

CENTRIC Observational Study: Effectiveness of Centrum Multivitamin Supplementation on Cognitive Function and Energy Parameters in the Indian Population

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ABSTRACT

Micronutrient deficiencies, or “hidden hunger,” affect a significant proportion of the global population, particularly in India. Multivitamin supplementation has been proposed as a practical approach to support brain function, energy metabolism, and overall health. This observational study evaluated the perceived effectiveness of Centrum multivitamin supplementation (Centrum Men, Centrum Women, and Centrum Adults 50+) on cognitive function, energy levels, and overall well-being among Indian adults using validated patient-reported outcome measures (PROMs). This study included 614 adult participants treated by 80 healthcare professionals (HCPs) across India. Participants had used Centrum supplements for at least three months. Data were collected through secure online questionnaires and included the Patient-Reported Outcomes Measurement Information System (PROMIS) Short Form (SF)-6a, and visual analogue scales (VAS) for energy, stress, and joint pain. Changes in health status were assessed using paired t-tests and chi-squared tests. Significant improvements were observed in cognitive performance, energy levels, and perceived immune fitness across all Centrum user groups. Mean PROMIS cognitive T-scores increased in all groups, particularly among users of Centrum Adults 50+. Self-reported energy scores increased by up to 44%, while stress levels declined significantly. Incidents of heart palpitations and high blood pressure decreased across all groups. Users of Centrum Women also reported improved skin radiance. HCPs corroborated these findings, with over 80% noting improvements in cognitive function and overall vitality in their patients. Regular use of Centrum multivitamins was associated with meaningful improvements in cognitive and physical health parameters among Indian adults in a real-world setting. These findings support the role of multivitamin supplementation as an accessible, supportive strategy for promoting health, particularly in populations with high nutritional demands.

KEYWORDS: multivitamins; cognitive function; energy; patient-reported outcomes

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I. INTRODUCTION

Micronutrients as compounds required in very small amounts (<100 mg/day) but are crucial for human health. Vitamins and minerals play essential roles in the production of hormones and enzymes, which are necessary for growth, development, and metabolic functions. Micronutrient deficiencies or “hidden hunger,” may lead to stunted growth,

impaired cognitive development, mental health disturbances, vision problems, learning difficulties, increased vulnerability to infections, and premature mortality.¹⁻³

Globally, over two billion people suffer from some form of micronutrient deficiency, and nearly half of the world's micronutrient-deficient population lives in India.^{4,5} Micronutrient deficiencies occur due to low bioavailability,

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insufficient intake, malabsorption, and physiological changes associated with aging.⁶ Among adults in India, 47% have vitamin B12 deficiency,⁷ 40% of individuals aged 41-60 years have vitamin B12 deficiency; the prevalence of folate deficiency was 12%.⁸ Among adults aged >60 years, the prevalence of vitamin C deficiency is 73.9%. Zinc deficiency is reported in up to 58% of non-pregnant women.⁹ Therefore, there is a need to provide micronutrient supplements to optimize function.¹

Micronutrients play a role in brain function and energy metabolism. ATP production requires B vitamins, vitamin C, iron, magnesium, zinc, copper, manganese, and sulphur to support cell division, active transport, nerve conduction, and complex cognitive tasks.² Zinc and magnesium aid in neurotransmission and signal transduction, while B vitamins play a role in DNA/RNA synthesis, and neurochemical signalling. Iron, magnesium, and vitamins B1 and D are linked to improved energy levels, decreased fatigue, improved muscle endurance, and improved emotional health. Combining these nutrients as a multiple micronutrient supplement can promote both physical and mental health.¹⁰ Vitamins offer therapeutic potential for enhancing cognitive performance and supporting mental health.¹¹

The advantages of multivitamin-multimineral (MVM) supplementation for cognitive health are supported by recent meta-analyses and randomized controlled trials. Daily supplementation was linked to improvements in global cognition and episodic memory, and long-term use enhances cognitive performance among older adults.⁵ Short-term dietary supplementation provides moderate and clinically meaningful benefits in joint pain and function in patients with osteoarthritis.¹²

MVM consumption is common, as is self-medication with MVMs. Vitamins and minerals account for ~14% of self-prescribed medications in India, and can lead to adverse drug reactions.¹³ Among urban Indians, 62.5% of respondents self-medicated with multivitamins, with advertisements and advice from medical representatives contributing to 25% of self-prescribed use.¹⁴

Modern healthcare emphasizes patient perspectives in health outcomes evaluation. Patient-reported outcome measures (PROMs) are validated tools for collecting patient data on health-related quality of life, symptoms, and functional status. These perspectives improve communication, decision-making, and patient care.¹⁵

These considerations form the basis of our study, which aims to assess the perceived effectiveness of Centrum multivitamin supplementation (Centrum Men, Centrum Women, and Centrum Adults 50+) on cognitive function, energy, stress and joint pain levels, and skin radiance using validated PROMs, while also evaluating healthcare professionals' perceptions of the benefits and tolerability of these standardized supplements.

II. METHODS

A. Study Design and Sample Size

This observational study aimed to assess the real-world effectiveness of Centrum multivitamin supplementation, Centrum Men, Centrum Women, and Centrum Adults 50+ on self-reported cognitive function and energy levels among Indian adults. Additionally, the study aimed to understand HCPs' perceptions regarding the benefits and tolerability of these supplements in clinical practice. The composition of the study products is given in Table 1.¹⁶⁻¹⁸ A sample size of 200 participants (per Centrum variant) was considered sufficient to have 80% chance of detecting a 20% difference in patient reported outcomes measures with a 5% error of margin. However, due to the real-world design of the study, there were no restrictions on the maximum number of participants who could be included. Data was collected between September 2024 and February 2025.

Table 1: Composition of Centrum Multivitamin Formulations Used in This Study¹⁶⁻¹⁸

Component	Centrum Men	Centrum Women	Centrum Adults 50+
Vitamin A	800 mcg	800 mcg	800 mcg
Vitamin C	80 mg	65 mg	65 mg
Vitamin D2	600 IU	600 IU	600 IU
Vitamin E	5 mg	9 mg	9 mg
Biotin	25 mcg	25 mcg	25 mcg
Folate	200 mcg	220 mcg	220 mcg
Vitamin B12	2.2 mcg	2.2 mcg	2.2 mcg
Vitamin B1	1.2 mg	1 mg	1 mg
Vitamin B2	1.2 mg	1 mg	1.1 mg
Vitamin B3	15 mg	14 mg	11 mg
Vitamin B5	5 mg	5 mg	5 mg
Vitamin B6	1.3 mg	1.3 mg	1.3 mg
Vitamin K	55 mcg	55 mcg	55 mcg
Calcium	250 mg	325 mg	250 mg
Iron	3.7 mg	4.4 mg	4.4 mg
Zinc	11 mg	11 mg	11 mg
Iodine	140 mcg	140 mcg	140 mcg
Magnesium	66 mg	66 mg	66 mg
Manganese	1.2 mg	1.8 mg	2.3 mg
Copper	0.45 mg	0.45 mg	0.9 mg
Selenium	40 mcg	40 mcg	40 mcg
Chromium	17.5 mcg	30 mcg	30 mcg
Molybdenum	45 mcg	45 mcg	45 mcg
Additional component	Grape seed extract 100 mg	Sodium hyaluronate 5 mg	<i>Boswellia serrata</i> extract 250 mg

B. Participant Recruitment and Eligibility

A total of 80 HCPs were digitally recruited, representing the fields of general medicine, obstetrics and gynecology,

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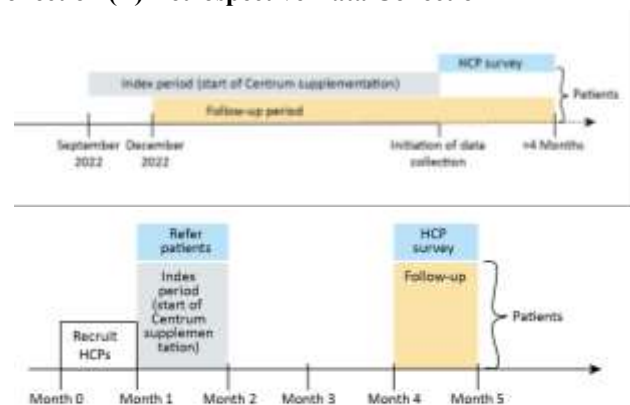
and orthopedics. HCPs were recruited based on the following criteria (i) practicing general medicine, obstetrics and gynaecology, or orthopedics; (ii) had at least 2 years' experience in practice (iii) spent 50% of the time in direct patient care and managed at least 100 patients a month (iv) had seen at least 10 patients in the past one year who have been regularly taking Centrum Men, Women, or Adults 50+ for 3 months or more, or planned to recommend Centrum multivitamin supplementation to at least 10 patients; and (v) routinely collect at least 3 of the following patient-reported outcome measures in practice: EQ-5D-5L, PROMIS Cognitive Function abilities short form 6a, single-item immune fitness and reduced immune fitness rating, visual analogue scale-100 mm for energy, visual analogue scale-100 mm for joint pain, visual analogue scale-100 mm for stress. Potential participants were identified through physician panels, contact lists and other relevant directories or databases in each territory and invited to participate. Interested doctors were screened to verify their eligibility. Those who were eligible then provided informed consent before they were permitted to continue with the online questionnaire.

Patients were included for analysis if they met the following criteria: (i) adults aged 18 years and above; (ii) had started taking Centrum between 1 September 2022 and 31 October 2024; (iii) had visited the clinic at least once prior to starting Centrum with their records including the patient-reported outcome measures before consuming Centrum multivitamin; (iv) were scheduled to return to the clinic for follow-up consultation visit within 4 months if patient-reported outcome measures had not already been collected after at least 3 months of regular Centrum intake. Patients were excluded from analysis if they had a physician-confirmed diagnosis of either cancer, autoimmune conditions or HIV/AIDS, were participating in any clinical trials and were pregnant or breastfeeding. Informed consent was obtained from eligible patients if their baseline (prior to starting Centrum) or follow-up (after at least 3 months' of regular Centrum consumption) records were not collected by the time of study data collection start.

C. Data Collection and Parameters

Data were collected through secure online questionnaires, completed either directly by patients or by their referring HCPs using anonymized data. Both retrospective and prospective data were captured. For prospective data collection (Figure 1A), data were collected at two time points, baseline (pre-supplementation) and follow-up (after 3–4 months). For retrospective data collection (Figure 1B), follow-up data were linked to previously recorded baseline metrics. Information on patients' sociodemographic (age, sex, educational level, employment status) and clinical characteristics including weight, height, co-morbid conditions, as well as duration and frequency of taking Centrum was collected.

Figure 1: Design of the Study (A) Prospective Data Collection (B) Retrospective Data Collection



HCPs, healthcare practitioners; PROs, patient-reported outcomes.

The questionnaire covered a range of self-reported outcomes, including cognitive function through PROMIS Cognitive Function SF-6a, and energy using a 100-mm VAS. The PROMIS Cognitive Function SF-6a is a validated, patient-reported outcome tool developed to assess perceived cognitive functioning. This is a six-item subset scale of the PROMIS cognitive function item bank that assesses patient-perceived cognitive deficits. It evaluates mental sharpness, memory, speed of thinking, ability to focus, track tasks, and think clearly without extra effort. Respondents rate their self-perceived cognitive deficits over the past 7 days for sharp mind, memory, thinking fast, keeping track of active task, concentration and thinking clearly, on a 5-point Likert-scale (Not at all, A little bit, Somewhat, Quite a bit, Very Much). The raw score is calculated by summing the responses before generating a T-score using a conversion scale. The T-score ranges from 24.50 to 66.16, with a lower T-score indicating less self-perceived cognitive deficits. This tool is used to measure changes in cognitive clarity and function over time or following interventions.¹⁹

Additionally, 100 mm VAS²⁰ were used to assess stress and energy levels and joint pain before and after Centrum supplementation. Stress was measured using a scale from 0 (no stress) to 100 (maximum stress), while energy levels were rated from 0 (no energy) to 100 (maximum energy). VAS scores for joint pain were categorized as follows: <5 mm (no pain), 5–44 mm (mild), 45–74 mm (moderate), and ≥75 mm (severe).²¹

No administration of any therapeutic agent and no procedures were required in the study, and no adverse events (AEs) were solicited throughout this study. However, spontaneously reported events were reported.

D. Statistical Analysis

Descriptive analyses were conducted to summarize characteristics of participating HCPs, including years of

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practice and medical specialty, as well as the sociodemographic and clinical profiles of their patients, recommended Centrum multivitamin usage by HCPs, and patient compliance with supplementation.

Continuous variables were reported as mean (standard deviation [SD]) or median (interquartile range, IQR), as appropriate. Categorical variables were presented as frequencies and percentages for the overall population and relevant subgroups. Mean ($\pm$ SD) values were calculated for PROMIS cognitive function T-scores, and VAS scores for energy, joint pain, and stress. Proportions were reported for the individual PROMIS cognitive function items (memory and concentration), incidence of palpitations, high blood pressure, and skin radiance both pre- and post-supplementation. Paired sample t-tests were used to assess changes in mean scores before and after Centrum multivitamin use. Chi-squared test was used to determine significance of differences in proportions of respective parameters before and after Centrum supplementation. Level of significance for statistical tests was 5%. Data analyses were conducted using STATA v14.1 (StataCorp, 2015).

E. Ethical Considerations

This study protocol and its amendments, along with the Informed Consent Form, were reviewed and approved by the Suraksha Ethics Committee, India [Registration No.: ECR/644/Inst/MH/2014/RR-20, OHRP No.: IORG0008323]. This study was conducted in accordance with the appropriate ethical guidelines, including the Declaration of Helsinki and all applicable privacy laws and local regulations for each participating site. Informed consent was obtained from all participants.

III. RESULTS

The analysis included 614 participants: 203 users of Centrum Men, 210 users of Centrum Women, and 201 users of Centrum Adults 50+. The median age was comparable in the Centrum Men and Women groups (39.0 and 38.0 years, respectively), whereas participants in the Adults 50+ group were older, with a median age of 59.0 years. Educational attainment differed markedly between groups; over 63% of participants in the younger groups had completed university or post-graduate education, compared to only 23.4% in the Adults 50+ group, where 39.3% had primary-level education as their highest qualification. The burden of chronic conditions such as diabetes and hypertension was notably greater among the Adults 50+ group, whereas a higher proportion of younger participants reported no existing comorbidities (Table 2).

Table 2: Demographic, Educational, and Health Characteristics of Centrum Users by Formulation Group

Parameter	Centrum Men (n=203)	Centrum Women (n=210)	Centrum Adults 50+ (n=201)
Median age (Quartile 1 – Quartile 3)	39.0 (33.1-44.9)	38.0 (30.9-42.5)	59.0 (59.9-65.2)
Sex	100% male	100% female	54% male; 46% female
Highest education level			
Primary	9.9%	6.2%	39.3%
Secondary	21.7%	26.2%	28.9%
University or post-graduate	63.5%	64.8%	23.4%
Other technical education or training	4.9%	2.9%	8.5%
Top three comorbid conditions	Diabetes mellitus: 36% Hypertension: 33% High cholesterol: 13.3%	Diabetes mellitus: 23.3% Hypertension: 21.4% High cholesterol: 9.5%	Diabetes mellitus: 58.7% Hypertension: 55.7% High cholesterol: 23.4%
No comorbidities	34.5%	48.1%	5%

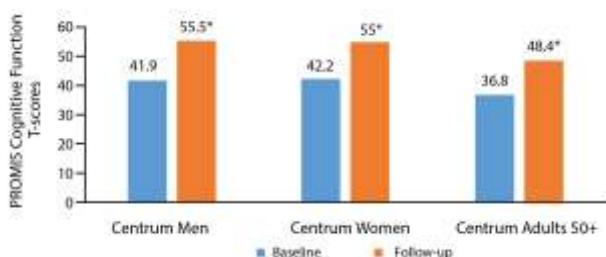
At follow-up, the majority of participants continued using their respective Centrum supplements, with adherence highest among adults aged 50+ (99%), followed by Centrum Women (92%) and Centrum Men (88%). This reflects high overall compliance across all user groups, with Centrum Adults 50+ showing the strongest sustained usage. Specifically, 59.7% of participants in the Centrum Adults 50+ group reported taking the supplement six or seven times per week (38.3% on a daily basis and 21.4% six days a week). In contrast, only 26.1% of participants in the Centrum Men group (10.3% daily, 15.8% six days/week) and 20% of participants in the Centrum Women group (7.6% daily, 12.4% six days/week) reported similar frequency. These findings highlight a notably higher level of adherence and routine supplement use among older participants, indicating a stronger perceived value or motivation for consistent intake in this age group.

Cognitive function improved meaningfully across all participant groups, as reflected in both higher PROMIS

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Cognitive Function T-scores (Figure 2) and substantial gains across all six assessed cognitive domains in all three treatment groups (Figure 3A, 3B, and 3C). Mean T-scores increased from 41.9 to 55.5 for Centrum Men, 42.2 to 55.0 for Centrum Women, and 36.8 to 48.4 for Centrum Adults 50+, indicating significantly enhanced cognitive performance. Across domains such as memory, clarity of thought, attention, fast thinking, and task tracking, marked improvements were reported. Specifically, over 90% of Centrum Men and Centrum Women users reported sharper mind, better memory, and clearer thinking following supplementation. Similarly, users of Centrum Adults 50+ experienced meaningful gains, with 65% to 75% of users rating the ability for each domain of cognitive functioning as “quite a bit” or “very much” at follow-up, up from as low as 12.9% at baseline. These consistent trends across cognitive indicators highlight the positive impact of Centrum on self-perceived cognitive health.

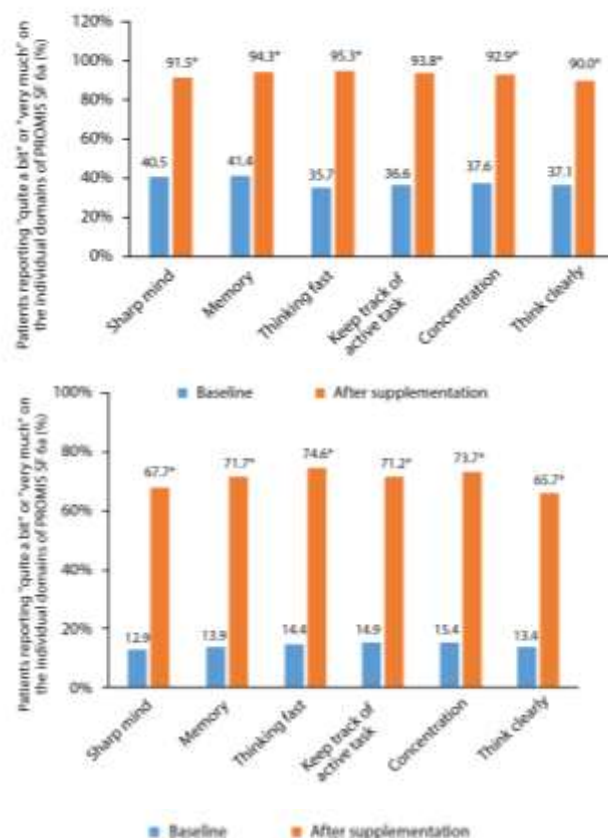
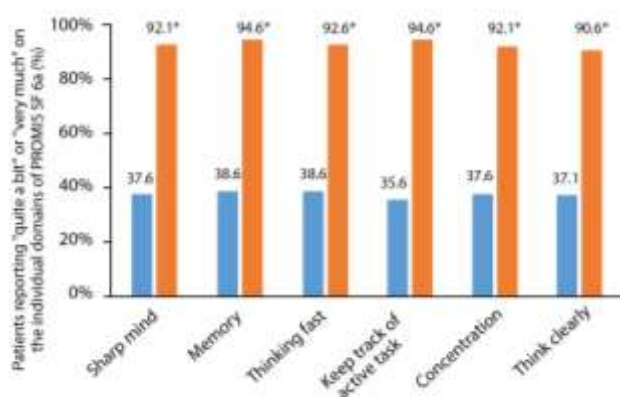
Figure 2: Mean PROMIS Cognitive Function T-scores at Baseline and Follow-Up



* P < .001 for follow-up vs. baseline.

PROMIS, Patient-Reported Outcomes Measurement Information System.

Figure 3: Patients Reporting “Quite a Bit” to “Very Much” for Each Domain of the PROMIS SF-6a at Baseline and Follow-Up: (A) Centrum Men; (B) Centrum Women; (C) Centrum Adults 50+



* P < .001 for follow-up vs. baseline.

PROMIS, Patient-Reported Outcomes Measurement Information System; SF, Short Form.

Energy levels improved substantially, with mean energy scores increasing by approximately 28.7% and 27.7% in users of Centrum Men and Centrum Women, respectively, and by 44.1% in users of Centrum Adults 50+. These changes were mirrored by increased energy levels and a notable reduction in self-reported stress (Figure 4A and 4B). Statistically significant reductions in the mean number of reported heart palpitations and high blood pressure episodes were observed across all Centrum user groups following supplementation (Table 3). Additionally, patients who took Centrum Adults 50+ reported a ~20-point reduction in joint pain scores, indicating significant improvement (P < .001).

Table 3: Change in Mean Incidents of Heart Palpitations and High Blood Pressure

Group	Heart palpitations		High BP episodes	
	Baseline	Follow-up	Baseline	Follow-up
Centrum Men (n=203)	0.6	0.1 ^a	0.9	0.2
Centrum Women (n=210)	0.4	0.1 ^a	0.6	0.2

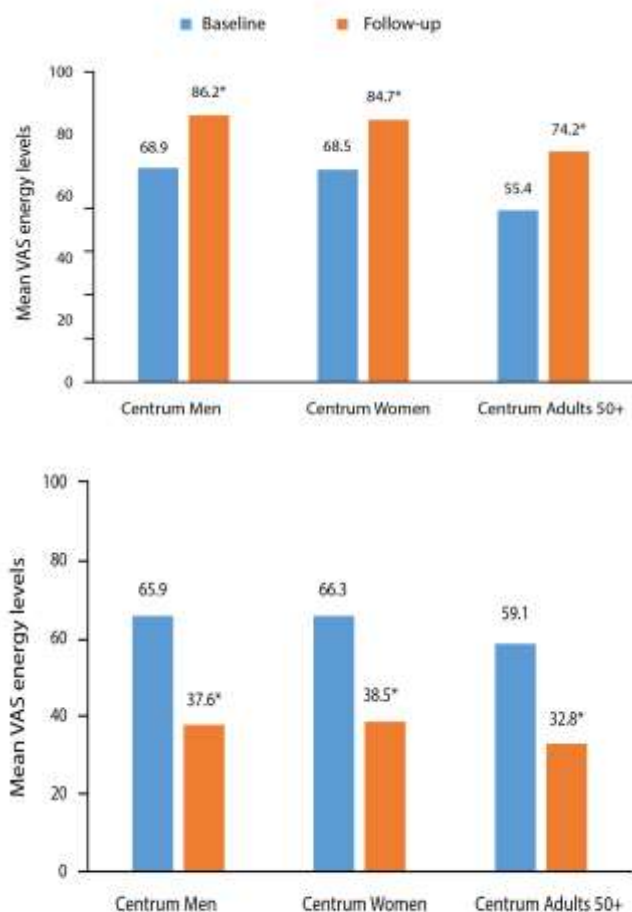
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Centrum Adults 50+ (n=201)	1.7	0.6 ^a	2.1	0.8
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^a P < .001.

BP, blood pressure.

Figure 4: Improvement in Energy and Stress Levels After Centrum Supplementation: (A) Mean VAS Energy Levels on the VAS 100 mm Scale; (B) Mean VAS Stress Levels on the VAS 100 mm Scale

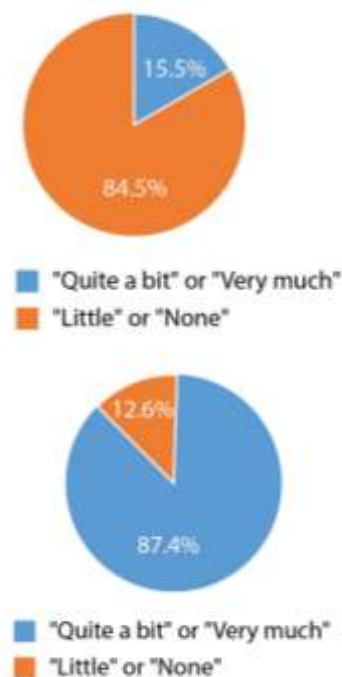


* P < 0.001 for follow-up vs. baseline.

VAS, Visual analog scale.

A significant improvement in perceived skin radiance was reported among users of Centrum Women (P < .001). At follow-up, 87.4% of participants rated their skin radiance as “quite a bit” or “very much,” compared to 15.5% at baseline (Figure 5A and 5B). Notably, 89.8% of participants reported at least a one-level improvement on the 4-point skin radiance scale. The majority showed a one- or two-level increase in perceived skin radiance rating, indicating a meaningful shift in self-assessed skin appearance.

Figure 5: Comparison of Perceived Skin Radiance Among Women: (A) Baseline (B) Follow-up



Clinician insights further reinforced the patient-reported outcomes, offering valuable external validation of Centrum's benefits. In a physician survey, a substantial majority, ranging from 81% to 90% noted clear improvements in their patients' cognitive function and physical performance following regular Centrum use. Specifically, 86% of doctors agreed that Centrum contributed to better general well-being. Furthermore, nearly 80% of clinicians reported noticeable gains in cognitive domains such as attention, orientation, and mental clarity. These findings align closely with participant feedback and underscore Centrum's multifaceted role in supporting day-to-day health and vitality across patient populations.

IV. DISCUSSION

This real-world study assessed the perceived effectiveness and health-related benefits of regular Centrum multivitamin supplementation, Centrum Men, Centrum Women, and Centrum Adults 50+ among adult Indians, as well as healthcare professionals' perceptions of its impact on patient outcomes. The findings demonstrate consistent and clinically meaningful improvements across multiple domains, including cognitive function, physical well-being, and patient-reported symptomatic burden.

Management of vitamin B12 deficiency due to malabsorption requires supplementation with at least 1 mg/day of cyanocobalamin, methylcobalamin, or adenosylcobalamin, according to guidelines from the National Institute for Health and Care Excellence NICE.²² The American Academy of Family Physicians recommends high-dose vitamin B12 of 1–2 mg/day for adults older than

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50 years or those consuming a vegan or vegetarian diet should consume vitamin B12 supplements²³

The COSMOS-Mind trial, conducted by Baker, et al., was a large randomized controlled study that evaluated the effects of daily multivitamin-mineral supplementation on cognitive outcomes in older adults. The study included 2,262 participants (mean age 73 years; 60% women), and 92% completed baseline and at least one follow-up assessment. Over the three-year follow-up, daily multivitamin-mineral supplementation led to statistically significant improvements in global cognitive function compared to placebo, with a mean z-score difference of 0.07 (95% CI: 0.02 to 0.12; $P = 0.007$). The benefits were particularly pronounced among individuals with a history of cardiovascular disease (mean z-score difference: 0.14; 95% CI: -0.02 to 0.31), compared to those without (0.06; 95% CI: 0.01 to 0.11), with a significant interaction ($P = .001$). Notable improvements were also reported in memory and executive function domains, reinforcing the broader cognitive benefits of multivitamin-mineral supplementation in this population.²⁴ The COSMOS-Web study demonstrated that the consumption of Centrum Silver for 3 years led to improved performance equivalent to 3.1 years of age-related memory change compared with placebo. After 1 year and 3 years of supplementation, there was a significant improvement ($P = .025$ and $P = .011$, respectively) in the ModRey immediate recall score.²⁵

In addition to aligning with findings from large-scale studies such as COSMOS-Mind, the results of our study are also consistent with those of Haskell, et al., who demonstrated that multivitamin and mineral supplementation led to improved cognitive performance and reduced fatigue during extended periods of multitasking in healthy adult women. In their placebo-controlled, double-blind trial, participants receiving a multivitamin-mineral supplement exhibited better accuracy on cognitive tasks during the first assessment ($P = .004$) and a trend towards improvement in accuracy during the second assessment ($P = .064$). Improvements were particularly notable in mathematical processing speed ($P < .019$ first assessment; $P < .001$ second assessment) and overall performance scores. Moreover, fatigue levels were significantly attenuated across both assessments ($P = .031$), and a reduction in homocysteine levels was observed among participants receiving supplementation ($P = .006$).²⁶ Another study conducted by Grima, et al., further supports our findings. In their systematic review and meta-analysis of 10 randomized controlled trials ($n=3,200$ participants), daily multivitamin supplementation was found to significantly improve immediate free recall memory ($P < .01$) compared to placebo.²⁷ Similarly, in our study, regular use of Centrum multivitamins was associated with significant improvements in cognitive function across multiple domains, including memory, clarity of thought, and concentration, as reflected

in PROMIS cognitive function scores and patient-reported outcomes. Participants also reported increased energy levels and reduced stress, suggesting an overall enhancement in mental and physical stamina. Together, these findings reinforce the growing evidence that multivitamin supplementation can support both cognitive function and vitality in healthy adults under real-world conditions.

Cognitive improvements observed in our study are strongly supported by existing evidence on the neuroprotective roles of micronutrients. With the increase in the elderly population worldwide, the prevalence of cognitive impairment is also increasing. Aging is well recognized as a key risk factor for cognitive decline and dementia.^{27,28} Multivitamin supplementation, providing a wide range of essential vitamins and minerals, has gained popularity among adults as a proactive approach to supporting brain health. B vitamins, in particular, play a critical role in neurological processes, including neurotransmitter synthesis, homocysteine metabolism, and myelin maintenance, all of which are essential for maintaining efficient brain signalling. Deficiencies in vitamins B6, B9 (folate), and B12 have been linked to accelerated cognitive decline, while adequate intake of these vitamins has been shown to slow brain aging, lower homocysteine levels, and reduce brain atrophy.²⁹ The improvements observed in PROMIS cognitive function scores and in self-reported memory, mental clarity, and concentration in our study are consistent with these mechanisms.

Evidence from Sim, et al., also supports these findings, demonstrating that vitamin C supplementation significantly improved attention and work absorption while showing a tendency to reduce fatigue in healthy young adults.³⁰ Long, et al., reported that MVM supplementation in young adult men for 3 months led to a decrease in perceived stress, while docosahexaenoic acid supplementation and placebo groups did not demonstrate this benefit.³¹ Our results similarly showed improvements in participants' perceived energy levels, reduced stress, and better overall vitality after Centrum supplementation.

The improvements in self-reported energy levels and stress reduction observed in our study are also supported by findings from Maric, et al., who evaluated the effects of multivitamin and mineral supplementation in women diagnosed with chronic fatigue syndrome. Their study demonstrated significant reductions in fatigue, sleep disturbances, headache severity, and symptoms related to autonomic dysfunction following two months of supplementation. Although improvements in global quality of life were less consistent, symptom-specific benefits were substantial.³² Similarly, in our study, participants reported notable improvements in vitality, reduced fatigue, and reductions in stress levels. Additionally, our study found that Centrum Adults 50+ use was associated with reduced

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joint pain, aligning with existing evidence on the benefits of nutritional supplements like vitamins D and E for joint health.^{33,34} Vitamin E has been shown to reduce oxidative stress and inflammation, improving joint function in older patients with osteoarthritis.³³ A meta-analysis of three randomized-controlled trials (RCTs; 662 patients) reported significant reductions in VAS pain scores with daily Vitamin D supplementation.³⁴ These findings support the role of comprehensive multivitamin supplementation in managing joint pain.

A meta-analysis of 10 cohort studies involving approximately 620,000 participants found no significant association between multivitamin use and cardiovascular disease mortality (risk ratio [RR]: 1.0; 95% confidence interval [CI]: 0.97–1.04). However, a pooled analysis of eight cohort studies including around 400,000 participants reported a reduced risk of coronary heart disease incidence associated with multivitamin supplementation (RR: 0.88; 95% CI: 0.79–0.97).³⁵ Consistent with these findings, our study observed self-reported reductions in incidents of heart palpitations and high blood pressure following Centrum multivitamin use, suggesting potential cardiovascular benefits in everyday settings.

The broad spectrum of health benefits observed in this study may be attributed to the well-documented physiological functions of key micronutrients included in the multivitamin formulation. Vitamin D plays a crucial role in maintaining musculoskeletal integrity, regulating muscle and nerve contraction, and supporting cellular function across all tissues. Vitamin E acts as a potent lipid-soluble antioxidant, supporting vascular integrity and immune function. Vitamin C (ascorbic acid) contributes to enzymatic activation, immune modulation, and mitigation of oxidative stress. Notably, vitamin C's antioxidant properties have been associated with reduced risk of cardiovascular disease, age-related macular degeneration, and photoaging-related skin conditions. B vitamins, particularly B6 and B12, serve as cofactors in fundamental metabolic reactions. Vitamin B6 supports cellular metabolism, whereas B12 is involved in DNA synthesis, methylation, mitochondrial function, and erythropoiesis. These functions are critical for energy production and cognitive health. Magnesium supports bone development, neuromuscular function, and cardiac rhythm regulation, and zinc is essential for tissue repair, immune response, brain development, and dermal regeneration. Together, these micronutrients contribute to the systemic, cognitive, and physical improvements observed in our study.³

V. CONCLUSION

The findings of this study highlight the broader functional benefits of multivitamin supplementation in everyday health maintenance, including cognitive function, stress levels, and energy levels. This study had limitations such as the

observational study design, lack of active comparators or placebo, and short follow-up duration.

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Conflict of interest: Dr Atul Sharma, Tanya Bhagat, Dr. Prashant Narang, Dr. Sheryl Tan and Dr. Jaya Abraham are on the payroll of Haleon. For the remaining authors, none were declared.

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