

Market Investigation Study of Surfactant Therapies in Neonates in Bangalore City of India

By

Shivam Parkash

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

Academic year, 2017-2019



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TO WHOMSOEVER MAY CONCERN

This is to certify that **Shivam Parkash**, student of MBA Pharmaceutical Management from The IIHMR University, Jaipur has undergone internship training at **Bharat Serums and Vaccines Limited** from **4th February 2019 to 4th May, 2019**.

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.

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Date 12th May 2019

Bharat Serums and Vaccines Pvt. Ltd.

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

We wish him all the best for future endeavors.

For Bharat Serums and Vaccines Limited,

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This is to certify that the dissertation titled **“Market assessment and investigational study of different surfactant therapies in neonates in Bangalore (KA)”** and submitted by **Shivam Parkash** Enrollment No **IIHMR-U/01/2017-19/0122** under the supervision of **Dr Saurabh Banerjee** for award of MBA in Hospital and Health in The IIHMR University carried out during the period from 4th February 2019 to 4th May 2019 embodies my original work and has not formed the basis for the award of any degree, diploma associate ship, fellowship, titles in this or any other institute or other similar institution of higher learning.



Shivam Parkash

ABSTRACT

Title of Report: Market Investigation Study of Surfactant Therapies in Neonates in Bangalore City of India.

Mentor: Mr. Rakesh Srivastava, General Manager, Bharat Serums & Vaccines Limited, Mumbai

Name of the Student: Shivam Parkash

Background – Respiratory trouble disorder (RDS) is seen essentially in preterm newborn children because of an insufficiency of surfactant in the lungs. Regularly likewise called hyaline film malady, which more precisely is a histological finding. Almost 30% of neonates—7.5 million—are brought into the world with an LBW (<2500 g) in India. RDS is seen in preterm babies, nonetheless, 6.4% to 7.8% of cases with RDS are analyzed in newborn children conceived at ≥ 37 weeks' growth, many being conveyed by cesarean segment. Among preterm newborn children, the occurrence shifts with development with expanding rate with diminishing growths. Babies of moms with diabetes are likewise at expanded danger of creating RDS. Respiratory Distress Syndrome (RDS) is seen in untimely babies (<37weeks). Surfactants generation is inadequate because of the youthful advancement of sort II Pneumocytes, which start to be delivered Surfactant at roughly 22-23 weeks growth. Lacking surfactant prompts diminished pneumonic consistence and expanded surface strain. It is expected, to inadequacy of aspiratory surfactant and is primarily restricted to preterm babies. Poor Oxygen supply to the body due to damage of Lungs (Alveoli).Which result to increase the Mortality rate, Infections and Permanent Neurodevelopment Handicap. So, with the help of this study we can find out the market potential of Surfactant brands in Bangalore city of Karnataka.

Key words: RDS (Respiratory Distress Syndrome), Surfactants, Neonates.

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I would also like to acknowledge **Dr. Saurabh Banerjee (Associate Professor)**, my guide from IIHMR University, Jaipur. I am gratefully indebted to him for his very valuable comments on this project.

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Introduction

Neonatal respiratory misery disorder (NRDS), also called hyaline layer illness (HMD), is a state of expanding respiratory distress, initiating at or soon after birth and expanding in seriousness until dynamic goals happens among the survivors, more often than not between the second and fourth day. About 1% of every single baby are influenced with this condition. It is expected, in any event partially, to inadequacy of aspiratory surfactant and is essentially bound to preterm newborn children.

NRDS is manifested by respiratory distress (cyanosis, tachypnoea, grunting, and recession) and respiratory failure is diagnosed by blood gas analysis. Oedema is frequently seen on the second day due to fluid retention and capillary leak. The diagnosis can be confirmed by an X-ray showing ground glass appearance and air bronchograms, although these radiological features are not pathognomonic of NRDS.

Action of Surfactant

Surfactant prevents atelectasis and edema, by decreasing interfacial surface tension. Thus, its role is instrumental in maintaining gas exchange and decreasing the work of breathing. Furthermore, surfactant serves as a lubricant in protecting the airways and promoting mucociliary transport.

The need for supplementary oxygen and mechanical ventilation decreases in patients receiving surfactant. Furthermore, the incidence of pneumothorax and pulmonary interstitial emphysema (PIE) is decreased by 50-80%. Analysis of all randomized trials indicates that surfactant supplementation decreases neonatal mortality by about 33% and increases survival without chronic lung disease by about 17%. Surfactant therapy has become a routine treatment for neonates with severe NRDS. Some clinicians advocate prophylactic surfactant at birth for small neonates born at less than 30 weeks of gestation, who are at high risk of developing NRDS.

Mechanism of Action

Surfactant reduces surface tension at the interface between the alveolar air and the membrane. Surfactant molecules are amphipathic. They have a hydrophilic head (water loving) and a hydrophobic (water-hating) tail. The most energetically favorable conformation for them is to lie with the hydrophilic head immersed in water and the hydrophobic tails safely removed from water, exposed to air. Surfactant molecules adsorb

at the air-fluid interface and reduce the surface tension. Thus, surfactant prevents atelectasis and edema, improves gas exchange and decreases the work of breathing.

Exogenous Surfactants

In case of surfactant deficiency as seen in neonates, particularly those born prematurely, surfactant supplementation becomes necessary. The desirable properties of any exogenous surfactant are efficacy and safety. Others include minimal immunogenicity, minimal batch to batch variability, good resistance against biodegradation and availability at reasonable cost.

Types of Exogenous Surfactants

- Natural Surfactant: Animal-derived lung lipid extracts or lung lavage extracts from porcine or bovine lungs are naturally occurring surfactants.
- Modified natural surfactants: These are essentially lung lipid extracts supplemented with phospholipid or other components.
- Human surfactant: This is isolated from amniotic fluid from full-term foetuses.
- Synthetic Surfactant: These do not contain proteins. Synthetic surfactants containing recombinant proteins or synthetic peptides are yet to be evaluated clinically.

Pharmacokinetic Profile

Endogenous and exogenous surfactants have similar clearance and catabolic pathways in the ELF. Within the ELF, the surfactant undergoes transition from a large aggregate form (lamellar bodies and tubular myelin) to a smaller vesicular form that has no surface activity and that is cleared from the ELF. Type 2 alveolar cells are a major site for the clearance and catabolism of surfactant. Only small quantities of exogenous and endogenous surfactant (3-7%) are cleared by the airways and some surfactant (10-30%) is taken up by alveolar macrophages. In type 2 cells, some exogenous surfactant is incorporated in lamellar bodies and secreted back to the ELF as intact molecules (recycling). Administration of surfactant into the airways is associated with the following phenomena.

First, there is rapid distribution of exogenous surfactant throughout patent airways and airspaces. During the next 1 to 2 hours, the amount of exogenous surfactant that can be lavage from the airways decreases rapidly, because the surfactant complex is associated

with lung parenchyma. Thereafter, surfactant flux from the ELF to the lung parenchyma continues at a rapid rate. However, the epithelial uptake of surfactant is balanced by surfactant secretion into the ELF.

Components of surfactant may be quantified based on a reference compound, such as sphingomyelin or protein. The most often used index is the saturated phosphatidylcholine to sphingomyelin (L/S) ratio.

Objectives

- To estimate the market value and market volume of Surfactant brands in Bangalore (Karnataka).
- To determine the market drivers and challenges for Surfactant.
- To study the competitor landscape of Surfactant brands in Bangalore (Karnataka).

Literature Review

Gallacher DJ, Hart K, Kotecha S. Common respiratory conditions of the newborn. *Breathe* 2016; 12: 30-42.

As indicated by this examination, Respiratory misery is seen in 6%-7% of babies, the most astounding incidence being among preterm neonates, followed by post-term and term newborn children. It is as of late discovered that the rate of NRDS in late preterm babies has an expanding pattern, which represents almost 33% of kids with NRDS.

Jian Wang, Xuehua Liu, Tong Zhu, Chaoying Yan. Analysis of neonatal respiratory distress syndrome among different gestational segments. *Int J Clin Exp Med* 2015;8(9):16273-16279

In this Study author states that the first hours and days of life are of crucial importance for the newborn infant as the infant adapts to the extra-uterine environment. The baby is helpless against a scope of respiratory maladies, numerous special to this time of early life as the creating liquid filled fetal lungs adjust to the extrauterine condition. The clinical indications of respiratory pain are imperative to perceive and additionally explore, to distinguish the fundamental reason.

Proquitté H¹, Dushe T, Hammer H, Rüdiger M, Schmalisch G, Wauer RR.

Through this study, Natural surfactants have been demonstrated to be better than engineered surfactants in the treatment of neonatal respiratory trouble disorder (RDS). In Germany, Alveofact (An) and Curosurf (C) are the most every now and again utilized **No table of figures entries found.**common surfactant arrangements. The point of this review, observational investigation was to analyze the distinctive surfactant treatments and result in untimely newborn children.

Research Problem

Respiratory trouble disorder (RDS) is seen essentially in preterm newborn children because of an insufficiency of surfactant in the lungs. Regularly likewise called hyaline film malady, which more precisely is a histological finding. Almost 30% of neonates—7.5 million—are brought into the world with an LBW (<2500 g) in India. RDS is seen in preterm babies, nonetheless, 6.4% to 7.8% of cases with RDS are analyzed in newborn children conceived at ≥ 37 weeks' growth, many being conveyed by cesarean segment. Among preterm newborn children, the occurrence shifts with development with expanding rate with diminishing growths. Babies of moms with diabetes are likewise at expanded danger of creating RDS. Respiratory Distress Syndrome (RDS) is seen in untimely babies (<37 weeks). Surfactants generation is inadequate because of the youthful advancement of sort II Pneumocytes, which start to be delivered Surfactant at roughly 22-23 weeks growth. Lacking surfactant prompts diminished pneumonic consistence and expanded surface strain. It is expected, to inadequacy of aspiratory surfactant and is primarily restricted to preterm babies. Poor Oxygen supply to the body due to damage of Lungs (Alveoli). Which result to increase the Mortality rate, Infections and Permanent Neurodevelopment Handicap. So, with the help of this study we can find out the market potential of Surfactant brands in Bangalore city of Karnataka.

Methodology

Research Plan:

- **Research Design:** Non-Probability (convenience Sampling).
- **Data Source:** Primary and secondary research
- **Data collection technique:** Survey
- **Data collection tool:** Researcher administered Semi structured questionnaire.

Sample Design:

- **Target population:** NICU Hospitals and Pharmacy
- **Sampling method:** Non-probability convenience sampling
- **Sample size:** 100 Prescribers and 50 Hospital Pharmacist (at 95% Confidence Interval and 8% Margin of error).
- **Study Location:** Major city of India
- **Duration of Study:** 3 Months.
- **Data Analysis Techniques:** The findings and the information's collected and compiled, analyzed on Microsoft Excel and SPSS.

Results, Analysis, and Discussion

Market Volume and Market Value of Surfactants

The market volume and value were calculated through secondary and using the retail based model.

Retailer Based Model: As referred in Neonatology Society of Karnataka and NEOCON 2018; there are about 50-55 hospital pharmacy stores in the city and therefore an average number of Pharmacies was calculated as 50 and used in the Calculations. The primary research provided the values for weekly sales, Average selling prices and number of prescriptions. The combined research data was used to calculate the Market volume And Market value of the individual surfactant existing in the market. The results are depicted in figure No.1

SAURFACTANT	No. of Pharmacy	No. of Prescriptions	Vials/Month	ASP(INR)	Market Volume	Market Value (INR)
SURVANTA 4ML	50	150	420	7500	15000	1125000
ALVEOFACT 1.2ML	50	45	178	3500	4500	157500
CUROSURF 1.5ML	50	35	53	6600	3500	231000
NEOSURF 3ML	50	32	48	4200	3200	134400
Total					26200	1647900

Table 1. Market Volume and Market Value of Surfactants

Comparison of Market Volume of different Surfactant:

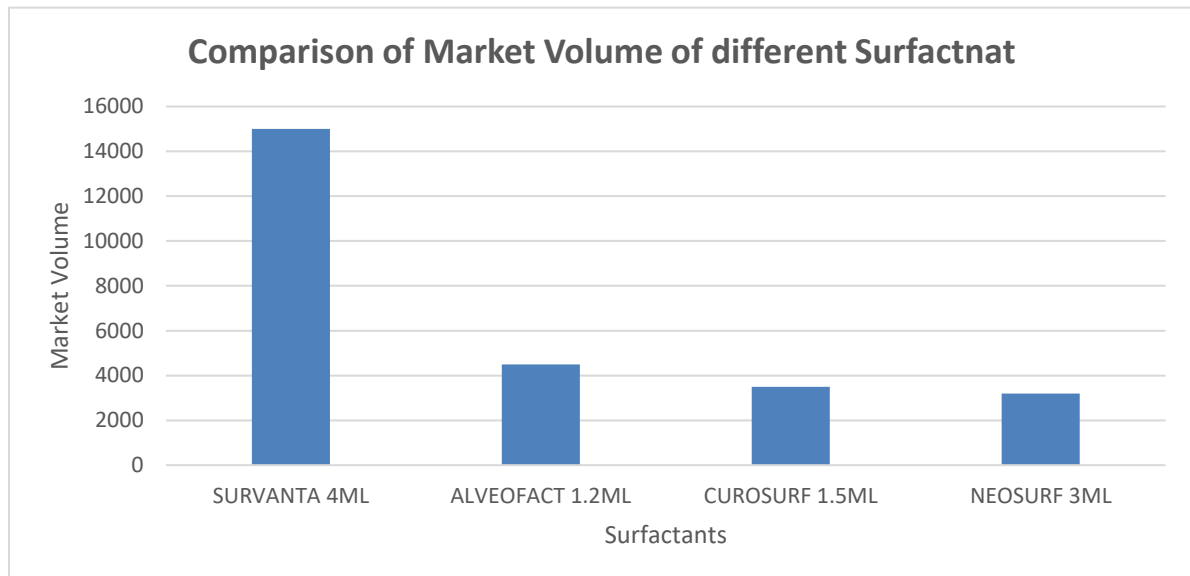


Figure 1. Market Volume

The primary research revealed the most prescribe Surfactant in NRDS was Survanta followed by Alveofact, Curosurf, Neosurf. Figure1

1. Comparison of Market Volume of different Surfactant:

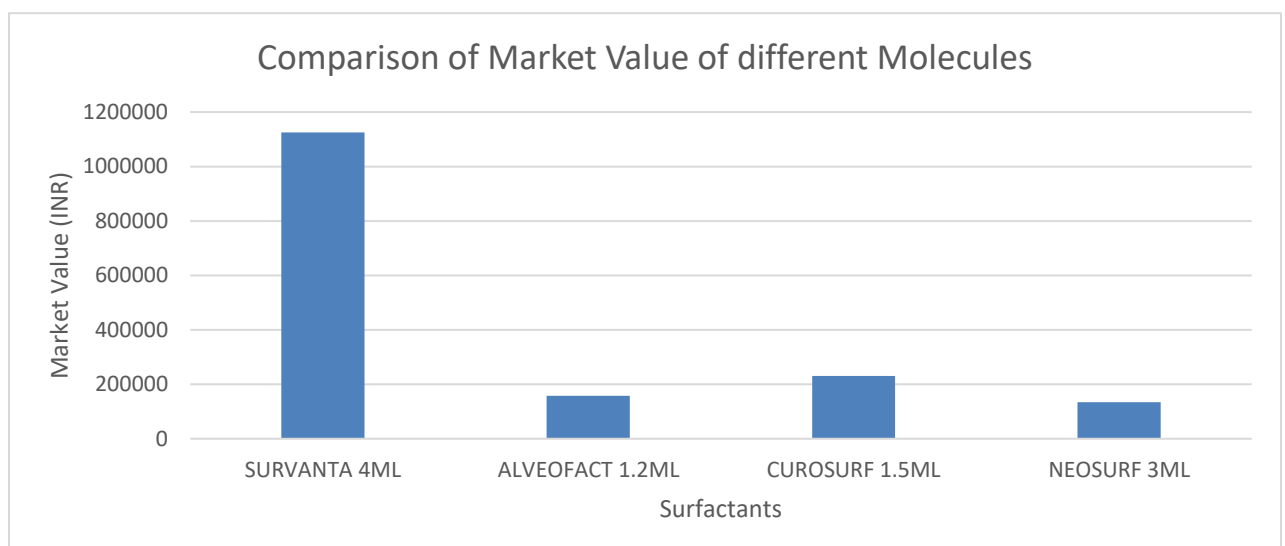


Figure 2. Market Volume of different Surfactant Brands

Survanta appeared to occupy major value share followed by Curosurf, Alveofact and Neosurf. Figure2.

Distribution of Different dosage Strengths of Surfactants:

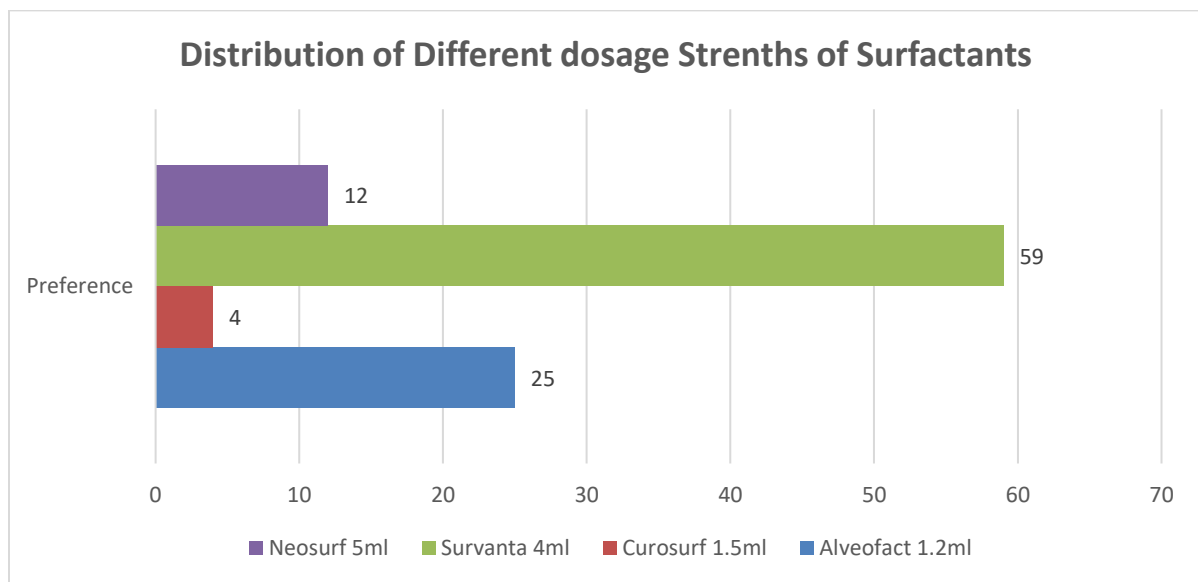


Figure 3. Distribution of Different dosage Strengths of Surfactants Brands

Figure 3 shows the prescription share occupied by different dose strengths within individual Surfactant. The highly prescribed strengths for individual molecules is 4 ml Surfactant, 1.2ml Alveofact, 5 ml Neosurf, 1.5 ml Curosurf.

Surfactant Market Overview with top selling Brands:

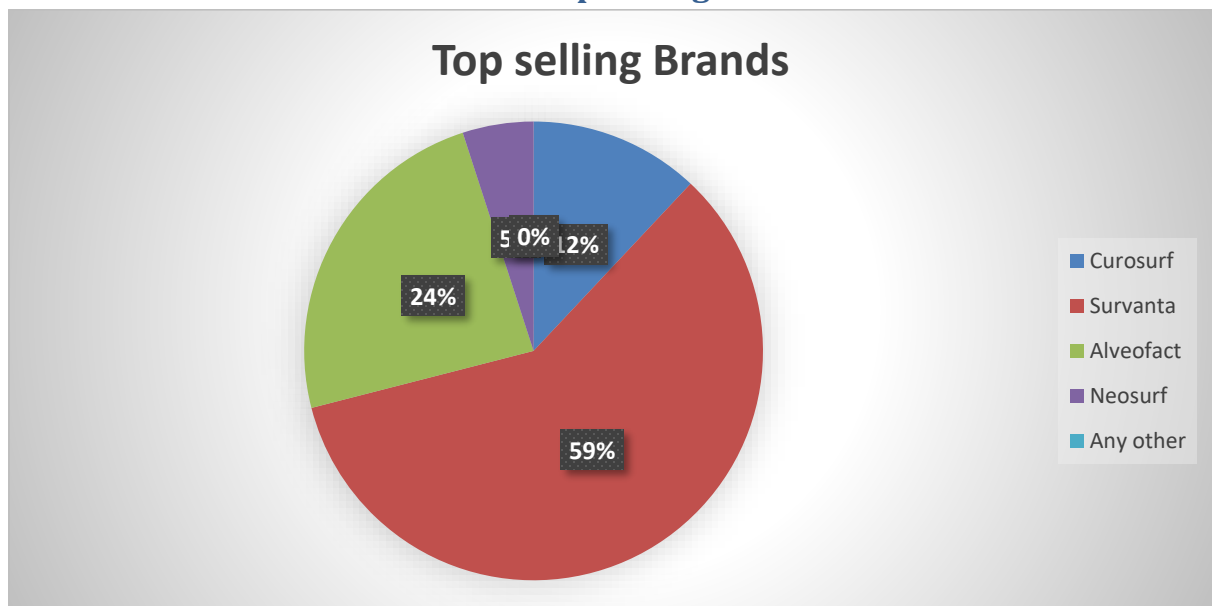


Figure 3. Trends observed in the prescription frequency and Selling Prices

Figure 3 depicts that the top 2 brands of Surfactants occupy about 24% and 59% share of the respective Market. The competition among brands for other molecules was quite defined with limited brands occupying a significant market share.

Reasons for availability of Brands present in the Market:

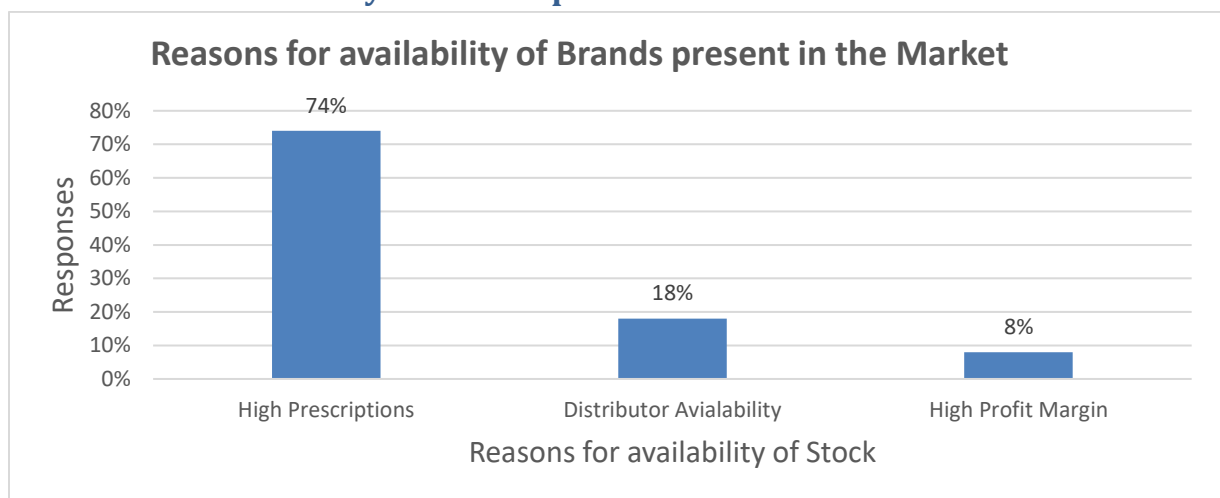


Figure 4. Reasons for availability of Brands present in the Market

About 74% of the respondents said that High prescription inflow was the main reason for them to keep availability of the major brands, and nearly 18% respondents said that the availability of the distributors was the reason to make these brands available at their stores, while only 8% participants agreed that they kept these brands at their stores due to high profit margins they provided.

2. Surfactants Market Landscape:

Surfactants Market Landscape			
Surfactants	Natural Surfactant	Modified natural surfactants	Synthetic Surfactant
Average monthly Sales (Qty)	162	423	0
	27.69 %	72.31 %	0.00 %
Highly prescribed Brands	Alveofact	Survanta	Surfaxin
	Neosurf		
	Curosuf		

Table 2. Market Landscape

Discussion:

The market estimation of Surfactants in the city was evaluated to be Rs. 16,47,900 at market volume of 26,200. The Surfactant advertise was found to involve 27.69 % normal surfactant and 72.31 % altered common surfactants. The Natural Surfactant advertise was separated into Alveofact, Neosurf and Curosuf. High medicine inflow and value factor (after DPCO) was a main factor in accessibility of explicit Brands in the market. As indicated by the essential members, the rate of solution has been expanded over the past while the normal selling cost has diminished. This might be a direct result of high challenge among items and intercession of Regulatory bodies about the valuing strategy (DPCO).

Conclusion& Recommendation:

Almost all the neonatologist prefer surfactant for the treatment of RDS. Natural surfactant have shown to have a better prognosis than synthetic surfactants.

The intraventricular hemorrhage, pneumothorax and rate of bronchopulmonary dysplasia were similar among patients treated with Alveofact, Curosurf and Survanta. The doctors preferred brand for the treatment of neonatal respiratory distress in preterm baby is Survanta because of high margin on Survanta in hospital pharmacy and well-established medicine brand for the treatment of NRDS patients.

There is another reason of doctors to prefer Survanta is pre-filled suspension vial. Survanta is in suspension form and no need to make suspension as in Alveofact before injecting to baby.

The adjusted common surfactants possess about 72% of Surfactant showcase in the city however their market has been radically affected by consistently diminishing costs after the mediation of DPCO. Survanta is profoundly recommended, however its market is additionally affected by the characteristic surfactant. For New participants, the market gives off an impression of being very testing because of set up client faithfulness by Older brands. The Market infiltration techniques could be connected so as to expand Market share. Deals power assumes a noteworthy job in the solution age in such aggressive markets.

Limitations:

The sample size was less. Study was conducted only in one city. Study depicts only the current data and not the forecast.

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