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Impact of Nutrition Intervention Among Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) Women Beneficiaries in Salem District, Tamil Nadu, India

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The study was undertaken to understand the impact of MGNREGS on the livelihood and nutritional status of women in Salem District, Tamil Nadu, India. The primary aim was to assess the socio-demographic, anthropometric, biochemical, clinical and dietary aspects. After non-formal nutrition education all parameters were re-assessed for impact analysis. The cross-sectional research design was utilized to estimate the prevalence of the outcome of interest for a given population. Among 1000 selected MGNREGS women beneficiaries, 500 were taken as samples by random sampling technique in 20 rural development blocks aged 20 to >60 years. A structured questionnaire was used to collect all the information. The data were analyzed for mean, standard deviation and two-tailed test with statistical significance level of ($p<0.05$) by SPSS 14.0 software. After intervention, improvement in waist-hip ratio was proven to be statistically significant ($p=0.044$); Comparing the percentage of each physical sites assessed clinically before and after nutrition intervention, Z-test was taken to ensure where the improvement was statistically significant ($p<0.05$). Nutritional intervention was carried out in their workplace, it is a cost-effective, feasible method and good option to create a higher level of awareness and standard of living among MGNREGS women beneficiaries.

Keywords: Anthropometric; Nutrition education; Socio-economic; Standard of living.

This study has focus on the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA), which is very effective way to reduce the rural poverty that could accelerate the work force, by providing continuous employment during non-agricultural seasons[1]. Rural poverty and unemployment in India have grown in an unprecedented manner during the last few decades, majority of population is residing in rural areas and their main source of occupation is agriculture[2]. Government of India has been taken several initiatives to raising rural employment for the alleviation of rural poverty[3]. The MGNREGA was implemented in August 25, 2005 and came into force on February 2, 2006 by amendment number 46[4,5]. Based on social protection initiative it is world's largest financial inclusion for providing poor people access to the formal banking system. It also considered as a silver bullet for eradicating rural poverty and unemployment[3]. The study has proven that there is an increase in the health status of the family as well as their standard of living by the way of nutrition intervention.

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MATERIALS AND METHODS

Randomly select 1000 adult MGNREGS beneficiary women in the selected rural areas in Salem district. The study aims to collect primary data regarding general information, socioeconomic status, lifestyle pattern and assess the food consumption pattern, nutritional and health status of the selected MGNREGS beneficiary rural women and provide nutrition education for creating nutritional awareness and to assess the nutritional and health status of the MGNREGS beneficiary adult women after nutrition education.

Selection of study area

For the present investigation, 20 villages under 20 blocks were selected with the permission of the Director of Rural Development & Panchayat Raj, Chennai. (Salem - Dhalavaipatty, Veerapandi - Veerapandi, Panamarathupatti - Gajjalnaickenpatty, Ayothiyapattinam- Valasaiyur, Valapadi - Kurichi, Yercaud - Yercaud, P.N.Palayam - Periyakrishnapuram, Attur - Paithur, Gangavalli - Kadambur, Thalaivasal - Manivilundhan, Kolathur - Sampalli, Nangavalli - Surapalli, Mecheri - Kuttapatti, Omalur - Manguppai, Tharamangalam - Manathal, Kadayampatti - Danishpet, Sankari- Devanagoundanur, Idapadi - Vellarivelli, Konganapuram - Erumaipatti, Magudanchavadi - Thappakuttai) in Salem district, Tamil Nadu was selected.

Study Population

Total 1000 MGNREGS beneficiaries screened, 500 beneficiaries were selected as respondents as per convenience sampling technique. The purpose and process of the study were explained to all the MGNREGS beneficiaries. There was a 100% response from the MGNREGS beneficiaries of all selected blocks in this study.

Study design and Duration

The cross-sectional research design was utilized for this study[6]. This study was carried out from October 2020 to April 2021 upon selected MGNREGS rural women beneficiaries, aged 20 to more than 60 years, from 20 blocks of Salem district, Tamil Nadu, India.

Inclusion Criteria

The age group between 20 years to greater than 60 years and those who are flexible and willingness to participate in the nutrition intervention programme were included.

Exclusion criteria

Less than 19 years of age and lack of interest in their lifestyle modification and beneficiaries who are not willing to participate in this study were excluded.

Strategy used for data collection

A pre-tested, semi-structured, and validated questionnaire in English and regional language were used to collect information through the direct interview method. Reliability and validity of the questionnaire was assessed through experts from similar field and final questionnaire was framed on the basis of recommendations from expert committee. The questionnaire included both the open and closed question characteristics like socio-demographics, lifestyle patterns, family medical history and dietary habits. Observatory and diagnostic methods were done to study biochemical and clinical assessments. For secondary data collection research institutes, government offices, electronic media and references from books, journals, periodicals and newspapers were used.

In Anthropometric assessment, height was measured using Inch Tape. The weight of the respondents was taken by using a 120 kg capacity Bathroom scale (BELITA BPS-M-1106). Biochemical profile of the MGNREGS beneficiaries was obtained from the tests like blood pressure (mmHg) by using OMRON Automatic Blood Pressure monitor (CE 0197) and Bio Plus Sphygmomanometer mercurial (BE-BP02) with Pulse-Wave™ Stethoscope. The blood glucose values were analysed (mg/dl) by using On-call Plus Blood Glucose Meter[7]. Haemoglobin (g/dl) levels were obtained by using DiaSpect Tm Hemoglobin Analyzer using HiCN reference method[8]. (MS Scientific Chemicals and Instruments, Fairlands, Salem-636016). Serum calcium (mg/dl) by using Arsenazo-III method and Vitamin-D (ng/mL) by using CLIA method by technicians in Apollo Diagnostics Laboratory, Salem-636007. BMI is < 25 considered Normal weight, 25-29.9 is (Grade I) Obese, 30- 40 is (Grade II) Obese and >40 is considered as (Grade III) Obese respectively, Hemoglobin is >12 g/dl[9]. The normal value of Blood pressure is 80/120 mmHg, Blood glucose <120 mg%. The normal range of waist-hip ratio (WHR) of the adult women is 0.85[7]. Serum calcium 8.4-10.2 (mg/dL) and Vitamin D 30-100 (ng/mL). All taken values of the selected samples

were compared with the normal reference values. Dietary assessment can be measured with the help of food frequency questionnaire and 24 hours dietary recall method. It is an evaluation of food and nutrient intake and dietary pattern of an individuals in the household or population group over time for micronutrient as well as macronutrient composition.

Nutrition Intervention

After analyzing the nutritional status of the selected subjects, nutrition education was imparted to all the MGNREGS beneficiaries in their workplace. Education was divulge to these subjects belonging to rural area through non-formal nutrition education on definitions of nutrients, source, recommended dietary allowances, deficiency problems and benefits of nutrients like iron, vitamin C, vitamin B12, calcium and vitamin D, all these nutrients are very essential for the absorption of the other nutrients and also given the sources of foods which enhance the immune power to the body. In pamphlets we have provided foods which have to be included and avoided for diabetes mellitus, blood pressure and cardiac problems. Food hygiene and sanitation also given for creating awareness of Covid-19 to the MGNREGS beneficiaries. Making use of 6000 pamphlets (6 types of pamphlets) were distributed to all the selected beneficiaries at the end of the session.

Projected visual presentation and videos were carried out using projector (EPSON EB – S41 EPSON Standard Throw (0.91 to 2.5) Multimedia Projector (MMP) with 800×600 (SVGA) Resolution) in all the selected villages to present the educational material. Nutrition Education covered all the topics especially importance of balanced diet, functions of nutrients in the body, cheap and locally available foods with high sources of nutrients, method of improving nutritional status like functional foods and fortified foods. The Nutrition Education is used to improve women empowerment. It can enhance the knowledge on nutrition, attitude, practice of literate and illiterate people[10,11]. In women well-being, empowerment is a vital role in day today life. Vigorous women can take actions successfully in health and wellness related problems more than others[12].

After imparting nutrition education, survey was conducted again after a gap of 2 months with the same questionnaire was given to all the selected MGNREGS beneficiaries for assessing the nutritional knowledge and health status of each subject.

Post Nutrition Intervention Investigation

After the intervention period, development or improvement was evaluated the using anthropometric, biochemical, clinical, and dietary measurements. The data collected through different tools were scored, coded, consolidated, tabulated and subjected to appropriate statistical analyses and interpretation.

Statistical analysis

The data were analyzed by using the statistical package for social sciences (SPSS 14.0) software. Descriptive statistical tools i.e., mean and

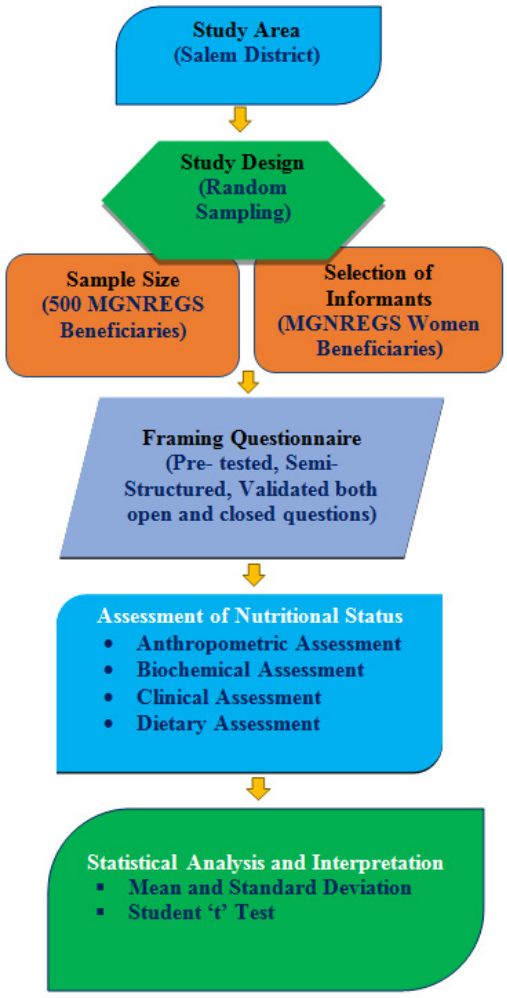

Fig. 1. Research design

standard deviation (SD) for continuous data and frequency (f) and percentage distribution (%) on categorical data were computed. Z-test was used to assess the association between the variables. Research design, Assessment of nutritional status, Statistical analysis and interpretation of the selected MGNREGS beneficiaries is shown in Figure-1

RESULTS AND DISCUSSION

Socio-demographic characteristics of the study population

Study population ranged between 20 and more than 60 years, with 38 percentage (50-60 years), 27 percentage (40-50 years), 14 percentage (30-40 years) and 20 percent (>60 years), a very small number i.e., 1 percentage of women belonged to the 20-30 years age group. People of Islamic origin participated in study was 0.4 percent and it is very low when compared to Hindu beneficiaries of 98.6 percent. Most of the respondents (65%) are illiterate, 16% completed their primary education, 11% completed secondary education. A point to be noted that no women had higher education degree such as post-graduation. A study done based on factors influencing participation in MGNREGA in Shettihalli GP in Karnataka, revealed that among the beneficiaries (75% of the population) 60.9% were illiterate followed by 7.3% belonging to secondary education category, 4.8% belonging to higher secondary education category and 2.4% belonging to primary education category[13].

Study sample belonged to the low-income group with 81 percentage, followed by 18 percent of the population falling under the middle-income group. From this, it is evident why women opted for MGNREGS as additional income source. A similar study stated that 59% of the beneficiaries belonged to the above poverty line and the remaining 41% belonged to the below poverty line[14].

Lifestyle pattern

With respect to the lifestyle pattern of MGNREGS beneficiaries, only 44 of the selected beneficiaries had a routine exercise habit. However, on the contrary, the energy level of the study population was good for 41 percentage, followed by the excellent level with 30 percentage. The sleep time was less than 7 hours for more than 70 percent of the study group. The percentage (60%) of respondents opting for a regular medical check-up is low and it might be particularly due to the economic and literacy rate among the study population. The study surveyed to analyse the knowledge on periodic medical checkup among

Table 1. Comparison of Mean & Standard deviation of Anthropometric before and after intervention

Parameters	Normal Value	Mean±SD before	Mean±SD After	Z value	P value
Body Mass Index	19-23.5	25.06±5.62	24.0012±16.62	-0.47	0.64^{NS}
Waist Hip Ratio	0.85	1±3.80	0.9026±2.85	-2.02	0.04**

NS- Non significant at ($p>0.05$); ** Significant difference at $p<0.05$

Table 2. Comparison of Mean & Standard deviation of Biochemical values before and after intervention

		Mean ± SD	Z value	P value
Systolic Blood Pressure	Before	135.84 ± 25.41	4.19	0.00**
	After	130.13 ± 16.79		
Diastolic Blood Pressure	Before	83.92 ± 12.53	-0.80	0.42^{NS}
	After	85.19 ± 33.56		
Haemoglobin	Before	13.77 ± 12.89	1.06	0.29^{NS}
	After	13.08 ± 6.56		
Blood glucose	Before	129.13 ± 81.23	0.26	0.79^{NS}
	After	127.74 ± 84.91		

NS- Non significant at ($p>0.05$); ** Significant difference at $p<0.05$

the south-west Nigerian population which revealed that 62% of the population have heard about periodic health check-up. Among the 62% of people, 79% have never done it and the remaining people had done it [15]. Another study conducted on awareness of annual doctor check-ups among the general population revealed that only 32% of the population indulge themselves in routine check-ups and the remaining people pay a visit to the hospital only when sick[16].

Anthropometric Parameters Comparison-Before and After Nutrition Intervention

On statistically determining the effectiveness of Body Mass Index changes on providing nutrition intervention is proven to be statistically insignificant (z=-0.47 and p=0.64^{NS}). A study conducted on the effect of nutritional intervention for weight loss in type 2 diabetes patients, the mean weight decrease among them was 3.3 ± 4.1[17]. Difference between mean and normal values of BMI and WHR present in Table-1.

The above table shows the improvement in waist-hip ratio among the selected MGNREGS beneficiaries after nutrition education is proven to be statistically significant (z=-2.02 and p=0.04). A study analyzed the effectiveness of weight loss nutrition intervention for fatty liver patients in Brazil. The intervention was carried out for a period

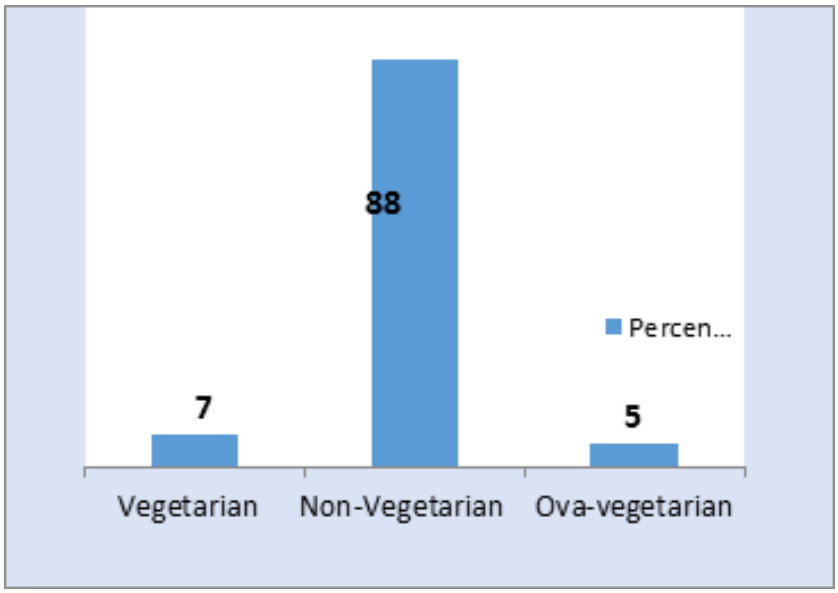

Fig. 2. Food habit of the selected MGNREGS beneficiaries

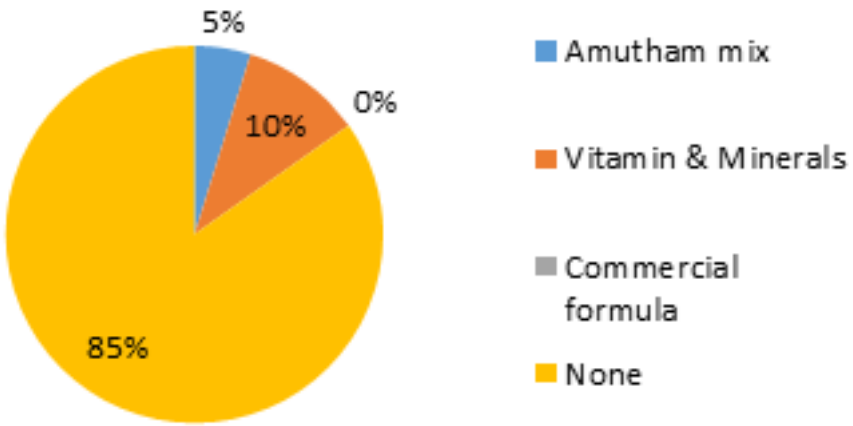

Fig. 3. Nutritional supplement usages among the selected MGNREGS beneficiaries

Table 3. Comparison of mean values of 24 hour dietary recall before and after assessment

Nutrients	Low Income			Middle Income			High Income		
	Normal RDA	Before NE (Mean)	After NE (Mean)	Normal RDA	Before NE (Mean)	After NE (Mean)	Normal RDA	Before NE (Mean)	After NE (Mean)
Net Energy (Kcal/d)	2850	2130	2460	2230	2300	2350	1900	3000	2560
Protein (g/d)	55	43	45	55	60	58	55	70	64
Visible Fat(g/d)	30	12	19	25	20	23	20	35	30
Dietary fibre(g/d)	30	24	28	30	21	26	30	24	29
Calcium (mg/d)	600	400	500	600	500	580	600	550	640
Iron (mg/d)	21	15	18	21	18	20	21	25	27
Retinol (mcg/d)	600	400	500	600	500	550	600	450	650
B carotene (mcg/d)	4800	3200	4000	4800	4000	4400	4800	3600	5200
Thiamine (mg/d)	1.4	1.0	1.3	1.1	1.4	1.2	1.0	0.8	0.9
Riboflavin (mg/d)	1.7	0.6	1.2	1.3	1.0	1.4	1.1	1.0	1.3
Niacin (mg/d)	16	11	14	14	12	13	12	10	11
Pyridoxine (mg/d)	2.0	1.1	1.8	2.0	1.5	1.8	2.0	1.5	1.2
Ascorbic acid(mg/d)	40	32	36	40	30	36	40	42	39
Dietary folate(mcg/d)	200	140	170	200	120	160	200	150	180
Vitamin B12 (mcg/g)	1.0	0.7	0.8	1.0	0.8	0.9	1.0	0.8	0.9
Magnesium (mcg/d)	310	268	285	310	280	300	310	260	295
Zinc (mg/d)	10	7	8	10	9	12	10	12	11

of 6 months and the results showed that the WHR of the patients has been significantly reduced from a mean value of 0.9 ± 5.4 to 0.8 ± 6.0. The result was also supported by the statistics having a p-value of 0.001[18].

Biochemical Parameters Comparison- Before and After Nutrition Intervention

Comparison of Mean & SD of Biochemical values before and after intervention shown in Table-2.

From the above table it is clear that there was a significant difference in systolic blood pressure before supplementation and after supplementation. Whereas there was no difference in diastolic blood pressure, Haemoglobin level and Blood glucose level. Statistical significance is attained for systolic blood pressure, when comparing mean value before and after health and nutrition intervention is found to be accept the alternative hypothesis (z=4.19; p=0.00**). The significance of the intervention of blood pressure can be statistically proven with the p-value being less than 0.5[19]. The percentage of the target population who have severe and life-threatening anaemia due to haemoglobin insufficiency deficiency was less than 1 percent. The haemoglobin levels improved after intervention yet statistically it is insignificant (z=1.06; p=0.29^{NS}). A study on impact of nutrition education and knowledge on the haemoglobin status of Malaysian adolescents revealed haemoglobin levels of the adolescents significantly differed between pre and post-intervention; level of haemoglobin was raised in the present study but not up to the level of statistical significance[20].

Clinical assessment of the selected MGNREGS beneficiaries before intervention compared to after intervention

All other abnormalities in physical factors or sites were less than 10%. No difference was seen in Hormonal features viz., normal and irregular menstruation and menopause. On comparing the percentage of each physical sites assessed clinically before and after nutrition knowledge imparting programme the improvement was statistically significant z-test was taken to ensure where the improvement was statistically significant and it is found to be so with a p-value less than 0.05. The study stated that single nutrient deficiencies are rare since combined deficiency was observed commonly. It concluded that nutrient supplementation could help in the overcome of the status[21].

Dietary assessment of the selected MGNREGS beneficiaries

The relationship between the consumption of vegetarian or non-vegetarian diet and obesity & diabetes in the Indian population was surveyed. The study stated that about 64% of the population were consuming a non-vegetarian diet while 5.2% belong to a semi-vegetarian, 3.2% to ova-vegetarian, 2.2% to pesco-vegetarian and 1.6% to vegan[22]. Nutritional supplements consumed by the selected MGNREGS beneficiaries are clearly mentioned in Figure-3.

80 percent of the study group did not have proper organized meal time while 140 of the respondents had the habit of skipping meals in their regular diet. An investigation on the prevalence of malnutrition among school children in showed results similar that lunch was the heaviest meal of the day responded by 59.7% of the population followed by dinner (27.5%) and breakfast (12.8%)[23].

The above table revealed that, the session was conducted by recalling the 24-hour dietary pattern from the MGNREGS women beneficiaries. Participants were asked on their 24-hour food intake as well as beverages intake by face to face interview and we jot down according to their consumption. Furthermore the food consumed by them were converted into grams and these values are calculated by using Nutrition Society of India (NSI) diet calculator. After the analysis, we found out that the intake of nutrients by the beneficiaries were insufficient. For that we have provided the nutrition education based on their dietary habits. It bring out that after nutrition education we observed from the analysis that all the nutrients consumption has been increased in their diet. The 24-hour dietary recall method is used to identify the deficiency and excess consumption of nutrients based on the recommended dietary allowance.

The present study shows 15 percent were aware that calcium is necessary for strong bones and teeth. Only 231 of the population were aware that vitamin D is obtained through sunlight. Similar to knowledge on calcium deficiency disorders, knowledge on vitamin D is also unknown to 14 percent of the target population. Half of the

population perceived that anaemia results due to deficiency or insufficiency of iron. The dietary sources of iron were unaware to only 12 selected beneficiaries. 33 percent of the study group were aware of the fact that vitamin C aids in iron absorption.

On Comparison of nutrient intake with before and after intervention, in the low-income group, nutritional improvement was seen in the consumption of B-vitamins and minerals. In the nutrient intake of middle-income group, positively deviated energy, protein thiamine and riboflavin amount were reduced while improvement was seen in all negatively deviated nutrients intake. Zinc intake alone shifted from negative deviation to positive deviation on an average in a day's consumption, because of nutrition intervention. The nutrition intervention of the high-income group, the positive difference between actual and recommended intake of the nutrients was reduced while the negative difference were increased. Similarly, a study on the effect of nutrient intervention in older people which revealed that the pre-intervention diet of older people lacked protein, energy and micronutrients which affected their nutritional status. A 12 months intervention programme rendered an improvement in protein in their diet along with the improvement in their quality of life [24]. From the other study we can find out that educational intervention have promoted lifestyle pattern and healthy eating habits,that can prevent many diseases. Following such kind of lifestyle can extend their lifespan[25].

CONCLUSIONS

Considering the evidence from the study it can be ascertained that Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) secures work and financial stability of the rural women of Salem district of Tamil Nadu. From the previous study by Debi Prasad Biswal. (2017), MGNREGS is an essential tool for Indian inclusive growth and poverty reduction. It enhance beneficial employment to rural people especially to the women and promotes self-assertion as they are able to lead their lives with nobility and freedom. They are able to gain positions of respect in the society. As well as financially independent and able to spend on all their needs and desires [26]. A study revealed that the nutritional education programme on balanced diet, food groups and its functions and the importance of precise diet to meet the body requirements was conducted for the farm women. The diet survey and 24 recall method revealed the after intervention, the food consumption of farm women changed and nutrient intake was increased. The work participation of farm women also increased with better nutrition [27]. Nutrition intervention promoted people's awareness on nutrient intake. On imparting nutrition education, nutritional status of the people shall be raised in addition to standard of living.

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Conflict of Interest

The authors declare that there is no conflict of interest.

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