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Impact of nutritional garden on health and nutritional security of Lodha tribal women in Mayurbhanj district, Odisha, India

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ABSTRACT

The study was carried out among Lodha women aged 18-45 years of age group in Mayurbhanj district of Odisha to know the impact of nutritional garden (NG) on their health and nutritional security. The questionnaire-cum-interview method was applied for data collection. The data was collected before and after establishment of nutritional garden. The collected data were analysed through SPSS and MSTAT-C software. The nutritional garden intervention showed a notable effect on the haemoglobin levels of Lodha tribal women. Prior to its implementation, only 3.67% of the participants were non-anaemic, while 48.33% were mildly anaemic, 45% moderately anaemic, and 3% severely anaemic. Following the introduction of the nutritional garden, the proportion of non-anaemic women increased to 23%. Mild anaemia rose to 65%, whereas moderate anaemia declined to 12%, and no cases of severe anaemia were observed. In addition, various clinical symptoms including Bitot's spots, constipation, joint pain, scurvy, and changes in general appearance, hair, eyes, skin, face, lips, tongue, teeth, gums, and nails showed improvement after the intervention. The mean scores for these symptoms decreased in most cases when compared to pre-intervention values. However, symptoms related to the face showed a slight increase. Overall, the findings indicate a reduction in disease prevalence and clinical symptoms among the participants after the establishment of the nutritional garden, suggesting an improvement in their overall health status.

Key words: Health, Lodha women, nutritional garden, nutritional security

INTRODUCTION

Despite sustainably producing the food grains, about 172.1 million people in India were malnourished (FAO, 2025). But the irony is that recently, India ranked 101st out of 116 nations in the Global Hunger Index (GHI, 2021; IFPRI, 2022; Lal et al., 2022). Food security is all about gaining or fulfilling the 4 dimensions such as availability, accessibility, utilization and stability (Gross et al., 2000; Hahn, 2000; Kundu et al., 2017; Weingärtner, 2009; Lal et al. 2022), which, when coupled with adequate food intake and good health, improves nutritional status. Nutritional security can be defined by the availability, accessibility of diverse, nutritious food (Ruel, 2013). Thus, achieving food and nutritional security primarily depends on agriculture and integrating nutrition into agriculture that pave the way to attain nutritional security with environmental sustainability by providing nutritious and diverse foods. Sahoo et al. (2019) worked on indigenous phyto-therapy of Kandha tribe for primary healthcare in Kandhamal district, Odisha. They added wild and domesticated plants and their parts to treat various diseases such as skin, dental, stomach disorder, rheumatism, jaundice etc. among the Kandha inhabitants with successful nutritional and health security. Mostly, in tribal dominated pockets of India, the nutritional

deficiencies and related health issues have drawn serious attention. Keeping view of this, the authors have been prompted to raise nutritional gardens with plants of nutritional values in the backyards of selected people in tribal dominated pockets of Mayurbhanj district of Odisha.

The Lodha community in India is classified as a particularly vulnerable tribal group (PVTG), predominantly inhabiting the forested border regions of Midnapur (West Bengal), Mayurbhanj (Odisha) and Singhbhumi (Jharkhand). As per the 2011 Census, the Lodha population is to about 9,088 individuals with a substantial concentration in the Mayurbhanj district, particularly in Morada and Suliapada administrative blocks (GOI, 2011). The socio-economic and health conditions of Lodha settlements in Mayurbhanj are characterized by multiple deprivations. These include poor health status, a high prevalence of malnutrition, growth retardation, reduced physical work and elevated rates of morbidity and mortality. The majority of households fall under small and marginal livelihood categories with rice constituting the principal dietary staple food. While rice serves as a major source of caloric intake, it is insufficient in providing essential micronutrients required for maintaining optimal health. Evidence indicates a high rate of micronutrient deficiencies among men and children in the region. Clinical manifestations such as anaemia, night blindness, keratomalacia, spongy bleeding gums, cheilosis, sore throat, angular stomatitis, and scurvey have been widely reported (Bhuyan, 2021). Such conditions reflect chronic dietary inadequacies, including insufficient intake of protein, energy and critical micronutrients such as iron and vitamin A, which collectively contribute to adverse health outcomes. Despite the recognized importance of vegetables as key sources of micronutrients, their per capita consumption in the Lodha dominated villages remain considerably low. In light of this, the present study aims to assess the effectiveness of nutritional garden interventions in enhancing dietary diversity, health status, and overall nutritional security among Lodha tribal women in the Mayurbhanj district of Odisha.

MATERIALS AND METHODS

The present study was conducted in ten selected villages across the Morada, Suliapada, Baripada, and Shyamakhunta blocks of the Mayurbhanj district, Odisha, considering the higher concentration of Lodha tribal population. The investigation was carried over two year periods i.e from 2019 to 2020. The sample comprised of 300 Lodha women selected through house to house survey. The participants were within the age group of 18-45 years and the pregnant and lactating women were excluded from the study. The survey was conducted for data collection in the selected villages. The enumeration process was conducted systematically, covering respondents from one end to the other to ensure adequate representation and reduce selection bias. Socio-demographic data were collected at the household level using a structured questionnaire that was developed by the author in accordance with the study objectives. Data was collected from the respondents about awareness of nutritional garden, dietary habits, intake of different food groups and occurrence of the diseases within three months through a predesigned questionnaire (Fig. 1). A rectangular NG measuring 200 sq. m was established in the backyards of the respondents. The area was further subdivided into eight plots, each measuring 3 m x 4 m, where various vegetable crops were grown. During the kharif season, crops such as brinjal, tomato, cowpea, okra (ladies finger), spinach, cucumber, bitter gourd, and pumpkin were grown. In the rabi season, vegetables including cabbage, cauliflower, tomato, brinjal, koshala saga (*Amaranthus*), green chilli and radish were cultivated. In addition, fruit and perennial plants such as papaya (two nos.), drumstick (two), lemon (one), curry leaf (one), and banana plant (one) were planted. Haemoglobin levels of all the respondents were assessed both before and after the establishment of the NG. Statistical methods such as correlation, regression, and chi-square tests were applied to determine the significance of the results. The different clinical symptoms along with haemoglobin level were analyzed before and after establishment of NG with the help of medical practitioner.

Fig. 1 (a, b, c, d). Group discussion and intervention of nutritional garden at the backyard

RESULTS AND DISCUSSION

The collected data was analyzed and interpreted as follows. It was observed that only one fifth of the respondents (21.33%) were aware about the concept of nutritional garden. But only 7% respondents had knowledge about different types of NG and the vegetable crops grown in the NG and only 6.33% of the Lodha tribal women had knowledge about fruit plants grown in the NG. Though some of the respondents had knowledge about the NG, they were not adopting it properly without any concrete idea about it. The above analysis was found to be statistically highly significant indicating that the Lodha women were not well aware of the concept of nutritional garden (Table 1).

Table 1. Opinion pool from tribal women of sample size 300 over knowledge on nutritional garden

Sl. No.	Parameters	Not aware (Nos.)	Not aware (%)	Aware (Nos.)	Aware (%)	Total
1	Awareness about nutritional garden	236	78.67	64	21.33	300
2	Types of nutritional garden	267	89.00	33	11.00	300
3	Vegetable crops are grown in a nutritional garden	279	93.00	21	7.00	300
4	Fruit plants are grown in a nutritional garden	289	96.33	11	3.67	300
	Chi-square	55.12**		P=0.000		Df=3

Table 2 shown the impact of intervention of the NG over the vegetable intake of tribal women. It was observed that before establishment of the NG, 62% of the Lodha women were adding green leafy vegetables in their daily diet, whereas 67% of them added leafy vegetables to their diet after the intervention of the NG. Similarly, due to establishment of NG 12.7% of the respondents included leafy vegetables in their diet on a weekly basis compared to 11.3% of the respondents earlier. In a similar pattern, 18.7% of the respondents used leafy vegetables in their diet occasionally before the establishment of a NG whereas 19.3% of the respondents cooked leafy vegetables occasionally in their diet after it. Further, it was observed that before the establishment of NG, 8% of the respondents never used leafy vegetables for their cooking whereas it was reduced to 1% after it's establishment.

Table 2. Impact of nutritional garden on vegetable intake of tribal women

Sl. No.	Parameters	Daily (%)	Weekly (%)	Occasionally (%)	Never (%)	Total
1	Vegetables intake, leafy vegetables, before	62.00	11.33	18.67	8	300
2	Vegetables intake, leafy vegetable, after	67.00	12.67	19.33	1	300
3	Vegetables intake, other vegetable, before	59.67	15	12.33	13	300
4	Vegetables intake, other vegetable, after	68.00	16	14	2	300
	Chi square	58.85**	P=0.000			Df=9

The intake of fruits and vegetables before and after the establishment of the NG by the Lodha tribal women is presented in Table 3. The fruit intake by the Lodha tribal women were only 11.13 g per day whereas after the establishment of the NG the fruit intake by them increased to 19.09 g per day which is 71.5% higher. Similarly, the roots and tubers intake by the respondents was 25.44 g per day but it is increased to 50.94 g which is 200% higher after the intervention of the nutritional garden. Before the development of the NG, the leafy vegetables intake by the Lodha tribal women was 24.12 g whereas after the establishment of this, the intake is increased to 71.18 g and increases up to threefold. The other vegetables intake by the respondents was 24.8g per day before the intervention of the NG and the intake was 86.39 g which is increased by 248%. Rahman et al. (2008) agrees with the findings on the NG before and after intervention. They indicated before the demonstration overall per day vegetable production was 318g and after the demonstration, it was 553g. Vegetable consumption was 202g and 364g before and after demonstration per day, respectively. Total calorie uptake from different consumed vegetable was 73 kcal and 111 kcal before and after the demonstration respectively.

Table 3. Impact of nutritional garden on intake of fruits and vegetables

Sl. No.	Food groups	ICMR standard (g)	Mean intake (g) Before	SD	% of ICMR standard	Mean intake (g) After	SD	% of ICMR standard
1	Fruits (g)	100	11.13	1.87	11.13	19.09	2.09	19.09
2	Roots and tubers (g)	100	25.44	6.15	25.44	50.94	9.02	50.94
3	Leafy vegetables(g)	100	24.12	7.39	24.12	71.18	10.18	71.18
4	Other vegetables(g)	100	24.80	6.54	24.80	86.39	9.63	86.39

The fruit, roots and tubers, green leafy vegetables and other vegetables intake before and after the intervention of the nutritional garden are significantly different from each other (P= 0.000) [Table 3]. The above findings on the nutritional garden before and after such intervention corroborates with the findings of Rahman et al. (2008).

Correlations of impact of nutritional garden of paired samples of fruits and vegetables intake have been described in Table 4.

Table 4. Paired samples correlations

Sl. No. of pair	Before and after	N	Correlation	Significance
Pair 1	Fruits, before and fruits, after	300	-0.108	0.061
Pair 2	Roots and tubers, before & roots and tubers, after	300	-0.061	0.288
Pair 3	Green leafy vegetables before & green leafy vegetables after	300	-0.062	0.282
Pair 4	Other vegetables, before & other vegetables, after	300	0.015	0.796

Table 5 indicated that all the vitamins and mineral intake increases significantly after the intervention of the nutritional garden ($p<0.001$). The protein intake by the Lodha tribal woman before the development of the NG was 32.15 g whereas after the development of the NG the protein intake by the respondents was 34.69 g which was increased by 7.9% higher. The carbohydrate intake of the respondents was 173.03 g and 190.13 g before and after the establishment of the NG (t-13.44) and both was more than the ICMR recommendation (130 g). This concluded their diet was rich in carbohydrates both before and after the development of the NG as they were mostly dependent on carbohydrates for their energy requirement.

The mean calcium, iron, vitamin A, thiamine, riboflavin, niacin, vitamin C and folic acid intake by the Lodha tribal women before the introduction of NG were 288.40 mg, 7.50 mg, 349.1 µg, 0.50 mg. 0.47 mg, 4.57 mg, 19.18 mg and 125.52 µg whereas the intake by them after implementation were 297.98 mg [t- (-11.54)], 8.70 mg [t- (-286.32)], 483.63 µg [t- (-4914)], 0.72 mg [t- (-248.99)], 0.77 mg [t- (-337.00)], 6.33 mg [t- (-36.21)], 25.70 mg [t- (-147.25)] and 157.81µg [t- (-3082)] respectively. Comparison with the before and after implementation of NG, implied that the significant difference was found to be very high on the intake of different nutrient and micronutrient like protein, vitamin A, vitamin C, calcium, and iron. Rahaman et al. (2008) found similar findings that homestead vegetable gardening increased the contribution of essential nutrients such as protein, vitamin A, vitamin C, Calcium, and iron in the diet. Vegetable grown in the home garden fulfilled 100% requirements of vitamin C, vitamin A and iron. It also fulfilled 47% of protein and 87% of calcium requirements.

Table 5. Impact of nutritional garden on nutrient intake

Sl. No.	Nutrients	ICMR standard	Mean intake (before)	SD	% of ICMR standard	Mean intake (after)	SD	% of ICMR standard
1	Protein (g)	45.7	32.15	4.16	70.3	34.69	4.49	75.9
2	Carbohydrate (g)	130	173.05	20.26	133.1	190.13	6.99	146.2
3	Calcium (mg)	1000	288.40	5.22	28.8	297.98	10.37	29.7
4	Iron (mg)	29	7.50	1.34	25.8	8.70	0.72	30.0
5	Vitamin A (µg)	840	349.1	4.94	41.5	483.66	25.44	57.5
6	Thiamine (mg)	1.7	0.50	0.04	29.4	0.72	0.09	42.3
7	Riboflavin (mg)	2.4	0.47	0.03	19.5	0.77	0.05	32.0
8	Niacin (mg)	14	4.571	0.26	32.6	7.27	0.65	51.9
9	Vitamin C (mg)	65	19.18	2.02	29.5	26.69	1.31	41.0
10	Folic acid (µg)	220	125.52	2.58	57.05	157.57	27.28	71.6

The intake of carbohydrates, iron, vitamin A, thiamine, riboflavin, vitamin C and folic acid before and after the intervention of NG are highly positively correlated with each other. The rest of the nutrients like protein, calcium and niacin before and after NG intervention are not correlated with each other. But in the paired sample test, the intake of all the nutrients before and after intervention of NG is highly significant at 1 % level of significance. This also concludes that the NG has a positive impact upon the nutrient intake of Lodha women (Table 6).

Table 6. Paired sample t-test statistics impact of nutritional garden on nutrient intake

Paired samples test									
Sl. No. of pair	Nutrients (before vs after)	Paired differences					*t*	Degrees of freedom (df)	Significance (2-tailed)
		Mean	Standard deviation	Std. error mean	95% confidence interval of the difference				
					Lower	Upper			
Pair 1	Protein (before vs after)	-2.53	4.61	0.27	-3.06	-2.01	-9.51	299	.000**
Pair 2	Carbohydrate (before vs after)	17.08	22.02	1.27	14.58	19.58	13.44	299	.000**
Pair 3	Calcium (before vs after)	-9.38	14.08	0.81	-10.98	-7.78	-11.54	299	.000**
Pair 4	Iron (before vs after)	-1.20	0.07	0.00	-1.20	-1.19	-286.32	299	.000**
Pair 5	Vitamin A (before vs after)	-134.53	0.47	0.03	-134.59	-134.48	-4914.00	299	.000**
Pair 6	Thiamine (before vs after)	-0.22	0.02	0.00	-0.22	-0.22	-248.99	299	.000**
Pair 7	Riboflavin (before vs after)	-0.30	0.02	0.00	-0.30	-0.30	-337.00	299	.000**
Pair 8	Niacin (before vs after)	-1.76	0.84	0.05	-1.85	-1.66	-36.21	299	.000**
Pair 9	Vitamin C (before vs after)	-6.52	0.77	0.04	-6.61	-6.44	-147.25	299	.000**
Pair 10	Folic acid (before - after)	-32.30	0.18	0.01	-32.32	-32.28	-3082.00	299	.000**

Impact of nutritional garden on health status

The findings of the study indicated that the introduction of NG had a significant effect on the haemoglobin status of Lodha tribal women. Prior to the establishment of NG, only 3.67% of the respondents were classified as non-anaemic, while 48.33% showed mild anaemia, 45% moderate anaemia and 3% severe anaemia. Following the implementation of NG, a marked improvement was observed: the proportion of non-anaemic women increased to 23%, and those with mild anaemia rose to 65%, whereas the prevalence of moderate anaemia declined to 12%. Notably, no cases of severe anaemia were recorded after the intervention (Fig. 2). These findings are consistent with the results reported by Suri (2020), who documented a reduction in the prevalence of anaemia among women from 91% prior to the establishment of NG to 62% post intervention (Table 7). This concurrence reinforces the potential of NG interventions in improving micronutrient status and reducing anaemia among vulnerable respondents.

The impact of nutritional garden on haemoglobin status of the Lodha tribal women (n= 300) as per WHO classification has been presented in Table 7 (WHO, 2024).

Table 7. The haemoglobin status of the Lodha tribal women as per WHO classification

	Hb level (WHO Standard)	Number of the respondents (n=300)	% of the respondents	Number of the respondents (n=300)	% of the respondents
Category		Before	Before	After	After
Non anaemic	>12.0 gm/dl	11	3.67	69	23
Mild anaemic	10.0-11.9	145	48.33	195	65
Moderate anaemic	7.0-9.9	135	45	36	12
Severe anaemic	<7.0	9	3	-	-

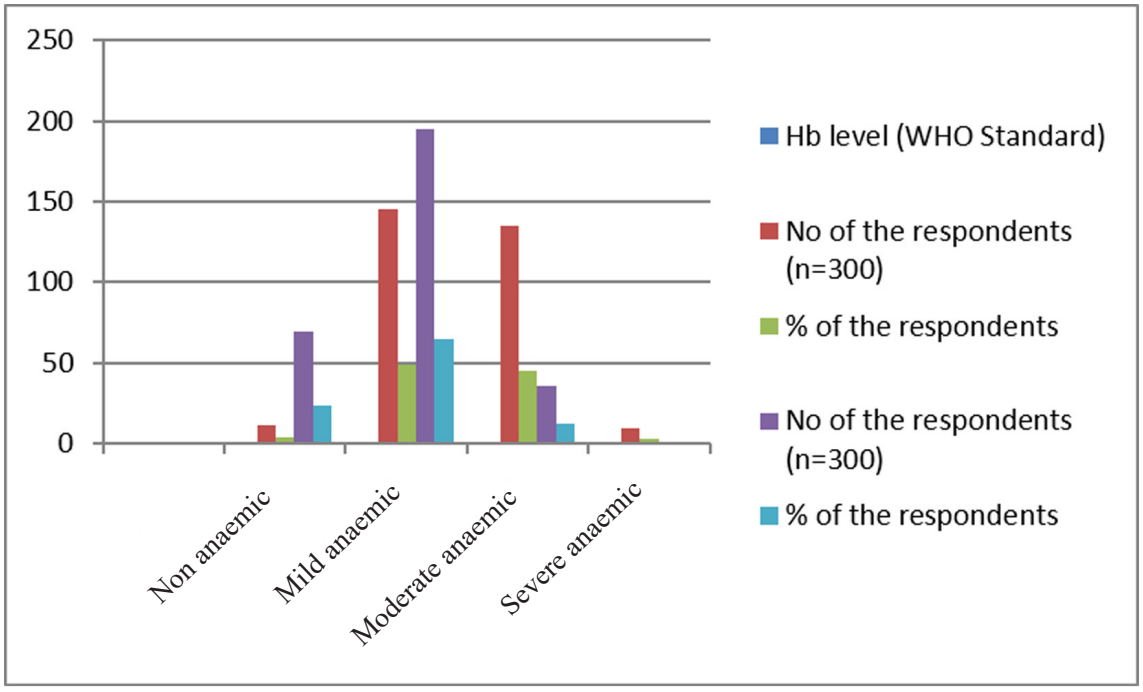

Fig. 2. Impact of nutritional garden on haemoglobin status

Table 8. Impact of nutritional garden on clinical symptoms of Lodha tribal women

Sl. No.	Signs and symptoms	Before frequency (n=300)	Before (%)	After frequency (n=300)	After (%)	Difference
1	General appearance					
	Normal built	21	7	45	15	8
	Thin built	215	71.7	198	66	5.7
	Sickly	64	21.3	57	19	2.3
2	Hair					
	Normal	32	10.7	96	32	21.3
	Dull and dry	205	68.3	168	56	- 12.3
	Easily pluckable	63	21	36	12	- 9
3	Eyes					
	Normal	205	68.3	246	82	13.7
	Night blindness	42	14	24	8	-6
	Pale conjunctiva	53	17.7	30	10	-7.7
4	Skin					
	Normal	45	15	75	25	10
	Xerosis	121	40.3	96	32	-8.3
	Dyspigmentation	134	44.7	129	43	-1.7
5	Face					
	Normal	255	85	276	92	7
	Malar and supra orbital pigmentation	45	15	24	8	-7
6	Lips					
	Normal	45	15	105	35	20
	lesions	125	41.7	96	32	-9.7
	Angular stomatitis	85	28.3	60	20	-8.3
	cheilosis	45	15	39	13	-2
7	Tongue					
	Normal	278	92.7	285	95	2.3
	Fissured	9	3	6	2	-1
	Scarlet and raw	13	4.3	9	3	-1.3
8	Teeth					
	Normal	112	37.3	147	49	11.7
	Carries	98	32.7	75	25	-7.7
	Mottled enamel	90	30	78	26	-4
9	Gums					
	Normal	41	13.7	78	26	12.3
	Spongy and bleeding	259	86.3	222	74	-12.3
10	Nails					
	Normal	45	15	75	25	10
	Brittle	215	71.7	162	54	-17.7
	koilonychia	40	13.3	63	21	7.7

The establishment of the NG was also associated with observable changes in the clinical profile of the respondents, particularly in terms of general body build. Prior to the intervention, only 7% of the women were categorized as having normal body build; this proportion increased to 15% following the implementation of NG. In contrast, the prevalence of thin body build showed a slight decline, decreasing from 71.7% before the intervention to 68% afterward. Similarly, the proportion of respondents classified as having a sickly body build decreased from 21.3% to 19% in the post-intervention phase. These changes suggest a modest but positive improvement in the overall physical condition of Lodha tribal women, indicating that the introduction of NG contributed to better nutritional status and general health outcomes (Table 8).

The NG resulted in significant improvements in clinical indicators related to hair, eye and skin among Lodha tribal women. Prior to the intervention, only 10.7% of participants showed normal hair, which increased substantially to 32% following NG implementation. Conversely, the prevalence of dull and dry hair decreased from 68.3% to 56%, while the proportion of individuals with easy fall hair declined from 21% to 12%. Ocular health indicators also demonstrated notable enhancement. The proportions of respondents with normal eye condition increased from 68.3% before the intervention to 82% afterward. In contrast, the prevalence of night blindness and pale conjunctiva showed a reduction from 14% to 8% and from 17.7% to 10% respectively. Similarly, improvements were observed in skin health, with the percentage of respondents showing normal skin rising from 15% prior to the intervention to 25% following the establishment of NG.

The implementation of NG also had a positive impact on facial clinical symptoms among the respondents. The proportion of women with a normal facial appearance increased from 85% prior to the intervention to 92% afterward. In contrast, the prevalence of malar and supra-orbital pigmentation decreased from 15% to 8% following its introduction. Notable improvements were also observed in lip health, initially only 15% of the respondents showed normal lips whereas it raised to 35% after the establishment of NG. Furthermore, the occurrence of lip related clinical conditions showed a declining trend. The prevalence of lip lesions decreased from 41.7% to 32%, angular stomatitis from 28.3% to 20% and cheilosis from 15% to 13% following the intervention.

There was a noticeable improvement in the clinical symptoms related to the face after the introduction of the NG. Initially, 85% of the respondents had a normal facial appearance, which increase to 92% following its intervention. Prior to the establishment of the NG, 15% of the tribal women showed Malar and supra orbital pigmentation; however, this proportion declined to 8% after the intervention. Similarly, the condition of the lips showed positive changes. Before the implementation of the NG, only 15% of the respondents had normal lips, but this percentage rose to 34% after its occurrence. Clinical signs associated with nutritional deficiencies, including lip lesions, angular stomatitis and cheilosis, were observed in 41.7%, 28.3% and 15% of the respondents, respectively, before the establishment of NG but these were reduced to 32%, 20% and 13% respectively after its introduction.

The research findings revealed that the majority of the respondents had a normal tongue condition. Before the establishment of the NG 92.7% of the women showed normal tongue, and this proportion increased to 95% after the intervention. Nutritional deficiency symptoms affecting the tongue, including fissured tongue and scarlet raw tongue, were observed in 3% and 4.3% of the Lodha tribal women, respectively, prior to the development of NG. Following the introduction of

the NG, the prevalence of these conditions declined to 2% and 3% respectively.

Prior to the study, only 37.3% of the Lodha tribal women had normal teeth, but this proportion increased to 49% after the introduction of the NG. Dental problems such as caries and mottled enamel were reported among 32.7% and 30% of the respondents, respectively, before the establishment of NG. Following the intervention, the prevalence of these conditions decreased to 25% and 26%, respectively.

Before the introduction of the NG, only 13.7% of the respondents had healthy gums. After the establishment of NG, the proportion of the respondents with normal gums increased to 26%. Symptoms related to poor gum health, such as spongy and bleeding gums, were observed in 86.3% of the women prior to the intervention; however, this percentage declined to 74% following the development of the NG.

The findings further indicated improvements in nail health after the introduction of the NG. Before the development of NG, only 15% of the Lodha tribal women had normal nails, whereas this proportion increased to 25% after the intervention. Clinical signs associated with nail abnormalities, such as brittle nails and koilonychias, were observed in 71.7% and 13.3% of the respondents, respectively, prior to the establishment of NG. Following the development of the NG, the prevalence of brittle nails declined to 54%, while Koilonychia was reported among 21% of the respondents (Table 8).

Table 9. Impact of nutritional garden on occurrence of diseases like Bitot's spot, constipation, joint pain and scurvey of Lodha tribal women

Diseases	No of the respondents (n=300) (Before)	% of the respondents (Before)	No of the respondents (n= 300) (After)	% of the respondents (After)	Difference (%)
Bitot's spot	78	26	45	15	11
Constipation	114	38	48	16	22
Joint pain	69	23	57	19	4
Scurvy	81	27	63	21	6

The study demonstrated the effect of the NG on the prevalence of certain health conditions among Lodha tribal women. Initially, 26%, 38%, 23%, and 27% of the respondents were affected by Bitot's spots, constipation, joint pain, and scurvy, respectively. Following the establishment of nutritional gardens in their backyards, these proportions declined to 15%, 16%, 19%, and 21%. This reduction, as illustrated in the graph, indicates an improvement in health status after the intervention (Table 9).

Table 10. Impact of nutritional garden on occurrence of diseases of Lodha tribal women

Paired samples statistics					
Sl. No. of pair	Diseases cond^{n} (Before vs After)	Mean	N	Std. deviation	Std. error Mean
Pair 1	Bitot's spot before	0.2900	300	0.45452	0.02624
	Bitot's spot after	0.1800	300	0.38483	0.02222
Pair 2	Constipation before	0.3633	300	0.48176	0.02781
	Constipation after	0.1433	300	0.35100	0.02026
Pair 3	Joint pain before	0.2300	300	0.42154	0.02434
	Joint pain after	0.1900	300	0.39296	0.02269
Pair 4	Scurvy before	0.2700	300	0.44470	0.02567
	Scurvy after	0.2100	300	0.40799	0.02356
Pair 5	General appearance before	2.1433	300	0.51349	0.02965
	General appearance after	2.0400	300	0.58269	0.03364
Pair 6	Hair before	2.1033	300	0.55409	0.03199
	Hair after	1.8000	300	0.63351	0.03658
Pair 7	Eyes before	1.4933	300	0.77801	0.04492
	Eyes after	1.2800	300	0.63478	0.03665
Pair 8	Skin before	2.2967	300	0.71439	0.04125
	Skin after	2.1800	300	0.80608	0.04654
Pair 9	Face before	1.0200	300	0.14023	0.00810
	Face after	1.0800	300	0.27175	0.01569
Pair 10	Lips before	2.2833	300	0.71045	0.04102
	Lips after	2.1100	300	1.03026	0.05948
Pair 11	Tongue before	1.1167	300	0.43630	0.02519
	Tongue after	1.0800	300	0.36612	0.02114
Pair 12	Teeth before	1.9267	300	0.81865	0.04726
	Teeth after	1.7700	300	0.83632	0.04828
Pair 13	Gums before	1.8633	300	0.34407	0.01986
	Gums after	1.7400	300	0.43937	0.02537
Pair 14	Nails before	1.9833	300	0.53292	0.03077
	Nails after	1.9600	300	0.67818	0.03915

The symptoms of Bitot's spot, constipation, joint pain, scurvy, general appearance, hair, eyes, skin, face, lips, tongue, teeth, gums and nails before the intervention of NG were 0.2900±0.45452, 0.3633±0.48176, 0.2300±0.42154, 0.2700±0.44470, 2.1433±0.51349, 2.1033±0.55409, 1.4933±0.77801, 2.2967±0.71439, 1.0200±0.14023, 2.2833±0.71045, 1.1167±0.43630, 1.9267±0.81865, 1.8633±0.34407, 1.9833±0.53292 whereas the symptoms of Bitot's spot, constipation, joint pain, scurvy, general appearance, hair, eyes, skin, face, lips, tongue, teeth, gums, and nails after the development of NG were 0.1800±0.38483, 0.1433±0.35100, 0.1900±0.39296, 0.2100±0.40799, 2.0400±0.58269, 1.8000±0.63351, 1.2800±0.63478, 2.1800±0.80608, 1.0800±0.27175, 2.1100±1.03026, 1.0800±0.36612, 1.7700±0.83632, 1.7400±0.43937 and 1.9600±0.67818. All the disease occurrences and clinical symptoms were reduced

among the respondents except the symptoms related to face after the intervention of the NG. Hence, it is inferred that the morbidity pattern among the respondents were significantly reduced after the establishment of the NG (Table 10).

CONCLUSION

Mayurbhanj is predominantly inhabited by tribal communities, with nearly 58.04% of its population coming under tribal groups. Across India, tribal populations often face social and economic disadvantages, including limited access to education, healthcare and income opportunities, which ultimately influence their nutritional and health conditions. Ensuring the availability and affordability of nutritious food is essential for maintaining good health. With the aim of improving household nutrition, nutrition garden was established and its impact was assessed among Lodha tribal women. The intervention showed encouraging outcomes, particularly in creating a positive perception toward nutritional improvements within their families. These findings may provide useful insights for policymakers in designing effective strategies to enhance the overall health and nutritional status of the general population, especially tribal women.

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