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Assessment of food consumption pattern of anganwadi children in Trivandram district, Kerala, India

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Abstract
Aim: To assess food consumption pattern of anganwadi centers in Trivandrum district, Kerala, India. SAMPLE: Ninety children attending the anganwadi centers in the age group of two to six years were studied. STUDY DESIGN: A random study was done to assess food consumption pattern such as food habit, frequency of food items, daily meal pattern and actual food intake of children (2-6 years) attending anganwadi centers in the Urban 2 project areas of Trivandrum district, Kerala. Children were selected randomly from sector 1 and sector 4. Data collected were compared with the standard values to find the disparities.
Locale of Study: Sectors I and IV in the Urban II project areas of Trivandrum district in Kerala was randomly selected for study.
Methodology: In order to achieve the objectives, following action programs were envisaged and conducted through, assessing the food habit, frequency of food items, daily meal pattern and actual food intake of children.
Results: More than 95.60 per cent of the beneficiaries are non-vegetarians. All the children had the habit of consuming rice, green gram, curry leaves, ground nut coconut and jaggery daily. Green gram, rice, ground nut toffies along with jaggery were made and provided to children daily at the anganwadi center. The mean intake of children in the age group of 1-3 years were calculated and the results shown that, their diet except the quantity of energy and protein were deficient in Vitamin A and Iron in their diet. In the case of children in the age group of 4-6 years their diet were deficient in energy, vitamin A and Iron. An alarming finding from the study pointed out that this amount is not sufficient for the children above the age of three years.
Conclusion: Findings of the present study recommends that there is a need to improve the menu pattern in the anganwadi children. Quantity of items taken and given to children need to be improved, especially for children in the age group of 4-6 years.

Keywords: anganwadi centre, food habit, food frequency, meal pattern, food intake, 24 hour recall method

Introduction
Child wellbeing reveals how a country guards and feeds its vulnerable members [1]. More than half of early child deaths are preventable or can be preserved with modest, reasonable intermediations [2]. The endowment of amenities delivered to women and children belonging to the lower strata of society are the biggest task in India as these sections of population are susceptible and mostly the victims of exploitation and abuse [3]. Integrated Child Development Services (ICDS) were implemented to help these vulnerable groups. A distinctive feature of ICDS is that it provides a package of health, nutritional and educational services to the target group that is more effective for child survival and development than a vertical approach to immunization [4]. Anganwadi centre is the central point for the delivery of services to children and mothers. They are the link of Indian health care. One of the important mandates of Anganwadi Centres is to provide supplementary nutrition to children under 6 years of age in the form of cooked food served at AWC on a daily basis or given in the form of take-home rations, along with the preschool education. Supplementary Nutrition is a boon to poor children. This initiative by the Government has benefited them a lot [5]. It is a targeted food transfer programme with a potential to improve the nutritional outcomes of the child beneficiaries [6].
Kerala has an outstanding record in woman and child development and ICDS started here in the year 1975-76. Narayanan (2020) reported that Kerala is in first rank among the states for their children's wellbeing. In a study conducted by Alim and Jahan (2017) reviewed that 76.4% of children receive supplementary nutrition and out of that 62.7% of children are having normal weight for age.
In the present research study an attempt is made to assess the food consumption pattern of children in the anganwadi centres of Trivandrum district.

2. Materials and Methods
2.1. Location of Study
The present study was conducted in Trivandrum Urban Project II. 175 anganwadi centers are there in this project which is further subdivided into five sectors. From the five sectors under the Urban Project No: II, sector I and IV was selected randomly. Impact of the programme on the nutritional status of preschool children had not been systematically evaluated earlier in these areas.

2.2. Selection of the respondents
90 preschool children in the age group of 2-6 years were selected purposively from the two sectors under the urban project center II for assessing the food consumption pattern.

2.3. Design of the study
In order to achieve the objectives, following action programs were envisaged and conducted.
Determining the nutritional status of selected preschool children through collecting details such as,

2.3.1. Food habit of the family
2.3.2. Frequency of using different food items
2.3.3. Daily meal pattern of the respondents
2.3.4. Actual food intake of children assessment through 24 hour recall method

2.4. Development of Tools and conduct of study
90 mothers of the child (2-6 years) beneficiaries were also interviewed using questionnaire to elicit information on the dietary methods.
The schedule was suitably structured after pretesting at the field and was finalized. The schedules were presented in appendix. Schedule for eliciting information related to nutritional status of children comprises of food consumption pattern and general food habits of the child.

2.4.1. Food consumption pattern of the respondents
A diet survey was conducted to assess food consumption pattern, frequency of having different food items and the meal timing. The pretested questionnaire is presented in the Appendix.
Frequency of using different food items were also examined under different heading as cereals, pulses, green leafy vegetables, other vegetables, roots and tubers, fruits, nuts and oilseeds, animal foods etc.

2.4.2. Actual food and nutrient intake
24 hour recall method was used to collect information on the food consumption practices details of quantity (gm) of each raw material in every day was weighed in the selected samples. Raw foods used for each meals by the child before cooking and after cooking weighed was recorded. The nutrients present in their diets were calculated using the Indian food composition table of NIN (2017). Mean intake of RDA intake were compared with the actual RDA required to find the deviation from what is needed and what they actually consumes.
Present investigation were undertaken after getting the consent from ICDS district officer Mrs. Sabeena mam.

3. Results
Results obtained in the study were explained below in various relevant sub headings.

3.1. Food consumption pattern of children.
Food consumption pattern of anganwadi children were assessed through the collection of details on the food habits, food consumption pattern, frequency of having different food items and the meal timing.

3.1.1. Food habits of children
Details of food habit furnished in the Table1 indicates that more than 95.60 per cent of the beneficiaries are non-vegetarians and only 4.40per cent of the children were having a habit of avoiding non vegetarian foods in their diet.

Table 1: Food habits of children

Category	No of children
Vegetarian	4 (4.40)
Non vegetarian	86 (95.60)

Values in parenthesis indicates percentage.

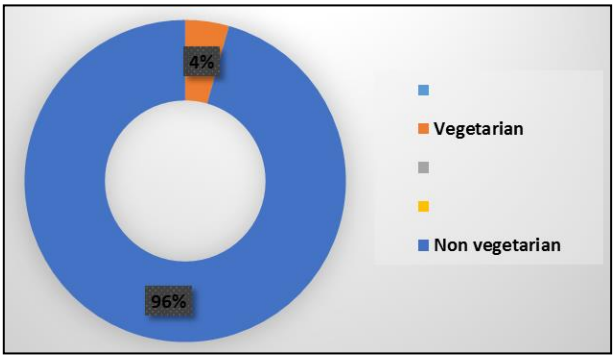

Fig 1: Food habit of respondents

3.2.2. Frequency of using Food Items
The frequency of use of different food items by the children were collected and are illustrated in the Table 2. All the children had the habit of consuming rice, green gram, curry leaves, ground nut coconut and jaggery daily. Green gram, rice, ground nut toffies along with jaggery were made and provided to children daily at the anganwadi center. All of them consumed wheat flour weekly thrice. 53.30per cent consume black gram weekly thrice and 46.70per cent twice, while 44.40per cent and 48.90per cent consumed dhal weekly thrice and weekly twice respectively. Highly perishable food product like fish were consumed daily by 81.10per cent, 11.10per cent weekly thrice and 3.30per cent twice a week. 86.87per cent of the children consumed tea or coffee daily during their tea time and only 13.30per cent of children do not have the habit of consuming tea or coffee in their diet. 63.00per cent of children never consumed amla in their diet. Majority of the population (96.70%) were not aware of the significance of sprouted pulses and never consumed them in their diet.

Table 2: Frequency of using different food items

Food item	Daily (%)	Weekly Thrice (%)	Weekly Twice (%)	Once in a Week (%)	Once in a month (%)	Occassionaly (%)	Never (%)
Cereals							
Parboiled rice	90(100)						
Wheat flour		90(100)					
Rice flakes			49(54)	28(31)	10(11)	2(2.2)	1(1.1)
Ragi			22(24.4)	53(58.9)	12(13.3)	3(3.3)	
Pulses							
Black gram		48(53.3)	42(46.7)				

Dhal		40(44.4)	44(48.9)	6(6.7)			
Bengal gram							
Green gram	90(100)						
Sprouted pulses						3(3.3)	87(96.7)
GLV							
Amaranthus		43(49.8)	36(40)	11(12.2)			
Coriander leaves		47(52.2)	30(31.3)	13(14.4)			
Drumstick leaves		41(45.5)	26(28.9)	20(22.2)		3(3.3)	
Curry leaves	90(100)						
Other Veg							
Cucumber		82(91.1)	8(8.9)				
Lady's finger		72(80)	14(15.6)	4(4.4)			
Plantain green		5(5.5)	36(40)	40(44.4)	9(10)		
Brinjal		25(27.8)	24(26.7)	41(45.6)			
Tomato		63(70)	20(22.2)	7(7.8)			
Roots & Tubers							
Onion	72(80)	10(11.1)	8(8.9)				
Carrot	69(76.7)	19(21.1)	2(2.2)				
Beetroot		63(70)	24(26.7)	3(3.3)			
Potato		6(6.6)	54(60)	30(33.3)			
Tapioca			61(67.8)	25(27.8)		4(4.4)	
Fruits							
Mango		5(5.5)	72(80)	10(11.1)		2(2.2)	1(1.1)
Orange			61(67.8)	9(10)	20(22.2)	2(2.2)	
Jack fruit			68(75.6)	20(22.2)			
Amla			12(13.3)	15(16.7)			63(70)
Guava			19(21.1)	35(38.9)	5(5.5)	31(34.4)	
Papaya	1(1.1)		28(31.1)	13(14.4)	39(43.3)	5(5.5)	5(5.5)
Nuts & Oil Seeds							
Groundnut	90(100)						
Coconut	90(100)						
Other items				31(34.4)		59(65.6)	
Animal Foods							
Egg		54(60)	23(25.6)	9(10)			4(4.4)
Meat				53(58.9)	33(36.7)		4(4.4)
Fish	73(81.1)	10(11.1)	3(3.3)				4(4.4)
Other							
Jaggery	90(100)						
Tea or coffee	78(86.87)						12(13.3)

3.2.3. Daily Meal Pattern

Table 3 gives the details of daily meal pattern of the family surveyed.

Table 3: Distribution of children with respect to time of consumption of meals

	Time	Working days	Holidays
Breakfast	08:00-09:00 am	73(81.00)	19(22.00)
	09:01-10:00 am	17(19.00)	71(78.00)
Lunch	12:00-01:00 pm	90(100.00)	28(31.00)
	01:01-02:00 pm	0	62(69.00)
Tea time	04:00-05:00 pm	45(50.00)	42(47.00)
	05:01-06:00 pm	38(42.00)	39(43.00)
	06:01-07:00 pm	7(8.00)	9(10.00)
Dinner	08:00-09:00 pm	79(88.00)	71(78.00)
	09:01-10:00 pm	11(12.00)	19(22.00)

Values in parenthesis indicates percentage

It is depicted in the Table 3 that 81.00% and 22.00% of the respondents had their breakfast before 9.00 am in the morning during working days and holidays respectively. On working days 19.00per cent had their breakfast between 9am and 10 am and 78.00 per cent had their breakfast at same time on holidays. All of the children had their lunch before 1pm since the meal time in anganwadi centres was 12.30pm. In holiday's 31.00per cent children had their lunch before 1pm and 69.00per cent children had between 1 to 2 pm. Tea was consumed by 50.00per cent of the respondents before 5pm in working days and 47.00per cent in holidays. On working days 42.00per cent had their tea by 5-6 pm. 8.00per cent had their dinner before 9pm on working days and 78.00 per cent on holidays. Twelve per cent and 22.00per cent had their dinner after 9pm on working days and holidays respectively.

3.2.4. Food intake of children assessed by 24 hour recall method

Food intakes of anganwadi children were assessed through 24 hour recall method and the nutrients present in their diets were calculated using the Indian food composition table of NIN (2017).

Mean intake were compared with the actual RDA required

to find the deviation from what is needed and what they actually consumed. Table 10 details the mean nutrient intake of children in the age group 1-3 years.

Table 4: Mean nutrient intake of children (1-3 years)

Nutrient	RDA	Intake	Deviation
Energy (k Cal)	10600.00	1068.00	+8.00
Protein (g)	16.70	20.81	+4.11
Vitamin A(µg)	3200.00	2044.70	-1155.30
Iron (mg)	9.00	8.96	-0.04

As furnished in Table 4 the mean intake of energy in the age group of 1-3 years was 1068 k Cal with an increase of 8kcal than their required. Intake of protein was also found to be excess (4.11g) than required RDA. But the diet shows a serious deficit in the intake of Vitamin A and iron.

The results of mean nutrient intake of anganwadi children in the age group of 4-6 years are depicted in the Table 5.

Table 5: Mean nutrient intake of children (4-6 years)

Nutrients	RDA	Intake	Deviation
Energy (k Cal)	1350.00	1268.00	-82.00
Protein (g)	20.10	29.32	+9.32
Vitamin A(µg)	3200.00	2154.00	-1046.00
Iron (mg)	13.00	10.45	-2.55

As revealed in the Table 5, the intake of calorie from the diet was found to be had a deficit of 82.00 k Cal than the actual requirements. The protein intake of 29.32 g was noted to be higher than their required recommended daily allowances. The diet was found to be deficient in Vitamin A and Iron.

4. Discussion

4.1. Food consumption pattern

Assessment of food consumption pattern helps to find whether the study population are well nourished or malnourished. Nutritional status of children can't be assessed totally only by the food consumption pattern [9]. Baig, ascertained that it is the result of so many constituents which are connected each other and is subjective to the quantity and quality of food taken by the individual

Ramachandran, pointed out that assessment of food consumption pattern of the study population along with other assessments will increase the significance of nutritional assessment value.

Food consumption pattern of the beneficiaries were assessed through the collection of details on the food consumption pattern, frequency of having different food items and the meal timing. Regarding the food habit of the children 4.4% were vegetarians. Vegetable diet is devoid of animal hence, nutrient income is based on lower levels of the food pyramid [12]. Absorption of Iron from a pure vegetarian diet is harder. Choline is a nutrient found only in meat and poultry. It is important for the health and functioning of brain. Vegetarians are devoid of this nutrient [13]. Hence they need to take special care on meeting the nutrient requirements.

Frequency of consumption of different food items by children were assessed. All of the beneficiaries consumes rice, green gram, curry leaves, ground nut coconut and jaggery daily. Green gram, rice, peanut chocolates made of ground nut and jaggery were made and provided to children daily at the anganwadi center. Adam and Hann (2009), reported that food preferences and food consumption of same foods are related each other. Through both of them dietary intakes can be predicted. Dietary intake can be used to predict the dietary intake and can provide an alternative to food frequency approach assessing dietary intake.

All of them consume wheat flour weekly thrice. Highly perishable food product like fish is consumed by 81.1% daily, 11.1% weekly thrice and 3.3% weekly twice. Fish is thought to be one of the healthiest foods. This is in line with the community-based study conducted by Lane (2019), reported that approximately 85% of Keralites consumes fish. Addition of fish in the diet of a child is an excellent way to reel in a prize catch of important nutrients. Eating fish daily is likely to have a healthy brain. Fish is rich in omega-3 and diet with fish is good for proper brain functioning. Specifically, fish has been shown to reduce the risk of diabetes in both children and adults.

A study conducted by Joseph (2014) found that vegetarian and non-vegetarian dishes consisting of fish, poultry and meat accompanied with rice compromises the diet plan of keralites. In majority of house hold, lunch will consists of rice, fish and vegetables. Another cross sectional study steered by Agarwal *et al.*, (2014), observed that one in five people in Kerala consume pesco vegan diet (dominated by fish).

86.87% of the children consume tea or coffee daily at their tea time only 13.3% of children does not have the habit of consuming tea or coffee in their diet. Majority of children were having the habit of consuming tea. It's not advisable and need to be replaced by milk. Due to the presence of caffeine content children should reduce intake of tea or coffee. Because it causes several side effects including nervousness, stomach upset, sleeping problems and improper development of children. A child who consume too much will be experiencing nausea, vomiting, diarrhoea, extreme restlessness etc. [18].

Mainstream of children (63.00%) in the present study never consume amla in their diet. They have to be made aware about of its importance. Amla is rich in high amounts of Vitamin C. it contains antioxidants there by reduces the damage of cells. Amla played significant role in the reduction of blood pressure values. Regular intake of small amounts of amla aids digestive enzymes and make the child to feel hungry [19].

Majority of the population (96.7%) are not concerned with the significance of sprouted pulses and consume never in their diet. They have to make aware about the significance of sprouted legumes. Legumes are sprouted to increase the digestibility and bioavailability of nutrients and hence they are significant in human nutrition. Increase in the protein content, vitamin C, *in vitro* protein digestibility and decline in phytic acid and trypsin inhibitor activity were observed after sprouting process [20].

Daily meal pattern of the family were also assessed. 81% of the respondents and 22% of the respondents have their breakfast before 9am in the morning in working days and holidays respectively. All of the children have their lunch before 1pm since the meal time in anganwadi centres are 12.30pm. The digestive power of an individual is stronger between 12 to 02.00pm. 88% of the respondents have their dinner before 9pm in working days and 78% in holidays.

Meal timing and intervals between it is also significant part of dietary intake. Gap between meals should not be more than four hours [21]. Regularity of meal times leads to

development of good eating habits [22].
All children were having the habit of consuming tea. It's not advisable and need to be replaced by milk. For the first time Chhattisgarh government decided to provide egg to the children under Integrated Child Development Services (ICDS), since it is one of the best source of protein for growing child [23]. It can be followed by other anganwadi centres also including our Kerala state. Presently vegetarian diet is provided in the anganwadi centres.

4.2. 24 hour recall method

Real food consumption of the nominated anganwadi children were calculated through 24 hour recall method and the nutrients present in their diets were calculated using the Indian food composition table of NIN (2017) in order to determine quality and quantity of food consumed.
It is one of the most widely used method. This method consists of recall and quantity intake of food materials consumed in a day before the interview is scheduled, first intake from morning to the last food taken till night. Researchers suggest that this method is thorough and complete method till date to assess the food intake [24].
Mean intake of RDA intake were compared with the actual RDA required to find the deviation from what is needed and what they actually consumes. Recommended Dietary Allowance (RDA) is the average daily dietary intake sufficient to meet nutrient requirement of nearly 97-98% healthy individuals. It will be periodically revised and updated [25].

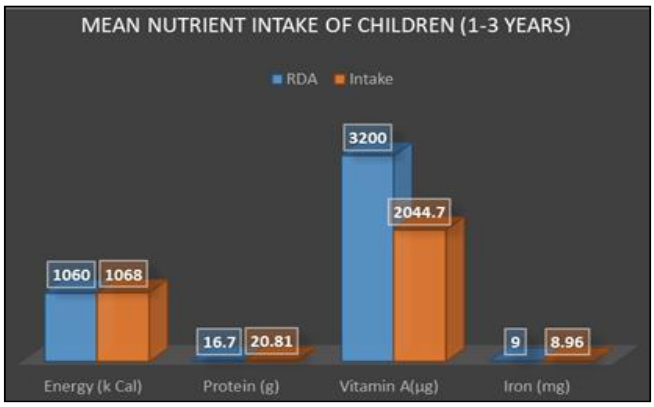

Fig 2: Mean nutrient intake of children

The mean intake of children in the age group of 1-3 years were calculated and the results shown that, their diet except the quantity of energy and protein were deficient in Vitamin A and Iron in their diet.
In the case of children in the age group of 4-6 years their diet were deficient in energy, vitamin A and Iron. 300 k Cal of energy and 10gm of protein is provide generally to children below the age of 6 years. An alarming finding from the study pointed out that this amount is not sufficient for the children above the age of three years.

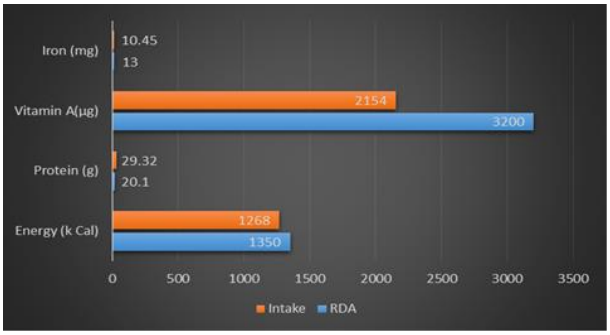

Fig 3: Mean nutrient intake of children

The results of the study shows a positive energy balance. This is in line with the study conducted by Joseph (2014), to assess the nutritional level status of children found intake of energy by the child beneficiaries was greater than the RDA values.
Vitamin A and iron are two important interconnected nutrients. A study was conducted by Michelazzo *et al.*, (2013), to assess the impact of Vitamin A supplementation on Iron status. Results shown that usage of vitamin A supplements along with the simultaneous use of iron has more efficiency to prevent iron deficiency anemia than using any of the nutrients alone.

5. Conclusion

Food consumption pattern of the beneficiaries were assessed through the collection of details on the food consumption pattern, frequency of having different food items and the meal timing. Regarding the food habit of the child family 4.40 per cent were vegetarians. All of the beneficiaries consumes rice, green gram, curry leaves, ground nut coconut and jaggery daily. Green gram, rice, peanut chocolates made of ground nut and jaggery were made and provided to children daily at the anganwadi center. Highly perishable food product like fish was consumed by 81.10 per cent daily. All of the children have their lunch before 1pm since the meal time in anganwadi centres are 12.30pm. The digestive power of an individual is stronger between 12 to 02.00pm. Food intake of anganwadi children were found through 24 hour recall method. Results of the mean intake of children in the age group of 1-3 years reveals that diet is deficient in Vitamin A and iron. While in the age group 4-6 years energy, vitamin A and iron was deficient.
Findings of the present study recommends that there is a need to improve the menu pattern in the anganwadi children. Quantity of items taken and given to children need to be improved, especially for children in the age group of 4-6 years. Anganwadi workers should be made aware of the need to provide special attention to malnourished children.

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