

Fisher Women Participation in Post-Harvest Sector-Health and Nutritional Status of Preschool Children in Coastal Fishing Villages of South India (Andhra Pradesh, Karnataka, Kerala and Tamil Nadu)

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Abstract

Based on the understanding from the field research, it is clear that there is a need to improve the general situation of women on a long-term basis. But as a priority, interventions in creating awareness among women on food, health, sanitation and child care, to educate women formally as well as informally in improvement of the quality of the product. Effort is to be made to have trained female extension workers. Women friendly technologies need to be tested, evaluated and proper techno economic reports prepared to facilitate their use through entrepreneurship development programs. Intake of cereal by the preschool children in the surveyed southern Indian states (Andhra Pradesh, Karnataka, Kerala and Tamil-Nadu) was found to be 136 gm/ C.U., and pulse intake was 10 gm/C.U. Protein, iron, calcium and B-complex vitamin intakes were low while that of vitamin A was above requirement values. It was observed their foods were of plant source whose nutrients bioavailability is poor. Therefore, application of improved food processing and storage techniques, dietary diversification and fortification with intensified nutrition education would reduce malnutrition in the area. The consumption of vegetables, fruits was also found to be low. Milk consumption was fairly low among the preschool children & fish consumption was found to be 34 gm/CU. The intake of nutrients in case of preschool children was found to be less than the Recommended Dietary allowances (RDA). It was observed that macro nutrient intake was better when compared to the micro nutrient intake. Anthropometric measurements revealed that overall height of the preschool children surveyed was found to be 90 cm and their overall weight was 12.7 Kg. Majority (41%) of them were in grade-1 malnutrition, 32 % were in normal, 19% were in grade -11 malnutrition and the remaining were in grade -111 category of malnutrition. All the children are shorter and lower in weight than the standards. Preschool children of Tamil Nadu are taller and heavier than other states. Kerala children were shortest, Andhra Pradesh children were with lowest mean weights ($P < 0.001$) 31% of preschool children were anemic. The other clinical symptoms like angular stomatitis, Cheilosis and dryness of skin were 35% on an average. The reason for high anemic might be due to low consumption of iron rich foods, poor health, hygiene and sanitation. Also, might be due to lack of nutritional awareness.

Keywords: Fisher Women; Post-Harvest Sector; Health; Nutritional Status; Pre School Children; Food Intake; Nutrient Intake and Clinical Observation

Introduction

An overview of the fish utilization trend in India reveals the importance of women's participation in post-harvest fisheries sector. Out of the total marine fish landings of about 2.2 million metric tons [1], nearly 65% are marketed as fresh fish for direct human consumption with women dominating the retail fresh fish trade in all most all the maritime states of India [2] providing a link between the producer and the consumer. As much as 20% of the catches are processed by traditional methods mainly by salting and drying, which is an important livelihood activity for a significant number of women, throughout the coastal India. The demand for traditional products is strong and hence offers an opportunity for income generation with relatively low investment for the poor in fishing communities. The fish reduction industry utilizes about 9% of the fish landing: mostly the smaller low-priced fish species, which are not preferred for human consumption and are sun dried to be used in poultry feeds or as manure. A significant proportion of women either independently process fish meal by sun drying or work as labour in by product units. The sea food export sector utilizes 6% of the marine fish catch and employs large number of women workers for grading, packing and freezing sea foods for export. Thus, the

contribution of women in every aspect of post-harvest handling, preservation and processing of fish is substantial in the overall development of fisheries sector. Srinath [3] has given an account on the role of women in small scale fisheries. Dubey and Kohli [4] have presented an overview on the contribution of women in Asian fisheries. Ashalatha, *et al.* [5] have depicted the changing role of fisher women in India. Sathiadas, *et al.* [6] have given an account in the socio-economic profile of the women workers in the post-harvest marine fisheries sector in Kerala. But the information on socio economic issues and nutritional status of fisherwomen in India is inadequate to suggest appropriate intervention to improve income generation, the standards of sanitation and hygiene, product quality and address the specific problems confronting women in post-harvest fisheries. Prema Ramachandran, *et al.* [7] published the child growth standards for infants and children up to the age of 5 years based on a multi-country studies (Bazil, Ghana, India, Norway, Oman and USA).

Insufficient food will not only result in under nutrition in terms of inadequate weight gain but will hinder growth. Malnutrition varies from country to country depending on economic, ecological, so-

cial and other factors. Healthy children with low blood levels some vitamins particularly folate, vitamin C and riboflavin score poorly on tests of memory and nonverbal abstract thinking. Anthropometry is one of the methods used in nutritional assessment. Nutritional anthropometry can be defined as measurement of variation of the physical dimensions and the gross composition of the human body at different age levels and degrees of malnutrition. Clinical assessment of a community gives valuable information especially in regions where malnutrition is wide spread hence a clinical examination was conducted among the preschoolers in the study. The impact of most important socio-economic factors on malnutrition through Nutritional, Anthropometric and clinical status.

Methodology

The present study attempts to generate information on the activities, constraints, priorities and need of fisherwomen, in selected coastal villages of Andhra Pradesh, Tamil Nadu, Karnataka and Kerala (Table 1). The interventions which can significantly improve the situation of women especially in aspects of nutritional wellbeing, improvement of product quality and significantly reduce losses rising in the income of fisherwomen are suggested. The data was collected using a questionnaire and discussions with the communities on the issues confronting women in post-harvest fisheries.

Andhra Pradesh		Karnataka		Kerala			Tamil Nadu	
East and West Godhavari District	Prakasham and Nellore District	Dakshina Kannada	Udupi	Alappuzha	Kollam	Thiruvanthapuram	North Tamil Nadu Chennai	South TamilNadu Tuticorin
Dummulupetta (200)	Vadarevu (250)	Bengre (160)	Hejmadi (87)	Aroor (433)	Thecku mbhagam (83)	Poovar (344)	Kasimedu (298)	Therespuram (278)
Uppada (200)	Pallepalem (250)	Bolloor (86)	Malpe (240)		Neendakara (348)		Pulicut (239)	Tharuvaikulam (281)
Bhairavapalem (200)	Mypadu (330)	Mulki (75)	Thottam (223)				Kovalam (300)	Punnakayal (285)
Pathapadu (100)	Krishnapatnam (170)		Gangolli (137)					
Perupalem (100)								

Table 1: Participation of Women in Post-Harvest Fisheries in selected villages.

To elicit the information on the food consumption of preschool children population of 2203 (1072^o:1131^a) were selected in the 28 coastal villages of 13 districts spread over 4 states viz. Andhra Pradesh, Karnataka, Kerala and Tamil Nadu with a total of 5744 Households. A detail information on the food consumed, frequency and amount purchased were noted and the total amounts of each food consumed for a period of one month was noted. This was divided by per Consumption unit to get the food consumption/C.U./day. 24-hour recall method combined with one day weighment was employed to assess the nutritional status of preschool children (1 - 5 years). The purpose of diet survey was explained thoroughly. i.e. food items served in plate before eating. The cooked ingredients were measured through cups and were then converted to raw ingredients.

Standardization of cups for volume: Take a set of the diet survey cups and mark the edges of all cups to a particular level. Fill each of the cups with water and measure the water in each cup with measuring cylinder to know the volume of the cups.

Standardization of cups for weight: Take a set of 12 diet survey cups and mark the edges of all cups to a particular level. Fill each of the cups in a uniform way with cooked rice and weighed. Deduct the weight of the empty vessel. The mean intake of raw equivalents from intake of cooked amounts were calculated using the formula [8].

Individual intake of items =

$$\frac{\text{(Total raw amounts of each Ingredient used in preparation)}}{\text{X (Individual in take cooked amount)}}$$

Total cooked amount of each preparation g/ ml.

The nutritive value of foods consumed were calculated using food consumption tables given by Gopalan., *et al* [9].

Anthropometric measurements of Preschool children: The height and weight obtained by survey were compared with NCHS standards because they were based on both weight for height as well as weight for age. They were also classified based on Gomez [10] Classification using weight for age which is based on percentage deviation from the medium of the reference standard. Hence based on this classification one can distinguish grades of malnutrition Grade - I (mild) Grade - II (moderate) and Grade - III (severe) and normal by establishing arbitrary cut off points. The details of Gomez classification are given below.

Nutritional Status	Grades of Nutrition
Normal	> 90% of standard weight for age
Grade - I (Mild)	75 - 89% of standard weight for age
Grade - II (Moderate)	60 - 74% of standard weight for age
Grade - III (Severe)	< 60% of standard weight for age

Clinical Observation of Preschool children: Clinical examination has always been and remains an important method of assessing the nutritional status of the community. Essentially the method is an examination for changes, believed to be related to inadequate nutrition, that can be seen or felt in superficial epithelial tissues especially the skin, eyes, hairs, etc [11].

Statistical Analysis: The data generated has been utilized to meet the objectives of the study. Frequency distributions Mean, and Standard Deviations and tests of significance were utilized, and the results are provided for each of the variables studied. Analysis of variance, chi square test and multiple comparison 't' test procedures were used [12].

S. No.	Organs/Systems	Signs known to be of value in nutrition survey
1	Hair	Lack of luster, Thickness and sparseness, Straightness, Dyspigmentation, Flag sign and Easy pluck ability
2	Face	Diffuse depigmentation, Nasolabial dyssebacea and Moon face
3	Eyes	Pale conjunctiva, Biotot spots, Conjunctival xerosis, Corneal xerosis, Kerotamalicia and Angular palpebritis
4	Lips	Angular stomatitis, Angular scar and Chelosis
5	Tongue	Oedema, Scarlet and raw tongue, Magenta tongue and Atrophic papillae
6	Teeth	Molted enamel
7	Gums	Spongy, bleeding gums
8	Glands	Thyroid enlargement and Parotid enlargement
9	Skin	Xerosis, Follicular Hyperkeratosis-Type 1 and 2, Pellagrous dermatitis Scortal and Vuval dermatitis
10	Nails	Koilonychia
11	Subcutaneous tissue	Oedema and Amount of subcutaneous fat
12	Muscular and skeletal systems	Muscular wasting, Craniotabes, Frontal and parietal bossing, Epiphyseal enlargement, beading of ribs, persistently open anterior fontanella and Knock-Knees or bow legs
13	Internal systems	
	a. Gastro-Intestinal	Hepatomegaly
	b. Nervous system	Psychomotor change, Mental confusion, Sensory loss, Motor weakness, Loss of position sense, Loss of vibratory sense, Loss of ankle and knee jerks and Calf tenderness
	c. Cardiovascular	Cardiac enlargement and Tachycardia

Clinical Signs and symptoms to be considered on medical assessment of nutritional status.

Results and Discussion

A large majority of women are involved in the fisheries related activity. It is clear that the fresh fish marketing and traditional fish processing are the more preferred activity of most fisherwomen (Figure 1). As much as 50 to 70% of the fisherwomen are dependent on fresh fish marketing and traditional fish processing (Table 2). The other activities are specific to the region such as, the clam collection and processing, fish processing plants and aquaculture in Kerala. The prawn seed collection, fish and shrimp farms and hatcheries and salt loading in Andhra Pradesh. Labour at landing Centre's, by products units and surimi plants in Karnataka provide work and income for large number of poor people especially women.

Figure 1: Fish utilization trend in India.

Activities	Andhra Pradesh	Karnataka	Tamil Nadu	Kerala
Fresh fish marketing	32	33	35	35
Traditional fish processing	25	38	30	25
Others*	43	29	35	40

Table 2: Major Post Harvest Activities of Fisherwomen (%).

Andhra Pradesh: Prawn seed collection, Fish farm, Shrimp farms and hatcheries salt loader.

Karnataka: Labour at landing centers, by product units, surimi plants and fish processing plants.

Kerala: Clam collection, processing, Sea food processing plants, Aquaculture practices.

Tamil Nadu: House wives.

The marketing of fresh fish is relatively easy with access to fish for women, facilitating flexibility of operation, financial security and occupational sustainability. But the venders have range of problems (Figure 2) with fish supplies becoming increasingly scarce, due to depletion of fish catches, increased competition from processing and export sector. Most women prefer this activity mainly due to the high demand for fresh fish and quick return of the investment.

Figure 2: Activities in Fisheries.

The small-scale women processors in the traditional sectors have more problems (Figure 3). The profit margins are low, fluctuations in the product supply, lack of storage facilities, insect infestation present them with risks and uncertainties.

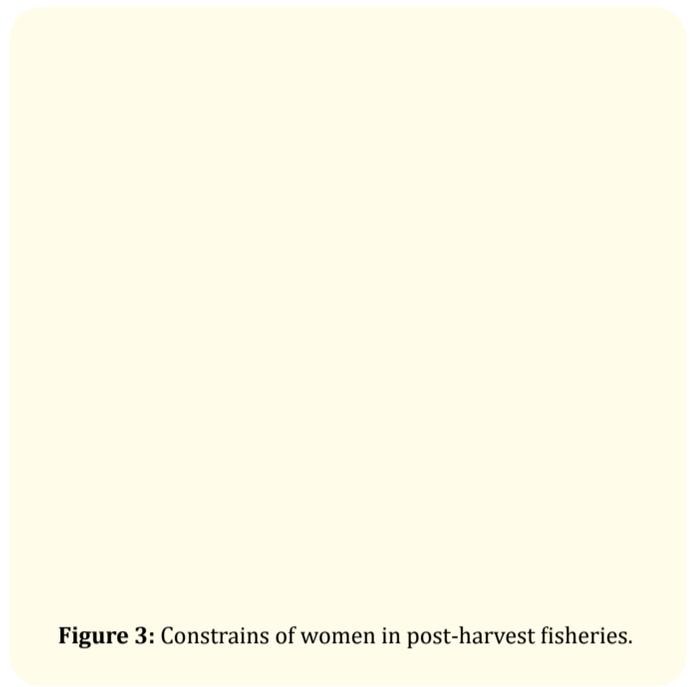


Figure 3: Constrains of women in post-harvest fisheries.

The frequently occurring occupational health hazards of women are mainly related to physical exhaustion due to long standing/long sitting/working in hot sun/untimely food/long working hours/long distance working with head load. Back ache, headache, chest pain, shoulder/joint/muscular pain/skin infection, burning sensation of eyes. Breathlessness are the common problems of fisher women associated with post-harvest fisheries activity in all the centres.

Researchers have demonstrated that by adopting systematic cost-effective approach, it is possible to bring improvement in the traditional fish processing sector.

There are several general problems (Figure 3) confronting fisherwomen. The advantages and preference of women to be in post-harvest and the socio-economic conditions need to be analyzed before planning any intervention. The intervention need to be of participative approach determining the willingness of women to adopt the interventions.

Total No. of house hold surveyed: 5697. The figures in the parenthesis denote number of households surveyed

Assessment of general situation of women in small scale fisheries

Six parameters namely Food Security and Nutrition, Income, Community Services, Division of labour, Fish processing and marketing were used to assess the position of general situation of women in small scale fisheries. The data obtain is provided in table 3. When states compared Karnataka occupies first rank in food security and nutrition, community services and fish processing. Kerala occupies 1st rank in division of labour and marketing. Andhra Pradesh occupies 1st rank in income whereas Tamil Nadu occupies 3rd rank in almost all the parameters when observed the mean of the relative ranks Kerala ranks 1st followed by Karnataka, Tamil Nadu and Andhra Pradesh. This clearly shows Kerala occupies first place in the position of general situation of women in small scale fisheries.

Parameters studies	States studies			
	Andhra Pradesh	Karnataka	Kerala	Tamilnadu
Food security and nutrition	60% (4)	72% (1)	70% (2)	65% (3)
Income	60% (1)	40% (4)	50% (2)	46% (3)
Community services	66% (3)	97% (1)	64% (4)	96% (2)
Division of labour	50 % (2)	40% (4)	52% (1)	45% (3)
Fish processing	40% (4)	80% (1)	70% (2)	50% (3)
Marketing	50% (4)	70% (2)	80% (1)	60% (3)
Total ranks	18	13	12	17
χ	3	2.17	2.0	2.8

Table 3: Position of general situation of women in small scale fisheries

Values in the parameters are ranks among the states; χ mean of the relative ranks.

Food intake: From the table 4 it was observed that the mean intake of cereals by the preschool children in the surveyed southern Indian states was found to be 136 gm/day/C.U., pulse intake was 9.8 gm/CU, milk consumption was 66gm/C.U. and poultry was 16.8 gm/C.U. whereas Fish intake was found to be 34 gm/C.U. All the food items consumed are lower than the recommended dietary allowances. Only in Andhra Pradesh preschool children were with cereal intake of 198 gm/CU/day. Children of other states were with cereal intake lower than 135 gm/CU/day. Milk intake is highest in Kerala children with dietary intake of 170 ml/CU/Day followed by

S. No	State	Cereals	Pulses	Green leafy vegetables	Other vegetables	Fat and oil	Fruits	Sugar and Jaggery	Milk (ml)	Poultry	Fish
1.	Andhra Pradesh	198.0 ± 55.1	11.6 ± 3.03	5.1 ± 2.5	13.1 ± 4.1	12.6 ± 3.2	9.2 ± 3.5	15.4 ± 3.49	64.8 ± 29.3	16.9 ± 15.9	40.9 ± 18.4
2.	Karnataka	132.6 ± 19.5	6.49 ± 4.26	2.94 ± 4.7	9.51 ± 3.4	20.1 ± 3.4	20.1 ± 3.4	8.08 ± 1.92	9.56 ± 2.7	9.91 ± 7.4	26.1 ± 9.5
3.	Kerala	107.0 ± 8.36	14.0 ± 3.55	9.0 ± 3.1	9.0 ± 3.1	27.3 ± 3.9	21.0 ± 3.9	13.0 ± 1.5	170.0 ± 37.8	35.0 ± 5	23.5 ± 8.5
4.	Tamil Nadu	108.0 ± 22.4	7.4 ± 1.6	4.3 ± 1.3	4.3 ± 1.3	17.1 ± 4.5	17.1 ± 4.5	12.3 ± 2.1	20.8 ± 2.3	5.5 ± 1.5	48.5 ± 11.5
	Overall	136.25	9.87	7.8	11.52	20.9	8.29	12.17	66.29	16.82	34.8
	RDA	20	37	60	35	20	171	275	200	-	-

Table 4: Food intake of preschool children [per capita/ day (gram)]

Note: Figures given are mean ± SD

RDA: Recommended Dietary Allowances, ICMR (1999).

Andhra Pradesh children with intake of 64.8 ml/CU/Day. Fish intake of 48.5 gm/CU/Day and 40.0 gm/CU/day in Tamil Nadu and Andhra Pradesh, respectively. Kerala and Karnataka consumption is relatively low.

Nutrient Intake

Macro Nutrient intake and adequacy: The data relating to the intake of macro nutrients are presented in the table 5.

S.No	State	Energy (K.cal)	Protein (gm)	CHO(gm)	Fat(gm)	Total ranks	Mean of relative ranks
1	Andhra Pradesh	753 (248)	22.2 (7.1)	129 (23)	16.5 (4.4)	12	3
2	Karnataka	632 (72)	12.4 (2.0)	127.4 (17.1)	8.1 (2.0)	16	4
3	Kerala	1497 (142)	53 (14.5)	238 (69)	37 (7.3)	4	1
4	Tamil-Nadu	1096 (143)	24.1 (3.1)	198 (28)	23.1(4.6)	8	2
5	Overall mean	995	27.9	173.1	21.2	-	-
6	RDA	1240	30	-	25	-	-
	% adequacy of overall mean	80.24	93.00	92.57	84.80	-	-

Table 5: Mean Macro Nutrient intake by the preschool children (per capita per day).

Figures within the brackets indicate SD

From the table 5 it was observed that the mean energy, Protein, CHO and Fat intake was found to be 1246 k.cal, 28.1 gm, 173 gm and 21.1 gm respectively. High intake of energy protein, CHO and fat was observed among the preschool children of Kerala, followed by the preschool children of Andhra Pradesh. Low intake of macro nutrients was observed among the children of Karnataka. Macro nutrients such as energy, protein carbohydrates and fat are most important for the assessment of dietary adequacies of preschool children. Variations in micro nutrient adequacy are observed.

Overall states it was observed that the mean values of energy, protein, CHO and fat intake was found to be 995 k.cal, 27.8 gm, 173

gm and 21.2 gm respectively. Intakes of these nutrients are lower than suggested allowances. High intakes of energy, protein, CHO and fat were observed among the preschool children of Kerala, followed by the preschool children of Tamil Nadu. Macro nutrient adequacies in Kerala children are more than 100%. Protein adequacy is 176.7%. Energy adequacy is 120.7%. Fat was also adequate by 148% of the recommended allowances.

Micro nutrient intake and adequacy: Micro nutrients include those that are required in smaller amount. They include B Complex Vitamins and Vitamin C. Details of vitamin intake are provided in table 6.

S. No	State	B1(mg)	B2 (mg)	Niacin (mg)	Vit. C (mg)	Total ranks	Mean nutritive ranks
1	Andhra Pradesh	0.55(0.2)	0.56(0.2)	8.1(2.7)	28.38 (4.2)	10	2.50
2	Karnataka	0.32 (0.04)	0.10 (0.02)	5.5(0.7)	4.2 (4.7)	15	3.75
3	Kerala	1 (0.40)	1 (0)	19 (4.9)	35 (29)	4	1.00
4	Tamil Nadu	0.6 (0.20)	0.8(0.1)	0.8 (0.1)	22.3 (4.3)	11	2.75
	Over all mean	0.62	0.62	8.35	22.5	-	-
	RDA	0.90	1.00	11	40	-	-
	Adequacy of overall mean %	69.8	62.0	75.9	56.3	-	-

Table 6: Vitamin intakes by preschool children (per capita/day).

Figures within the brackets indicate SD

From the table 6 it was observed that the Vitamin intake was highest among the preschool children of Kerala followed by the preschool children of Tamil-Nadu. Low intake of vitamins was observed among the children of Karnataka and Andhra Pradesh. Kerala children intakes were close to adequacy or more than adequacy of all the vitamins. Niacin was adequate by 172.7%. Intake of B1

was adequate by 111.1%. Low intake of micro nutrients was observed among the children of Karnataka and Tamil Nadu.

Mineral intake and adequacy: Mineral form the structural component in some body parts and some others act as catalysts. Details of mineral content of the dietaries of preschool children are provided in the table 7.

S.No	State	Minerals		Total ranks	Mean of relative ranks
		Calcium (mg)	Iron (mg)		
1	Andhra Pradesh	348 (46)	17.1 (5.9)	5	2.5
2	Karnataka	120.78 (56.0)	2.18 (0.41)	8	4.0
3	Kerala	499 (46)	27 (8.4)	2	1.0
4	Tamilnadu	372 (64)	12.1(5.0)	5	2.5
	Mean	334 (53.0)	14.5 (4.92)	-	-
	RDA	400.0	18.0	-	-
	Adequacy of overall states mean %	83.8	81.1	-	-

Table 7: Mineral intakes by the preschool children (per capita/day).

Figures within the brackets indicate SD.

RDA: Recommended Dietary Allowances for Indian, ICMR [13].

From the table 7 it was observed that the mineral intake by the preschool children of southern states surveyed was 334 mg and 14.5 mg of calcium and iron respectively. The percentage adequacy of mineral intake in different states as well as for all states is given in figure 4 and 5. High mineral intake was observed among the preschool children of Karnataka and Kerala, followed by Andhra Pradesh. Low mineral intake was observed among the preschool children of Karnataka.

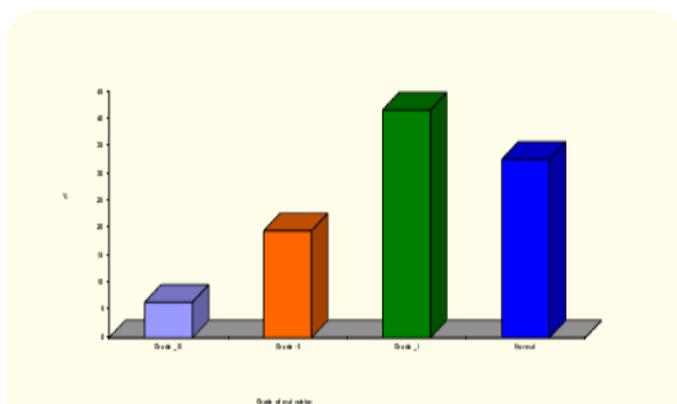


Figure 4: Forms of malnutrition of children (overall) based on Gomez classification.

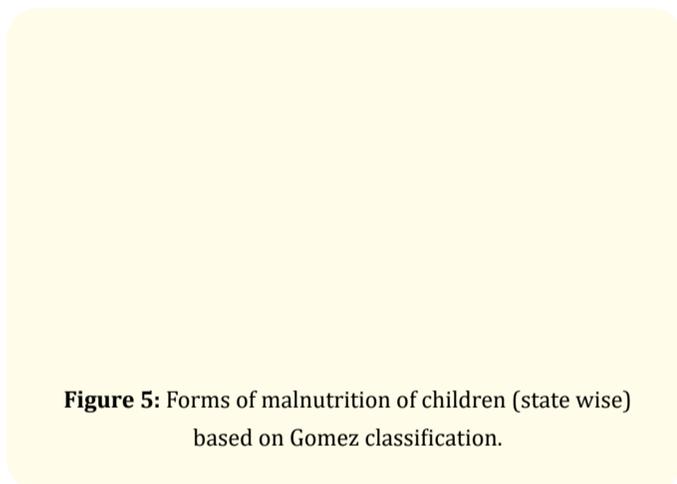


Figure 5: Forms of malnutrition of children (state wise) based on Gomez classification.

Anthropometrical measurements of Preschool children: Height and weight were measured for all children of below 5 years. These were compared with the standards for given age and weight. Gomez classification was utilized for the assessment of various forms of malnutrition. The mean (SD) of height and weight of preschool children is given in table 8.

Sl. No	State	Height (cm)	Weight (kg)
1	Andhra Pradesh	92 ^a (16.2)	11.6 ^a (3.9)
2	Karnataka	89 ^b (8.6)	12.4 ^b (2.0)
3	Kerala	80 ^c (6.0)	12.0 ^a (1.1)
4	Tamil Nadu	99 ^d (16)	14.8 ^c (5.2)
Overall Mean F ratio between states (d. F.)		90.6(35.8) 82.34(3996)	12.7 (3.83) 41.38 (3966)

Table 8: Anthropometric measurements of Preschool children.

Figure in brackets indicate SD abcd Means followed by the same superscript with in a column are not significantly different ($p > 0.01$).

Interpretation of the data shows that the overall height of the preschool children surveyed in south India was 90.6 cm and their mean weight was 12.7 kg. All the children are shorter and lower in weight than the standards. Preschool children of Tamil Nadu are taller and heavier than other states. Kerala children were shortest, Andhra Pradesh children were with lowest mean weights ($P < 0.001$).

Forms of malnutrition in preschool children (Table 9): Prevalence of malnutrition by Gomez classification is provided in table below. Variations in the forms of malnutrition between states are significant severe form and Moderate forms are more in Andhra Pradesh and Tamil Nadu. Mild forms of malnutrition were highest in Karnataka and Kerala. Normal was very high in Tamil Nadu and Andhra Pradesh followed by Kerala, Karnataka.

S. No.	State	Sample surveyed	Grade -3 (severe)	Grade -2 (moderate)	Grade -1 (Mid)	Normal
1	Andhra Pradesh	316 (100)	44 (14.0)	82 (26)	97 (30.5)	93 (29.5)
2	Karnataka	186 (100)	--	19 (10)	110 (60)	57 (30)
3	Kerala	215 (100)	3 (1.5)	26 (12)	115 (53)	71 (33.5)
4	Tamilnadu	253 (100)	18 (7)	64 (25)	80 (32)	91 (36)
Over-all		970 (100)	65 (6.5)	19 (19.5)	402 (41.5)	312 (32.5)

Table 9: Forms of malnutrition of children based on Anthropometric measurements

*Figure in bracket indicate %.

It is observed that that 6.5% of the preschool children in all states were severely malnourished, 19.5% were moderately malnourished, 41.5% of them were mildly malnourished and the remaining 32.5% of them were normal. It is clear from the table 9 and figure 4 that 14% of the children in Andhra Pradesh were severely malnourished in spite of the child welfare programs run by the state government (figure 4). Hence, nutrition education was given on the nutritive value of the meal given at the Anganwadi center. The parents of the preschool children were requested to send their children to Anganwadi School.

In Tamil Nadu majority (36%) of them were normal and the remaining were in different grades of malnutrition. In Karnataka majority (60%) of children were mildly malnourished, and 30% were normal. In Kerala 53% were mildly malnourished and 33% were normal (Figure 5). Nutrition education was provided to the mothers with the emphasis on nutritive value of the meal given at the Anganwadi center.

These prevalence rates of malnutrition indicated that the under five children of this study area were in a better condition compared to malnutrition reported by a number of other studies [14-17]. This study mainly indicated family income as an important predictor of malnutrition even in the seemingly uniformly poor society. Thus, development and poverty alleviation program must focus on the poorest segment of societies to improve their economic status and thereby the health conditions. Denise, *et al.* [18] reported the nutritional status of preschool children from low income families and stated that Girls were taller and heavier than boys, while we observed similar BMI between both genders. The z scores tended

to rise with age. A Pearson Coefficient of Correlation of 0.89 for W, 0.93 for H and 0.95 for BMI was documented indicating positive association of age with weight, height and BMI. The frequency of children below -2 z scores was lower than expected: 1.5% for W, 1.75% for H and 0% for BMI, which suggests that there were no malnourished children. The other extremity of the distribution evidenced prevalence of overweight and obesity of 16.8% and 10.8%, respectively. Okoroigwe, *et al.* [19] studied the nutritional status in Nigeria and reported that the mean weights and heights of the children ranged from 11.6 ± 2.19 to 19.3 ± 1.84 kg and 85.7 ± 7.61 to 111.6 ± 3.99 cm, respectively. Melkie Edris [20] also found the similar results in North West Ethiopia. The daily energy intake of the children ranged between 51.2 and 62.9% of their energy requirement daily. Their daily protein, iron, calcium, and B-complex vitamin intakes were generally poor while that of vitamin A was above requirement values. However, most of their foods were of plant source whose nutrients are poorly bio-available. Therefore,

application of improved food processing and storage techniques, dietary diversification and fortification with intensified nutrition education would reduce malnutrition in the area. Dolla, *et al.* [21] reported the current nutritional status of pre-school children of Kodaku tribe. A total twenty-five villages were selected by Stratified proportional sampling method. Four hundred eighty-five households and one hundred and eighty-two preschool children covered in this study. The Kodaku boys and girls were shorter and lighter than NCHS standard. According to weight for age 59.8% of the children were under-weight (< median-2SD) and about 26.2% children had very low body weight which were < 3 SD of the standard. Height for age and weight for height data revealed that 43% children suffered from stunting and 35% recorded wasting. However higher prevalence of Vitamin A deficiency 2.6% was observed.

Clinical status of Preschool children: The clinical signs / symptoms observed are presented in the table 10.

Sl. No.	State	Sample surveyed (no.)	Anemia	Angular stomatitis	Cheilosis	Bleeding gums	Dryness of skin
1.	Andhra Pradesh	343	133(38.8)	138(40.2)	101(29.4)	107(31.2)	63(18.4)
2.	Karnataka	186	92(49.5)	67(36.0)	66(35.5)	74(39.8)	64(34.4)
3.	Kerala	215	9(4.2)	-	-	-	-
4.	Tamil Nadu	work not attempted	-	-	-	-	-
	Total	744	234/744 (30.8)	205/529 (38.1)	167/529 (32.5)	181/529 (35.5)	129/744 (26.4)

Note: Figures within the parenthesis indicate percentage.

Table 10: Clinical symptoms observed in preschool children.

It was observed that 31% of the preschool children were anemic. Out of 529 children observed 38% had angular stomatitis, 32.5% had Cheilosis and 35.5 % had bleeding gums. 17% out of 744 were observed to have dryness of skin. It was found that 72 % of women were anemic, other clinical symptoms observed were angular stomatitis, Cheilosis, bleeding gums and dryness of skin to be between 25 - 30%. In case of preschool children 31% were observed to be anemic. The other clinical symptoms like angular stomatitis, Cheilosis and dryness of skin were also observed but the % of children with these symptoms were 35% on an average (figure 6). The reason for high anemic might be due to low consumptions of iron rich foods, poor health, hygiene and sanitation and also might be due to lack of nutritional awareness.

mood and behavior of children. Kerala children are seen with better dietaries and better nutritive adequacies. High anemic state may be due to low consumption of iron rich foods, poor health, hygiene and sanitation. Also, might be due to lack of nutritional awareness. Finally, it is recommended that Nutrition Education to create awareness on food, nutrients and health is very much essential. Women friendly technologies to be adopted for better nutritional status and better economic status. Though the fisherwomen were not aware of hygiene, environmental sanitation, health education repeated awareness and training programs may contribute for better understanding.

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Figure 6: Percentage of clinical symptoms of preschool children.

Summary

Food intake by the preschool children was observed to be inadequate when compared with the Recommended Dietary Allowances. This may be due to low economic status, literacy, lack of nutritional awareness of the mother and lack of time of the mother to attend on the children. Such low intake may lead affect cognitive function,

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