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The Drivers of Dietary Diversity Among the Tribal Children - A Micro Analysis

Aparna H. Nath[1] and Sithara Balan V.[2]

1. Research Scholar, PG Department & Research Centre of Home Science, Government College for Women, Thiruvananthapuram, Kerala, India

2. Assistant Professor, PG Department & Research Centre of Home Science, Government College for Women, Thiruvananthapuram, Kerala, India

Corresponding author's e-mail: aparna.hareendranath@gmail.com

ABSTRACT

Malnutrition is a multifaceted issue, often stemming from various interrelated causes. While inadequate food intake plays a significant role, parental knowledge, attitudes, and practices regarding child feeding are equally important determinants. The Knowledge-Attitude-Practice (KAP) model provides an insightful framework for understanding how these three factors influence parental behavior and, in turn, a child's nutrition. The present study was carried out during 2020-2024 and focuses on exploring the factors affecting the dietary diversity of the children in tribal areas of Kerala. The study revealed that a parent's nutritional knowledge level and attitude toward healthy eating practices directly impact the dietary patterns they establish for their children. Gender do influence the Dietary diversity of the children in tribal areas. Tribal diets are predominantly based on locally available food, which may not always provide the required diversity for adequate nutrient intake. Understanding these challenges through a KAP study allows for a comprehensive analysis of parental influences on child nutrition, helping to create effective educational and intervention programs. The study highlights a significant gap between knowledge, attitude, and practice regarding healthy eating among parents. While many parents have some knowledge of healthy eating (67% have medium or high knowledge), this does not necessarily translate into positive attitudes or practices, as reflected in the higher percentages of low practice levels (39%). This suggests that more targeted interventions focusing on raising awareness and changing behaviors and attitudes are necessary to ensure better alignment between knowledge and practical implementation of healthy eating habits.

Keywords: *Dietary diversity; dietary habits food frequency; KAP Model, tribal children*

INTRODUCTION

School-going age is a critical period in which there is rapid growth in physical development, such as height, weight, and coordination of bodily movements. This period also fosters the development of fine motor skills. The children's energy levels will be very high, requiring adequate calorie intake. Cognitive development, including the development of the brain, concrete thinking, inculcating curiosity, and acquisition of knowledge, is faster during this period (2024). The role of nutrition in children's well-being is a crucial determinant of a child's holistic well-being, growth, and development. Nutrition during school years contributes to developing a healthy mind and body and to better living. Children in tribal areas often are marginalized from the mainstream of the society due to their socio-cultural backgrounds and belief systems. Malnutrition is a significant cause of first-day fatalities globally, accounting for 25 per cent of cases, and it is a widespread problem in India. Tribal baby and child mortality rates from malnutrition are concerning in Kerala, a state with notable accomplishments in human development. The most common causes include intrauterine growth retardation, asphyxia, acute respiratory distress syndrome, aspiration, apnoea, pre term and low birth weight. Compared to 14.1 deaths per 1000 live births in the rest of the state, Attap bn bnpady has a lower infant mortality rate of 66 (2014). The tribal groups are generally at a different level of social and

economic development than the general population, they tend to lag in social-economic domains of life. Tribal populations have greater disparities in health and nutrition. Compared to the general population, they are far more vulnerable due to their poor relationship with the environment (Priya & Bhat, 2023). Poor eating habits that are formed in childhood may continue into adulthood, raising the risk of obesity and its associated problems, including Type 2 Diabetes Mellitus. Early dietary changes, particularly in children, have been shown to improve health and lower the chance of contracting diseases later in life. Studies have indicated that parents' eating habits significantly impact their offspring's eating habits, irrespective of demographic factors like age, gender, nation, or financial level. Nevertheless, the precise process remains unclear (Muhammed, 2019). Tribal communities in Kerala have poorer nutrition, despite the state having a higher health indicator than other Indian states. Among tribal children under five years of age, the district exhibits 22.5 per cent underweight, 31.3 per cent stunting, and 16.1 per cent wasting. Since these tribal groups were vulnerable due to their unique culture, isolation, and remote location, their status has not changed over the previous thirty years despite several nutritional intervention programmes (Krishna & Srijayanth, 2022). Among school-age children, under nutrition is a serious public health concern. Sufficient nourishment is essential for children's healthy growth and development. The science of food and its relationship to health is one definition of nutrition. It is focused chiefly on nutrients' role in the body's development, growth, and maintenance. "Maintaining a nutritional status that enables us to grow well and enjoy good health" is the definition of good nutrition (Debbarma *et al.,* 2018). A number of aspects associated with food security, including physical dimensions (availability), the economy (buying power), nutrition (fulfillment of demands), personal cultural and religious beliefs, food security (health), and time (continuous availability), all have an impact on children's nutritional status. Since parenting styles can influence how families eat and how their children nurse, parenting styles can also have an impact on nutritional status. Analysis reveals a negative correlation between malnutrition in tribal children and breast feeding practices, economic level, mother's prenatal care, and women's autonomy in making decisions (Kumar *et al.,* 2024). The prevalence of anemia and its association with various socio-demographic variables among preschool tribal children in Kerala was investigated by Arjun (2018), who revealed that anaemia prevalence in preschool tribal children in Kerala is nearly double that of non-tribal children, highlighting the need for targeted interventions and improved healthcare services for this population. Anaemia was found to be significantly correlated with pre term, low birth weight, length of breast feeding, overcrowding, and mother's educational attainment. Because of inadequate intake of vital micronutrients, many preschoolers in the area suffer from nutritional anemia. Preschoolers from tribal communities are nearly twice as likely to suffer from anemia as children from non-tribal groups, which suggests that there is still a gap in their standards of living. While analyzing the secondary data, it was evident that there is a declining trend in the food consumption pattern of the tribal population concerning their food habits, which was predominantly based on their locality, culture, and ecosystem. While some attention has been paid to the dietary practices and health outcomes of Kerala's tribal populations, few studies have explicitly looked at the KAP of parents to child nutrition. Parental understanding of healthy eating and their attitudes toward food are crucial, particularly in environments where food choices are limited and traditional knowledge may not align with modern nutritional standards. Studies have shown that increasing parental knowledge can significantly improve children's dietary habits. However, little work has been done to assess the baseline KAP levels among tribal parents and how this influence child nutrition.

Objectives:

1. To examine the demographic background of the selected respondents.

2. To analyze the dietary diversity of the families of the selected respondents and to develop a nutritional status index based on it.

3. To compare the Knowledge – Attitude and Practice of the parents of the selected respondents.

METHODOLOGY

The present study was carried out among a sub-sample of hundred tribal children aged 7-9 years from the leading study group of four hundred and twenty-two children. The children belonging to the tribal settlements of Thiruvananthapuram district were selected using purposive random sampling method. A pretested Interview Schedule was utilized to gather information on demographic details, lifestyle patterns, hygiene practices, dietary habits, and eating patterns. A diet survey was conducted among the respondents to determine dietary habits and practices. The assessment was done with the help of their parents. The diet survey comprises both qualitative and quantitative aspects. A qualitative diet survey includes information about the nature of the diet, food combinations used, food likes and dislikes, regularity of meals, reasons for skipping meals, and inclusion of special foods daily during school days. The quantitative aspect includes anthropometric assessments, twenty-four-hour dietary recall, and food frequency. In the present study, the Dietary Diversity Scores were calculated for 100 sub-samples based on the recommendations from the Food and Agricultural Organisation (FAO), and the development of the Nutritional Status Index was also calculated.

Dietary diversity was assessed to quantify the number of food groups in a diet during a specific period. Twelve food groups such as Cereals, roots and tubers, Pulses and legumes, Leafy Vegetables, Other Vegetables, Fruits, Milk and milk products, Fish, Meat and Meat products, Nuts, oil seeds and oils, Sugar, honey and jaggery, Beverages, and Spices and Condiments were considered for the scoring. The number of food groups and the type of groups to be used may vary according to the nature of the samples and the study design (Kennedy, *et al.*, 2011). These food groups were identified and categorized as predefined food groups. The frequency of consumption was marked and scored as 7 to 1 for daily, weekly, fortnightly, thrice a week, monthly, occasionally, rarely, and never consumed will receive a score of zero. The sum of all the scores across the group represents the dietary diversity score of the respondents. DDS was calculated by summing the number of unique food groups consumed during the last 24 hours.

$$DDS = 1 \sum n \text{Score of Food Group } i$$

Where 'n' is the total number of food groups.

The Food Use Frequency Scores are used in nutritional research studies to assess and analyze individuals' or populations' dietary patterns and nutritional status. It helps to identify the frequency of consumption of specific foods, which can be linked to dietary habits and potential nutritional deficiencies or excess. Food consumption was rated using the five pre-coded categories of responses: more than twice a week, twice a week, fortnightly, once a week, and monthly. The samples were asked to report their consumption over the past few months. For the present study, 3-point scale assessed the food preferences of the respondents in this study on a checklist of 12 food groups: cereals, pulses and legumes, leafy vegetables, roots and tubers, other vegetables, milk and milk products, fruits, nuts and oil seeds, fish, meat products, fats and oils, sugar, bakery products, and beverages. Respondents were asked to give score for each food item based on their frequency of consumption. The sum of the total scores obtained for all the eleven food groups represents the food use frequency score of a family. It was then categorized into low, medium, and high.

The Nutritional Status Index for the specified age group was determined by considering their Calorie Intake, Protein Intake, Iron Intake, Vitamin A, and Vitamin C intake about the Recommended Dietary Allowance. In addition, factors such as Height, Weight, waist-hip ratio, and Haemoglobin were included in the analysis. The values of these variables were initially standardized

using Z-scores. A principal component analysis was run on z scores of 9 variables to determine the weights to be assigned for calculating the NSI. Further, based on the mean and standard deviation, the respondents were categorized into groups indicating "good nutritional status" and "poor nutritional status." The exact formula for the NSI will depend on the study's objectives, the population studied, and the available data (Thompson and Subar, 2017). Researchers may choose different indicators or weight them differently based on their study context. The following formula was used for calculating the Nutritional Status Index of the respondents for the present study.

$$NSI = \frac{\sum \left[X_{ii} - N_{ii} \right]}{S_{ii}}$$

Where, Xii =Observations corresponding to ithvariable for the ithsample

N ii = Normal value corresponding to ithvariable for the ithsample

S ii = Standard Deviation corresponding to ithvariable for the ithsample

$\sum$ = indicate the overall sum of the variables for the ithsample/respondents

Furthermore, the respondents were classified based on their Nutritional Status Index: those above the Mean + Standard Deviation (S.D.) as high, those between the Mean ± S.D. as medium, and those below the Mean – S.D. as having low NSI.

Since the target population were small children, it is essential to understand the nutritional knowledge and awareness level of them. Nutritional awareness of the parents have a direct relation on the eating habits of young children. Separate checklists were used to assess the parents' knowledge and practices regarding healthy eating. An attitude scale was created to assess participants' emotional, perceptual, and cognitive beliefs and understanding of their diet, potentially impacting their nutritional behaviors (Kennedy, *et. al*, 2011). The parents' knowledge on nutrition and its importance were tested with a set of 35 questions, the responses for which were categorical Yes (1) or No (0). If a parent answer all questions as 'Yes' the maximum score will be 35 (35 x 1), while all questions answered as 'No' will get a maximum of 0 (35 x 0). The 33rd and 66th percentile of total scores obtained were calculated as 20 and 24. The total scores less than 20 were treated as low, scores between 20 and 24 as Medium and scores greater than 24 were treated as high. Based on these classification the parental knowledge were summarised. The parental attitude towards nutritional aspects of children were obtained as 5-point scale responses to 35 measures. A respondent who strongly agrees to all the measures will score a maximum of 175 (35 x 5). On the contrary, one who strongly disagrees to all the 35 measures will be assigned a score of 35 (35 x 1). The 33rd and 66th percentile of the total scores obtained were computed as 114 and 122. All the total scores below 115 were classified as low, those between 115 and 122 as medium and those above 122 were treated as high. The parents' practices of nutritional enrichment was tested with a set of 35 questions, the responses for which were a categorical Yes (1) or No (0). If a parent answers all questions as 'Yes' the maximum score will be 35 (35 x 1), while all questions answered as 'No' will get a maximum of 0 (35 x 0). The 33rd and 66th percentile of total scores obtained were calculated as 20 and 24. The total scores less than 20 were treated as low, scores between 20 and 24 as Medium and scores greater than 24 were treated as high. The total scores obtained from each tools were then categorized as low, medium, and high and the K-A-P scores of the parents were developed accordingly.

RESULTS AND DISCUSSION

Knowledge Attitude & Practice of the parents (Pre-Intervention)

Parental nutritional awareness is closely associated with the eating habits of young children. To assess parents' knowledge and practices surrounding healthy eating, separate checklists were employed. Additionally, an attitude scale was created to evaluate the emotional, perceptual, and

cognitive beliefs that participants have regarding their diet, which can influence their nutritional behaviors. The total scores from each assessment were classified into low, medium, and high categories. The Knowledge-Attitude-Practice (K-A-P) scores of the parents were calculated and are presented below.

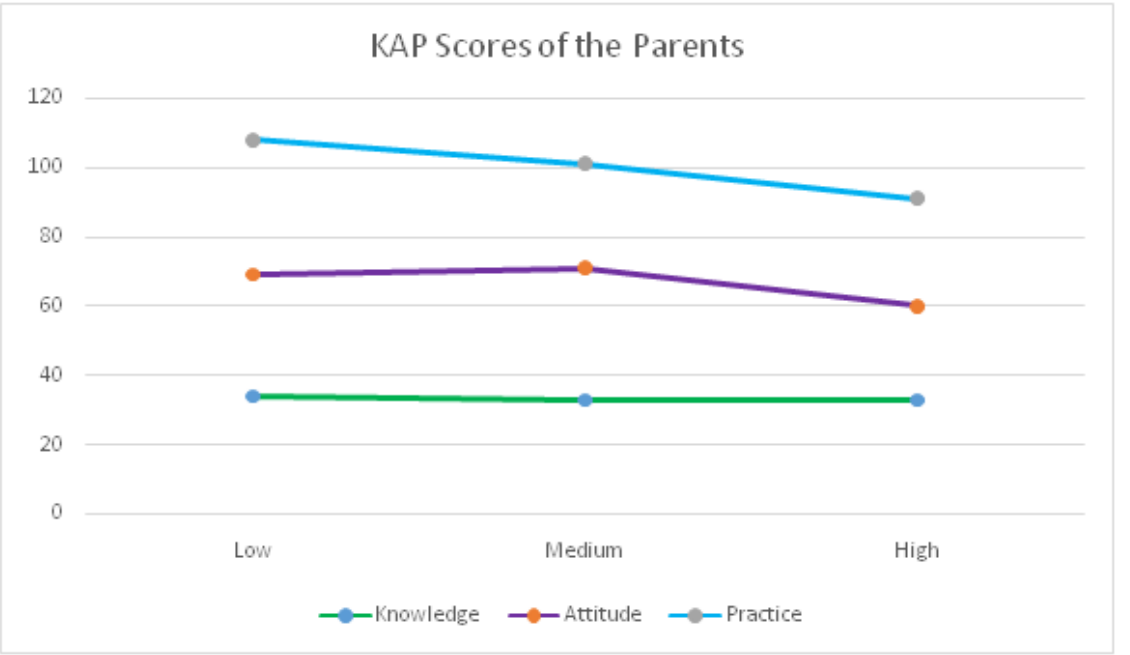

Fig. 1. KAP Scores of the Parents

From the study, it was observed that the parents' level of knowledge regarding healthy eating habits was categorized into low, medium, and high based on the scores they received from the KAP tools. About 34 per cent of the parents have a low level of knowledge, 33 per cent have a medium level of knowledge, and 33 per cent have a high level of knowledge regarding healthy eating. The attitude levels were found to be 35 per cent (low), 38 per cent (medium), and 27 per cent (high), and the level of practice was found to be lower at 39 per cent, medium for 30 per cent, and 31 per cent at higher levels. This suggests that a large proportion of parents fall into the low and medium knowledge categories, indicating a potential need for educational interventions to improve awareness of healthy eating practices among parents. Most parents fall into the medium attitude category, but the relatively small percentage (27%) of parents with a high attitude level implies that while they may be aware of healthy eating habits, their positive attitude towards adopting them could still be improved. This shows a concerning gap between knowledge, attitude, and actual practice. Even among those with higher knowledge and attitude, many parents may not consistently practice healthy eating habits.

Knowledge level of the Parents (Pre-Intervention)

The parents' knowledge of nutrition and its importance was tested with a set of 35 questions, the responses for which were categorical Yes (1) or No (0). It includes statements related to eating habits, fast food consumption, knowledge regarding the nutrient sources and understanding on basic nutrition. The total scores of less than 20 were treated as low, scores between 20 and 24 were treated as medium, and scores greater than 24 were treated as high. Based on this classification, the parental knowledge was summarised and shown in the figure below.

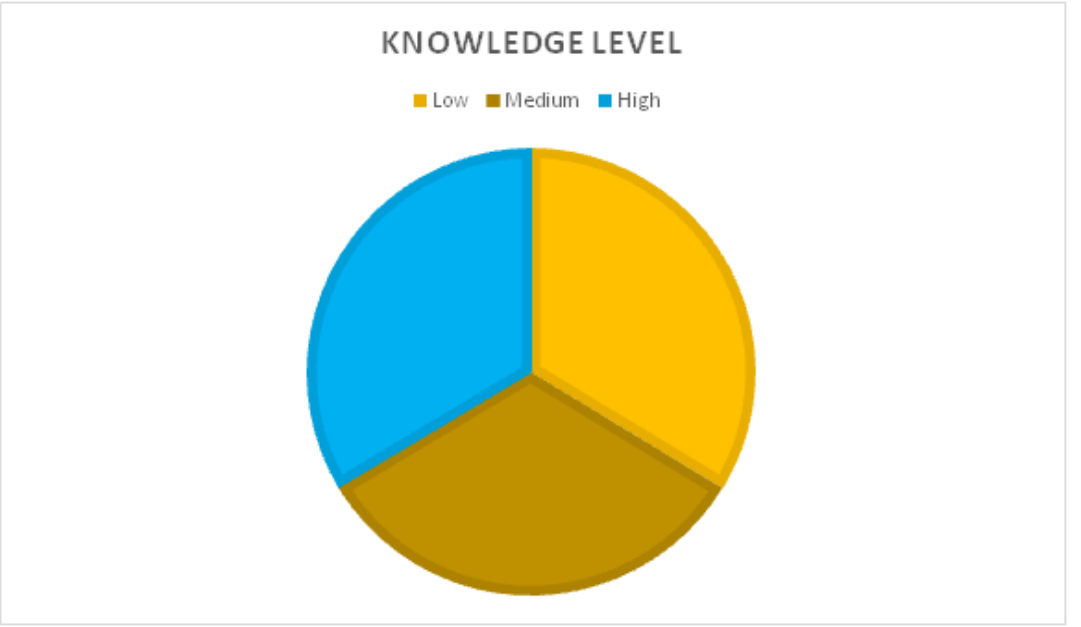

Fig. 2. Knowledge level of the Parents

It was observed that 34 per cent of the parents had a low level of knowledge of nutrition, whereas another one-third had only medium knowledge. The remaining 33 per cent of parents were found to have a high level of knowledge of nutrition and its importance.

Attitude level of the Parents (Pre Intervention)

The parental attitude towards the nutritional aspects of children was obtained using a 5-point scale of responses to 35 measures. All the total scores below 115 were classified as low, those between 115 and 122 as medium and those above 122 were treated as high. The following table depicts the low, medium, and high classification of the attitudes of parents toward the nutritional aspects of children Table 1.

Table 1
Attitude level of the Parents

Levels	Score ranges	Percentage (n=100)
Low	<115	35
Medium	115-122	38
High	<122	27

Nearly 35 per cent of the parents had a low attitude towards nutrition, whereas 38 per cent showed only a medium attitude. The remaining 27 percent of parents were found to have a high attitude towards nutrition and its importance.

Parental Practices of Nutritional enrichment(Pre Intervention)

The study administered both pre and post-test in order to find out the effect of intervention on the level of knowledge, attitude and practices of the parents towards healthy eating and nutrition. Based on the scores obtained by each respondents, they were further categorised as low, medium and high and the classification the parental knowledge is summarised in the given chart.

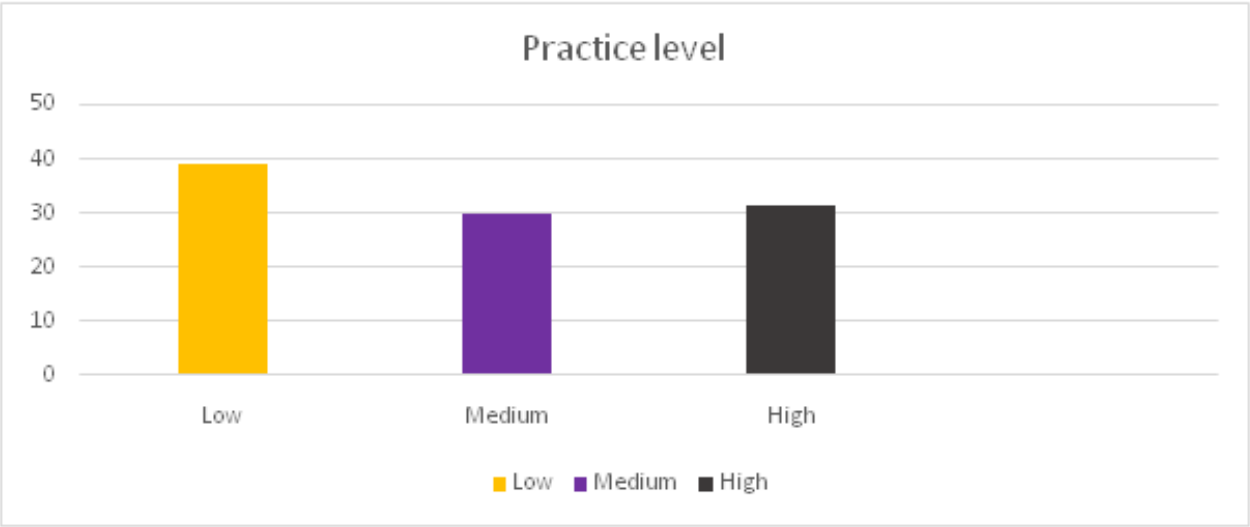

Fig. 3. Level of Practice of the Parents

The study revealed that 39 per cent of the parents have a low level of practice in adopting healthy eating habits, 30 per cent have a medium level of practice, and 31 percent have a higher level of practice towards adopting healthy eating habits.

Post Intervention results

The tools used to analyse the participants' Knowledge, Attitude, and Practice were further administered after one month and three months of the intervention. This was done to identify the effectiveness of the intervention programme.

Table 2
Comparison of the KAP scores after the intervention

Pre-intervention Scores				**Post Intervention Scores (after 1 month)**			**Post Intervention Scores (after 3 months)**		
	K	A	P	K	A	P	K	A	P
Low	34	35	39	13	03	13	15	8	11
Medium	33	38	30	39	20	25	50	28	49
High	33	27	31	48	77	62	35	64	40

The interpretation of the data presented in Table 2 suggests that the effectiveness of the intervention varies across groups. There was a huge positive difference in the KAP levels soon after one month of the intervention, which shows that the participants' retention level was high. However, there was a slight decline in the practice levels after three months.

Comparison of Means across KAP

To evaluate the differences in means for Knowledge (K), Attitude (A), and Practice (P) scores across the time points of pre-intervention, one-month post-intervention, and three months' post-intervention, we employed repeated measures ANOVA. The statistical analysis provided insights into how the scores varied over time. The detailed results of this analysis can be found in the table below.

Table 3
Comparison of Means across KAP

Item	Source of Variation	Sum of Squares (SS)	Degrees of Freedom (df)	Mean Square (MS)	F-value	p-value
Knowledge	Between Groups	1234.56	1	1234.56	15.67	0.002*
	Within Groups	789.34	4	197.34		
	Total	2023.90	5			
Attitude	Between Groups	456.78	1	456.78	8.90	0.015*
	Within Groups	205.12	4	51.28		
	Total	661.90	5			
Practice	Between Groups	345.67	1	345.67	7.45	0.025*
	Within Groups	185.33	4	46.33		
	Total	531.00	5			

While analysing the data using the ANOVA test Table 3, it was found that p-value (0.002) obtained for the knowledge is less than the significance level of 0.05, we reject the null hypothesis. This indicates that there is a statistically significant difference in knowledge scores between the pre and post assessments across the different categories (low, medium, high). The p-value (0.015) obtained for the attitude scores is also less than 0.05, leading us to reject the null hypothesis for attitude as well. This indicates a statistically significant difference in attitude scores between the pre and post assessments. The similar results were obtained for the practice scores as well. The p-value (0.025) is again less than 0.05, allowing us to reject the null hypothesis for Practice. This indicates a statistically significant difference in practice scores between the pre and post assessments. All three areas (knowledge, attitude and practice) showed statistically significant differences between pre and post scores, as indicated by their p-values being less than the significance level of 0.05. The results suggest that the intervention was effective in improving knowledge, attitude, and practice among the participants.

Effects on multiple dependent variables on the KAP levels

To analyze the effects on multiple dependent variables simultaneously using MANOVA, the provided data was framed under three groups (low, medium, high) across three time points (pre-intervention, post intervention after 1 month, and post intervention after 3 months) for three dependent variables (knowledge, attitude, and practice).

Table 4
Effects on multiple dependent variables on the KAP levels

Item	Wilks lambda	frequency	Degrees of Freedom (df)	Df2	p-value	Partial Eta Squared
Knowledge	0.321	12.456	6	12	0.001	0.678
Attitude	0.245	15.789	6	12	0.000	0.755
Practice	0.512	3.456	12	24	0.045	0.388

In the Table 4, MANOVA results indicate a significant effect of the group (low, medium, high) on the combined dependent variables (knowledge, attitude, and practice), with a Wilks' Lambda of 0.321 and a corresponding F-value of 12.456 (p = 0.001). Since the p-value is less than the significance level of 0.05, we reject the null hypothesis that there are no differences in the means of the dependent variables across the different groups. This suggests that the level of intervention (low, medium, high) has a statistically significant impact on the outcomes measured. The analysis also shows a significant effect of time (pre, post 1 month, post 3 months) on the dependent variables, with a Wilks' Lambda of 0.245 and an F-value of 15.789 (p = 0.000). since the p-value is less than 0.05, we reject the null hypothesis for time effects. This indicates that the outcomes measured (knowledge, attitude, and practice) significantly change over time, suggesting that the intervention has a lasting impact. The interaction between group and time is also significant, with a Wilks' Lambda of 0.512 and an F-value of 3.456 (p = 0.045). The p-value for the interaction effect is also below the 0.05 threshold, leading us to reject the null hypothesis for the interaction. This indicates that the impact of the intervention varies depending on both the group and the time of measurement, suggesting that different groups may respond differently to the intervention over time.

Interrelationship between the Knowledge, Attitude and Practice scores

Further to explore the interrelationship between the Knowledge, Attitude and Practice scores, Correlation analysis was used.

Table 5
Interrelationship between the Knowledge, Attitude and Practice scores

Correlation	Knowledge	Attitude	Practice
Knowledge	1.000	0.845	0.678
Attitude	0.845	1.000	0.456
Practice	0.678	0.456	1.000

Data revealed from Table 5 that, there is a strong positive correlation between knowledge and attitude scores (correlation co-efficient = 0.845). This suggests that as Knowledge scores increase, Attitude scores tend to increase as well. There is a moderate positive correlation between knowledge and practice scores (correlation co-efficient = 0.678). This indicates that higher knowledge scores are associated with higher Practice scores, but the relationship is not as strong as that with attitude. There is a moderate positive correlation between attitude and practice scores (correlation co-efficient = 0.456). This suggests that as attitude scores increase, practice scores also tend to increase, but the relationship is weaker compared to the other two pairs. Hence, it can be concluded that, the correlation analysis indicates that there are positive relationships between knowledge, attitude, and practice scores.

Dietary Diversity Scores (DDS)

The Dietary Diversity Scores were calculated based on the incorporation of twelve food groups in the diet. Further to scoring, higher scores indicate greater dietary diversity, which is generally associated with better nutritional quality and health outcomes. Lower scores suggest limited dietary diversity, potentially indicating a risk of nutrient deficiencies or food insecurity.

Table 6
Dietary Diversity Scores of the Respondents

Dietary Diversity Score (DDS)	Frequency (n=100)	Mean	Standard Deviation	P value
Under (below 6)	21	7.07	0.9347	1.000
Adequate (6-8)	74			
High (above 9)	5			

From the Table 6 it is found per cent of the respondents had low dietary diversity scores, indicating a relatively low consumption of food groups over a twenty-four-hour period. This may lead to nutrient inadequacy and, ultimately, deficiencies. The study's results are concerning and emphasize the urgent need to improve the nutritional status of children in the tribal areas included in the study.

Table 7
Comparison of the means of DDS with selected variables

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25.094	14	1.792	2.481	.005[b]
	Residual	61.416	85	.723		
	Total	86.510	99			

a. Dependent Variable: Dietary Diversity Score
b. Predictors: (Constant), P, Famsize, VitaminC, A, GenderQ2, AgeQ1, Annualincome, eatingpattern, Protein, HB, VitaminA, K, Iron, Calorie

Table 8
Regression analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.840	2.532		.727	.469
	Age	-.048	.098	-.047	-.492	.624
	Gender	-.404	.185	-.217	-2.179	.032
	Famlysize	.119	.157	.082	.759	.450
	Annualincome	1.057	.558	.194	1.892	.062
	HB	.190	.135	.142	1.412	.162
	Eating pattern	.047	.143	.034	.330	.742
	Calorie	.001	.001	.131	.827	.411
	Protein	.025	.016	.230	1.583	.117
	Iron	-.022	.042	-.057	-.535	.594
	VitaminA	.000	.000	-.189	-1.832	.071
	VitaminC	.002	.003	.079	.750	.455
	Knowledge	-.045	.036	-.130	-1.233	.221
	Attitude	.013	.007	.175	1.839	.069
	Practice	-.002	.032	-.006	-.050	.961

a. Dependent Variable: Dietary Diversity Score

A multiple linear regression analysis was conducted to examine the impact of various independent variables (such as age, gender, income, etc.) on dietary diversity, with the "Dietary Diversity Score" as the dependent variable. The study results reveal a significant association between gender and dietary diversity score (p = 0.032), and the negative coefficient (-0.404) suggests that girl children exhibited a lower dietary diversity score Table 8. The remaining variables studied, such as the size of the family, age, annual income of the family, hemoglobin levels, eating patterns, and nutrient intake, have shown positive correlations towards the dietary diversity of the respondents selected for the study but are not statistically significant. In a study conducted by Bansal *et al.*, 2021, a significant association was found in the dietary diversity of adolescents with respect to their gender, where adolescent male samples had better dietary diversity and consumption patterns compared to others. A simple linear regression analysis was done to understand whether the Dietary Diversity Score and the Food Used Frequency Scores have any significant association. The results include an ANOVA table and regression coefficients.

Table 9
Comparison of Means of DDS and FUFS

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.789	1	7.789	9.697	.002[b]
	Residual	78.721	98	.803		
	Total	86.510	99			
a. Dependent Variable: Dietary Diversity Score b. Predictors: (Constant), Food Used Frequency Score Coefficientsa						

Table 10
Regression analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.270	.272		23.043	.000
	Food Used Frequency Score	.019	.006	.300	3.114	.002
a. Dependent Variable: Dietary Diversity Score						

Based on the results ($p < 0.05$), the model is considered statistically significant, indicating that the Food Used Frequency Score effectively predicts the Dietary Diversity Score. This suggests that the Food Used Frequency Score plays a significant role in explaining the variation in Dietary Diversity Score. A positive coefficient indicates that an increase in the frequency of food use correlates with an increase in the dietary diversity score. Therefore, it can be inferred that the Food Used Frequency Score significantly and positively impacts the Dietary Diversity Score. As individuals consume a wider variety of foods more frequently, their dietary diversity improves. Although the effect size is relatively small, the predictor remains statistically significant, demonstrating that enhancing food variety and frequency could potentially enhance dietary diversity.

Nutritional Status Index (NSI)

The Height, Weight, Waist-hip ratio, Haemoglobin, Calorie Intake, Protein Intake, Iron Intake, Vitamin A, and Vitamin C intake of the subset sample of 100 children were initially standardized using Z-scores. A principal component analysis was run on z scores of 9 variables to determine the weights to be assigned for calculating the NSI. The Principal Component Analysis using varimax rotation extracted four components, and each variable's unrotated component matrix loading was taken as weights. The weights arrived at using Principal Component Analysis are shown in the table below.

Table 11
Factor loading – Weights

Variables	Factor Loadings (Weights)
Zscore: Height	.017
Zscore: Weight	.133
Zscore(Was_Hip_Ratio)	.024
Zscore: Haemoglobin	.010
Zscore: Calorie	.875
Zscore: Protein	.790
Zscore: Iron	.635
Zscore: Vitamin_A	-.011
Zscore: Vitamin_C	.476

The z-scores of the 9 variables were then multiplied by their respective weights, and the weighted z scores were added up to arrive at each individual's nutritional status index (NSI). The descriptive statistics of 100 individual NSI are shown below:

$$NSI = (0.083\times Zheight) + (0.220\times Zweight) + (0.094\times ZWHR) + (0.037\times ZHb) + (0.884\times Zcalorie) + (0.808\times Zprotein) + (0.609\times Ziron) + (-0.038\times ZvitaminA) + (0.421\times ZvitaminC)$$

Table 12
Nutritional Status Index – Descriptive Statistics

N	Minimum	Maximum	Mean	SD
100	-6.60	4.76	0.000001	2.049479

It is releated from Table 12 that the average nutritional status index is 0, indicating that, on average, the respondents' nutritional status is balanced and falls around the middle of the scale. With a standard deviation of 2.049, there is a moderate spread of values around the mean, showcasing variability in the nutritional status among respondents. The index range is from -6.60 (minimum) to 4.76 (maximum), signifying a diverse nutritional status among the respondents selected for the study, covering both extremes of nutrition. This is picturized using a histogram.

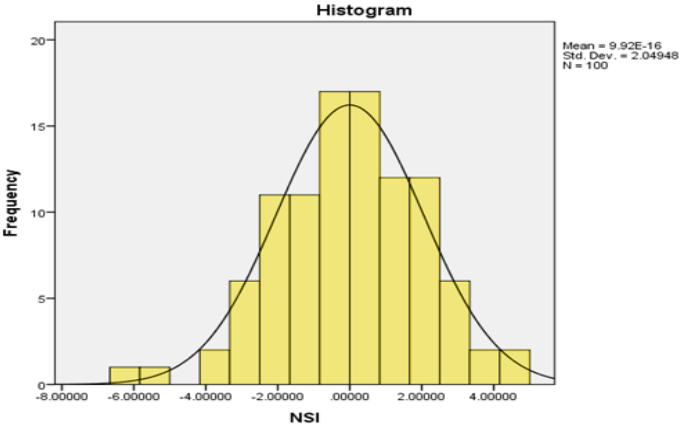

Fig. 4. Histogram representing the Nutritional Status Index of the Respondents

Figure number 4displays the Nutritional Status Index (NSI) distribution based on a sub-sample size of 100 participants (as indicated by N = 100). The mean of the NSI data is approximately 0 (specifically 9.92×10-16, essentially zero), indicating that the data is symmetrically distributed around the center. The standard deviation (Std. Dev.) is 2.04948. This value quantifies the average deviation of the NSI values from the mean, indicating the spread of the data. A higher standard deviation would suggest a wider spread, while a lower value would indicate that the data points are closer to the mean. The standard deviation of approximately 2.05 suggests a moderate spread of the NSI values around the mean. The NSI values range from approximately -7 to +6, with most values concentrated around the mean. The tails of the distribution are shorter, indicating that extreme NSI values (very high or very low) are less frequent.

The histogram of NSI values suggests that the data is approximately normally distributed, centered around a mean of 0, with a standard deviation of about 2.05. The symmetry of the histogram indicates a lack of skewness, and the data is spread within a reasonable range, showing no extreme outliers or deviations from normality. The histogram suggests that the sample population has a moderate overall nutritional status. While a portion of the population is experiencing better nutritional health (positive NSI values), an almost equal portion faces poorer nutritional conditions (negative NSI values). This indicates a need for targeted dietary interventions to address the disparity and improve the overall nutritional well-being of the population. The analysis shows that the frequency of food consumption has a significant positive impact on the diversity of the diet. This means that individuals or households who eat a wide variety of foods more often are likely to have a more diverse diet. In tribal settlements, consuming a wide range of foods more frequently indicates access to various food groups such as fruits, vegetables, and grains. This access contributes to a diverse diet, which is important for getting enough essential nutrients. On the other hand, there is a significant gap in the consumption of food from other dietary sources, including milk and milk products, meat, and protein-rich foods. These findings are important for public health interventions.

CONCLUSION

Promoting dietary diversity through improved food variety and frequency of consumption is an effective strategy for enhancing nutrition and preventing micronutrient deficiencies, particularly in vulnerable populations. The knowledge, attitude, and practices of parents have a severe impact on determining the dietary diversity of children. This also shows the necessity to incorporate sustainable and targeted interventions in tribal areas to improve the nutritional needs and enhance the quality of life. Encouraging households, particularly in rural and underserved areas, to increase the frequency and variety of their food intake could lead to better overall dietary quality and health outcomes. Initiatives like school meal programs, food security efforts, and community awareness campaigns can promote diverse food consumption.

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Abbreviations and Acronyms
NSI- Nutritional Status Index
DDS- Dietary Diversity Score
KAP- Knowledge- Attitude- Practice
ICMR- Indian Council of Medical Research
FUFS- Food Use Frequency Score

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