

Product-Market Strategy and Performance: An Analysis of D-up (Cholecalciferol) in New Delhi

By

Hemant Chandwani

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

Academic year, 2015-2017



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TO WHOMSOEVER MAY CONCERN

This is to certify that Mr. Hemant Chandwani of MBA Pharmaceutical Management from The IIHMR University, Jaipur has undergone internship training at Seagull Pharmaceuticals Private Limited, Delhi from 10th February, 2017 to 10th May, 2017.

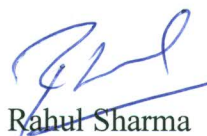
The Candidate has successfully carried out the study designated to him during internship training and his approach to the study has been sincere, scientific and analytical.

The Internship is in fulfillment of the course requirements.

I wish him all success in all his future endeavors.



(Col.) Dr. Ashok Kaushik
Dean, Academics and Student Affairs
The IIHMR University, Jaipur



Mr. Rahul Sharma
Assistant Professor
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Appendix E

The certificate is awarded to

Mr. Hemant Chandwani

In recognition of having successfully completed his/her
Internship in the department of

P M T

and has successfully completed his/her Project on

**Product-Market Strategy and Performance: An Analysis of D-up
(Cholecalciferol) in Delhi from**

10th FEB'2017- 10th MAY'2017

in Seagull Pharmaceuticals Pvt. Ltd.

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

We wish him/her all the best for future endeavors

A handwritten signature in blue ink, appearing to read "Shruti", is written over the printed name of the Personnel Executive.

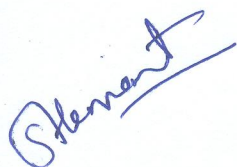
Personnel Executive

Original Literary Work Declaration

THE IIHMR UNIVERSITY, JAIPUR

CERTIFICATE BY SCHOLAR

This is to certify that the dissertation titled "*Product-market Strategy and Performance: An Analysis of D-up (Cholecalciferol) in New Delhi*" and submitted by **HEMANT CHANDWANI**, Enrollment No: **IIHMR-U/02/2015-17/0037**, under the supervision of **Mr. Rahul Sharma** for award of (MBA in Pharmaceutical Management) Postgraduate in Pharmaceutical of the University carried out during the period from **10th February, 2017** to **10th May, 2017** 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.



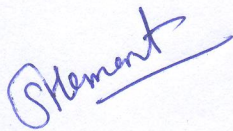
HEMANT CHANDWANI
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Certificate of Ethical Clearance

THE IIMR UNIVERSITY, JAIPUR

CERTIFICATE BY SCHOLAR

This is to certify that all ethical issues have been considered while collecting data for my dissertation titled **"Product-market Strategy and Performance: An Analysis of D-up (Cholecalciferol) in New Delhi"**



HEMANT CHANDWANI
Signature of student

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Product-market Strategy and Performance: An Analysis of D-up (Cholecalciferol) in New Delhi

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Abstract:

Cholecalciferol commonly known as Vitamin D3 is essential for human body and vital for normal functioning of organs also known as calcium transporter. D-up product of seagull Pharma launched in the year 2014 in granules form, sachets, Drops and Injectable.

This study is conducted to understand the market of Cholecalciferol and important parameters which help the prescriber to be reminded of the brand before prescribing.

Objectives:

- To identify the market scenario of Cholecalciferol
- To analyze the prescription pattern of Cholecalciferol
- To determine highest sales volume & stock of Cholecalciferol
- To investigate the factors responsible for Prescribing Cholecalciferol

Methodology

The Study was descriptive. The primary data has been collected by using semi-structured questionnaire from physicians and pharmacist, secondary data for this project was gathered through different dependable articles and research reports and data available in PMT Department. Sample size was 133.

Conclusion

Factors affects the prescription pattern of Cholecalciferol such as 71% of doctors says Price is an important parameter and 45.83% of doctors says solubility also because many Cholecalciferol products are less soluble. But in doctor's chamber information shared and communicating the required information is necessary.

Keywords:

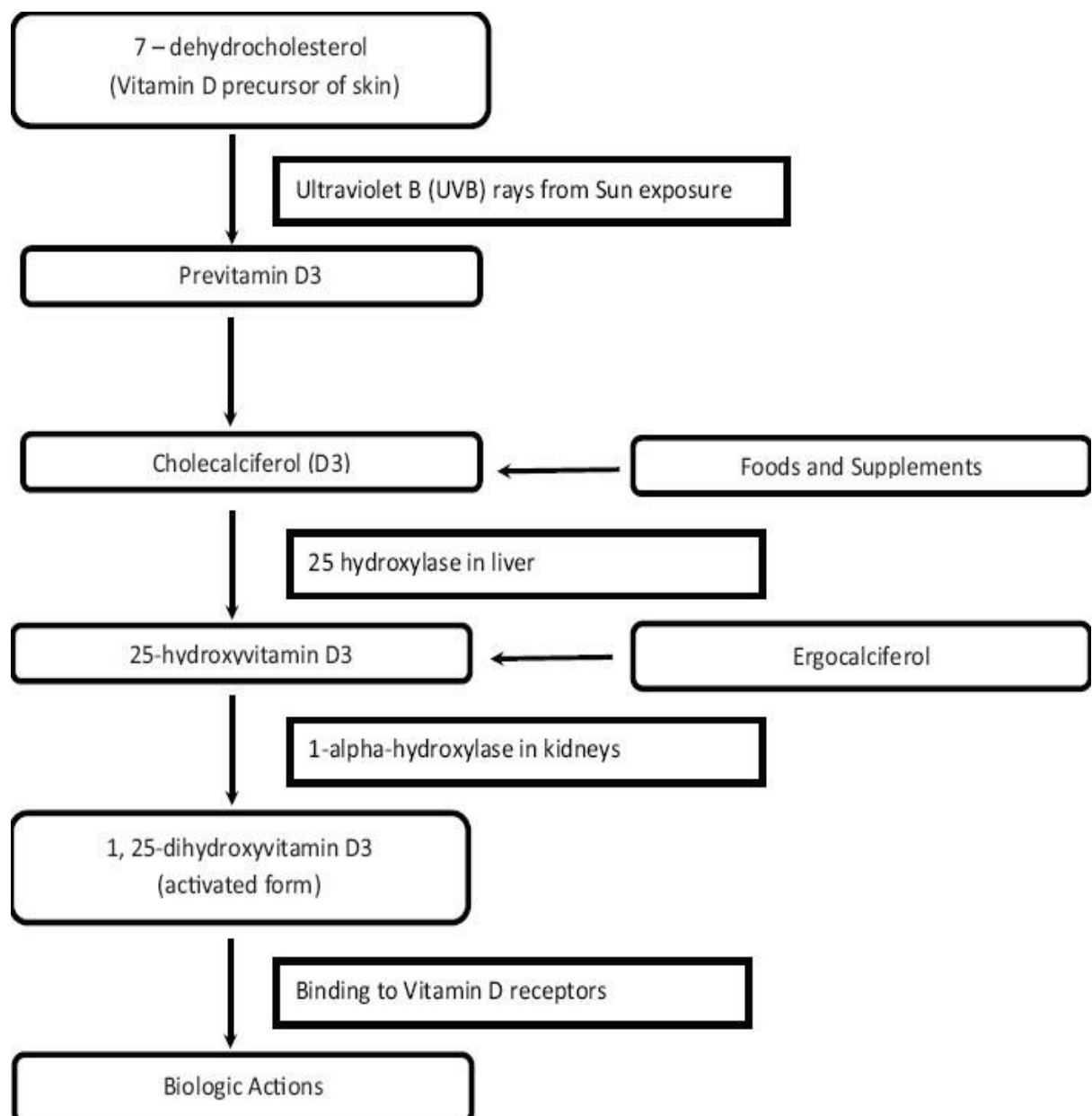
Cholecalciferol, Preferred brand, substitution, Availability, Price.

Introduction:

Vitamin D is a hormone precursor that is present in 2 forms.

- Ergocalciferol, or vitamin D₂, is present in plants and some fish.
- Cholecalciferol, or vitamin D₃, is synthesized in the skin by sunlight.

Humans can fulfill their vitamin D requirements by either administration of vitamin D or being exposed to the sun for adequate time to produce sufficient amount of vitamin D. (Teresa Kulie, November–December 2009)



(Maseeh, 2012 Apr-Jun)

Table: Process of Vitamin D circulation in body

Possible health benefits of vitamin D

1) Vitamin D for healthy bones

Vitamin D plays a ample role in the regulation of calcium and preservation of phosphorus levels in the blood, two factors that are particularly important for the maintains healthy bones. We need vitamin D to absorb calcium in the intestines and to retrieve calcium or else that will be excreted through the kidneys.

2) Reduced risk of flu

Children given 1,200 IU of vitamin D per day for 4 months throughout the winter reduced their risk of influenza infection by over 40%.

3) Reduced risk of diabetes

In type 2 diabetics, insufficient vitamin D levels may have an adverse effect on insulin secretion and glucose tolerance and may cause insulin resistance in the body.

4) Healthy infants

Low vitamin D status has also been allied with a higher risk and severity of atopic childhood diseases and allergic diseases, including asthma, atopic dermatitis and eczema etc.

5) Healthy pregnancy

Pregnant women who are deficient in vitamin D seem to be at superior risk of developing preeclampsia, gestational diabetes mellitus and bacterial vaginosis and needing a caesarean section.

6) Cancer prevention

Vitamin D is extremely important for regulation of cell growth and also helps in cell-to-cell communication. Some studies have recommended that calcitriol (the

hormonally active form of vitamin D) can shrink cancer progression by slowing the growth and development of new blood vessels in cancerous tissue which will increase cancer cell death and by reducing cell proliferation and metastases process. Vitamin D has an influence on more than 200 human genes, which can be impaired when D status is suboptimal.
(LD, 2016)

Deficiency

In vitamin D deficiency, calcium absorption cannot be increased in sufficient amount to satisfy the body's calcium basic. Consequently, PTH production by the parathyroid glands is greater than before and calcium is mobilized from the skeleton to maintain normal serum calcium levels — a condition known as secondary hyperparathyroidism.

Severe vitamin D deficiency

Rickets

In infants and children, severe vitamin D deficiency results in the failure of bone to mineralize. The process of mineralization, which involves the production of crystals of calcium phosphate by bone-forming cells, determines the hardness and strength of bones. Vitamin D deficiency severely affects rapidly growing bones. The growth plates of bones continue to enlarge, but in the absence of adequate mineralization, weight-bearing limbs (arms and legs) become bowed. In infants, rickets may result in delayed closure of the fontanelles (soft spots) in the skull, and the rib cage may become deformed due to the pulling action of the diaphragm. In severe cases, low serum calcium levels (hypocalcemia) may cause seizures.

Osteomalacia

Although adult bones are no longer growing, they are in a constant state of turnover, or "remodeling." In adults with severe vitamin D deficiency, the collagenous bone matrix is preserved, but bone mineral is progressively lost, resulting in a softening of bones (osteomalacia), bone pain, and increased risk of osteoporosis

Muscle weakness and pain

Vitamin D deficiency causes muscle weakness and pain in children and adults.

Serum 25-Hydroxyvitamin D [25(OH)D] Concentrations and Health*

[1]

nmol/L**	ng/mL*	Health status
<30	<12	Associated with vitamin D deficiency, leading to rickets in infants and children and osteomalacia in adults
30 to <50	12 to <20	Generally considered inadequate for bone and overall health in healthy individuals
≥50	≥20	Generally considered adequate for bone and overall health in healthy individuals
>125	>50	Emerging evidence links potential adverse effects to such high levels, particularly >150 nmol/L (>60 ng/mL)

* Serum concentrations of 25(OH)D are reported in both nanomoles per liter (nmol/L) and nanograms per milliliter (ng/mL).

** 1 nmol/L = 0.4 ng/mL

(National institute of Health)

Risk factors for vitamin D deficiency

Both environmental factors and cultural practices result in variations in vitamin D status:

- **Environmental conditions:** Geographical locations, including latitude and altitudes, and atmospheric conditions (e.g., air pollution, presence of clouds) greatly influence the intensity of UVB radiation that reaches the ground. Seasonal changes also affect the quality and quantity of UVB rays and thus vitamin D production in skin
- **Concealed clothing style:** In a study of 2,032 Middle Eastern women, who wore a headscarf or covered all skin for religious or cultural reasons, 96% had serum 25-hydroxyvitamin D levels less than 20 ng/mL, and 60% had vitamin D levels below 12 ng/mL. Rickets and osteomalacia are not uncommon in the Middle East and North African regions where children and women cover the majority or all of their skin whenever outside
- **Sun safety measures:** Sun protection practices, including limiting sun exposure, wearing protective clothing and hats, and applying sunscreens, hinder skin exposure to sunlight and thus result in lower vitamin D₃ production and circulating vitamin D metabolites unless there is adequate oral intake. Of note, the application of sunscreen (2 mg/cm²) with a sun protection factor (SPF) of 10 reduces UVB radiation by 90%
- **Exclusively breast-fed infants:** Infants who are exclusively breast-fed and do not receive vitamin D supplementation are at high risk for vitamin D deficiency, particularly if they have dark skin and/or receive little sun exposure. Human milk generally provides 10-80 IU of vitamin D per liter (L), which corresponds to 0.2-1.5 µg/day (8-60 IU/day) when using an average daily milk intake of 0.75 L (25 oz). The American Academy of Pediatrics recommends that all breast-fed and partially breast-fed infants be given an oral vitamin D

supplement of 400 IU/day. Maternal vitamin D supplementation during breast-feeding may contribute to improved vitamin D status of the breast-fed infant, especially in populations with a high prevalence of vitamin D deficiency. Older infants and toddlers exclusively fed milk substitutes (e.g., soy-based formulas) and weaning foods that are not vitamin D fortified are at risk for vitamin D deficiency.

The efficiency of vitamin D synthesis, absorption, and metabolism also depends on a variety of biological factors:

- **Skin pigmentation:** People with a dark complexion synthesize less vitamin D on exposure to sunlight than those with light-colored skin. A national US survey reported average 25-hydroxyvitamin D serum levels of 28 ng/mL, 20 ng/mL, and 14 ng/mL in Caucasian, Mexican American, and African American women aged 20 to 39 years old, respectively.
- **Genetic variations:** Vitamin D bioavailability varies among individuals and is dependent on the level of circulating vitamin D-binding protein (DBP), a carrier protein that binds 85%-90% of circulating 25-hydroxyvitamin D. The fraction of circulating serum 25-hydroxyvitamin D that is not bound to DBP can be considered readily bioavailable, i.e., more quickly available to act on target tissues. Serum DBP concentrations are influenced by genetic variations (called polymorphisms) in the sequence of the gene coding for DBP. Thus, for a given level of total 25-hydroxyvitamin D, the level of bioavailable 25-hydroxyvitamin D will greatly depend on that of DBP. A polymorphism found to be prevalent in African Americans has been recently associated with a lower level of DBP, suggesting that DBP polymorphisms across different ethnical populations may render the measure of total 25-hydroxyvitamin D sometimes inadequate to reflect vitamin D status.
- **Older age:** The elderly have reduced capacity to synthesize vitamin D in skin when exposed to UVB radiation and are more likely to stay indoors or use sunscreen, which prevents vitamin D synthesis. It has been estimated that across Canada, the US, and Europe, the prevalence of vitamin D deficiency ranges between 20%-100% in free-living elderly (36). Moreover, institutionalized adults who are not supplemented with vitamin D are at extremely high risk of vitamin D deficiency.
- **Chronic kidney disease (CKD):** Vitamin D deficiency in patients with impaired renal function is due to a reduced synthesis of 1,25-dihydroxyvitamin D and an increased loss of 25-hydroxyvitamin D in urine.
- **Fat malabsorption syndromes:** Vitamin D deficiency is common among people with cystic fibrosis and both cholestatic and non-cholestatic liver diseases due to decreased absorption of dietary vitamin D and impaired conversion of vitamin D to 25-hydroxyvitamin D.
- **Inflammatory bowel disease:** People with inflammatory bowel disease like Crohn's disease appear to be at increased risk of vitamin D deficiency, especially those who have had small bowel resections.

- **Obesity:** Obesity (body mass index ≥ 30 kg/m²) increases the risk of vitamin D deficiency (42). Once vitamin D is synthesized in the skin or ingested, it can be sequestered in body fat stores, making it less bioavailable to people with higher body fat mass. Moreover, vitamin D supplementation trials have shown that obese people reached much lower levels of serum 25-hydroxyvitamin D levels compared to normal weight (BMI <25 kg/m²) participants with equivalent oral dosages.
- **Magnesium deficiency:** Recent findings suggest that high magnesium intakes may reduce the risk of vitamin D insufficiency. Magnesium regulates the activity of critical enzymes in vitamin D metabolism, which would explain how magnesium deficiency negatively affects vitamin D status (jane Higdon, 2014)

The Recommended Dietary Allowance (RDA)

In 2010, the Food and Nutrition Board (FNB) of the Institute of Medicine set a Recommended Dietary Allowance (RDA) based on the amount of vitamin D needed for bone health. While the RDA was increased from the adequate intake (AI) set in 1997, the optimal levels of recommended intakes and serum 25-hydroxyvitamin D to minimize hyperparathyroidism and maximize bone health in the general population remain controversial. The RDA for vitamin D is listed in **Table 1** by life stage and gender.

Recommended Dietary Allowance (RDA) for Vitamin D					
Life Stage	Age	Males		Females	
		µg/day	IU/day	µg/day	IU/day
Infants (AI)	0-6 months	10	400	10	400
Infants (AI)	6-12 months	10	400	10	400
Children	1-3 years	15	600	15	600
Children	4-8 years	15	600	15	600
Children	9-13 years	15	600	15	600
Adolescents	14-18 years	15	600	15	600
Adults	19-70 years	15	600	15	600
Adults	71 years and older	20	800	20	800
Pregnancy	all ages	-	-	15	600
Breast-feeding	all ages	-	-	15	600

(jane Higdon, 2014)

Food sources

Vitamin D is found naturally in only a few foods, such as some fatty fish (mackerel, salmon, sardines), fish liver oils, and eggs from hens that have been fed vitamin D. (National institute of Health)

Health Risks from Excessive Vitamin D

Vitamin D toxicity can cause non-specific symptoms such as anorexia, weight loss, polyuria, and heart arrhythmias. More seriously, it can also raise blood levels of calcium which leads to vascular and tissue calcification, with subsequent damage to the heart, blood vessels, and kidneys

The most common symptoms of hypervitaminosis D are headache and nausea but can also include loss of appetite, dry mouth, a metallic taste, vomiting, constipation, and diarrhea (National institute of Health)

Tolerable Upper Intake Levels (ULs) for Vitamin D

[1]

Age	Male	Female	Pregnancy	Lactation
0–6 months	1,000 IU (25 mcg)	1,000 IU (25 mcg)		
7–12 months	1,500 IU (38 mcg)	1,500 IU (38 mcg)		
1–3 years	2,500 IU (63 mcg)	2,500 IU (63 mcg)		
4–8 years	3,000 IU (75 mcg)	3,000 IU (75 mcg)		
9–18 years	4,000 IU (100 mcg)	4,000 IU (100 mcg)	4,000 IU (100 mcg)	4,000 IU (100 mcg)
19+ years	4,000 IU (100 mcg)	4,000 IU (100 mcg)	4,000 IU (100 mcg)	4,000 IU (100 mcg)

(National institute of Health)

Despite of appropriate sunny environment, hypovitaminosis D is common in India. Among apparently many healthy Indian subjects residing in India, more than 90% have been observed to have subnormal low therapeutic level of serum 25-hydroxy vitamin D (25OHD) levels. During winters, the 25OHD values of those Healthy People also are almost undetectable of these, 20% also revealed the evidence of parathyroid hyperactivity due to vitamin D Deficiency. Inadequate exposures to

sunshine and skin pigmentation are thought to be responsible for hypovitaminosis D in them.

Evidence is also available signifying that improving vitamin D status has beneficial effects and may reduce health care expenditure for many chronic diseases which is possible with hypovitaminosis D. However, in spite of abundant evidence presented concerning the importance of vitamin D, in general health and reliable data on prevalent occurrence of vitamin D deficiency, little data are available concerning about the treatment of this condition. (C.V. Harinarayan, 2015)

Cholecalciferol (D3) and ergocalciferol (D2) are equally effective in raising 25OHD levels. It has been pragmatic that the conventionally administered supplements are inadequate even for prevention; much higher doses such as loading dose followed by maintenance dose are required for treatment of vitamin D deficiency. (C.V. Harinarayan, 2015)

It has been widely accepted that vitamin D deficiency (VDD) is a global health problem that impacts not only musculoskeletal health but also Prolong diverse acute and chronic diseases. Low vitamin D has been associated with an increased risk of diabetes mellitus, cardiovascular disease, certain cancers, cognitive decline, autoimmune disorders and pregnancy complications. It has been estimated that 20 to 80% of US, Canadian and European men and women are vitamin D deficient. In Middle East and Asia, VDD is highly prevalent irrespective to age and gender. Even in India, numerous studies across various regions of the country indicate that approximately 70-90% of apparently healthy population is vitamin D efficient. Low vitamin D status is prevalent irrespective of age, sex, profession, rural/urban settings or regional distribution (Y. LHAMO, January - February 2016)

The major source of vitamin D is exposure to sunlight. It has been presumed that Indians are vitamin D sufficient due to adequate sunshine throughout the year. However, reduced cutaneous synthesis of vitamin D could be attributed to limited UV exposure due to increased skin pigmentation, with topical application of sunscreen, certain socio cultural practices and urban life style adapted to Western culture disturbed biological clock.

Secondary sources include dietary intake of foods naturally rich in vitamin D such as salmon, cod liver oil, sun dried mushrooms, Dairy Products or vitamin D fortified foods.

In our country, availability of Secondary source, acceptability and cost of these dietary products limits their extensive use by the general population. This complex back-and-forth between lack of adequate sun exposure, deficient intake and ineffective food fortification strategies makes Asian Indian population prevalent to vitamin D insufficiency/deficiency. (Y. LHAMO, January - February 2016)

Need for Study

Vitamin D Deficiency is a growing problem in world, especially in India. Seeing the scenario Seagull Pharma took Pleasure to Introduce Cholecalciferol in the market in various dosage forms with the Name of Dup. product was launched with aggressive Promotions which results in good number of sales with continuous growth Quarter by Quarter. Since last few Quarter sales of Dup is in Negative growth. This study is carried out to find out the preference of Prescriber while prescribing Cholecalciferol and Preferred Brand.

This study will also help us in analysis of market potential & prescription trends are needed to find out unmet medical needs.

The study helps to find:

- ✓ Market Strategy analysis for Cholecalciferol.
- ✓ Market scenario of Cholecalciferol
- ✓ Indication for usage of Cholecalciferol
- ✓ Most commonly prescribed Cholecalciferol with other parameters.
- ✓ Most prescribed combination therapy with Cholecalciferol
- ✓ Identification of highest stock & sale of Cholecalciferol
- ✓ Most prescribed brands
- ✓ Major competitors
- ✓ Unmet Medical Need in case of Vitamin D Deficiency with future scopes of Cholecalciferol

Research Question:

- What are the factors affecting the sales of D-Up (Cholecalciferol)?
- What are the attributes of products responsible for Prescribers?
- What is the market potential of Cholecalciferol in patients with vitamin D Deficiency in New Delhi city?

Objectives

- To identify the market scenario of Cholecalciferol
- To analyze the prescription pattern of Cholecalciferol
- To determine highest sales volume & stock of Cholecalciferol
- To investigate the factors responsible for Prescribing Cholecalciferol

Methodology

Sample design

The research conducted was descriptive (Cross-sectional)

Sampling method

The sampling method was Non-Probability (Purposive) sampling

Study Area

The study was carried out in South Delhi.

Sample size

Sample size for the study is 133:

Doctors: 48

Pharmacist: 85

Sampling Criteria

It includes

- General physician, consultant physician, Orthopedician, Gynaecologist, Diabetologist, cardiologist, Paediatrician and endocrinologist and,
- Pharmacists

Ethical consideration

Before collecting data ICF filled by respective respondents.

Sampling Technique

Convenient Sampling

Data collection

Primary data- The primary data for this project was gathered through survey using questionnaire, face to face interview online format also.

Secondary data- The secondary data for this project was gathered through different dependable articles and research reports and data available in PMT Department.

Research Instrument (tools and techniques)

Research instrument is the semi-structured questionnaire consists of both type of open and close ended questions for both Pharmacist and doctors

The information was collected by interviewing with doctors and Pharmacist.

Study duration

3 months (12th February to 10th May)

Data Collection Procedure

- Data has been collected by using both open and close ended questionnaire (Doctors Questionnaire 8 Questions, Pharmacist Questionnaire 8 Questions).
- Questionnaire consist of both Qualitative and quantitative questions
- Questionnaire was pre-tested by other than respondents.
- After confirmation of pre-test questionnaire used in the field to collect data.
- Collected data was filtered and analyzed by using MS Excel.
- Data presented in the form of visual by using table and graphs.

Data Analysis

Software: MS Excel

Tools: Pivot Table

Literature review

Mattia Bellan in 2015 described that in the last few years the same definition of “vitamin D” has been debated and remains the subject of intense controversy. In fact, vitamin D is not only obtained by dietary intake, like the other vitamins, since its greater amount derives from endogenous synthesis. Importantly, the concept of “vitamin” is static, while vitamin D and PTH participate in dynamic system acting on several biological targets. For these reasons vitamin D is currently, more correctly, defined as “hormone D”; in fact the relationship between vitamin D and PTH shares many similarities with the other endocrine networks. Obtaining a normal vitamin D status is paramount in preventing RA related osteoporosis and the correction of a deficient vitamin D status should be suggested to each rheumatic patient. However, since the correlation between vitamin D and PTH is less linear in RA, this system is not correctly defined by the single evaluation of plasma 25(OH)D concentration. Many patients with a normal vitamin D concentration are affected by secondary hyperparathyroidism and present an inadequate vitamin D status. Therefore, we propose that in rheumatic diseases both Vitamin D and PTH. (Bellana, 2015)

Robert P Heaney in 2017 explained about Human serum 25-Hydroxycholecalciferol response to extended oral dosing with Cholecalciferol which says this study represents the first formal attempt to estimate the steady state Cholecalciferol input required to achieve or maintain any given serum 25(OH)D concentration. We found, by using a broad range of controlled oral doses in subjects with low inputs of vitamin D from food sources and by performing these measurements during the winter season when solar vitamin D input is minimal, that the slope of the relation is 0.70 nmol. (Heaney, May10,2017)

Chittari Venkata Harinarayan (2012) studied about “Efficacy and Safety of Cholecalciferol Supplementation in Vitamin D Deficient Subjects Based on Endocrine Society Clinical Practice” Guidelines which defines that the present study has emphasized on “*supplementation therapy*” for achieving vitamin D sufficiency and later “*maintenance therapy*” to be followed as a preventive strategy for up keeping bone health based on guideline recommendations. The present study also addresses the non-responders follow up. In the present study, only 23% of subjects attained vitamin D sufficiency at the end of 2 months of supplementation with threefold rise in serum 25OH D levels. We had used 9572 IU/day of Cholecalciferol which is the near upper tolerable intake level (UL) as per the guidelines. In our study, 23% of subjects attained vitamin D sufficiency as compared to 54% of subjects who attained normalcy in other study from India which has used similar dosage schedule. The probable reason could be that the present study was conducted beginning in July and the supplementation schedule followed through winter till December. The other study in India, the patients were recruited in March and followed through summer till May/June. Increased sunlight exposure could be the possible explanation for these differences. This explanation is substantiated by another study from India in the same location which showed 2000 IU/day (50 µ/day) of Cholecalciferol provided different incremental response in serum 25 OH D levels of a group of patients supplemented in summer and winter. The incremental response of 25 OH D was higher in summer

compared to winter which concludes that Vitamin D supplementation based on recent ESCPG even up to upper tolerable intake levels (UL) along with elemental calcium of 1gm/day is safe and does not lead to hypercalcemia. (Harinarayan, 2012)

Anna-Mari Natri explained that Vitamin D status is largely dependent on dietary vitamin D intake at high latitudes during winter. In a study of healthy young subjects, 26% of the women and 29% of the men were vitamin D deficient (serum 25OHD , 25 nmol/L); based on the inverse relation between serum 25-OHD and PTH concentrations, 86% of the women (serum 25OHD , 80 nmol/L) and 56% of the men (serum 25OHD , 40 nmol/L) had inadequate vitamin D status during the winter. In a recent study it was estimated that 12.5 mg vitamin D is needed from the diet daily to sustain the serum 25 –OHD concentration at 70.3 nmol/L throughout the winter. Thus, it is not unexpected that low serum 25-OHD concentrations were found even in people with a vitamin D intake above the recommended 5 mg/d. Unfortunately, vitamin D occurs naturally in only a few food sources. Extending the current selection of foods fortified with vitamin D might be an effective way of maintaining adequate vitamin D status during the winter months. (Natri, 2017)

In-Jin Cho et al (2015) studied Efficacy of a Once-Monthly Pill Containing Ibandronate and Cholecalciferol on the Levels of 25-Hydroxyvitamin D and Bone Markers in Postmenopausal Women with Osteoporosis which depict that female patients with postmenopausal osteoporosis who took a single once-monthly pill containing both ibandronate (150 mg) and cholecalciferol (24,000 IU) exhibited a significant increase in serum 25(OH)D levels after 16 weeks of treatment. Moreover, there was a significant increase in the proportion of patients with sufficient vitamin D levels (≥ 20 ng/mL), and none of the patients exhibited a vitamin D deficiency (< 10 ng/mL) after 16 weeks of treatment. (Cho, 2015)

The nature of optimal vitamin D status remains controversial. The Endocrine Society defines the lower limit of the normal range as a 25(OH)D concentration of 30 ng/mL [6], while the Institute of Medicine considers 20 ng/mL as the lower limit of the normal range [7]. In Korea, widespread vitamin D deficiency exists, even when the more liberal definition of the lower limit of the normal range (20 ng/mL) is applied [4,8]. The high prevalence of vitamin D deficiency in Korea may be due to behavioral factors, such as an indoor lifestyle, the use of sunscreen, and the low consumption of vitamin D-fortified foods (Cho, 2015)

Data Analysis (Findings & Inferences)

Analysis of Doctors' views

Market scenario of Cholecalciferol

Number of Patients per doctor weekly

It was found out that approximately 35% of doctors examined around 20-30 patients weekly followed by 20% in the range more than 40 patients.

Table as well as figure below provides a data of number of patients and percentage of doctor's response in each array.

no. of Patients	Response	% of Patient
Less than 10	8	16.66
10-20	6	12.5
21-30	17	35.41
31-40	7	14.58
More than 40	10	20.83
Total	48	100

Table 1: Number of Vitamin D Deficient patients examine by doctors weekly

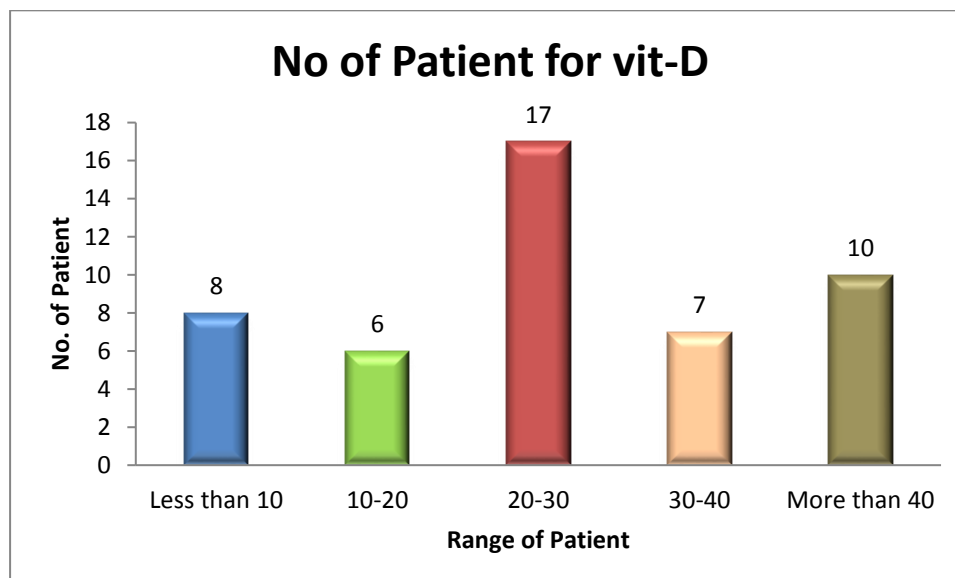


Figure 1: Number of Vitamin D Deficient patients examine by doctors weekly

Top 3 Brands Prescribed by Doctor

It was found out that approximately 21.13% of doctors responded for top 3 brands of Cholecalciferol prescribed was Calcirol to patients with vitamin D Deficiency followed by 12.68% for Tayo. And D3 Must 11.27%.

Table number as well as figure number provides a data of number of Brands of Cholecalciferol is been prescribed by doctors and percentage of doctor's response in each array.

Row Labels	Count of Brands of Cholecalciferol	% of Brands of Cholecalciferol
Calcirol	30	21.13%
Tayo	18	12.68%
D3 must	16	11.27%
D-Up	15	10.56%
calciquick	15	10.56%
calcimax	13	9.15%
D rise	13	9.15%
Db60k	9	6.34%
Kam-D	8	5.63%
Zindee	4	2.82%
Justdee	1	0.70%
Grand Total	142	100.00%

Table 2: Top Brands of Cholecalciferol Prescribed by doctors

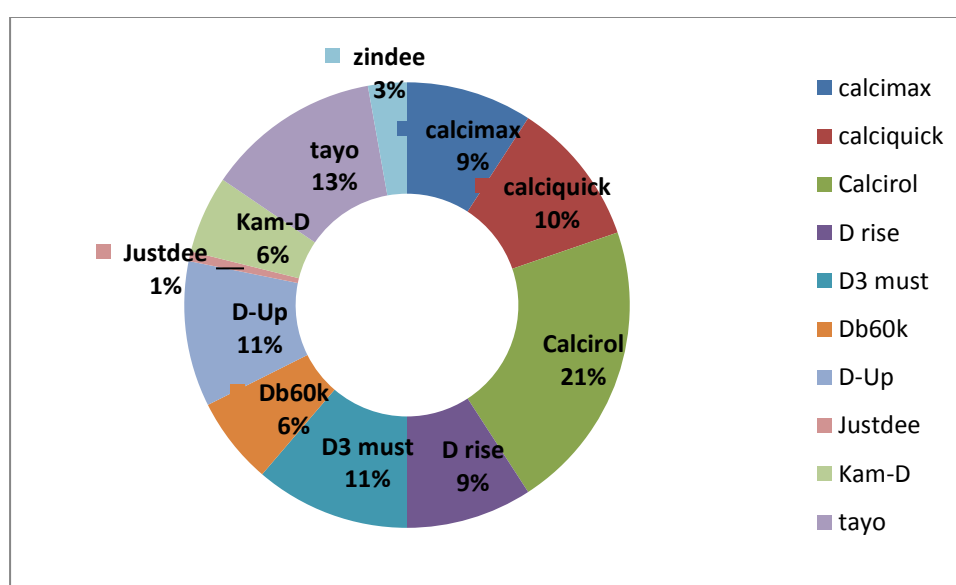


Figure2 : Top Brands of Cholecalciferol Prescribed by doctors

Preferred Dosage form of Cholecalciferol by Doctors

It was found out that approximately 26.11 %of doctors responded for Preferred Dossage form for Cholecalciferol Mentioned is Sachets (Granules) to patients with vitamin D Deficiency followed by 22.38% for Capsule and 21.64% for Tablet.

Table number as well as figure below number provides a data of Preferred Dosage of Cholecalciferol is been prescribed by doctors and percentage of doctor's response in each array.

Respondents	Dossage form	Response in %
Tablet	29	21.64
Capsule	30	22.38
Injection	16	11.94
Sachets	35	26.11
Oral liquids	24	17.91
Total	134	100

Table 3: Preferred Dosage form of Cholecalciferol Prescribed by doctors

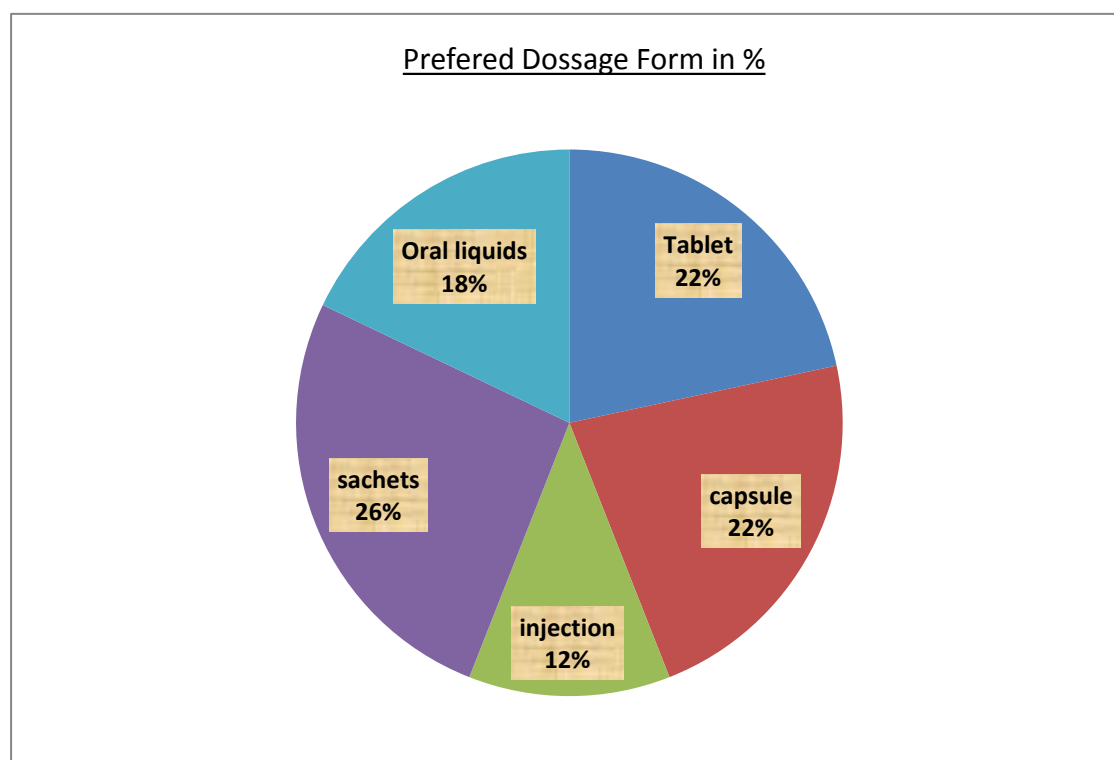


Figure 3: Preferred Dosage form of Cholecalciferol Prescribed by doctors

Any combination therapy preferred with Cholecalciferol

It was found out that approximately 62.5% of doctors responded for Preferred to use combination therapy for Cholecalciferol to patients when diagnosed with other symptoms also like low back pain, sounds from Joints like wise then Cholecalciferol is given with vitamin D Deficiency which is either with Calcium or with Calcium and Vitamin K2.

Table number as well as below figure number provides a data of percentage of Doctors use combination therapy of Cholecalciferol response in each array.

Count of Respondents	Response	Combination Therapy in %
Yes	30	62.5
No	18	37.5
Total	48	100

Table 4: use of combination for cholecalciferol

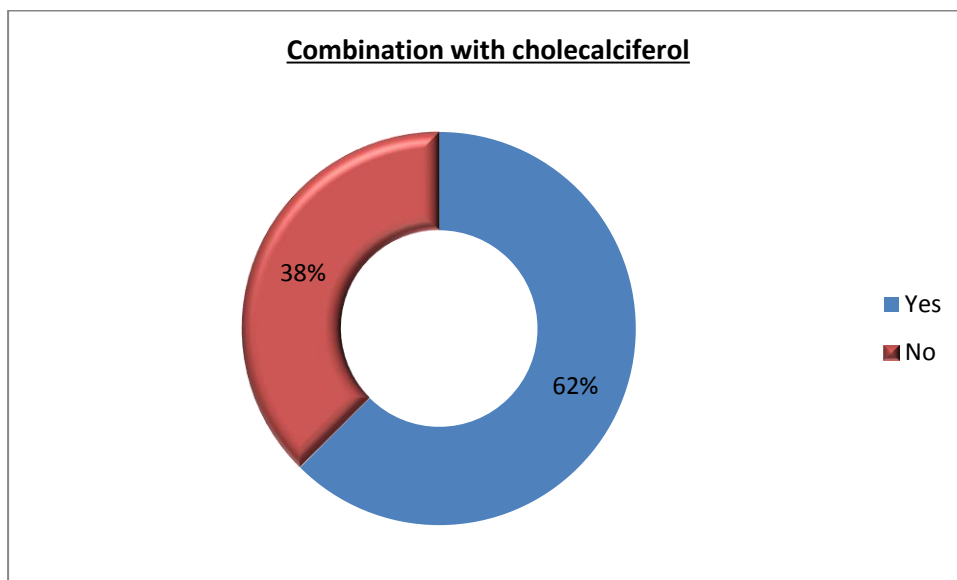


Figure 4: Use of combination for cholecalciferol

Indication in which you prescribe Cholecalciferol

It was found out that approximately 28 % of doctors Prescribe in vitamin D Deficiency followed by PCOS 11%, Arthritis 9% and low Back Pain 8% are the indications where Cholecalciferol in been Prescribed

Table number as well as figure below number provides a data of Preferred Dosage of Cholecalciferol is been prescribed by doctors and percentage of doctor's response in each array.

Row Labels	Indication	% of Indication
All Babies below 1 year	1	0.69%
Arthritis	13	9.03%
Back Pain	1	0.69%
Bone pain	1	0.69%
Charcot joint	1	0.69%
Chronic Muscular pain	4	2.78%
Hyperandrogenism	8	5.56%
hypertension	1	0.69%
Joint Pain	3	2.08%
Low Back Pain	12	8.33%
Osteoporosis	5	3.47%
Pcos	16	11.11%
Postmenopausal	11	7.64%
Pregnancy	1	0.69%
Radiculopathy	13	9.03%
Rickets	2	1.39%
Sciatica	10	6.94%
Spondylitis	1	0.69%
Vitamin D Deficiency	40	27.78%
Grand Total	144	100.00%

Table: Indications for cholecalciferol is prescribed

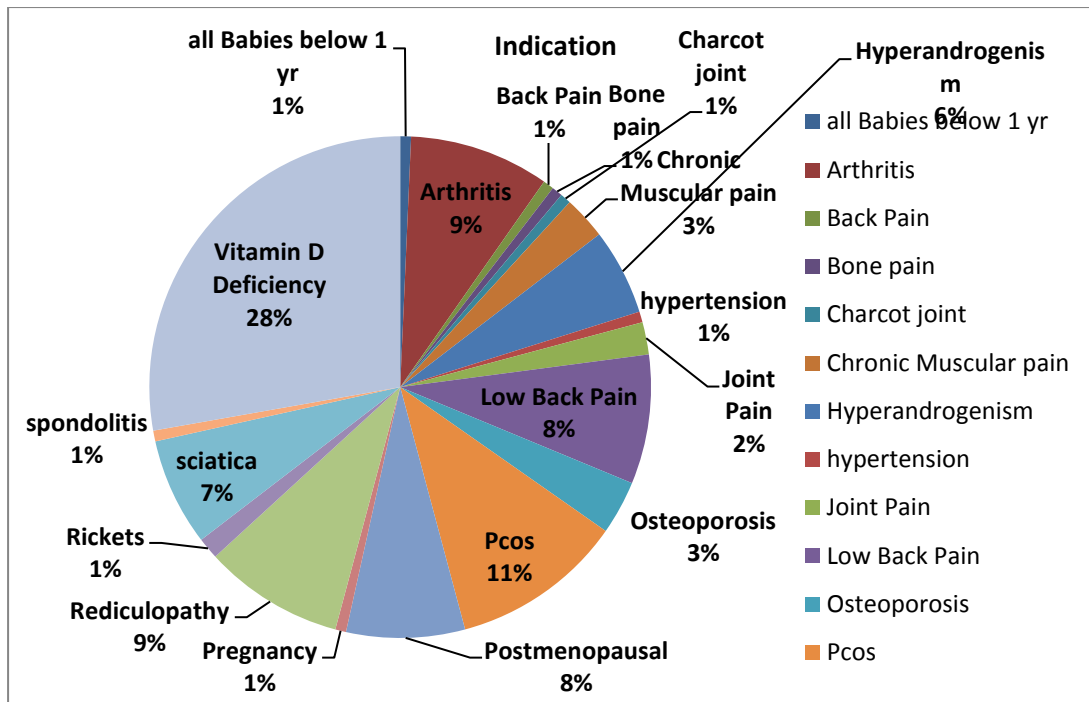


Figure: Indication for Cholecalciferol is prescribed

What catches attention of doctor during the product promotion

It was found out that approximately 31% of doctors replied for Ability to solve query by sales representative for Cholecalciferol by doctor.

Table number as well as figure below number provides a data of Preferred Dosage of Cholecalciferol is been prescribed by doctors and percentage of doctor's response in each array.

Name of the company	Product or brand name	Ability to solve Query by sales representative	Count of Information's shared by the sales representatives
33	25	40	32
25.38461538	19.23076923	30.76923077	24.61538462

Table 5: Attention on Product promotion

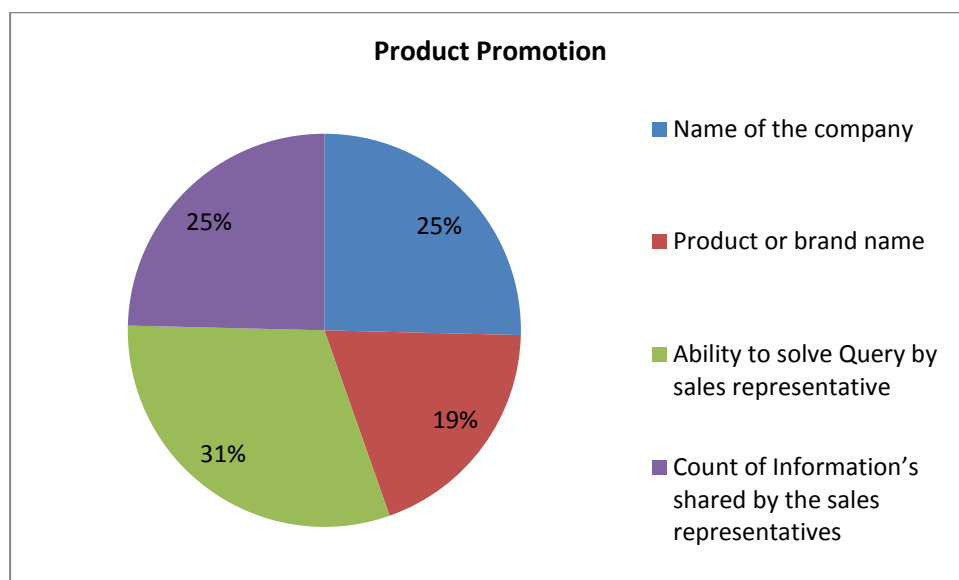


Figure 5: Attention on Product promotion

parameter consider, best define the mentioned Cholecalciferol Brands

Price:

It was found out that approximately 70% of doctors gave 5 rating to price as a parameter to consider for Cholecalciferol where only 21% doctors were neutral about price.

Table number as well as figure below number provides a data of Preferred Dosage of Cholecalciferol is been prescribed by doctors and percentage of doctor's response in each array.

Row Labels	Price of Brand	% of Price
1	2	1.01%
2	1	1.01%
3	14	21.21%
4	3	6.06%
5	28	70.71%
Grand Total	48	100.00%

.

Table 1: Rating of Price by doctors

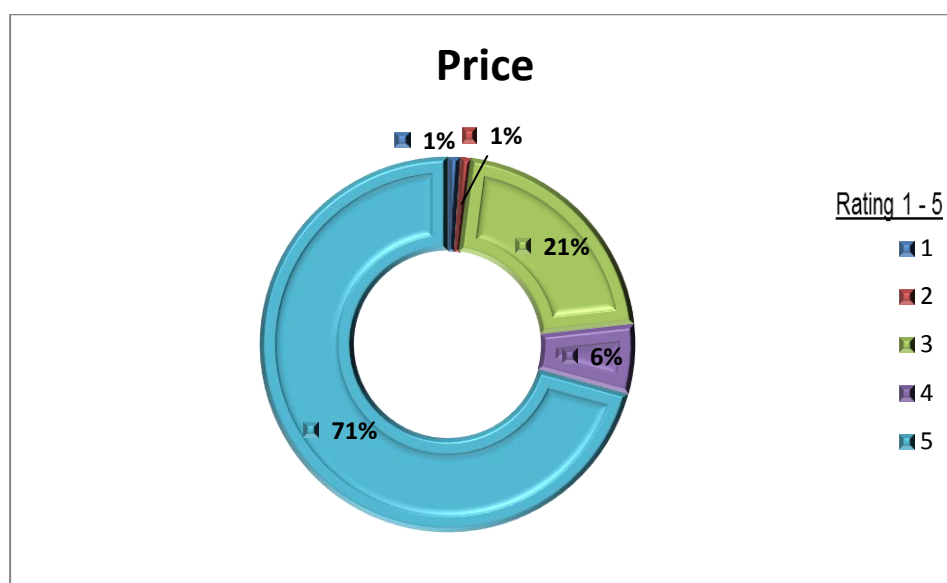


Figure : Rating of Price by doctors

Taste

It was found out that approximately 48% of doctors gave 5 rating to Taste as a parameter to consider for Cholecalciferol where only 27% doctors were neutral about Taste.

Table number as well as figure below provides a data of Preferred Dosage of Cholecalciferol is been prescribed by doctors and percentage of doctor's response in each array.

Row Labels	Taste	% ofTaste
1	6	12.50%
3	13	27.08%
4	6	12.50%
5	23	47.92%
Grand Total	48	100.00%

Table 1: Rating of Taste for Cholecalciferol brand by doctors

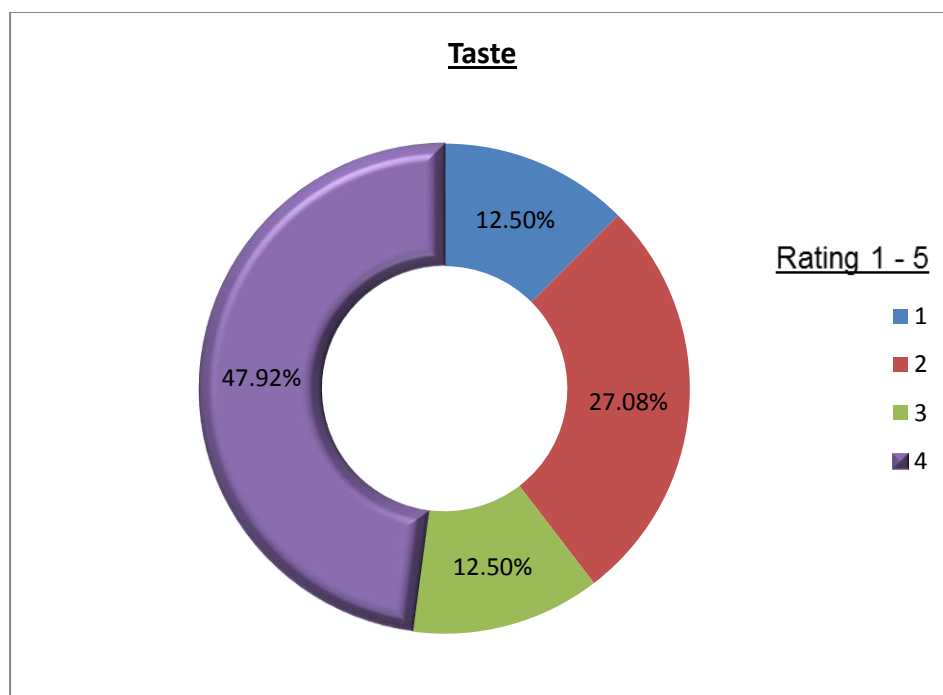


Figure : Preferred Dosage form of Cholecalciferol Prescribed by doctors

Solubility

It was found out that approximately 45% of doctors gave 5 rating to price as a parameter to consider for Cholecalciferol where only 29% doctors were neutral about price.

Table number as well as figure below provides a data of Preferred Dosage of Cholecalciferol is been prescribed by doctors and percentage of doctor's response in each array.

Row Labels	Solubility	% of Solubility 2
1	4	8.33%
2	1	2.08%
3	14	29.17%
4	7	14.58%
5	22	45.83%
Grand Total	48	100.00%

Table 1: Rating of Solubility for Cholecalciferol brand by doctors

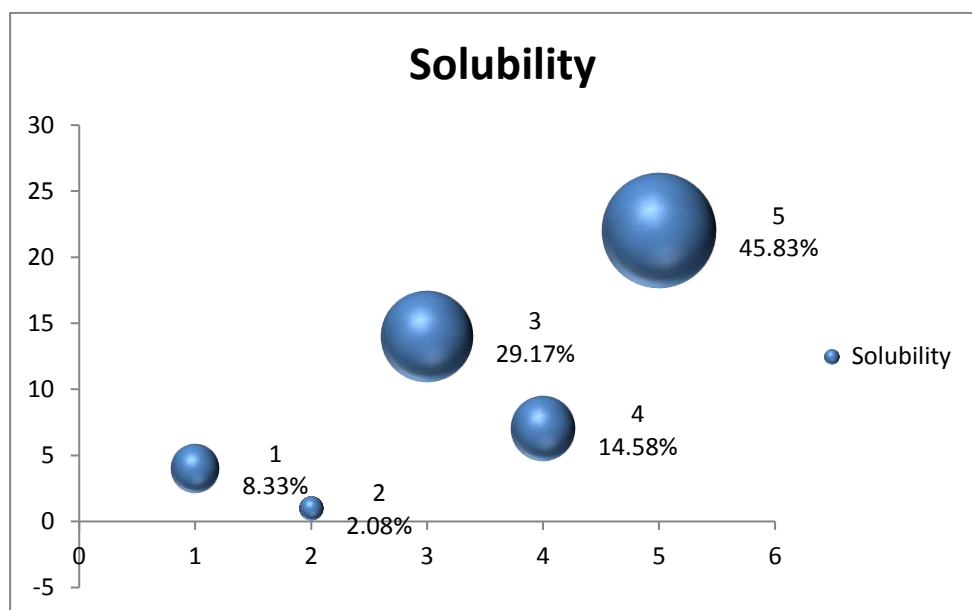


Figure : Rating of Solubility for Cholecalciferol brand by doctors

Bioavailability

It was found out that approximately 48% of doctors gave 5 rating to Bioavailability as a parameter to consider for Cholecalciferol where only 27% doctors were neutral about Bioavailability.

Table number as well as figure below provides a data of Preferred Dosage of Cholecalciferol is been prescribed by doctors and percentage of doctor's response in each array.

Row Labels	Bioavailability	% of Bioavailability2
1	5	10.42%
3	13	27.08%
4	7	14.58%
5	23	47.92%
Grand Total	48	100.00%

Table 1: Rating of Taste for Cholecalciferol brand by doctors

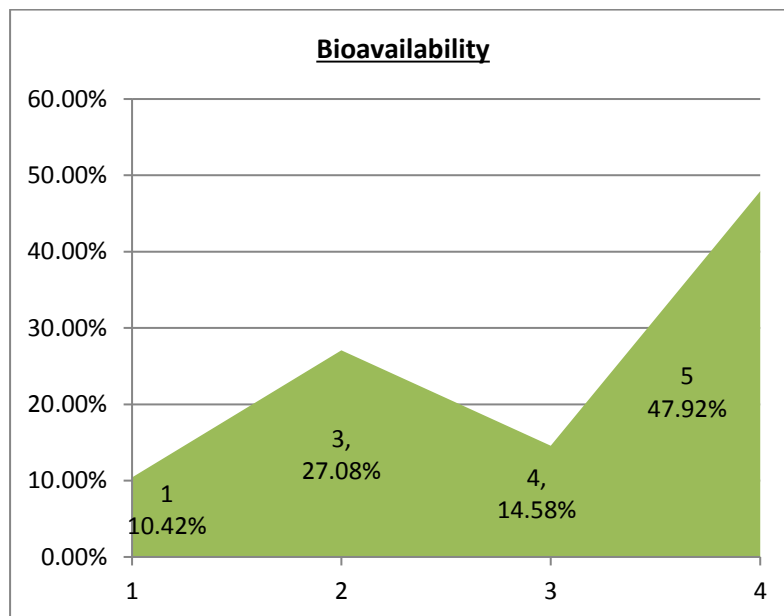


Figure: Rating of Taste for Cholecalciferol brand by doctors

Clinical Evidence

It was found out that approximately 54.17% of doctors gave 5 rating to Clinical evidence as a parameter to consider for Cholecalciferol where only 21% doctors were neutral about Clinical evidence.

Table number as well as figure Below provides a data of Preferred Dosage of Cholecalciferol is been prescribed by doctors and percentage of doctor's response in each array.

Row Labels	Clinical evidence	% of Clinical evidence2
1	3	6.25%
3	10	20.83%
4	9	18.75%
5	26	54.17%
Grand Total	48	100.00%

Table 1: Rating of Clinical Evidence for Cholecalciferol brand by doctors

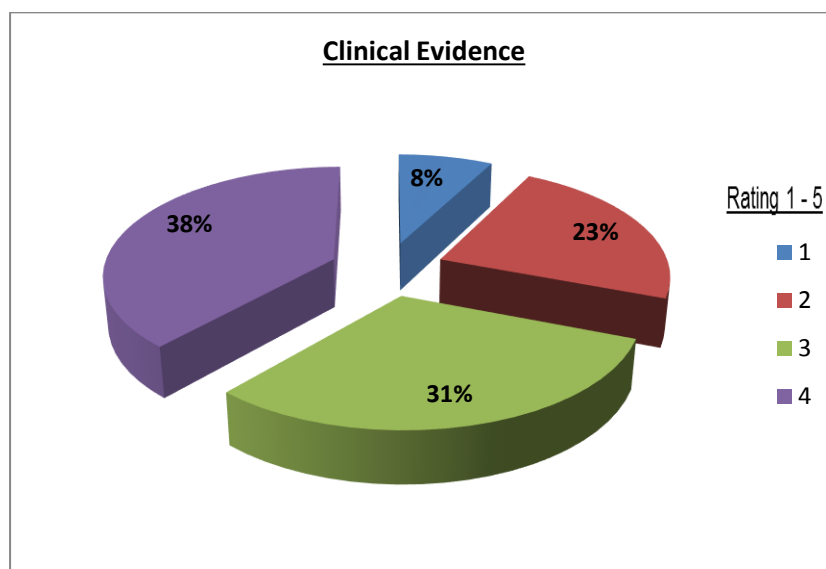


Figure: Rating of Clinical evidence for Cholecalciferol brand by doctors

Dosage Form

It was found out that approximately 42% of doctors gave 5 rating to Dossage form as a parameter to consider for Cholecalciferol where only 41.67% doctors were neutral about Dosage form.

Table number as well as figure number provides a data of Preferred Dosage of Cholecalciferol is been prescribed by doctors and percentage of doctor's response in each array.

Row Labels	Dosage form	% of Dosage form2
1	2	4.17%
2	1	2.08%
3	20	41.67%
4	5	10.42%
5	20	41.67%
Grand Total	48	100.00%

Table 1: Rating of Dosage for Cholecalciferol brand by doctors

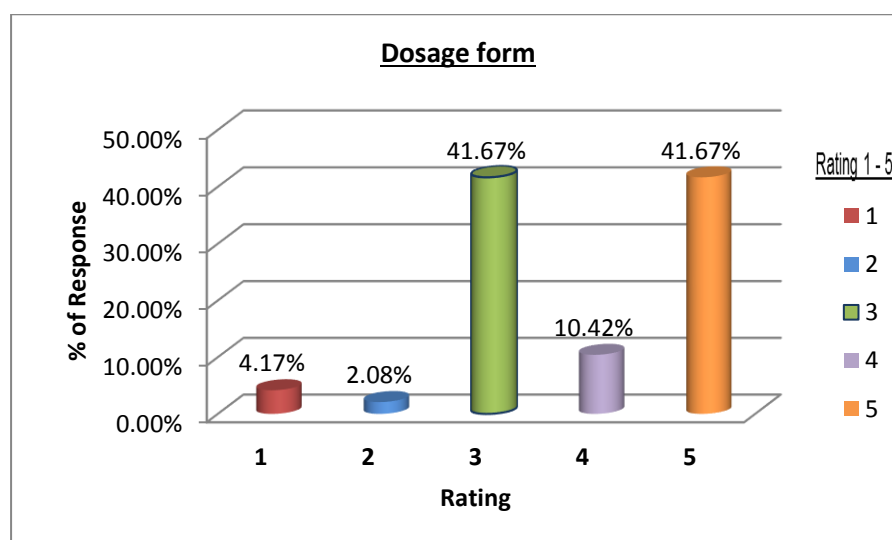


Figure: Rating of Dosage Form of Product for Cholecalciferol brand by doctors

Availability of Product

It was found out that approximately 58.33% of doctors gave 5 rating to Availability of Product as a parameter to consider for Cholecalciferol where only 16.67% doctors were neutral about Availability of Product.

Table number as well as figure number provides a data of Preferred Dosage of Cholecalciferol is been prescribed by doctors and percentage of doctor's response in each array.

Row Labels	Availability	% of Availability
1	5	10.42%
3	8	16.67%
4	7	14.58%
5	28	58.33%
Grand Total	48	100.00%

Table 1: Rating of Availability of Product for Cholecalciferol brand by doctors

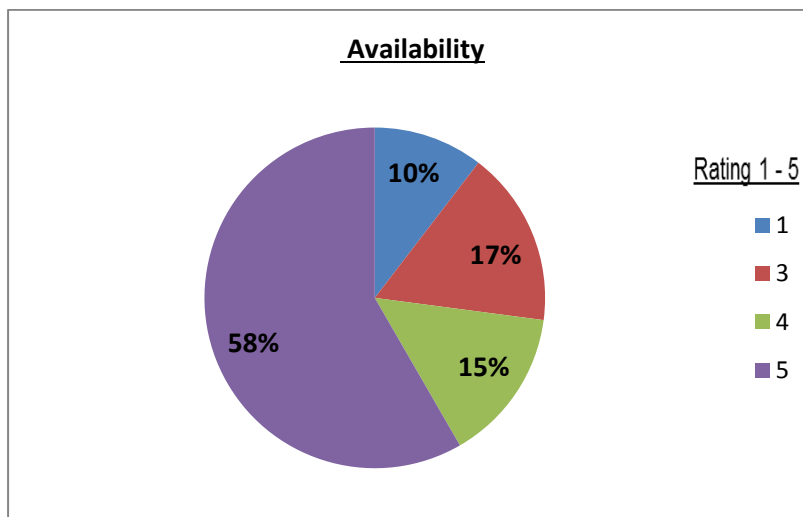


Figure: Rating of Availability of Product for Cholecalciferol brand by doctors

Overall view of Parameters for Cholecalciferol

It was found out that approximately 70% of doctors gave 5 rating to price as a parameter to consider for Cholecalciferol where only 21% doctors were neutral about price.

Table number as well as figure below provides a data of Preferred Dosage of Cholecalciferol is been prescribed by doctors and percentage of doctor's response in each array.

Respondent	Price	Taste	Solubility	Bioavailability	Clinical evidence	Dosage form	Availability
1	2	6	4	5	3	2	5
2	1	0	1	0	0	1	0
3	14	13	14	13	10	20	8
4	3	6	7	7	9	5	7
5	28	23	22	23	26	20	28

Table 1: Rating of all Parameters of Product for Cholecalciferol brand by doctors

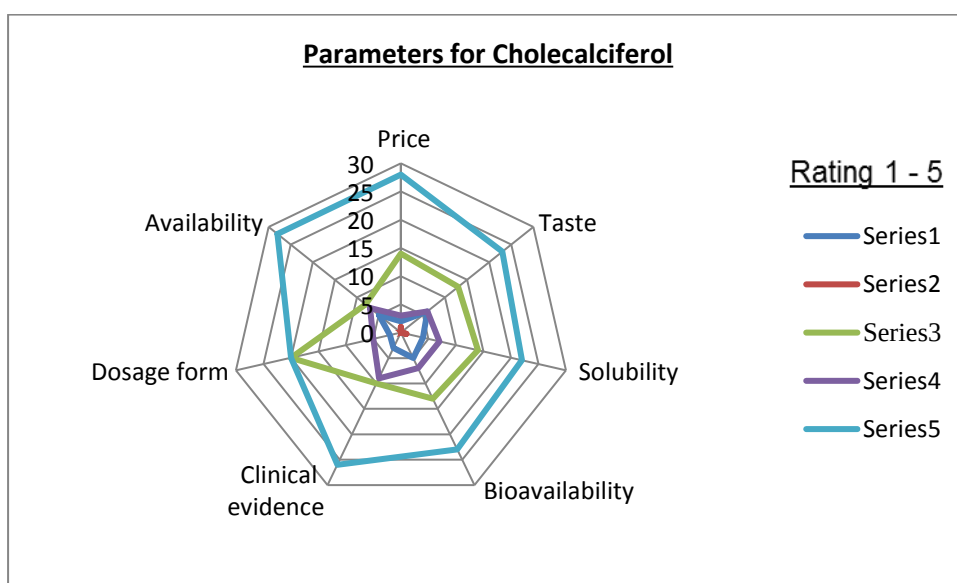


Figure: Rating of Availability of Product for Cholecalciferol brand by doctors

Analysis of Pharmacists' views

Market scenario of Cholecalciferol

Number of Brands

It was found out that approximately 41.17 % of Pharmacists keep more than 6 brands.

Table number 16 as well as figure number 16 gives a data of number of brands keep by Pharmacist and percentage of Pharmacist's response in each range.

No of Patient	Response	No. of Brands in Percentage
1-3	16	18.82
4-6	34	40
More than 6	35	41.17
Total	85	100

Table : Number of Cholecalciferol Brands Available

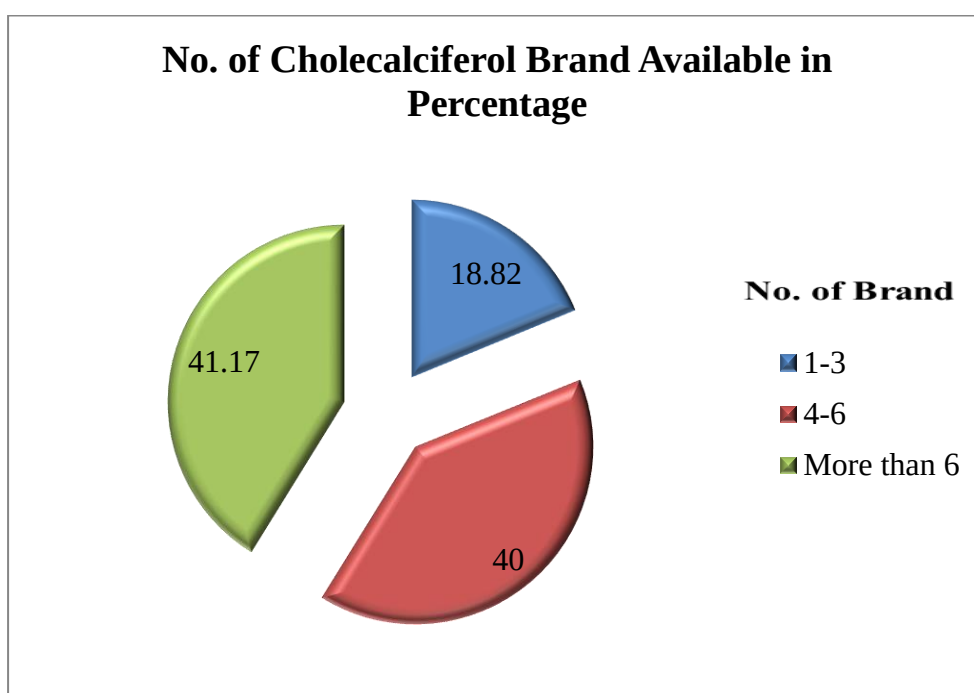


Figure : Number of Cholecalciferol Brands Available

Brands of Cholecalciferol available in stock at Pharmacy store

It was found out that approximately 58% of Pharmacists keep calcirol in the store which is followed by D3 must 53 counters, D-rise %3 Counter.

Table as well as figure below gives a data of number of brands keeps by Pharmacist and percentage of Pharmacist's response in each range.

Brands	Available	% of available
D rise	53	11.37
Calcirol	58	12.44
D-up	31	6.65
Zindee	38	8.15
D3 must	53	11.37
Tayo	54	11.58
calciquick D3	50	10.72
calcimax	30	6.43
CAM D3k	48	10.30
Up rise	28	6.00
D Shine	23	4.93
Total	466	100

Table 1: Brands of Cholecalciferol Available in Pharmacy

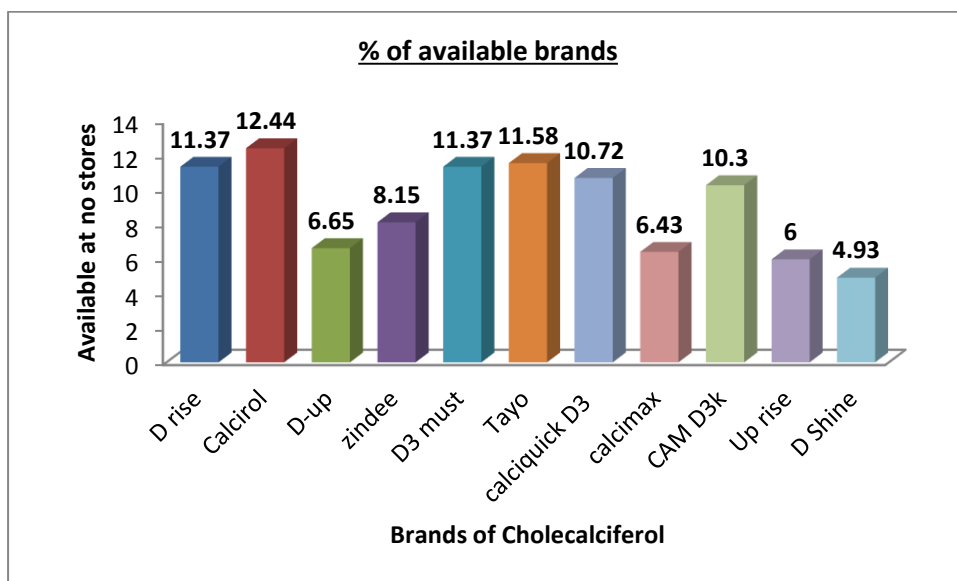


Figure 1: Brands of Cholecalciferol Available in Pharmacy

Top 3 major brands of cholecalciferol selling most on Pharmacy counter and their sales.

Brands	Sum of Stock	% of Stock
Calcirol	1058	44.96%
Drise	219	9.31%
Tayo	198	8.41%
D3 Must	191	8.12%
CalciquickD3	154	6.54%
D-Up	134	5.69%
Calcimax	122	5.18%
Zindee	72	3.06%
Db60k	64	2.72%
UpRise	62	2.63%
CAM D3	60	2.55%
calciquick	10	0.42%
D rise	5	0.21%
Dshine	4	0.17%
Grand Total	2353	100.00%

Table 1: Available Brands of Cholecalciferol and their Sales at Pharmacy store

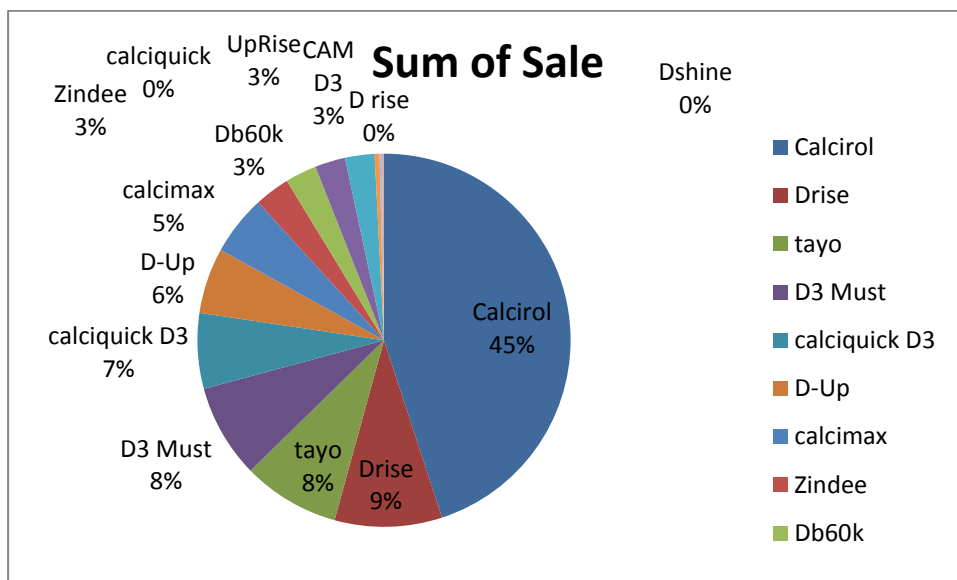


Figure: Available Brands of Cholecalciferol and their Sale at Pharmacy store

Sale other brand of same molecule in absence of prescribed brand

It was found out that according to 67% of chemist they do not sale other brand of same molecule if the prescribed brand is not present.

But the 33% chemist who sale other brands say they sale the substitute with the available Brand and with the permission of doctor who prescribed.

Substitution is completely based on the availability of the product with different brand name.

Table as well as figure below gives a data of number other brands sale & percentage of chemist's response in each range.

sale of other brand than Rx	Response	% Response
No	57	33%
Yes	28	67%
Total	85	100%

Table: Sale of Other Brand of same molecule name Prescribed

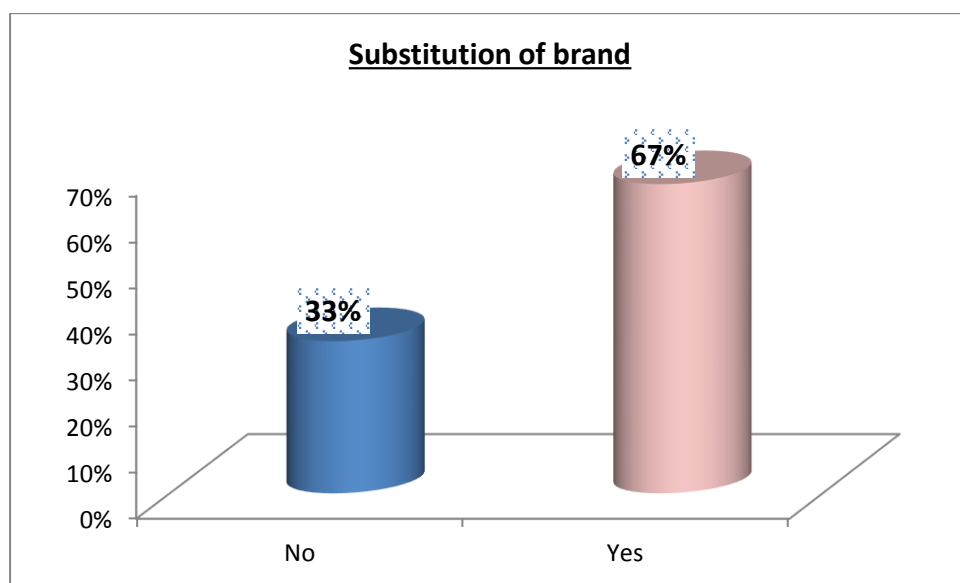


Figure: Sale of Other Brand of same molecule name Prescribed

Dosage form of Cholecalciferol is most prescribed

It was found out that according to 32% of chemist Responded that they sale Sachets more then any other dosage form of Cholecalciferol which is followed by capsule 24% and tablet 22% which also depict that 7% of oral liquids are mostly prescribed by pediatricians

Table as well as figure below gives a data of number other brands sale & percentage of chemist's response in each range.

Values	Response	Response in Percentage
Tablet	76	22.22
Capsules	84	24.56
Sachets	110	32.16
Injections	48	14.03
Oral Liquid	24	7.01
Total	342	100

Table: Most selling dosage form of Cholecalciferol

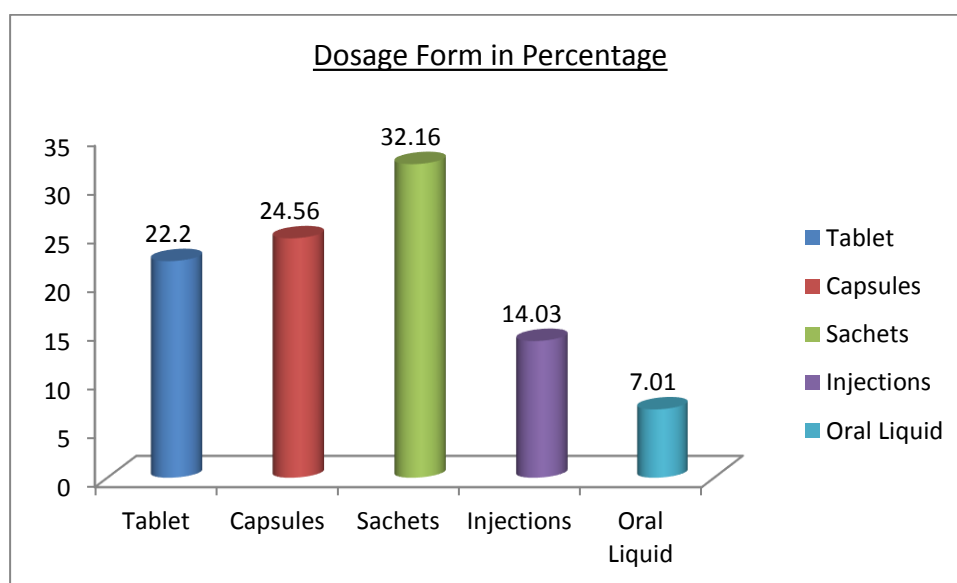


Figure: Most selling dosage form of Cholecalciferol

Findings based on observation & key opinions

- ❖ Number of patients with Vitamin D Deficiency therapy is increasing exponentially.
- ❖ Prescription pattern of Cholecalciferol depends on the presentation of sales representatives in the chamber
- ❖ Prescription pattern follows Price competitiveness of the Product
- ❖ Prescription pattern follows economy status of the patients such as PCPM (Per capita Per Month).
- ❖ Availability is the major issue need to solve for product to be approachable to consumers. Otherwise, major substitute is available in the market which will permanently evaporate the bounced prescription.
- ❖ According to some doctors prescription trend never remains equal, it keeps on changing as per Product being Promoted effectively
- ❖ Many doctors prefer approved article for the indications products being promoted.

Conclusion

1. Prescription pattern also follows with the information shared by the company all the updated views provided for use of Cholecalciferol and various studies changes the prescription pattern is Cholecalciferol.
2. As Calcitriol has highest volume in sales which is 44.96% and stock 12.44% stock is of Calcitriol as well as in prescription which states that availability of your product in the market makes foundation even for substitution at times.
3. Many factors affect the prescription pattern of Cholecalciferol such as 71% of doctors say Price is an important parameter and 45.83% of doctors say solubility also because many Cholecalciferol products are less soluble. But in doctors' chamber information shared and communicating the required information is necessary.

Suggestions

- 1) As India is developing country, with a large population which is Vitamin D Deficient. D-Up Repositioning along with different parameter with same USP could be able to generate new prescriptions.
- 2) It is been observe that query handling in major indications is not upto the mark. This can cause symentic barrier between the products attribute and doctors understanding.
- 3) Combination therapy with Calcium and Calcium with Vitamin K2 as Add on therapy could be future market driver as it is having good efficacy.
- 4) Rigorous Brand Promotion of D-Up with various separate inputs segregated for the speciality could help to increase the sales of D-Up.
- 5) During the study it was found that language is a major constraint. For awareness of a particular product among doctors, company's sales representatives should know the local languages.

Limitations

- 1) Sample unit are limited for survey, it affect the accuracy of outcomes.
- 2) Survey was carried out in one region only (Mumbai).
- 3) Time duration of the survey did not allow collecting more data.
- 4) The respondents were very busy and could not afford more time to answer.

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Annexure
Doctor's questionnaire

QUESTIONNAIRE

Dear Doctor,

As part of my curriculum, I am working on a project **“Product-market Strategy and Performance: An Analysis of Cholecalciferol”**. Please spare a few minutes of your valuable time to help me in my learning's. The data will be kept confidential.

S.No.			
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Date: _____

Name: _____ Location: _____

- How many vitamin D deficient patients you examine weekly?

- a) Less than 10
- b) 10-20
- c) 20-30
- d) 30-40
- e) More than 40

- Which Cholecalciferol Brand you are Prescribing?

a. _____ b. _____ c. _____

- **Which dosage form you prefer for the Cholecalciferol?**

Tablets ☐ Injections ☐ Capsules ☐

Oral Liquids ☐ Sachets ☐

- **. Any combination therapy you preferred with cholecalciferol?**

- a) No
- b) Yes

If yes, _____

- **Indications in which you prescribing Vitamin Cholecalciferol?**

1. _____ 2. _____
3. _____

- **What catches you attention during the product promotion?**

Name of the company

Product or brand name

Information's shared by the sales represent

Ability to solve Query by sales representat

Thank You for your Participation

Pharmacist Questionnaire

“Questionnaire for Pharmacist

S.No.			
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Date: _____

Name: _____ Location: _____

1. How many brands of cholecalciferol do you have in your stock?

- a) 1-3
- b) 4-6
- c) More than 6

2. what brands do you have in stock and what is the stock level of these brand(s)?

☐	D Rise _____ ☐	Calciro _____ ☐	D-up _____
☐	Zindee _____ ☐	D3 MUST _____ ☐	Tayo _____
	Others _____		

3. What are the 3 major brands of cholecalciferol selling most on your counter?

a. _____ b. _____ c. _____

4. How much these top 3 brands do you sell ? ;

Brand Asales/month

Brand B..... sales/month

Brand C.....sales/month

5. Do you provide another brand of same molecule if prescribed brand is not available in your stock?

No

Yes

If yes, then which brand?

6. *What Dossage form of Cholecalciferol is most prescribed?

A) Capsules B) Tablet C) Sachets D) Injections E) Oral liquid

Others_____

Thank you for your Participation