

Brand-Level Price Variation of Calcium Supplements in India: A CIMS 2023–24 Cross-Sectional Cost-Variation Study

Shriram Kaurav¹, Anjali Kushwah², Meghana Shinde³, Tasneem Hussain¹,
Manan Parmar¹

1, Post-graduate Resident Mahatma Gandhi memorial medical college, Indore M.P

2 Associate professor Mahatma Gandhi memorial medical college, Indore M.P

3 Assistant professor Mahatma Gandhi memorial medical college, Indore M.P

Date of Submission: 15-09-2025

Date of Acceptance: 25-09-2025

ABSTRACT: Background: Brand-to-brand price dispersion for identical medicines can erode affordability and adherence in out-of-pocket settings. Calcium supplements—used widely in India as plain salts and as fixed-dose combinations (FDCs) with vitamin D₃ and other micronutrients—are marketed by multiple brands at varying prices. We quantified brand-level price variation using a national compendium.

Methods: We conducted a cross-sectional descriptive cost (price-variation) analysis using the Current Index of Medical Specialties (CIMS) 2023–24. Eligible entries were calcium preparations in tablet or syrup/suspension forms. For each identical strength and dosage form, we extracted per-unit maximum retail prices (MRPs) for all listed brands and derived the minimum and maximum price, absolute difference, and percentage price variation (%PV = [(max – min)/min] × 100). Single-brand listings were retained (%PV = 0 by definition). All calculations were performed in a spreadsheet; no inferential testing was planned.

Results: Brand multiplicity within an identical preparation ranged from 1 to 34. Substantial dispersion was observed between the least- and most-expensive brands. The highest %PV occurred among calcium + multivitamins/minerals combinations (7,729.78%). Plain salts showed smaller spreads; calcium carbonate 500 mg exhibited 15% variation. Several calcium + vitamin D₃ combinations had wide ranges, for example: 1250 mg + 500 IU (two brands; ₹5.90–₹14.83; difference ₹8.93; 151.35%), 500 mg + 1000 IU (three brands; ₹6.14–₹12.90; difference ₹6.76; 110.09%), and 500 mg + 250 IU (15 brands; ₹1.23–₹10.89; difference ₹9.66; 785.36%). Single-brand categories (e.g., some strengths of

calcium carbonate or calcium + vitamin D₃) yielded %PV = 0.

Conclusion: Within the same calcium dose and formulation, brand choice alone can multiply patient costs several-fold—especially for multi-ingredient combinations. Generic-name prescribing with price-checked brand options and per-unit MRP-based formularies may improve affordability and adherence. Limitations include reliance on compendium MRPs and cross-sectional design; future work should link dispersion to utilization and persistence.

KEYWORDS: Brand-to-brand price variation; Calcium-supplements; Fixed-dose-combinations (FDCs); Vitamin D₃ combinations; Price dispersion; Current Index of Medical Specialties (CIMS); Maximum retail price (MRP); Cost analysis; Pharmaceutical economics

I. INTRODUCTION

Calcium is fundamental to skeletal health, neuromuscular function, and intracellular signaling, and inadequate calcium intake is linked to osteopenia, osteoporosis, and fracture risk across the life course. Osteoporosis alone is a major non-communicable disease globally, affecting roughly one in three women and one in five men over 50 years of age, with Asia projected to shoulder more than half of the world's osteoporotic hip fractures by 2050.^{1,2} In India, multiple reports point to chronically low dietary calcium intake, persisting vitamin D insufficiency, and substantial downstream bone health consequences—factors that collectively contribute to widespread clinical use of calcium supplements as monotherapy or in fixed-dose combinations (FDCs) with vitamin D and other micronutrients.^{3,4}

Quantitatively, the gap between recommended and actual calcium intake in India is

striking. Surveys have reported adult daily calcium intake near ~400–450 mg/day—far below contemporary recommendations—along with consistent signals of inadequacy in regional studies.⁵ The Indian Council of Medical Research–National Institute of Nutrition (ICMR–NIN) revised nutrient recommendations in 2020 and issued updated dietary guidelines in 2024, underscoring higher calcium needs across age–sex groups and the need for food-based approaches to close intake gaps.^{6,7,8} Although specific targets vary by age, sex, and physiological state, the broad message is consistent: typical intakes in India remain below recommended levels, and supplementation is frequently used in clinical practice to bridge shortfalls.^{4–8}

The Indian pharmaceutical market is characterized by extensive brand multiplicity, including numerous brands of the same active ingredient and a large number of FDCs. For calcium products, this spans plain salts (e.g., calcium carbonate) and combinations with cholecalciferol or multivitamin–mineral blends. Some calcium-related products fall under the National List of Essential Medicines (NLEM) framework—e.g., calcium carbonate and cholecalciferol—placing them within the Drugs (Prices Control) Order (DPCO) apparatus for scheduled medicines; however, many FDCs and “nutraceutical-leaning” combinations may not be scheduled, creating space for wide brand-level price dispersion.^{9,10}

Affordability is not a marginal consideration in India. Out-of-pocket expenditure (OOPE) still constitutes a large share of total health spending; recent National Health Accounts and official summaries report OOPE at ~47% of total health expenditure in 2019–20, despite a secular decline from earlier levels.^{11,12} Evidence from health services research consistently links higher patient cost-sharing to reduced adherence and worse outcomes across therapeutic areas.¹³ In the context of long-term supplementation—where perceived “symptom-free” states already challenge adherence—brand-driven price differences can be especially consequential for persistence, rational use, and equity.^{11,12,13}

Drug price-variation studies therefore play a useful descriptive and policy-adjacent role. They do not evaluate clinical outcomes, but they quantify the magnitude of intra-preparation price spread across brands, highlight categories where dispersion is greatest, and inform practical choices for prescribers and payers. Methodologically, most Indian price-variation analyses compute, for each

strength/formulation, the minimum and maximum brand prices and report absolute and percentage price variation $(\max - \min) / \min \times 100$ $(\max - \min) / \min \times 100$, sometimes alongside the number of available brands per preparation.¹⁴ Such studies are correctly classified as **partial economic evaluations** (cost analyses), not full pharmacoeconomic evaluations (which relate costs to outcomes via cost-effectiveness, cost-utility, etc.).¹⁵ This distinction is important for accurate positioning of findings and claims.^{14,15}

A key practical consideration is the choice of a comprehensive, standardized data source for brand and pricing information. The **Current Index of Medical Specialties (CIMS)** is a widely used compendium in India that collates brand-wise details—names, strengths, formulations, manufacturers, and maximum retail prices (MRPs)—across therapeutic categories. Using CIMS as a sampling frame allows a consistent, cross-sectional snapshot of the market offerings for calcium salts and FDCs over a defined time window (e.g., 2023–24), improving comparability within and across preparations.¹⁶

Within this context—high burden of calcium inadequacy, heavy OOPE, brand multiplicity, and mixed price regulation—the present study undertakes a **brand-level price-variation analysis** of calcium supplements listed in CIMS 2023–24. Specifically, we (i) enumerate the number of brands available for commonly used calcium preparations (plain salts and FDCs; tablets and syrups/suspensions), (ii) compute the absolute and percentage price variation for identical strengths/formulations based on minimum and maximum MRPs, and (iii) highlight categories demonstrating the widest dispersion. By design, this is a descriptive cost analysis that does **not** assess comparative effectiveness or cost-effectiveness. The findings aim to support cost-conscious prescribing (e.g., generic name with price-checked brand options), enable patient-centered shared decision-making, and inform procurement and policy discussions focused on rational, affordable access to widely used supplements in India.^{11,15,16}

II. METHODOLOGY

We conducted a cross-sectional **price-variation (cost) analysis** using the **Current Index of Medical Specialties (CIMS) Annual 2023–24** as the sole standardized source of brand-wise pricing in India. All calcium preparations listed in CIMS during 2023–24 were screened, including

plain calcium salts and fixed-dose combinations (FDCs) with vitamin D₃ and/or multivitamins/minerals, in tablet and syrup/suspension dosage forms. Each analytic unit (“preparation”) was defined by **identical strength and dosage form** (for example, calcium carbonate 500 mg tablet or calcium + vitamin D₃ syrup). For uniform comparison, maximum retail prices (MRPs) were **standardized per unit**—per tablet for solid orals and per millilitre for liquids. When multiple pack sizes existed for the same brand and strength, the per-unit price was derived from the listed MRP and pack quantity; entries **without a listed price** were excluded. Listings marketed by a **single manufacturer** were **retained**; by definition, their minimum and maximum per-unit prices were identical and the percentage price variation was zero.

Two reviewers independently extracted per-unit MRPs for all eligible brands within each preparation and verified equivalence of strength and dosage form before comparison; discrepancies (including duplicate or obviously miscoded entries) were resolved by consensus using compendium context. For every preparation we computed the **number of brands**, the **minimum** and **maximum** per-unit price, the **absolute difference** (maximum – minimum), and the **percentage price variation**, calculated as $(\text{maximum} - \text{minimum}) \div \text{minimum} \times 100$ ($(\text{maximum} - \text{minimum}) \div \text{minimum} \times 100$). The **primary endpoint** was percentage price variation at the preparation level. To aid interpretation, outputs were **summarised by formulation type** (plain calcium salt; calcium + vitamin D₃; calcium + multivitamins/minerals/other) and **by dosage form** (tablet vs syrup/suspension), mirroring how products are encountered in prescribing and procurement.

This was a **descriptive cost analysis**; **no hypothesis testing or correlation analyses** were planned or performed. All calculations and tabulations were completed in a spreadsheet application with independent cross-checks on a sample of entries. The study used **publicly available brand-listed price data** and involved no human participants or patient-level information;

therefore, **ethics approval and informed consent were not required**.

III. RESULTS

Price listings in CIMS 2023–24 showed wide brand multiplicity across calcium salts and fixed-dose combinations (FDCs) marketed in India. The number of brands available for a given, identical strength and dosage form ranged from **1 to 34**, indicating substantial intra-preparation competition.

Consistent with this, pronounced price dispersion was observed between the least and most expensive brands of the same preparation. The **highest percentage price variation** was recorded for **calcium + multivitamins & minerals (and other combinations)** at **7,729.78%**, whereas the **lowest variation** was noted for **calcium carbonate 500 mg** at **15%**.

Among plain calcium salts, several preparations were listed by a single manufacturer and therefore showed **%PV = 0** by construction (e.g., calcium carbonate **625 mg** and **300 mg** tablets), while strengths with more than one brand displayed modest spreads (e.g., calcium carbonate **500 mg**, **15%**; **250 mg**, **21.76%**; **225 mg**, **32.66%**).

In contrast, many **calcium + cholecalciferol** combinations exhibited larger price ranges. For example, **1250 mg + 500 IU** had two brands with a minimum of $\square 5.90$ and maximum of $\square 14.83$ (absolute difference $\square 8.93$; **151.35%**), and **500 mg + 1000 IU** (three brands) ranged from $\square 6.14$ to $\square 12.90$ (**110.09%**).

Some high-strength combinations had many brands and very large spreads—for instance, **500 mg + 250 IU** (15 brands) from $\square 1.23$ to $\square 10.89$ (difference $\square 9.66$; **785.36%**), and **1250 mg + 250 IU** (≈ 12 – 13 brands) from $\square 1.91$ to $\square 9.00$ (difference $\square 7.09$; **371.2%**).

Notably, large dispersion could also arise even when only two brands were listed, as seen with **625 mg + 125 IU** (min $\square 1.14$, max $\square 4.37$; **283.33%**).

Conversely, several combinations appeared as single-brand listings (e.g., **500 mg + 400 IU**; **500 mg + 200 IU**; **250 mg + 1000 IU**; **250 mg + 500 IU**), all yielding **%PV = 0**.

Taken together, **multi-ingredient combinations** (particularly calcium with multivitamins/minerals)

Preparation (strength & composition)	Dosage form	Brands (n)	Min price (₹/unit)	Max price (₹/unit)	Absolute diff (₹)	% Price variation*
Plain calcium salts						
Calcium carbonate 500 mg	Tablet	2	1.66	1.91	0.25	15.00%
Calcium carbonate 250 mg	Tablet	2	2.60	3.166	0.566	21.76%
Calcium carbonate 225 mg	Tablet	2	7.992	10.60	2.608	32.66%
Calcium carbonate 625 mg	Tablet	1	—	—	0	0%
Calcium carbonate 300 mg	Tablet	1	—	—	0	0%
Calcium + vitamin D₃ combinations						
Calcium 1250 mg + D ₃ 500 IU	Tablet	2	5.90	14.83	8.93	151.35%
Calcium 500 mg + D ₃ 1000 IU	Tablet	3	6.14	12.90	6.76	110.09%
Calcium 500 mg + D ₃ 250 IU	Tablet	15	1.23	10.89	9.66	785.36%
Calcium 1250 mg + D ₃ 250 IU	Tablet	~12–13	1.91	9.00	7.09	371.20%
Calcium 625 mg + D ₃ 125 IU	Tablet	2	1.14	4.37	3.23	283.33%
Calcium 500 mg + D ₃ 400 IU	Tablet	1	—	—	0	0%
Calcium 500 mg + D ₃ 200 IU	Tablet	1	—	—	0	0%
Calcium 250 mg + D ₃ 1000 IU	Tablet	1	—	—	0	0%
Calcium 250 mg + D ₃ 500 IU	Tablet	1	—	—	0	0%
Calcium multivitamins/minerals (category summary)	Mixed	—	—	—	—	Max observed %PV = 7,729.78% †

Table 1: Brand-wise price dispersion for representative calcium preparations listed in CIMS 2023–24 (per-unit MRP) displayed the **largest brand-level price spreads**, while **plain calcium salts** tended to show smaller dispersion, especially where only one or two brands were listed.

As expected, categories represented by a **single manufacturer** consistently had **zero** variation, whereas categories with numerous brands often exhibited very high percentage differences in maximum retail price. Representative entries extracted above illustrate how a patient’s out-of-pocket cost for

therapeutically comparable options can vary several-fold solely based on brand selection within the same strength and formulation.

IV. DISCUSSION

This cross-sectional cost (price-variation) analysis of calcium products listed in CIMS 2023–

24 demonstrates substantial brand-level dispersion within identical strengths and dosage forms, with the largest spreads concentrated in multi-ingredient combinations and generally smaller spreads among plain salts. These observations matter in a country where the clinical need for calcium supplementation is pervasive across the life course. Osteoporosis remains a major non-communicable disease with a growing burden, and Asia—including India—is projected to account for an expanding share of osteoporotic fractures.^{1,2} Converging nutrition and bone-health literature shows that habitual calcium intake in India is frequently below recommended levels, which, alongside widespread vitamin D insufficiency, sustains long-term demand for calcium supplements either as single-ingredient salts or as fixed-dose combinations (FDCs) with cholecalciferol and other micronutrients.³⁻⁵ Current national guidance emphasises closing intake gaps using food-based approaches and, when clinically indicated, rational and affordable supplements.⁶⁻⁸

The regulatory and financing context helps to interpret our findings. Elements of calcium therapy (e.g., calcium carbonate, cholecalciferol) intersect with the National List of Essential Medicines (NLEM) and thus fall under the Drugs (Prices Control) Order (DPCO) ceiling prices administered by NPPA.^{9,10} At the same time, India's health system continues to rely heavily on out-of-pocket expenditure (OOPE), making brand-to-brand price differences salient for adherence and persistence.^{11,12} Broader adherence literature shows that higher patient cost-sharing is linked to worse persistence and outcomes across therapeutic areas; while not specific to calcium, it underscores how large intra-preparation price spreads can translate into missed doses or early discontinuation, particularly when supplements are perceived as optional.¹³ Conceptually, our analysis is a **partial economic evaluation**—a descriptive cost comparison without linking prices to clinical outcomes—consistent with standard definitions.¹⁵ Use of a single, widely used compendium (CIMS) as the sampling frame offers consistency across salts, strengths and dosage forms.¹⁶

Our results align with—and in some categories exceed—price dispersion documented elsewhere in India. Vitamin D market audits reported very large dispersion over time, with >1,000% variation for common cholecalciferol strengths and near-ten-fold increases in calcitriol price spread over seven years, mirroring the high spreads we saw when vitamin D is bundled with calcium.¹⁷ Studies focused on calcium supplements

have also recorded extreme variability; a tertiary-care audit reported maximum percentage price variation (PPV) of ~**4,361%** for calcium citrate + vitamin D₃, consistent with our observation that combination products often exhibit the highest dispersion.¹⁸ Large within-molecule spreads are not unique to bone-health agents: antithrombotics (e.g., clopidogrel 75 mg PPV ≈ **395%**)¹⁹ and anticancer regimens (e.g., paclitaxel 260 mg injection PPV ≈ **2,830%**)²⁰ show wide ranges, underscoring a system-level pattern. Recent audits of oral antidiabetic medicines likewise report triple- to quadruple-digit PPVs for several agents and fixed-dose combinations (e.g., glimepiride + metformin SR 1/500 mg PPV ≈ **1,246%**).²¹ Together, these data corroborate our central finding: **within** an identical strength and dosage form, brand choice alone can multiply a patient's cost several-fold—particularly for multicomponent or nutraceutical-leaning combinations.

Strengths and limitations. Strengths include a transparent metric $(\max - \min) / \min \times 100$, per-unit standardisation, and retention of single-brand listings (explicitly yielding %PV = 0).¹⁶ Limitations merit caution. First, **coverage**: a compendium, while widely used, may not list all marketed brands at any given time.¹⁶ Second, **price type**: MRPs may exceed transaction prices after local discounts; nonetheless, MRP is a common, comparable upper bound. Third, **design**: our cross-sectional, descriptive approach does not infer causality, utilisation, or outcomes.¹⁵ Fourth, **regulatory heterogeneity**: we did not stratify by scheduled vs non-scheduled status or nutraceutical classification, which could clarify policy drivers of dispersion. Finally, we did not evaluate quality, interchangeability, or bioequivalence; comparisons are restricted to labeled strength and form.

For clinicians, **generic-name prescribing plus a price-checked brand** can reduce patient bills without altering dose or formulation; where clinically suitable, **plain salts** may offer more predictable pricing than multi-ingredient combinations. For hospital committees and payers, **formulary curation and procurement** guided by per-unit prices can improve affordability at scale, particularly in ambulatory care where OOPE dominates. For policymakers, routine dashboards highlighting **high-dispersion categories** and tracking WPI-linked ceiling-price updates may nudge markets toward value.^{10,11,12} Future work should link price dispersion to **utilisation and**

persistence (e.g., pharmacy sales, claims), and stratify by regulatory status to parse the contribution of policy instruments over time.¹⁰

V. CONCLUSION

Using CIMS 2023–24, we found substantial brand-level price dispersion within identical calcium strengths and dosage forms in India. Brand counts ranged from 1 to 34, and percentage price variation spanned from 0% in single-brand listings to **7,729.78%** for calcium + multivitamin/mineral combinations; plain salts showed smaller spreads (e.g., calcium carbonate 500 mg \approx **15%**). In a high out-of-pocket system, such spreads likely undermine affordability and adherence. Clinically, prescribe by **generic name** and pair it with **price-checked brand options**, favouring **plain salts** when interchangeable; pharmacists and procurement teams should curate **per-unit MRP-based formularies** and flag high-dispersion lines for counselling. Policymakers may consider transparent category dashboards and continued attention to price oversight. Key limitations are reliance on compendium MRPs, cross-sectional design, and no linkage to utilization or outcomes. Future work should relate dispersion to **persistence/uptake** and examine differences by **scheduled vs non-scheduled** status.

REFERENCES

- [1]. International Osteoporosis Foundation. Epidemiology—Global burden of osteoporosis [Internet]. 2024–2025 [cited 2025 Sep 16].
- [2]. International Osteoporosis Foundation. Key statistics for Asia—Projected hip fractures [Internet]. 2024–2025 [cited 2025 Sep 16].
- [3]. Harinarayan CV, Akhila H, Poojari VG. Modern India and Dietary Calcium Deficiency—Half a Century Nutrition Data: Retrospect, Introspect, and the Road Ahead. *J Clin Res Pediatr Endocrinol*. 2021;13(Suppl 1):1–10.
- [4]. Shlisky J, et al. Calcium deficiency worldwide: prevalence of inadequate intakes and associated health outcomes. *Ann N Y Acad Sci*. 2022;1513(1):5–20.
- [5]. Pal R, et al. Dietary calcium intake and association with serum 25(OH)D among Indian adults. *Indian J Endocrinol Metab*. 2024;28(6):xxx–xxx.
- [6]. Indian Council of Medical Research–National Institute of Nutrition (ICMR–NIN). A brief note on nutrient requirements for Indians: the RDA and EAR [Internet]. 2020 [cited 2025 Sep 16].
- [7]. National Institute of Nutrition. Dietary Guidelines for Indians—2024 [Internet]. 2024 [cited 2025 Sep 16].
- [8]. National Institute of Nutrition. Dietary Guidelines for Indians—Additional resources and updates [Internet]. 2024 [cited 2025 Sep 16].
- [9]. National List of Essential Medicines (NLEM) 2022. Central Drugs Standard Control Organisation (CDSCO) [Internet]. 2022 [cited 2025 Sep 16].
- [10]. Press Information Bureau, Government of India. NPPA fixes ceiling prices of scheduled medicines under DPCO, 2013—Overview and annual WPI revisions [Internet]. 2025 Aug 8 [cited 2025 Sep 16].
- [11]. Press Information Bureau, Government of India. National Health Accounts Estimates for India 2019–20: OOPE share 47.1% [Internet]. 2023 Apr 25 [cited 2025 Sep 16].
- [12]. National Health Systems Resource Centre. National Health Accounts—Estimates for India 2019–20 [Internet]. 2023 [cited 2025 Sep 16].
- [13]. Eaddy MT, Cook CL, O’Day K, Burch SP, Cantrell CR. How patient cost-sharing trends affect adherence and outcomes: a literature review. *Am J Manag Care*. 2012;18(12):e464–76.
- [14]. Ray A, et al. A cost variation analysis of drugs available in the Indian market for the management of thromboembolic disorders. *J Clin Diagn Res*. 2020;14(4):FC09–FC13.
- [15]. Lau F, et al. Economic evaluation: full vs partial (cost-only) analyses. In: *Handbook of eHealth Evaluation*. NCBI Bookshelf; 2017.
- [16]. MIMS/CIMS India. Drug directory and medication information portal [Internet]. 2025 [cited 2025 Sep 16].
- [17]. Chugh PK, Dabas A. Price dispersion of vitamin D supplements over time: An initiative for prescriber education. *Indian J Endocrinol Metab*. 2021;25(2):142–147. doi:10.4103/ijem.ijem_159_21.
- [18]. Nerlekar S, Seetharaman R, Ranadive S, Karia S. Cost analysis of calcium supplements used in a tertiary care

- hospital. Int J Sci Res. 2019;8(8):[pagination not stated].
- [19]. Deepak KR, Geetha A. Cost variation analysis of various brands of anticoagulants, fibrinolytics, and antiplatelet drugs currently available in Indian market. Natl J Physiol Pharm Pharmacol. 2019;9(5):368–372. doi:10.5455/njppp.2019.9.0205602032019
- [20]. Patil RJ, Bhandari PR, Gaiwale SD, Dugad VJ, Jagtap SB. Variation in cost among anticancer drugs available in India: A cross-sectional study. J Clin Diagn Res. 2023;17(8):FC06–FC09. doi:10.7860/JCDR/2023/65520.18297.
- [21]. Sathyanathan T, Joshi R, Singh S, Dharapur P, Loarine S. Cost variation analysis of commonly used oral antidiabetic drugs available in the Indian pharmaceutical market: a cross-sectional study. Int J Basic Clin Pharmacol. 2025;14(5):774–780. doi:10.18203/2319-2003.ijbcp20252575.