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Efficacy and Safety of an Oral Nutritional Supplement in Treating Nutritional Deficiencies and Related Conditions: A Phase 3 Randomized Controlled Trial

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Abstract- Nutritional deficiencies are common worldwide and can also lead to weak immunity, weak stamina, metabolism and decreased bone health. To address these challenges, relying solely on diet may be insufficient, as most individuals do not consume nutritionally balanced diets. Nutritional supplements can help in achieving optimal, balanced nutrition while preventing nutritional deficiencies. This multicentre, double-blind, randomized, parallel-group phase 3 clinical trial evaluated the efficacy and safety of a nutritional supplement from British Life Sciences, Pvt. Ltd, BSURE Sugar-Free (Dutch Chocolate Flavour) against a multivitamin powder (Zooversandhaus Jung, Germany) in patients with nutritional deficiencies, weak immunity, low stamina, compromised bone health, and weak metabolism. Over three months, 231 participants were recruited, with 200 completing the study. Results demonstrated that BSURE achieved 97% and 98% efficacy in improving weak immunity and stamina, respectively, and showed comparable safety and tolerability to the control product. These findings support the use of the product for nutritional support in adults.

Index Terms- Nutrition, Malnutrition, Supplements, Health, Diet

I. INTRODUCTION

Nutritional deficiencies are common among populations worldwide and at the national level. The Lancet Global Health indicates that over 5 billion people worldwide do not consume enough micronutrients like iodine, vitamin E, calcium, etc. Additionally, more than 4 billion people are deficient in iron, B complex vitamins and vitamin C (Passarelli et al., 2024). Furthermore, as per a report in 2022 by the WHO, approximately 890 million adults are living with obesity worldwide and more than 2 billion individuals are deficient in key vitamins and minerals (WHO, 2022; WHO and UNICEF, 2006).

At the national level, India has the highest burden of anaemia with 57% women (15-49 years) and 25% men having iron deficiency as of 2021 (NFHS-5 (2019-2021)). Other nutrient deficiencies include vitamin A deficiency among 19.1 million pregnant women, 32% and 37% adolescents suffering from zinc and folate deficiencies respectively and 14-31% adolescents being deficiencies in vitamin D (Venkatesh et al., 2021).

Apart from micronutrient deficiencies, the Indian population has a high burden of Non-Communicable Diseases (NCDs) like diabetes, hypertension, cardiovascular diseases (CVDs), etc. This is majorly contributed by vegetarian dietary patterns with a predominance of fruits, vegetables, pulses and cereals along with high-fat, high-sugar foods (Green et al., 2016). Furthermore, India has seen a nutrition transition of diet shifting from high in cereals and fibre to diets high in sugar, fats and animal foods, contributing to higher rates of obesity and other chronic diseases (Satija et al., 2015).

Nutritional deficiencies contribute significantly to weakened immunity, reduced stamina, and impaired bone health in adults and to combat these deficiencies and to prevent NCDs, a balanced diet along with the required nutritional supplements is a must (Shao et al., 2021; Azzolino et al., 2020; Sale, C. and Elliott-Sale, K.J., 2019; Shoemaker et al., 2022). This study compares BSURE Sugar-Free (Dutch Chocolate Flavour) from British Life Sciences, Pvt. Ltd., with a widely used multivitamin powder to assess efficacy and safety in addressing these conditions over a 3-month treatment period.

II. METHODOLOGY

Study Design: A multicentre, double-blind, randomized, parallel-group, active-controlled phase 3 trial.

Participants
Inclusion criteria:

- Patients >18 years of age during enrolment
- Patients of both sexes
- Patient with nutritional deficiencies
- Informed consent granted
- Weak stamina and weak metabolism
- Willing to get treated for nutritional deficiency, weak immunity, weak stamina, bone health and healthy metabolism.

Exclusion Criteria

- Patients with haematological disorders that compromise the surgical changes (e.g., myeloproliferative syndromes, anaemia Hb <11.0 g/dL)
- Platelets <150,000 mm³
- Patients with disorders of haemostasis (INR >1.40) (rTTPA >1.40)
- Patients with renal dysfunction (creatinine >1.50)
- BMI: <18 or >39 kg/m²
- Have an IBS symptom severity score <175 as defined by IBS-SSS
- Patients with a history of allergy to Aluminium Hydroxide
- Confirmed clinical diagnosis of bile acid malabsorption and/or on medication for bile acid malabsorption
- Infection (e.g., endocarditis, infection of immune human (HIV), hepatitis B and C, septicaemia, and pneumonia)
- Recent history of current epilepsy, HIV infection, diabetes, or cardiovascular.
- Change of diet e.g., FODMAP, gluten-free within the last 3 months
- Use of acetylsalicylic acid is less than 5 days
- 13.History of chemotherapy (except for gestational conditions) or radiotherapy
- Use of low molecular weight heparin for less than 24 hours; OR
- Have a malignant disease or any concomitant end-stage organ disease.
- Hypersensitivity to any trial product.

III. RECRUITMENT

Participants were recruited after the baseline screening including clinical examinations (physical examinations and vital signs like body temperature, blood pressure, etc.) and laboratory parameters (Complete blood count, CT scan, Serum Creatinine, Blood Urea, Electrolytes, etc.). Each patient was given a unique patient ID after enrolment and ensuring the inclusion-exclusion criteria was met. A total of 231 participants were approached, out of which 21 patients did not qualify in the baseline screening and from the remaining participants (n=210), 10 failed to turn up for the follow up and 200 participants completed the study (Figure 1). The mean age of the participants in the study was 56.8 years.

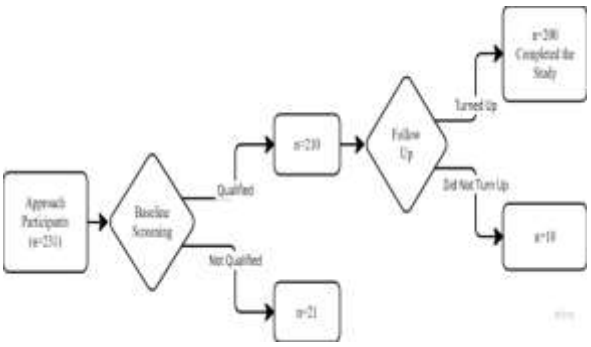

Figure 1: Participants Recruitment

Informed Consent
Patients signed an informed consent by IEC/IRB in their preferred language (English/Telugu) prior to participation. The consent form mentioned about the study and ensured confidentiality of the patients. The principal investigator informed them that participation was voluntary.

Intervention: Participants were randomized into two groups:
Test Group: BSURE Sugar-Free (Dutch Chocolate Flavour) – 3 scoops (30 g) mixed with 200 mL lukewarm water daily.
Control Group: Multivitamin powder (Zooversandhaus Jung, Germany) – 3 scoops (30 g) daily.
Study Period: April 15, 2024, to July 12, 2024 (Baseline, 1 month, 2-month, 3-month)

Outcome Measures

- **Efficacy:** Assessed using the Nutritional Assessment Questionnaire (NAQ 1.5) from baseline to end of treatment (EOT) as compared to multivitamin powder 100 grams of Zooversandhaus Jung, Germany.
- **Safety:** Evaluated through adverse events, vital signs, clinical chemistry profiles, and tolerability ratings in each arm throughout the trail duration and clinical chemistry profiles at the baseline and end of study.

IV. RESULTS

Efficacy Assessment
Efficacy assessment was done at baseline, 1-month, 2-month and 3-month intervals for weak immunity, weak stamina, bone health and weak metabolism.

At baseline, the efficacy of the product in improving cases of weak immunity was 16%. By the third month, this proportion increased significantly to 97%. Similarly, the reference product showed an increase in efficacy from 21% at baseline to 98% by the third month.

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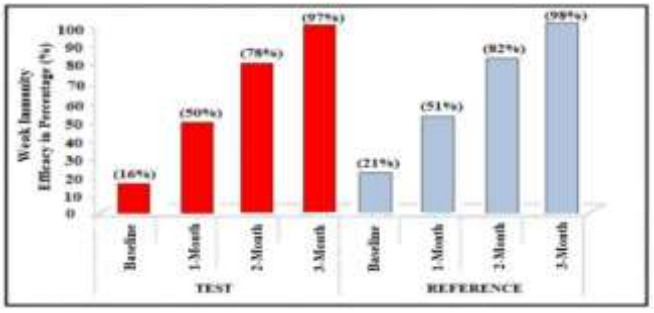
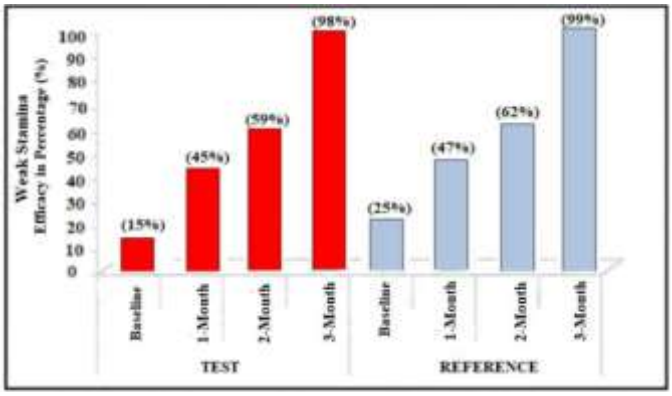
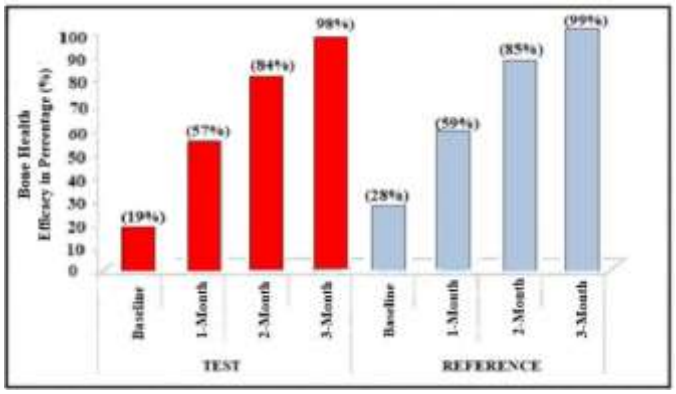


(Test: BSURE Sugar free Dutch Chocolate Flavour; Reference: Multivitamin Powder Zooversandhaus Jung, Germany)

For weak stamina, at baseline, the product demonstrated an efficacy of only 15% in improving it. By the third month, the proportion of cases with improved stamina increased significantly to 98%. Similarly, the reference product showed an increase in efficacy from 25% at baseline to 99% over the same period.



For weak bone health, at baseline, the product demonstrated an efficacy of only 19% in improving it. By the third month, the proportion of cases with improved bone health increased significantly to 98%. Similarly, the reference product showed an increase in efficacy from 28% at baseline to 99% over the same period.



Similar results were seen in improving the efficacy of weak metabolism. At baseline, the product demonstrated an efficacy of only 16% in improving weak metabolism. By the third month, the proportion of cases with improved metabolism increased significantly to 96%. Similarly, the reference product showed an increase in efficacy from 19% at baseline to 98% over the same period.

Overall, as per the participants, 88% cases from test group had good to excellent efficacy of treatment comparable to 93% cases among the reference powder group where the difference was insignificant.

Assessment	Test product (n=100)	Reference product (n=100)	p-value
	n (%)	n (%)	p>0.05, NS*
Excellent	73 (73)	79 (79)	
Good	15 (15)	14 (14)	
Fair	12 (12)	7 (7)	
Very poor	--		
P<0.05 (*NS-Not Significant)			

Table 1: Overall efficacy of the treatment by the patients

Visit	Drug code	N	Parameters	Mean	Std. deviation
Baseline	Multivitamin Powder (100g)	200	IgG	11.231	1.92
			IgM	60.824	17.21
			IgE	1.52	0.732
	BSURE	200	IgG	11.732	1.82
			IgM	59.211	17.19
			IgE	1.44	0.69
EOT	BSURE	200	IgG	11.621	1.99
			IgM	61.211	17.34
			IgE	1.77	0.84
	Multivitamin Powder (100g)	200	IgG	12	2.12
			IgM	58.811	17.04
			IgE	1.63	0.52
Baseline	Multivitamin Powder (100g)	200	Hemogram	14.22	1.463
	BSURE		Hemogram	13.965	1.301
EOT	BSURE	200	Hemogram	14.225	1.455
	Multivitamin Powder (100g)		Hemogram	13.970	1.292
Baseline	Multivitamin Powder (100g)	200	SGOT	28.105	6.54
			SGPT	27.39	10.88
	BSURE	200	SGOT	29.83	5.12

			SGPT	30.04	9.77
EOT	BSURE	200	SGOT	27.64	4.59
			SGPT	27.30	8.40
	Multivitamin Powder (100g)	200	SGOT	28.54	3.51
			SGPT	29.89	8.50

Furthermore, overall, 91% cases from the test group and 93% cases among the reference powder group had excellent tolerability to the treatment but the difference was not statistically significant.

Systemic Safety
To observe systemic safety, hemogram, SGOT and SGPT tests were conducted at the baseline and at the EOT. Changes in IgG, IgM and IgE were also seen.
Tables below represent the descriptive statistics for IgG, IgM and IgE; hemogram; SGOT and SGPT:

It was found that all parameters were normal at the baseline and at EOT, indicating that the product is safe to use for a period of 3-months and can be used for a longer period based on the individual's condition. Furthermore, reduction in mean scores for IgG, IgM, and IgE was observed, indicating a positive impact on immune response.

V. DISCUSSION

At the end of the 3-month treatment period, the proportion of cases with weak immunity significantly decreased. The efficacy of the test product reached 97%, as compared to the reference product, which demonstrated an efficacy of 98% for improving weak immunity. A similar study conducted in geriatric patients demonstrated improved nutritional status and reduced morbidity and mortality rates following an 8-week supplementation with an oral nutritional supplement (ONS) (Ordóñez et al., 2010).

Furthermore, following 3 months of treatment, the proportion of cases with weak stamina showed substantial improvement. The efficacy of the test product reached 97%, matching the efficacy of the reference product, which was also 98% effective for improving weak stamina. A study by Allen et al. (2013) reported similar findings, showing improved stamina among adults, with most participants meeting their energy and protein requirements after 63 days of supplementation. Additionally, Cramer et al. (2016) observed enhanced strength in malnourished older adults who consumed a high-protein oral nutritional supplement (ONS) for 12 weeks.

The proportion of cases with compromised bone health decreased significantly after 3 months of treatment with the test product, achieving an efficacy of 99%. This result was comparable to the reference product, which also demonstrated 99% efficacy in improving bone health. Similar findings were reported in a study by Ashkenazi et al. (2022), which observed improved nutritional status in patients following surgeries for hip fractures. Likewise, a randomized controlled trial by Wyers et al. demonstrated that three months of ONS supplementation after hip fractures resulted in enhanced nutritional intake and overall health status.

Improvements were observed in metabolic health, with the proportion of cases with metabolic concerns decreasing after 3 months of treatment. The efficacy of the test product reached 96%, compared to the reference product, which was 98% effective in enhancing metabolism.

The safety and tolerability of the test product was evaluated using a tolerability scale to identify side effects or changes during the treatment. The findings revealed no adverse events or side effects throughout the study. The product was well-tolerated by all participants. A significant reduction in mean scores for IgG, IgM, and IgE was observed, indicating improved immunity. These results demonstrate the high safety profile and efficacy of the test product in improving immunity, stamina, bone health, and metabolism.

VI. CONCLUSION

The present study was conducted to evaluate the safety and efficacy of B-SURE SUGAR-FREE (DUTCH CHOCOLATE FLAVOUR) of British Life Sciences Pvt. Ltd. with Multivitamin powder 100 grams of Zooversandhaus Jung, Germany in patients with nutritional deficiencies, weak immunity, weak stamina, compromised bone health and weak metabolism.

After 3 months of treatment with the product, there was a significant improvement reported in management of nutritional deficiency, weak immunity, weak stamina, bone health and metabolism. The safety results of this study demonstrated the product to be safe and well tolerated when administered orally. Hence, BSURE Sugar-Free offers an alternative for patients requiring comprehensive nutritional support.

Ethical Considerations: The study received ethical clearance from the Mythri Hospital Mehdipatnam ethics committee, adhering to ICMR guidelines. Written informed consent was obtained from all participants.

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Conflict of Interest: None

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