★★★ **Amazing relief**

Reviewed in the United States on 19 November 2022

Verified Purchase

This really **helps with clogged ducts**. Also really easy to use compared to the **soft massagers**



jen

★★★★★ **Life Saver. Extraordinary Breastmilk Extractor**

Reviewed in the United States on 14 April 2020

Verified Purchase

This massage roller saved me from cying day and night because **I can't extract enough milk** for my LO for a month. I was hitting my breast at one point because I know it's filled with so much milk and he was just losing weight. He wasn't latching good. I tried warm compress while pumping and nothing happened. But with this roller, everything went so well. LO is 6 months and a half now and still providing him breastmilk:)

Cons: using it constantly directly on my **skin gave me rashes**.

July 8, 2020

Update: this is my 2nd roller. I only used it for 1 month and it **broke already**. My 1st one lasted more than 5 months and i used it a lot. This 2nd one seems to **be flimsy**. The moment i opened the box, i knew something was wrong



elizabeth

★★★★☆ **Not best to use while nursing**

Reviewed in the United States on 8 December 2021

Verified Purchase

This is great for what it is but definitely too **hard to use while nursing**. I didn't want to wack my baby in the face with it. I ended up **going with an electric vibrating massager** that worked much better for during nursing to help flow.



E.K.

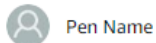
★★★★★ **Good product**

Reviewed in the United States on 1 September 2022

Verified Purchase

I use it as a **face massager** and like it very much! Quality product.

Product reviews



Pen Name

★★★★☆ **Could be a good tool**

Reviewed in the United States on 9 March 2021

Colour: Teal | **Verified Purchase**

It was a good tool, but I think I **overdid it that it inflamed/bruised my breast tissue.**



K

★★★★☆ **Great quality with one problem**

Reviewed in the United States on 1 August 2021

Colour: Teal | **Verified Purchase**

I really wanted to love this. I was on the fence about getting it forever and the reviews were great so I did. It's definitely good quality and can confirm it's completely waterproof. The battery lasts forever also. My issue is that the vibration seems strongest in the middle of the device as opposed to either end which is where you need it. The small end doesn't have nearly as much either which sucks for trying to break bad clogs. The **shape is perfect though and if the vibration were in the right places it would definitely be 5*.**



This Home

★★★★☆ **Great for clogs AND TEETHING babies!**

Reviewed in the United States on 20 May 2021

Colour: Teal | **Verified Purchase**

This worked well for keeping clogs at bay when I used it in conjunction with massage, heat, and sunflower lecithin. It is not a cure all by any means if you are very clog prone or have a big oversupply, but it Definitely made a difference when I started using it. I saw the biggest difference when I would use it in the shower and then hand express immediately after. **Got out some pretty stubborn clogs that way.**

I have since weaned and now it is the **BEST TEETHER EVER.** 10/10 would recommend as a baby teether! 🙌😊

Ref: www.amazon.in



Kyanne

★★★★☆ **Hard to use while breastfeeding**

Reviewed in the United States on 6 June 2021

Colour: Teal | **Verified Purchase**

Worked great and I believe it does **help unclog milk ducts, but I returned mine.** I thought it was expensive for the size. I also had a **hard time using it while I was breastfeeding.** I have to use both my hands to feed my baby so I couldn't ever use this while breastfeeding which is **highly recommended to do if you have mastitis,** so it seemed pointless to have if I couldn't use it then. It had 2 speeds and I did like the more pointed end, but again, it was not efficient for me



Jordyn

★★★★☆ **Too powerful, not necessary**

Reviewed in the United States on 24 July 2021

Colour: Teal | **Verified Purchase**

The quality of the product is great (quality material, holds a charge, etc.), but even the **lowest vibration setting is too strong.** In my experience, it does not help relieve clogs and does not have an impact on pumping output. You **can't wear it while pumping** because it's vibrating so hard your brain is rattling. There are lots of products out there that make lactation and parenthood easier— save your \$\$ on this one.



Fiona

★★★★☆ **Not for mastitis but everyday nice tool**

Reviewed in the United States on 26 May 2020

Colour: Teal | **Verified Purchase**

Didn't help with my severe clogged duct/mastitis but could see it as a **nice tool for everyday breastfeeding or pumping.**



April

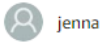
★★★★☆ **It was amazing! Until it broke** 😞

Reviewed in the United States on 3 June 2021

Colour: Teal | **Verified Purchase**

It was incredible. **Kept me from getting mastitis and helped keep my milk flowing...**until it broke.

Product reviews



jenna

★☆☆☆☆ **Could be helpful but so overpriced!**

Reviewed in the United Kingdom on 14 September 2021

Verified Purchase

I bought these when I was struggling with blocked milk ducts but very aware that they're so expensive for what they are. I haven't used them much as you have to hold them in place and keep loving them, which isn't convenient when breast feeding.



Sidney

★★★★☆ **Mixed Emotions**

Reviewed in the United States on 28 November 2022

Verified Purchase

Ok- this is a long one but bare with me because there's a lot of good info!

I ordered these to help me with clogs because I was getting them every day, sometimes multiple clogs, in each boob. For the purpose of getting rid of clogs, I genuinely think these help- they DO NOT prevent them (in my opinion). So instead of having a clog that lasts 1-2 full days, I'm able to clear it using these in 1-2 pump sessions (sometimes 3 for those really bad ones).

The CONS

A) They're expensive. Let's be real- who wants to spend \$80 to massage their boobs? No one.

B) The batter life SUCKS. Trust all the other reviews on that. I got these after reading reviews saying the battery sucked and thought maybe those people just didn't take care of them or didn't follow the instructions- nope- they really do suck. I am able to use them on vibrate for 1.5 sessions max. It runs for about 20 minutes so when I have a really bad clog, sometimes I need more than that. If you forget to plug them in between uses (who can remember that between the sick toddler and the crying baby and washing bottles and pump parts and using the bathroom and showering and... aaah) then you will not be able to use them for your entire next pump. It's completely unrealistic and for the larger price tag of \$80 you should at LEAST be able to use them for 2 full pump sessions in my opinion.

C) They are not hands free if you get clogs like I do. That sounds lovely but I still have to apply a bit of pressure and usually move them in a circular massaging motion while they're on heat and vibrate for those dang clogs.

I'm giving them 4 stars because I was about to quit pumping due to severe clogs and these actually saved me BUT- there are some serious flaws with battery life that make me question if they were worth the money I spent on them. If the battery sucks this bad when they're brand new, how will it be after I've had them for a month or two 😞

Ref: www.amazon.in



Darcy

★★★★☆ **Good product not great**

Reviewed in the United States on 11 February 2023

Verified Purchase

While I do like these massagers for when I'm pumping and very engaged, the battery life on these just do not seem to last and I'm constantly having to charge after every use which is kind of frustrating. That being said they did what they were designed to do.



Vanessa

★★★★☆ **This is a must when you feel full but hardly any**

Reviewed in the United States on 13 April 2023

Verified Purchase

This is a must when you feel full but hardly any milk is coming out while pumping!!!!!!

PROS: This has cut down my pumping sessions by 10 minutes and increased my milk supply by almost double! I have no idea how my milk supply went up so much when I had tried almost everything to increase it.

CON: the battery life is not good, if it's fully charged it will last 20 minutes at most.



M

★★★★★ **So far so good**

Reviewed in the United States on 22 May 2023

Verified Purchase

New mom here and I've only used a few times. The various heat options and the vibration feature have been really nice to relieve some breastfeeding discomfort. Seems to help with breast tightness and probably helps the milk flow a bit easier after using



Ashley

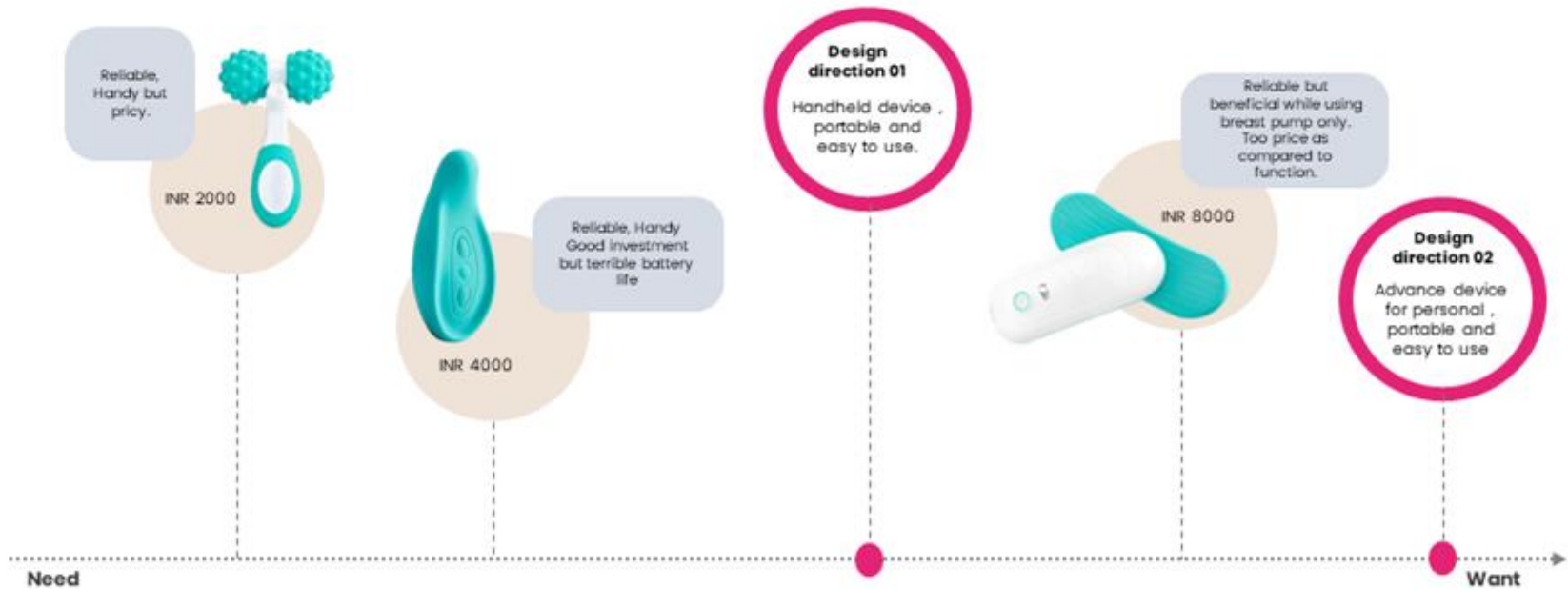
★★★★☆ **If you've ever had a clogged duct....**

Reviewed in the United States on 15 May 2023

Verified Purchase

If you've ever slept on one side too long and woke up with a painful knot in your boob from a clogged duct just buy it already! The heat is warm enough to "melt" the knot but not too hot to burn your skin. The vibration really gets the milk flowing and increases letdowns. My only grip is it has to be charged between every 1-2 uses because this little batter does not last. If the battery was better it would be 5 stars.

Product analysis Inference



Analysis:

Comparative analysis of the existing products in the market Allows to understand the setbacks and scope of the deign. Most of the products existing are not used or introduced in India. The reviews were collected from the internet through various ecommerce sites. There are limited number of users from India and the product is not welcomed in India due to various stakeholders scenarios. Globally, the products are well accepted and adapted. There are certain limitations to the product which are addressed in the reviews which can be incorporated in the further design development.

Fig 25: Product analysis Chart
Source : Author

Inference:

The products like breast massagers are more of lifestyle product and product of "want" rather than the "need". The Product is assistance to breastfeeding but there are other manual or conventional methods being practiced. There are users who are aware of the application and willing to invest for the convenience. This increase the scope of technological affordance of the product.

Understanding the Market trends

Product analysis Inference : Product Gap

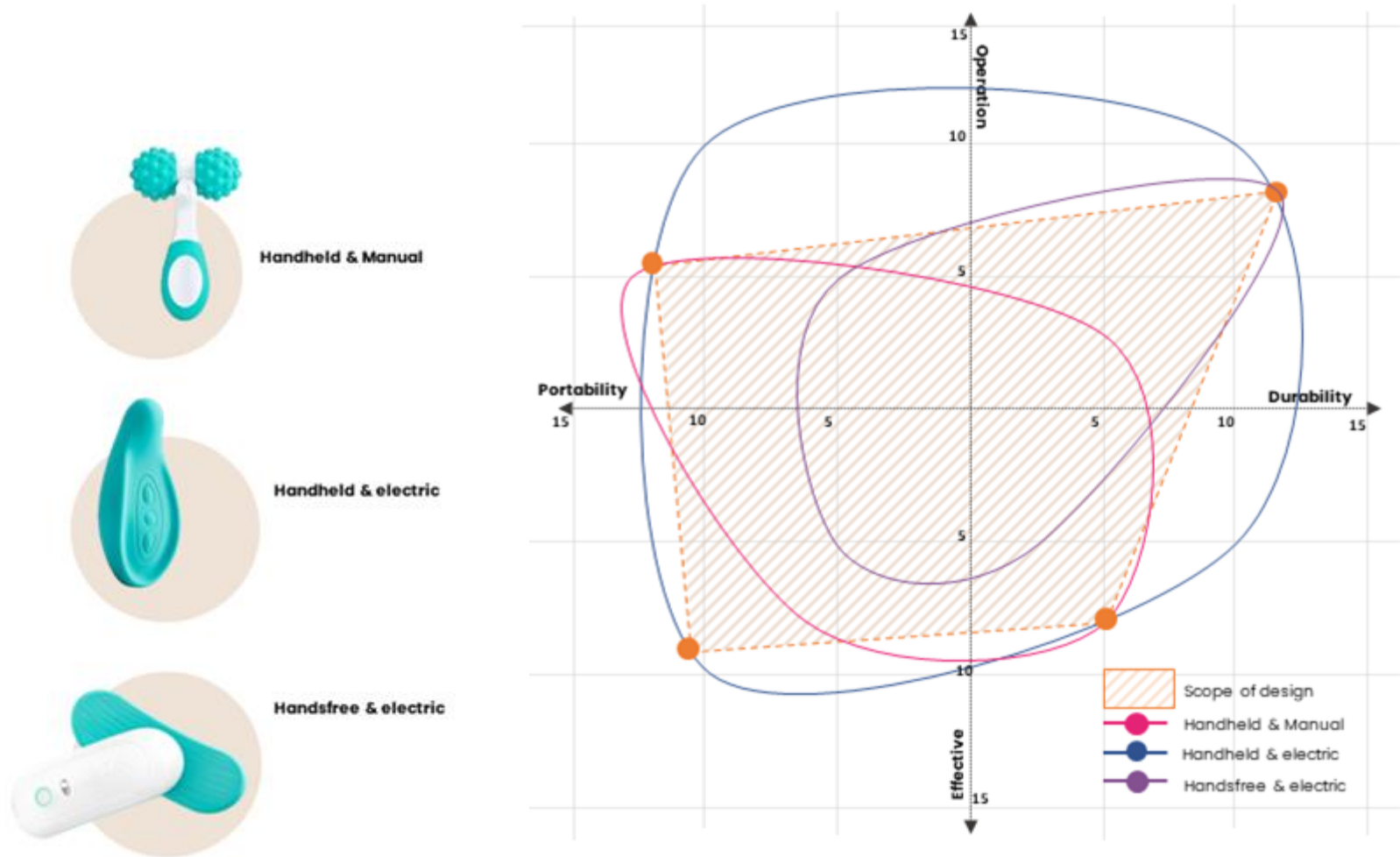


Fig 26: Product analysis Graph
Source : Author

Chapter 06 : Design Brief

Design brief

Breastfeeding is the recommended method of feeding for infants, and lactation is the natural process of producing breastmilk. However, some women may experience difficulties with lactation, including low milk production and engorgement. Breast massage has been shown to be an effective method of increasing milk production and relieving engorgement

Problem Statement:

There is a need for a breast massager that is specifically designed to support lactation by providing gentle and effective massage to the breasts, promoting milk flow and relieving engorgement.

Objectives:

The breast massager should:

- Be comfortable and easy to use
- Provide gentle and effective massage to the breasts
- Promote milk flow and relieve engorgement
- Be portable and easy to transport
- Be affordable and accessible to all mothers

Target Users:

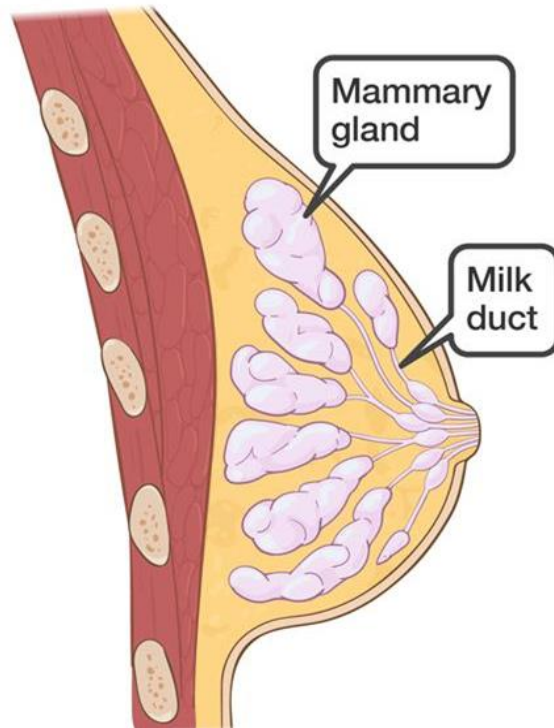
The breast massager is intended for use by breastfeeding mothers who are experiencing difficulties with lactation, including low milk production and engorgement.

Design Considerations:

- Comfort: The massager should be designed for comfort, with soft materials and adjustable settings to accommodate different breast sizes and shapes.
- Massage techniques: The massager should incorporate a variety of massage techniques, including vibration, compression, and rolling, to promote milk flow and relieve engorgement
- Portability: The massager should be lightweight and portable, with a rechargeable battery or USB charging capabilities, so that it can be used anywhere.
- Ease of use: The massager should be easy to operate, with intuitive controls and clear instructions.
- Hygiene: The massager should be easy to clean and disinfect to maintain good hygiene

Chapter 07 : Understanding the Stakeholders

Anatomy of deformity



Normal Breast

Fig 27: Anatomy of Normal Breast

<https://www.aboutkidshealth.ca/Article?contentid=441&language=English>

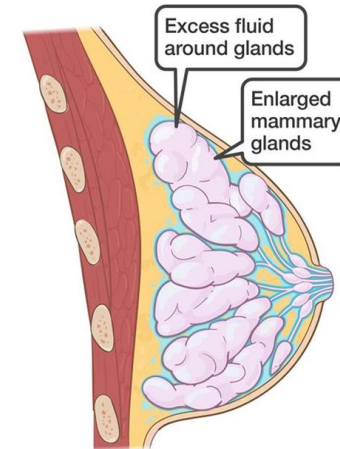


Fig 28: Anatomy of Engorge Breast

Engorgement Breast

Symptoms

- The whole breast feels hard, heavy and tight
- Breasts may have some redness and shine
- Tenderness
- Usually both breasts are affected

Causes

- The breast is not emptied for a long period of time
- The baby is not latching or drinking effectively
- It is part of the natural process of milk production in the first three to five days after delivery

Anatomy of deformity

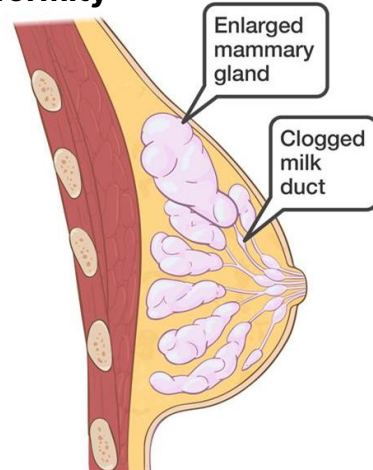


Fig 29: Anatomy of Clogged Breast

Clogged duct Breast

Symptoms

- Tender lump, or lumpy area in the breast—this is different from engorgement, as there is hardness in just one area of the breast
- Area may look red or feel warm
- Decreased milk flow from affected breast
- You otherwise feels well overall

Causes

- The baby is not latching well
- The baby is feeding less than usual due to illness
- Feeds or breast pumping sessions have been missed or shortened
- Tight restrictive clothing; wearing an underwire bra
- Sleeping on your tummy or more on one side

<https://www.aboutkidshealth.ca/Article?contentid=441&language=English>

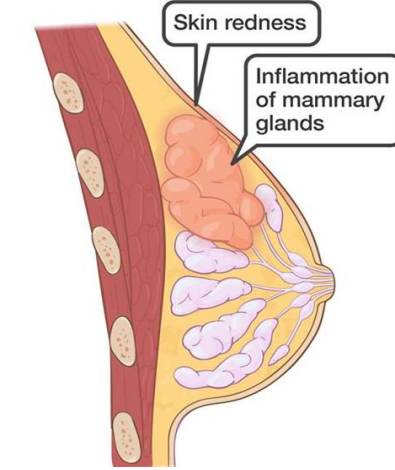


Fig 30: Anatomy of Mastitis Breast

Mastitis Breast

Symptoms

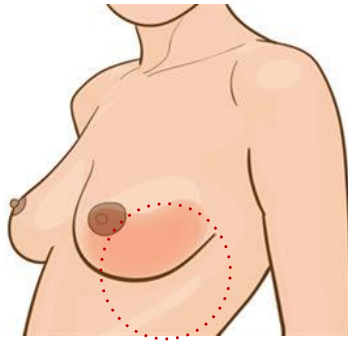
- A red area on the breast—there can be red streaks
- Breast pain
- Flu-like symptoms such as fever, chills, fatigue, general aches and pains
- It usually affects only one breast
- Decreased milk supply on the affected side

Causes

- Infrequent feeding or pumping
- Persistent engorgement or a plugged duct
- A poor latch
- Restricting feeding times
- An oversupply of milk
- Rapid weaning

Method of relief

Affected area



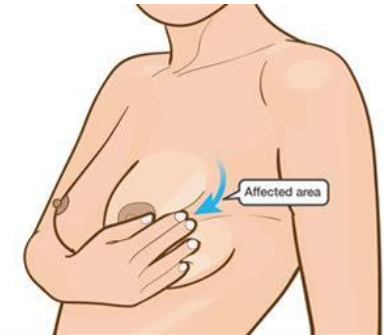
1. Cold compression



2. Moist Heat compression



3. Massage



Engorgement in the breast can be identified by the following signs: breasts feeling full, heavy, and larger than usual; tightness, tenderness, and pain in the breasts; warmth, redness, and stretched skin; difficulty latching or breastfeeding; and decreased milk flow. To alleviate engorgement, frequent breastfeeding or pumping, warm compress application, breast massage, and proper latch and positioning are recommended.

Cold compression offers several benefits, including reducing swelling and inflammation, alleviating pain and discomfort, promoting healing, improving circulation, providing a soothing effect, and serving as a preventive measure. Applying a cold compress to the breasts for 20 minutes after or between breastfeeding or pumping sessions can help reduce swelling, numb the area, and promote faster recovery..

Hot compression, or heat therapy, offers several benefits. It relieves pain, discomfort, and breast tenderness, promoting relaxation during breastfeeding. The heat improves blood flow, aiding in milk letdown and enhancing milk supply. It also softens breast tissue, reducing engorgement and helping to clear blocked milk ducts. Additionally, heat promotes healing by delivering nutrients and oxygen to the affected area, assisting in the recovery of cracked nipples or tissue damage.

Massage offers numerous benefits, including relieving muscle tension and pain, promoting relaxation and stress reduction, improving flexibility and range of motion, boosting circulation, aiding in postpartum recovery, supporting breastfeeding by improving milk flow and relieving engorgement, and providing emotional support. It enhances physical and mental well-being by increasing blood flow, releasing endorphins, and promoting a sense of calm and relaxation

Professional Review

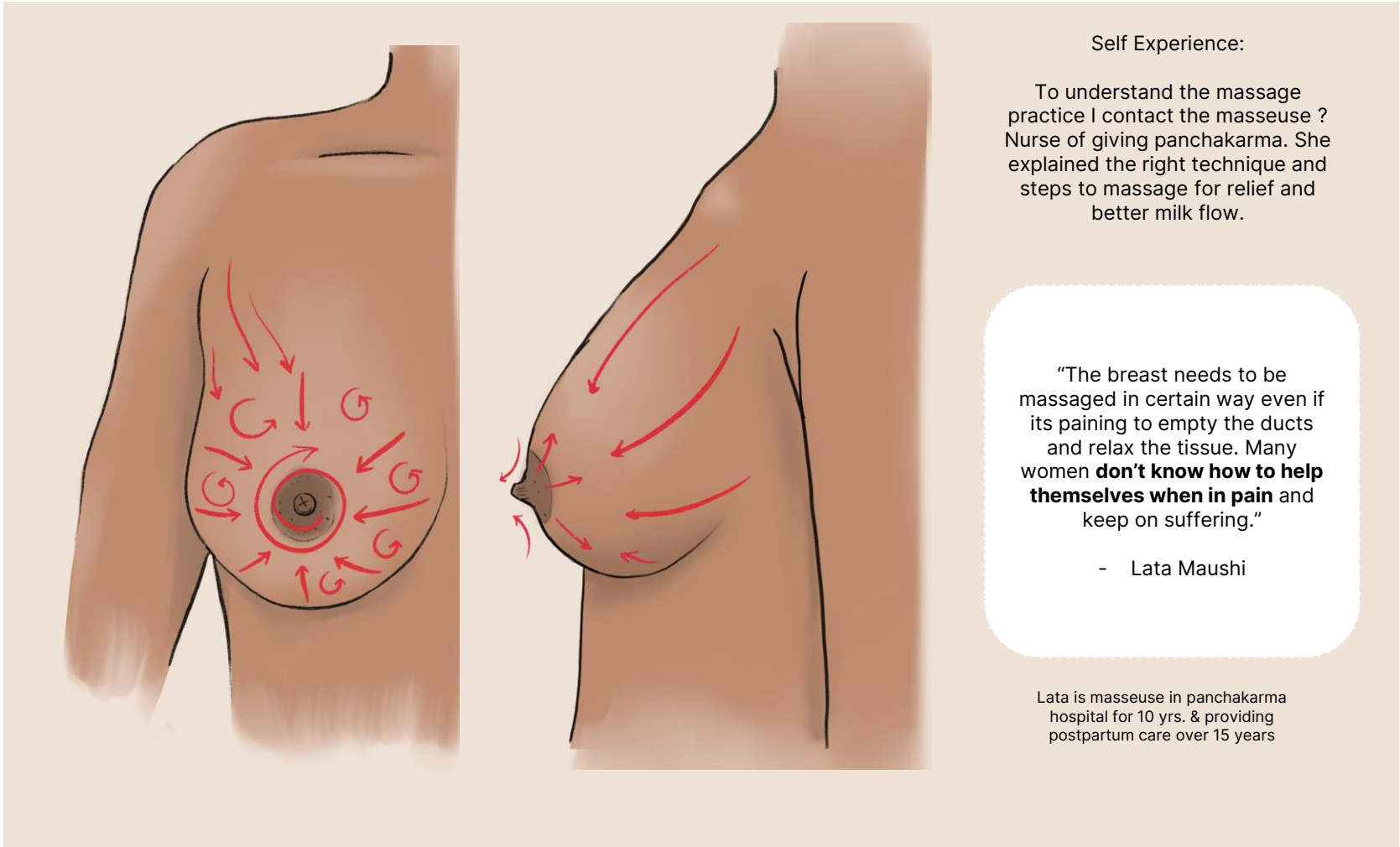


Fig 31. Massage techniques for pain relief
Source : Author

Chapter 08 : Design Development

Persona Development

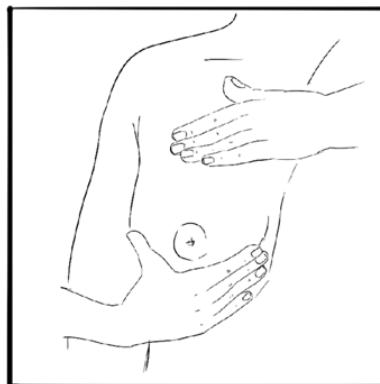
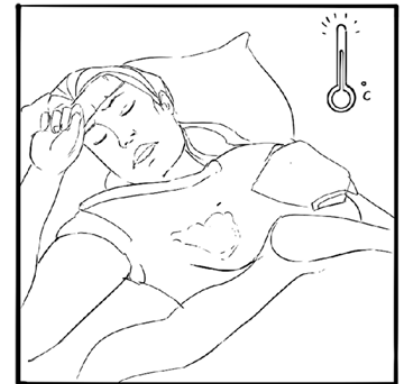
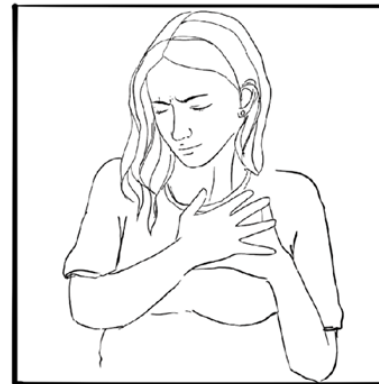
Mahati , Age 32

11 months Post partum.
First pregnancy
Full term / C-section

Mahati is working mother. After her first pregnancy she started working again after 7 months post partum. She is balancing her motherhood and work life with grace. Her partner and parents are very supportive during her journey of motherhood. Mahati choose to breastfeed her baby for at least an year

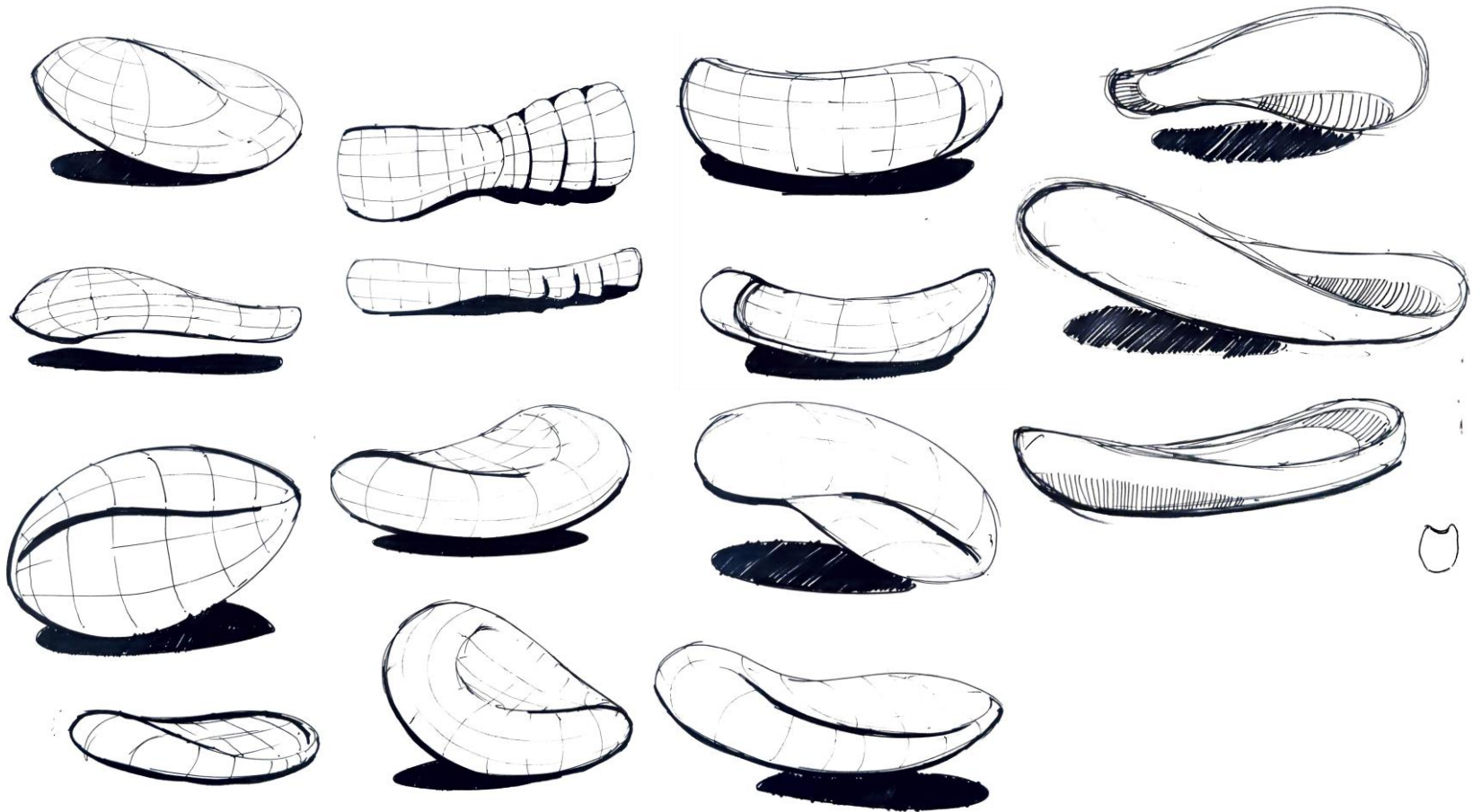
Scenario:

Mahati started experience discomfort in her breast at middle of the night. Thinking it as the call for expressing milk, she tried doing so , discomfort got more severe. The pain us unregistrable and she was not able to feed here baby as well.



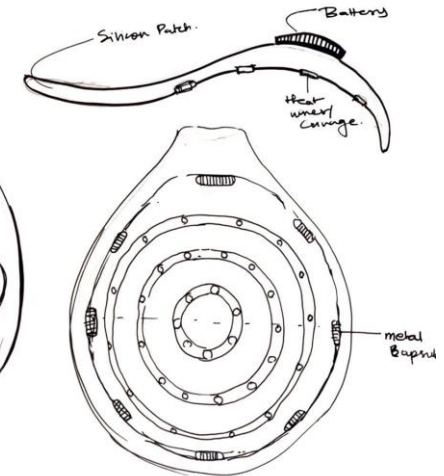
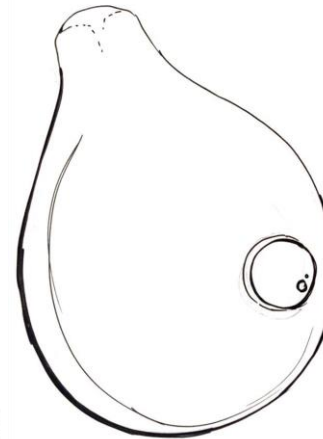
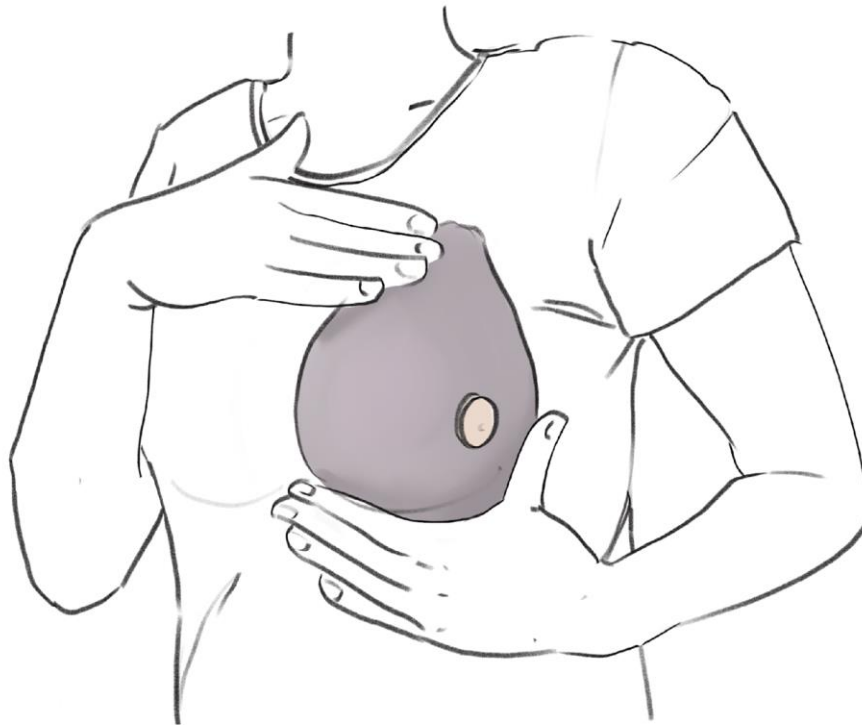
Design development

Form Development



Design development

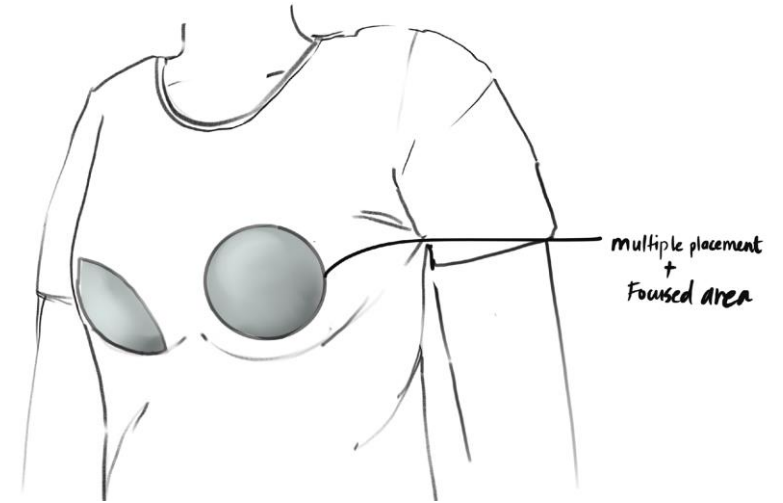
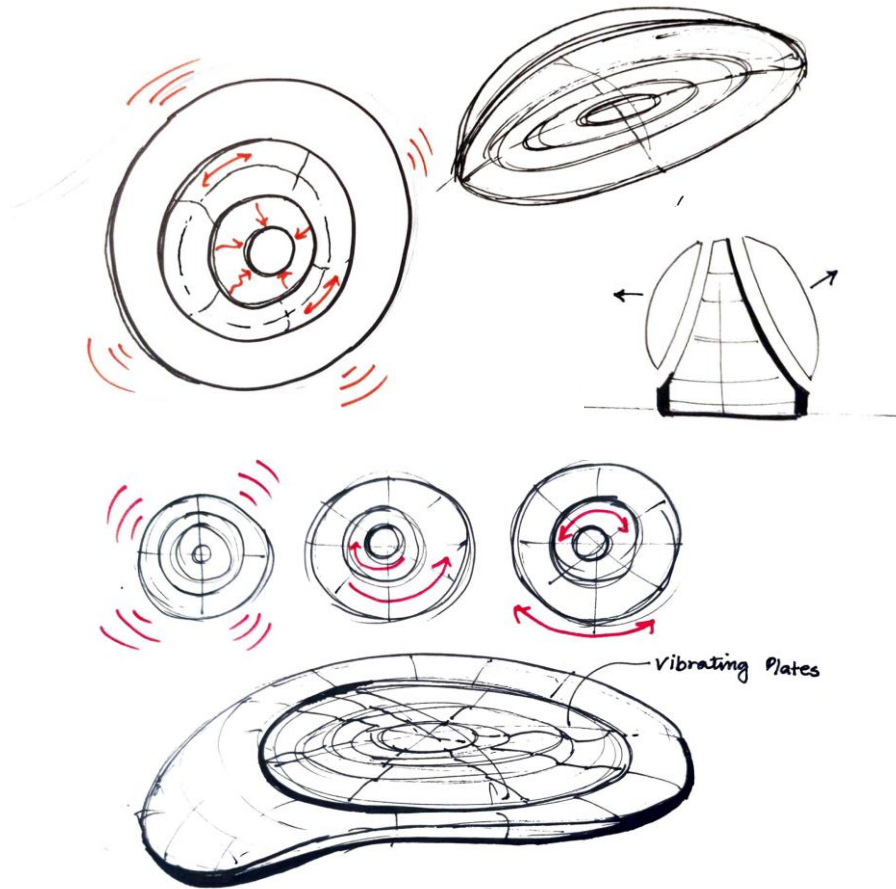
Concept 01



- Silicon pads are convenient to use and require minimal upkeep. They can be easily applied and maintained due to their self-adhesive nature.
- Some pads incorporate rotating bearings or magnets that provide a stimulating massage, promoting circulation and relaxation. They are designed to accommodate different breast sizes, ensuring a comfortable fit.
- Additionally, silicon pads are lightweight and effortless to maintain, making them user-friendly for a variety of individuals

Design development

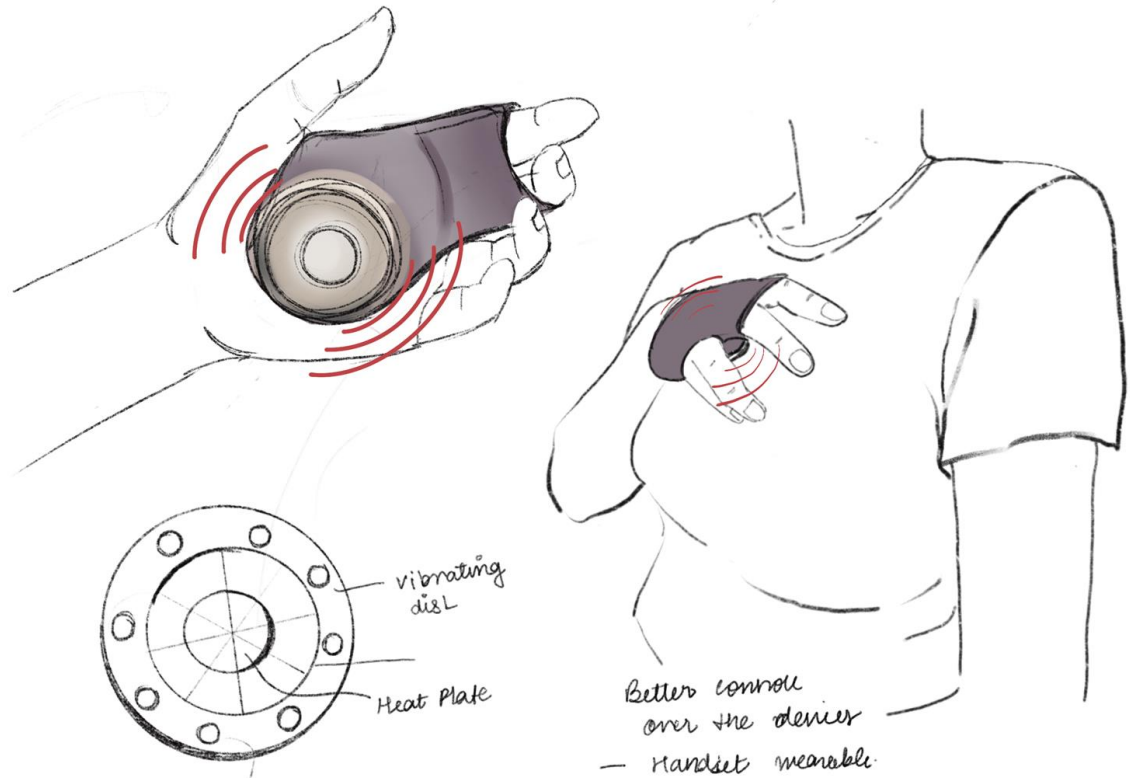
Concept 02



- The disc's universal curve allows for versatile use on both sides of the breasts. Rotating bearings/magnets provide a stimulating massage, promoting circulation and relaxation.
- It is feasible for multiple breast sizes, lightweight, and easy to maintain.
- The included dock enables quick charging and setup, enhancing convenience.

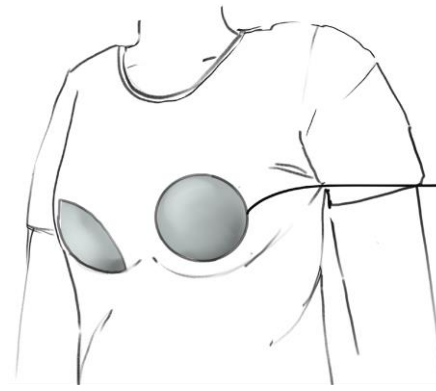
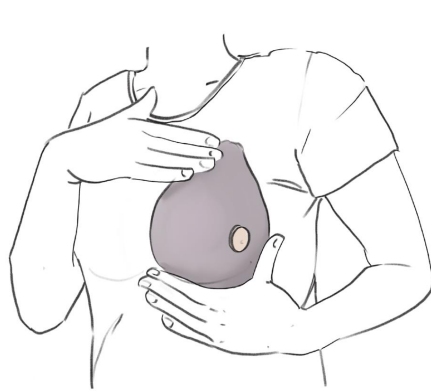
Concept 03

- The rotating bearings or magnets within the wearable sleeve create a unique massage experience. As the sleeve is worn, these components generate gentle vibrations that penetrate the muscles, promoting relaxation and relieving tension.
- The user can easily adjust the pressure to their preference, enhancing the customization of their massage.
- The sleeve's lightweight design ensures comfort and mobility, allowing it to be worn for extended periods without causing discomfort. It requires minimal maintenance, adding to its convenience.
- The included dock provides a quick and easy charging solution, ensuring the sleeve is always ready for use.
- Furthermore, the warming effect generated by the disc and the added vibration feature contribute to a soothing and effective massage session.



Design development

Concept Evaluation



	CONCEPT 01	CONCEPT 02	CONCEPT 03
PORTABILITY	Lightweight and easy to carry	Lightweight and easy to carry Easy to carry and charge	Lightweight and Compact
DURABILITY	Silicon allows material flexibility	Silicon allows material flexibility	Single vibrating device easy to maintain.
OPERATION	Provide handsfree operation No specific provision for milk discharge	Provide handsfree operation Flexible for any curve Not feasible for under bust areas	Provide handset operation Flexible for any pressure
USP	Over all massage and wearable	Spot healing and compact wearable	Allows better control over pressure and intensity using handset

Final Concept

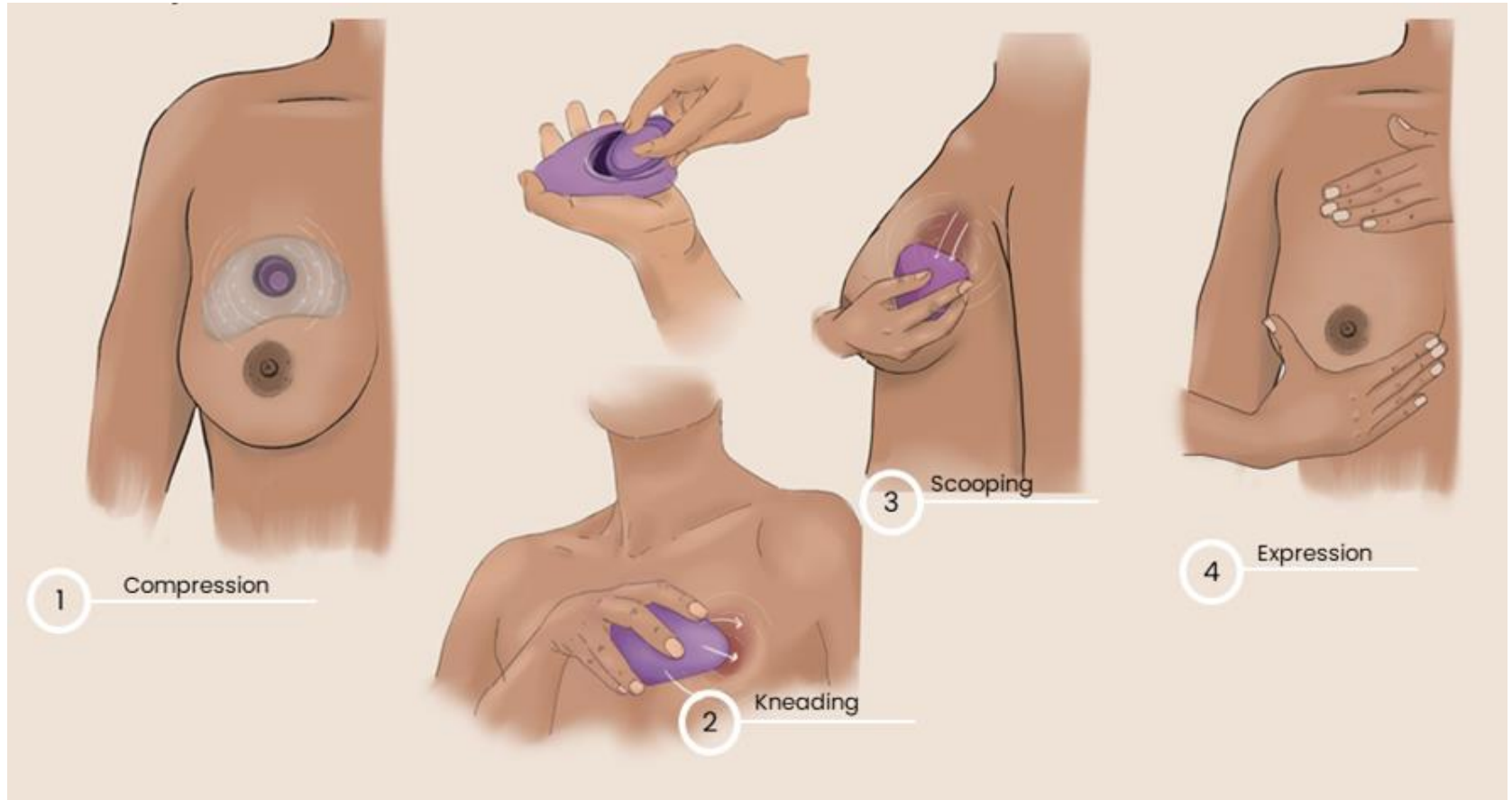
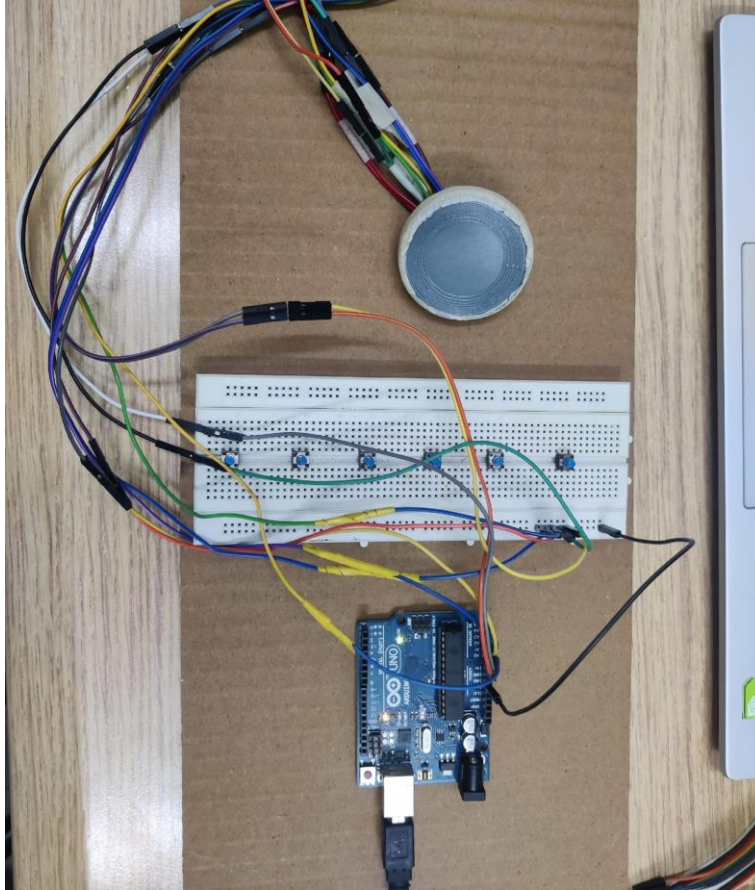


Fig 32. Final concept
Source : Author

Concept Rig



The rig is to imitate the vibrating motion in the circular motion as prescribed by the nurse. The vibration disk along with the wearable patch and handset is demonstrated.

Fig 33. working rig setup
Source : Author

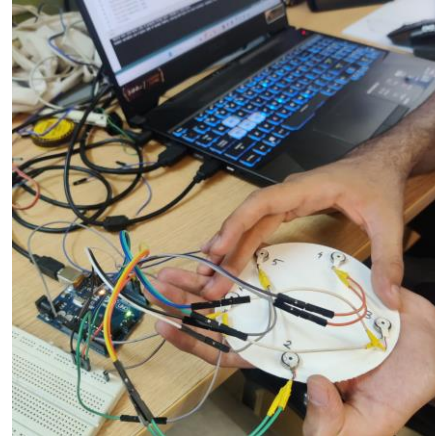


Fig 34. Work in progress

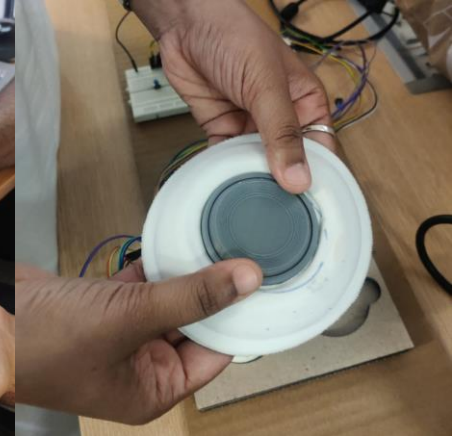


Fig 35. Wearable attachment rig



Fig 36. Device docking rig



Fig 37. Device handset

Form and Ergonomics

The form exploration of different gripping positions for the handset for the device.

Kneading end

Scooping end



Fig 38 Handset form exploration

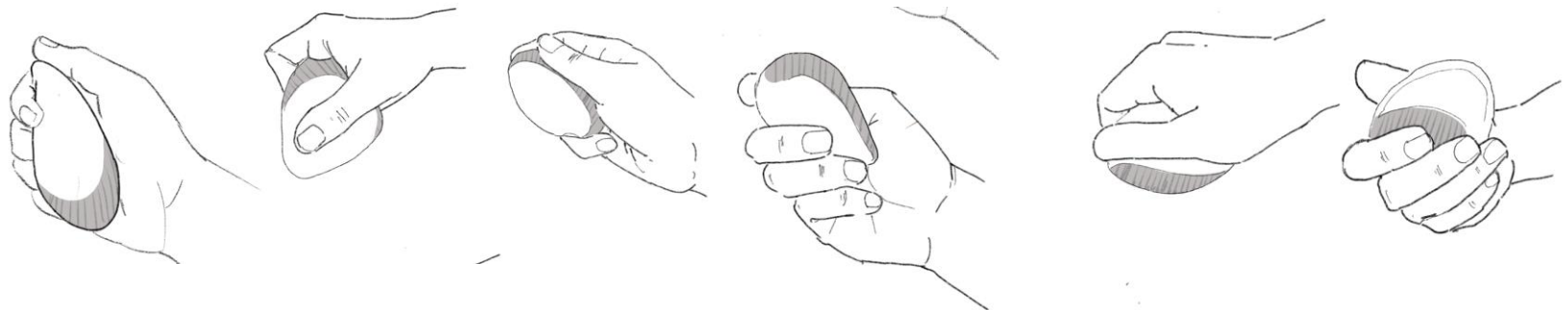


Fig 39 Gripping-positions

The form developed focusing on the he two actions followed after compression. The kneading end and the tapered end for scooping.

Form and Ergonomics



Fig 40. user testing for form exploration

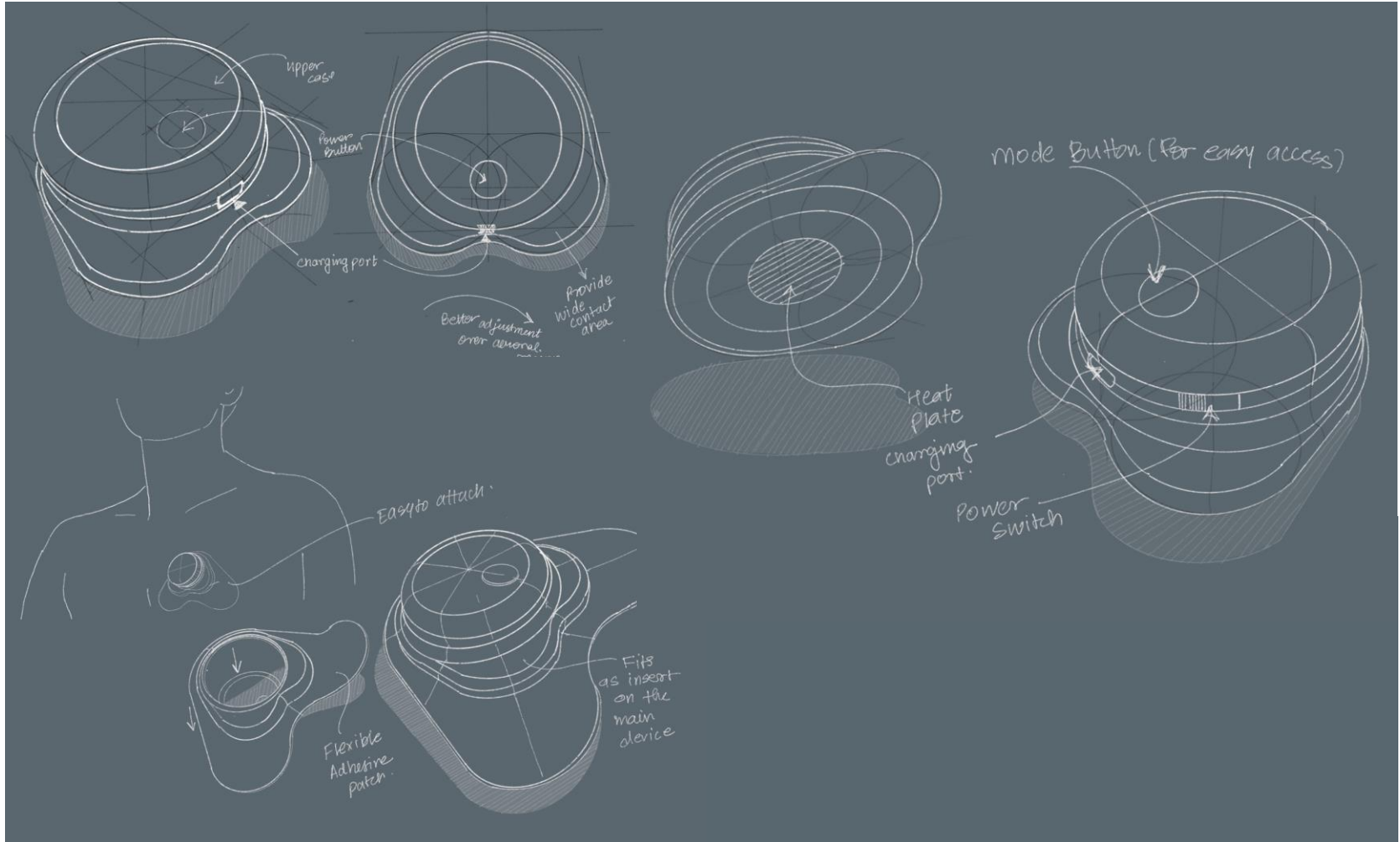
Material study

	ABS	PVC-P	EPDM	SILICON
Material specification	<p>Acrylonitril-butadieën-styreen Mass: Melting point : Amorf. Min. service temp : -45°C Max. service temp : 85°C Density : 1050kg/m³ Thermal exp: 67.5 E-6/k</p>	<p>Polyvinyl chloride Mass: Melting point : Amorf. Min. service temp : -20°C Max. service temp : 42°C Density : 1235kg/m³ Thermal exp: 180 E-6/k Shrinkage : 1.75% Thermal conductivity : 0.14W/mK</p>	<p>Ethylene Propylene Diene M-class rubber Melting point : Amorf. Min. service temp : -54°C Max. service temp : 150°C Density : 1430kg/m³ Thermal exp: 180 E-6/k Shrinkage : 1.75% Thermal conductivity : 0.26W/mK</p>	<p>Melting point : Amorf. Min. service temp : -54.67°C Max. service temp : 560°C Density : 2334kg/m³ Thermal exp: 250 E-6/k Thermal conductivity : 0.26W/mK</p>
CMF	<p>Opaque Yellowish-white color Multi-color dye High surface gloss Scratch Resistance High Charpy & Impact resistance</p>	<p>Opaque White or transparent Multi-color dye Matte finish or gloss surface</p>	<p>Opaque White or colorless Multi-color dye Matte finish</p>	<p>Opaque White or transparent Multi-color dye Matte finish or gloss surface</p>
Process of manufacturing	<p>Injection moulding Adhesive: Solvent glues or 2-k glues. Welding : PMMA Printable surface: Tampon, film, silk screen printing Metal Plating: Nickel, copper, chromium</p>	<p>PVC can be processed as a thermoplastic Injection moulded can easily be welded and glued</p>		

Chapter 09 : Product Development

Product development

Final form development



Product Development - Prototype

Evolution of form

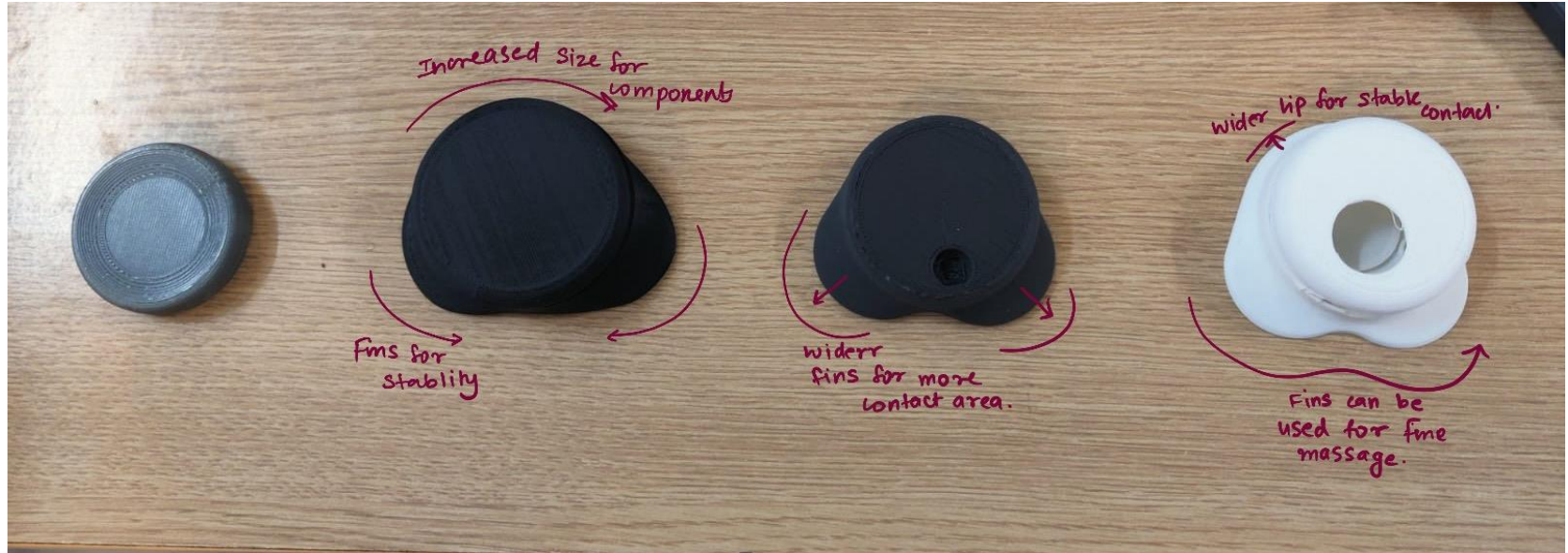


Fig 47. Evolution of form

The initial concept rig for the vibrating device.

The form iterate through the reviews of the users. The circular disk was relatively small to contain the technical components. The fins were added to provide stability to the device while active.

In the further iteration, the fins are fine tuned and made a little wider to increase the contact area on the skin.

The fins are evolved to provide micro massage to the sensitive regions like areola.

Product development

Electrical Circuit

Sr.No	List of Component	POC
1	Vibrating coin Motors	
2	Transistors (NPN type)	
3	Ceramic heat plate	NA
4	Micro Processor	Arduino Micro pro
5	Charging Unit	Generic
6	Li-Po Battery	3.7V 500mAh
7	Slide switch	
8	Tactile push button	

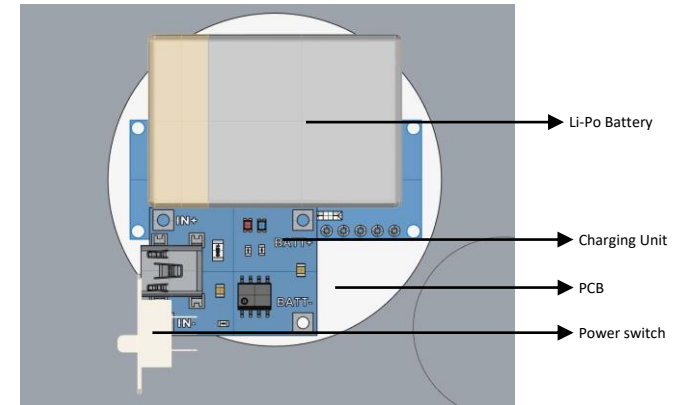


Fig 41. plan of POC circuit

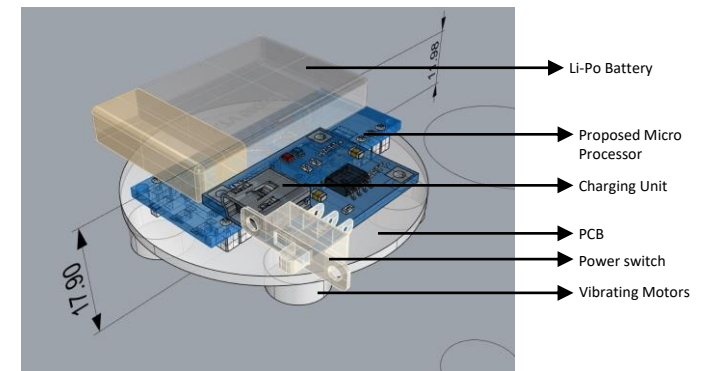


Fig 42. Exploded view of POC circuit

Product development

Electrical Circuit

Initial schematic rig is further converted to the proof of concept. The development of the circuit , process code and hardware built were developed on the basis of final concept.



Fig 43. PCB development

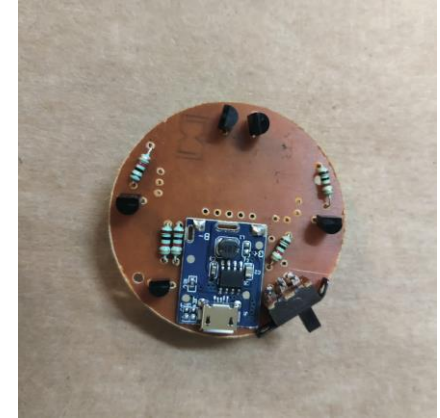


Fig 44. PCB preliminary assembly



Fig 45. PCB top view



Fig 46. PCB bottom view

The POC was guided by a fellow peer Prince Agrawal

Product Development - Prototype

Silicon casting

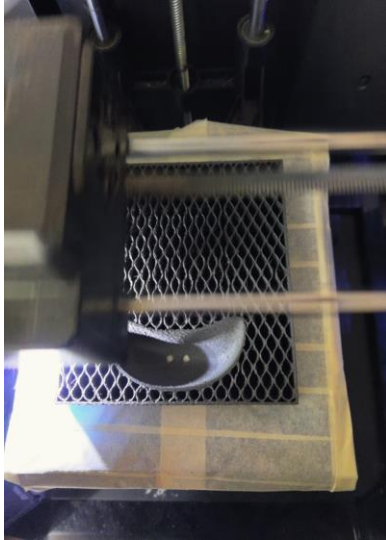


Fig 48. Printing the mold

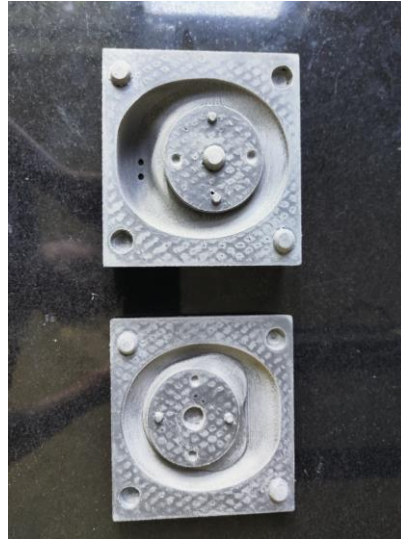


Fig 49. Preparing the mold



Fig 50. Injecting the silicon mixture



Fig 51. Setting the cast



Fig 52. Demolding the cast

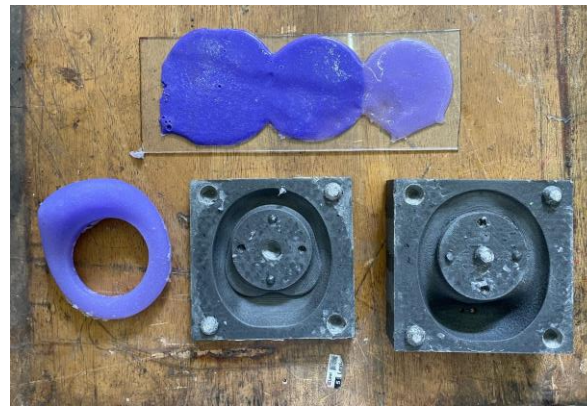
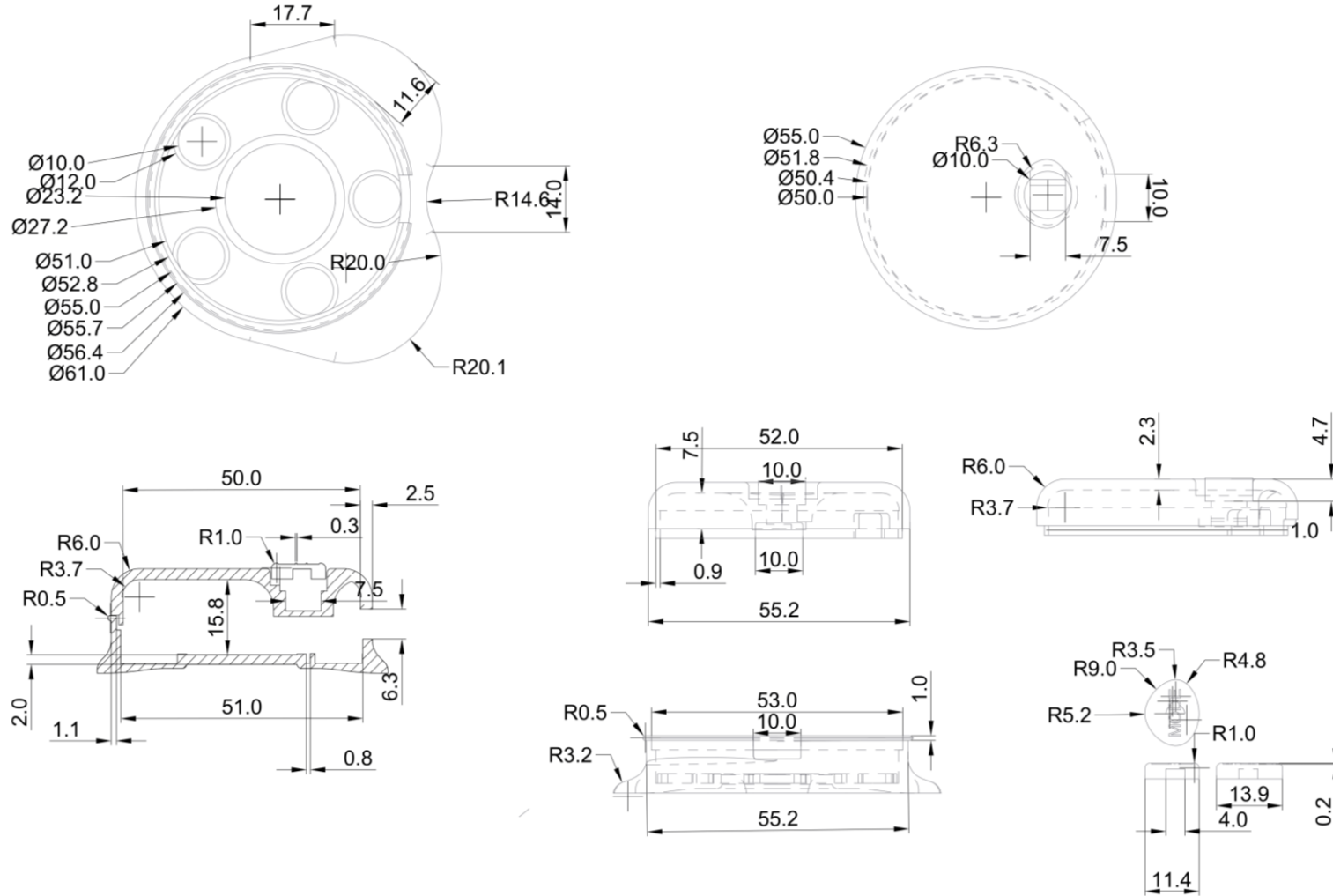


Fig 53. Final output

Product Development –technical drawings

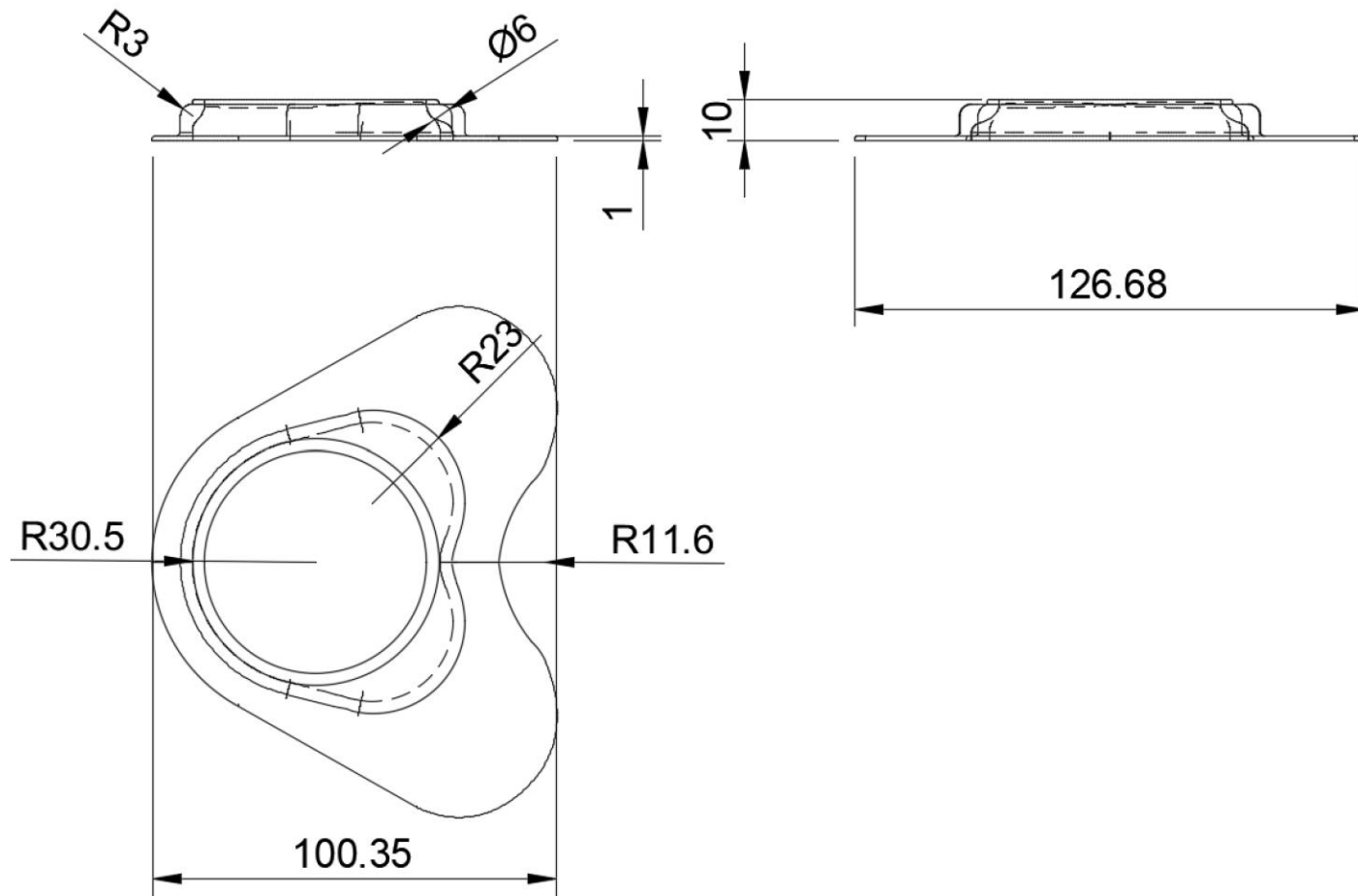
Device case details



Note : All the drawings are N.T.S.

Product Development –technical drawings

Device patch details



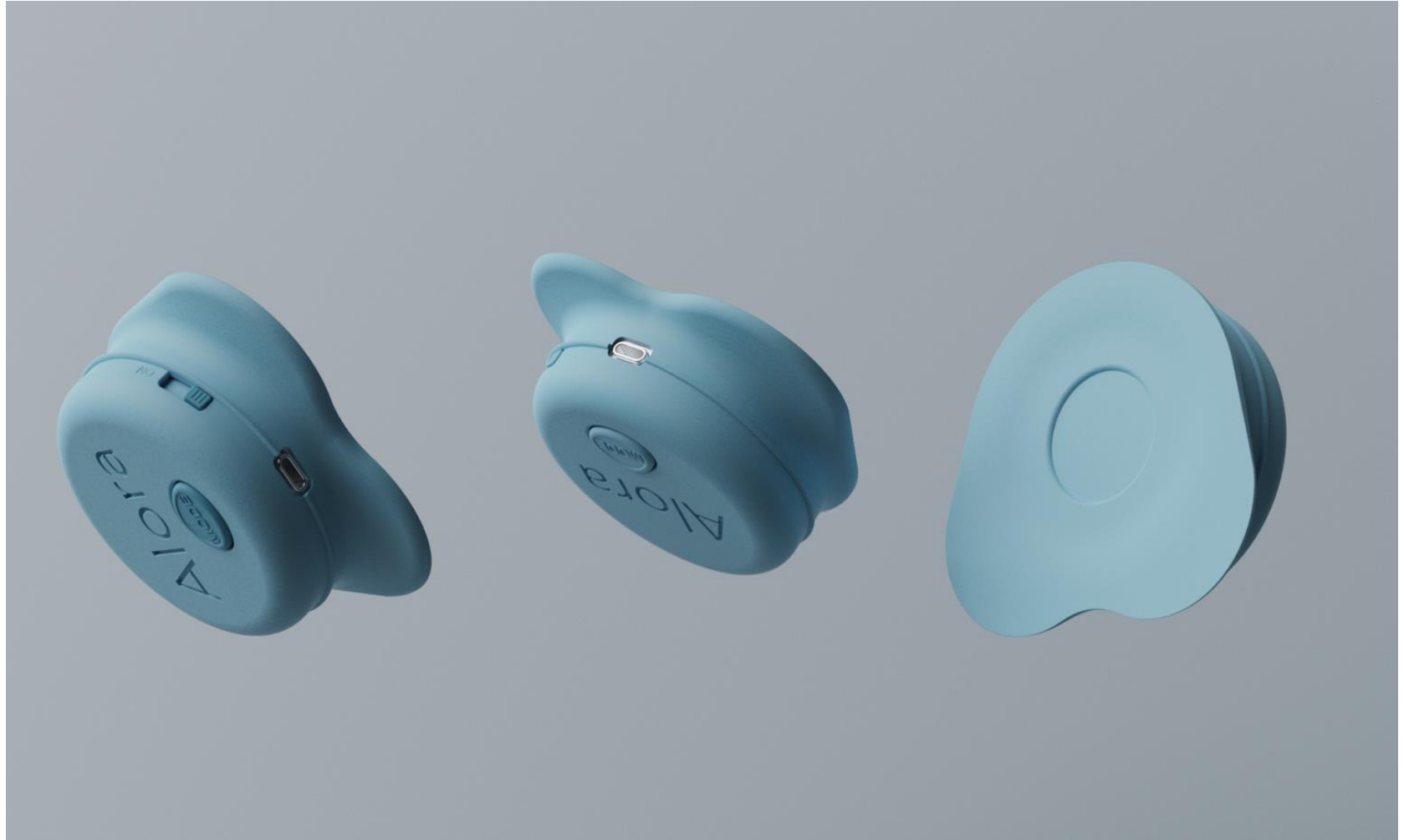
Note : All the drawings are N.T.S.

Product visualisation



Product Visualisation

Overall form



Product Visualisation

Silicon casing



Chapter 10 : Challenges and Learning

The project started off with an intent of addressing the glory of mothers multitasking along with raising their child. The women go through various stages of life of which mother is being the most rigorous one. The objective of the project was to help women address and resolve some of the issue faced by women in their motherhood journey. There are certain taboos and inconvenience faced by new mothers during pregnancy and post partum.

Further in the process, I realized there is a huge gap in guidance and self care of women in post partum, in terms of communication and product. There are certain discomforting issues that has to brought to limelight. Understanding the Indian context, there is always someone to assist the new mother. But in the period of assistance is very subjective and oriented towards the infant care. Women goes through transformation continuously for over an year until they adapt the motherhood, which barely talked about.

Last decade parents have become more cautious about the child care which have boomed the childcare product market. And recent time women are more encouraged to take self care, given they are more financially independent and aware. But the market has limited products catering the needs which gave me niche to introduce my design.

Chapter 11 : Miscellaneous

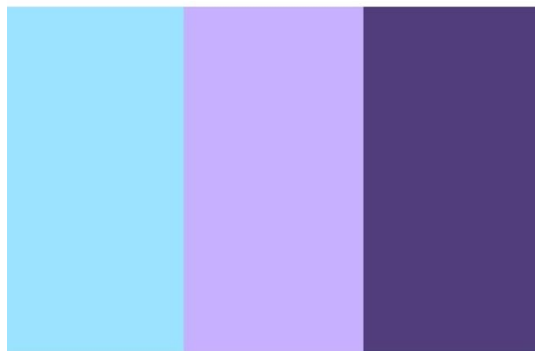
Miscellaneous

Brand Identity

Product name : **Alora**
Product type : Lactation massager
Parent Brand name : Love & nurture
Tag line : "Embrace motherhood with care"
Product range: Mother and Baby care products (electronic devices)
Brand value : **Calmness, feminine, support, empowerment, trust**

Aa Aa

PP Charlevoix
Diphylleia Regular



#9CE3FF

#C7B0FF

#503E7C



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