

INTAKE OF FRUITS AND VEGETABLES AMONG EARLY ADOLESCENTS AGED 10 TO 13 YEARS IN TAMILNADU, INDIA

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Abstract

Background: Nutrition during early adolescence (10 to 13 years) has implications not only on long term health of the individual but also on the health of their potential offsprings. Fruits and vegetables intake are considered the cornerstone of healthy nutrition in adolescents. This cross-sectional study was undertaken with the primary objective of estimating fruits and vegetables intake among early adolescents aged 10 to 13 years in Tamilnadu, India. The secondary objectives were to study the preferences of early adolescents regarding fruits and vegetables intake and to determine the factors influencing fruits and vegetables intake. **Methods:** A total of 168 adolescents fulfilling inclusion and exclusion criteria were included in the study. The study was conducted over a period of three months from March 2023 to May 2023. Demographic details, details of fruits and vegetables intake, environmental factors, lifestyle factors and dietary preferences regarding fruits and vegetables intake were collected from the parents in a predesigned questionnaire and analysed. **Results:** Only 39.29% of the early adolescents consumed five or more servings of fruits and vegetables per day. 58.33% of the early adolescents preferred of fruits over vegetables. Preference of fruit juices over fruits were noted in 52.98% of the early adolescents. 58.93% of the study participants had fruits and vegetables with every meal. There was regular availability of fruits and vegetables at home in 47.62% of the study participants. Intake of green leafy vegetables, Vitamin A and Vitamin C rich fruits and vegetables on regular basis was observed in 25.60%, 46.43% and 50% of the study participants respectively. Statistical significance of fruits and vegetables intake was observed with gender, age, family type, maternal employment status, employment of cook at home, sleep duration, parental intake of fruits and vegetables and easy availability of fruits and vegetables in neighbourhood. **Conclusion:** Multi-level interventions targeting individual, family, environment, school and society will help to improve the fruits and vegetables intake among early adolescents.

INTRODUCTION

Early adolescence (10 to 13 years) is considered a very crucial transitional period of development which lays foundation for long term health behaviours. Considerable physical and cognitive development occur in this phase. Increasing importance to self-care, egocentrism, peer influence, psychological need to exert independence are few major changes experienced. The adolescent eating habits guide adult eating patterns. Nutrition during early adolescence has implications not only on long term health of the individual but also on the health of their potential offsprings.^[1] Several government and social agencies place greater emphasis on adolescent nutrition. Fruits

and vegetables intake are considered the cornerstone of healthy nutrition in adolescents.

MATERIALS AND METHODS

This cross-sectional study was undertaken with the primary objective of estimating fruits and vegetables intake among early adolescents aged 10 to 13 years in Tamilnadu, India. The secondary objectives were to study the preferences of early adolescents regarding fruits and vegetables intake and to determine the factors influencing fruits and vegetables intake among early adolescents. A total of 168 adolescents fulfilling inclusion and exclusion criteria were included in the study. The study was conducted over a period of three months from March

2023 to May 2023. Early adolescents aged 10 to 13 years whose parents were willing to participate in the study were included. Adolescents with chronic illnesses, acute illnesses, medications, obesity, overweight, thinness, intellectual disability and behavioural problems were excluded from the study. After obtaining informed consent, demographic details and details regarding fruit and vegetables intake, preferences regarding fruits and vegetables intake, details of lifestyle factors and environmental factors were collected in a predesigned questionnaire. Parents were asked to document the intake of fruits and vegetables over the past 3 days by dietary recall method and the average was taken as the average daily serving of fruits and vegetables. Socioeconomic status was classified as per Modified Kuppusamy's Socioeconomic Status Scale. Serving size of fruits and vegetables were determined as per American Heart Association (AHA) recommendations of fruits and vegetable servings.^[2] Data collected were analysed by suitable statistical methods using SSPS 25 software. Statistical significance was assessed at 5% level of significance (P value < 0.05).

RESULTS

168 early adolescents aged 10 to 13 years fulfilling the inclusion and exclusion criteria was included in the study. The demographic characteristics of the study participants as per gender, age, socioeconomic status and family type are shown in [Table 1]. 55.95% of the mothers of the study participants were employed while 44.05% were homemakers. Cooks were employed in 21.43% of the households.

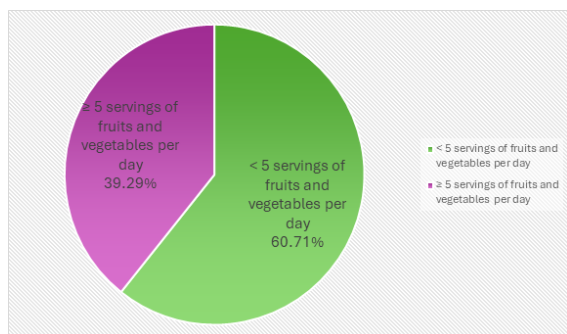


Figure 1: Fruits and Vegetables Intake among Early Adolescents

Only 66 (39.29%) of the study participants consumed the recommended 5 or more servings of fruits and

vegetables per day, while 102 early adolescents (60.71%) consumed less than 5 servings of fruits and vegetables per day. [Figure 1]. Statistically significant correlation of fruits and vegetables intake per day was observed with gender, age, family type, maternal employment status and employment of cook at home with P value less than 0.05 [Table 2].

Among the lifestyle factors, statistical significance was observed between fruits and vegetables intake of early adolescents with sleep duration. Statistically significant relationship of fruits and vegetables intake of adolescents was not observed with screen time and physical activity. [Table 3]

Among the environmental factors, Parental intake of ≥ 5 servings of fruits and vegetables per day and easy availability of fruits and vegetables at neighbourhood had statistically significant association with fruits and vegetables intake among early adolescents. (Table 4). 99 (58.93%) of the 168 study participants had fruits and vegetables with every meal. There was regular availability of fruits and vegetables at home in 80 (47.62%) of the study participants. [Table 4]

Majority of the study participants (58.33%) preferred fruits over vegetables. (Figure 2). 52.98% of the early adolescents in the study preferred fruit juices over whole fruits. The other preferences regarding fruits and vegetables intake among the study participants are shown in [Table 5].

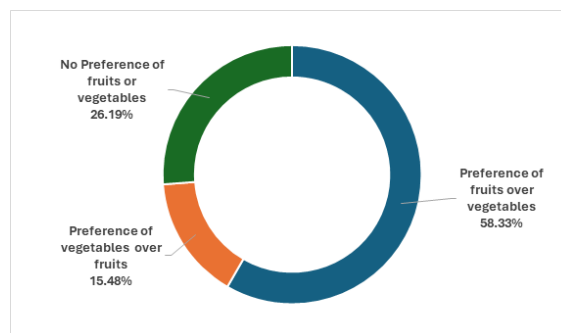


Figure 2: Preference between fruits and vegetables in early adolescents

Only a very small percentage (25.60%) took green leafy vegetables on regular basis. Intake of vitamin A and Vitamin rich fruits and vegetables on regular basis are more compared to regular intake of green leafy vegetables at 46.43% and 50% respectively. [Table 6]. Other dietary habits related to fruits and vegetables intake among study participants is shown in [Table 6].

Table 1: Demographic characteristics of the study participants.

	Number	Percentage
Gender		
Male	94	55.95%
Female	74	44.05%
Age		
10 years	45	26.80%
11 years	38	22.62%
12 years	46	27.40%
13 Years	39	23.18%
Socioeconomic Status		

Class I	18	10.72%
Class II	36	21.43%
Class III	52	30.95%
Class IV	33	19.64%
Class V	29	17.26%
Family Type		
Nuclear Family	104	61.90%
Joint Family	64	38.10%
Maternal Employment Status		
Employed	94	55.95%
Home maker	74	44.05%
Employment of cook		
Yes	36	21.43%
No	132	78.57%

Table 2: Fruits and Vegetables intake among early adolescents

	< 5 servings of fruits and vegetables per day (n = 102)	≥ 5 servings of fruits and vegetables per day (n = 66)	Total (n = 168)
Gender			
Male	50 (49.02%)	44 (66.67%)	94(55.95%)
Female	52 (50.98%)	22 (33.33%)	74 (44.05%)
Chi Square Test		X2 - 5.0634 P Value - 0.024437 (Significant)	
Age			
10 years	32 (31.37%)	13(19.70%)	45 (26.79%)
11 years	16 (15.69%)	22 (33.33%)	38 (22.62%)
12 years	34 (33.33%)	12 (18.18%)	46 (27.40%)
13 Years	20 (19.61%)	19 (28.79%)	39 (23.18%)
Chi Square Test		X2 - 12.3707 P Value - 0.006215 (Significant)	
Socioeconomic Status			
Class I	11(10.78%)	7 (10.61%)	18 (10.72%)
Class II	20 (19.61%)	16 (24.24%)	36 (21.43%)
Class III	30 (29.41%)	22 (33.33%)	52 (30.95%)
Class IV	23 (22.55%)	10 (15.15%)	33 (19.64%)
Class V	18 (17.65%)	11 (16.67%)	29 (17.26%)
Chi Square Test		X2 - 1.7406 P Value >0.05 (Not Significant)	
Family Type			
Nuclear Family	84 (82.35%)	20 (30.30%)	104 (61.90%)
Joint Family	28 (27.45%)	36 (54.55%)	64 (38.10%)
Chi Square Test		X2 - 24.4327 P Value <0.01(Significant)	
Maternal Employment Status			
Employed	65 (63.73%)	29 (43.94%)	94 (55.95%)
Home maker	37 (36.27%)	37 (56.06%)	74 (44.05%)
Chi Square Test		X2 - 24.4327 P Value - 0.011638 (Significant)	
Employment of cook			
Yes	16 (15.69%)	20 (30.30%)	36 (21.43%)
No	86 (84.31%)	46 (69.70%)	132 (78.57%)
Chi Square Test		X2 - 5.0849 P Value – 0.024136 (Significant)	

Table 3: Fruits and Vegetables intake and Lifestyle factors of early adolescents

	< 5 servings of fruits and vegetables per day (n = 102)	≥ 5 servings of fruits and vegetables per day (n = 66)	Total (n = 168)
Screen Time			
≤ 2 hours	50 (49.02%)	34 (51.52%)	84 (50.00%)
>2 hours	52 (50.98%)	32 (48.48%)	84 (50.00%)
Chi Square Test		X2 - 0.0998 P Value > 0.05 (Not Significant)	
Sleep Duration			
9 to 11 hours	64 (62.75%)	18 (27.27%)	82 (48.81%)
< 9 hours	16 (15.69%)	38 (57.58%)	54 (32.14%)
>11 hours	22 (21.57%)	10 (15.15%)	32 (19.05%)
Chi Square Test		X2 - 33.0722 P Value <0.01 (Significant)	
Physical Activity			
≥ one hour	72 (70.59%)	40 (60.60%)	112 (66.67%)
Less than one hour	30 (29.41%)	26 (39.40%)	56 (33.33%)
Chi Square Test		X2 - 1.7968 P Value >0.05 (Not Significant)	

Table 4: Fruits and Vegetables intake and Environmental factors among early adolescents

	< 5 servings of fruits and vegetables per day (n = 102)	≥ 5 servings of fruits and vegetables per day (n = 66)	Total (n = 168)
Parental intake of ≥ 5 servings of fruits and vegetables per day			
Yes	30 (29.41%)	34 (51.52%)	64 (38.10%)
No	72 (70.59%)	32 (48.48%)	104 (61.90%)
Chi Square Test	X2 - 8.3015 P Value - 0.003961 (Significant)		
Regular availability of fruits and vegetables at home			
Yes	50 (49.02%)	30 (45.45%)	80 (47.62%)
No	52 (50.98%)	36 (54.54%)	88 (52.38%)
Chi Square Test	X2 - 0.2042. P Value >0.05 (Not Significant)		
Intake of plenty of fruits and vegetables by friends			
Yes	65 (63.73%)	33 (50.00%)	98 (58.33%)
No	37 (36.27%)	33 (50.00%)	70 (41.67%)
Chi Square Test	X2 - 3.1059 P Value >0.05 (Not Significant)		
Easy availability of fruits and vegetables at neighbourhood.			
Yes	18 (17.65%)	41 (62.12%)	59 (35.12%)
No	84 (82.35%)	25 (37.88%)	109 (64.88%)
Chi Square Test	X2 - 34.7849 P Value <0.01 (Significant)		
Have fruits or vegetables with every meal			
Yes	66 (64.71%)	33 (50.00%)	99 (58.93%)
No	36 (35.29%)	33 (50.00%)	69 (41.07%)
Chi Square Test	X2 - 3.5806 P Value >0.05 (Not Significant)		

Table 5: Preferences regarding Fruits and Vegetables intake among early adolescents

Preference	Number	Percentage
Preference of fruits over vegetables	98	58.33%
Preference of vegetables over fruits	26	15.48%
No Preference of fruits or vegetables	44	26.19%
Preference of fruit juice over whole fruits	89	52.98%
Preference of dry fruits over fresh fruits	65	38.69%
Preference of JUNCS over fruits and vegetables	102	60.71%
Preference of fruits as snacks	85	50.60%
Preference to eat fruits and vegetables at social setting	76	45.24%
Preference to eat fruits and vegetables at school setting	94	55.95%
Preference to eat fruits and vegetables during weekends	88	52.38%

Table 6: Dietary habits related to fruits and vegetables intake among early adolescents

Dietary habits related to fruits and vegetables intake	Number	Percentage
Intake of green leafy vegetables on daily basis	43	25.60%
Intake of vitamin A rich fruits and vegetables on daily basis	78	46.43%
Intake of Vitamin C rich fruits and vegetables on daily basis	84	50.00%
Intake of fruit juices on daily basis	96	57.14%
Intake of fruits or vegetables in every meal	52	30.95%
Intake of fruits as snacks	58	34.52%
Inclusion of variety of fruits and vegetables on regular basis	65	38.69%
Intake of regional and seasonal fruits and vegetables on regular basis	126	75.00%

DISCUSSION

Fruits and vegetables are a rich source of several vitamins and minerals in addition to providing dietary fiber. They are sources of phytochemicals that function as antioxidants, phytoestrogens, and anti-inflammatory agents. Fruits and vegetables intake is linked to lower incidence of cardiovascular disease and obesity.^[3] The intake of fruits and vegetables has more importance in early adolescence as it decreases the risk of many chronic diseases and cancers and also aids in weight management and improves overall health. Also, dietary behaviours in this phase of life is often carried into the adult phase of life and extends the dietary influences not only the individual but also on the family, peer groups and even the society as a whole.

The Dietary Guidelines for Americans 2020–2025 recommend that, for people two years and older, vegetables and whole fruits represent one-half of a

healthy diet.^[4] Indian Academy of Pediatrics (IAP) parental guidelines on nutrition for adolescents recommends the daily intake of two servings of fruits, one serving of green leafy vegetables, one serving of other coloured vegetables and one serving of tubers, radish, cucumber, etc.^[5] World Health Organization (WHO) recommends at least 400 g (i.e. five portions) of fruit and vegetables per day excluding potatoes, sweet potatoes, cassava and other starchy roots.^[6]

A positive association of fruit and vegetable intake with mental health of adolescents was noted in a systemic review of 17 observational studies by Dominika Głąbska et al.^[6] Considering the importance of fruits and vegetables intake, this study was done with the primary objective of estimating fruits and vegetables intake among early adolescents aged 10 to 13 years in Tamilnadu, India. The secondary objectives were to study the preferences of early adolescents regarding fruits and vegetables

intake and to determine the factors influencing fruits and vegetables intake among early adolescents.

Only 21% of the 823 grade ten students reported eating five servings of fruit and vegetables a day in a survey by Marium Salwa et al at Dhaka, Bangladesh.^[7] The proportion of those who met the recommendations of eating five servings per day ranged between 10 and 29% among adolescent in Arab countries.^[8] A study in Norway by Anderson LF et al, demonstrated that adolescents consumed less than half the recommended fruits and vegetables.^[9] Our study however reported a much higher percentage of 39.29% of the study participants consuming five or more servings of fruits and vegetables per day. This can be probably attributed to the local cultural dietary and cooking habits with incorporation of vegetables in traditional food on regular basis.

Better cooking skills correlated with greater of fruits and vegetables intake in the study by Leblanc et al.^[10] In our study we observed a significant relationship between employment of cook at home with intake of fruits and vegetables among early adolescents. Considering the increased intake of JUNCS (Junk foods, Ultra-processed foods, Nutritionally inappropriate foods, Caffeinated/colored/carbonated foods/beverages, and Sugar-sweetened beverages) food among the adolescents, there is a pressing need to promote home cooked food among adolescents. This can be achieved by teaching cooking skills to all adolescents irrespective of gender at both home and school setting. Parental occupational status was found to influence fruits and vegetables intake among adolescents in the study by Pearson et al similar to our study.^[11]

Less than 15% of Australian adolescents met the recommended guidelines for vegetable intake while around 70% met the guidelines for fruit intake in the study by Jongenelis et al.^[12] We observed a similar trend in our study also with majority of the early adolescents preferring intake fruits over vegetables. Only a very small percentage (25.60%) of the study participants consumed green leafy vegetables on regular basis. Intake of Vitamin A and Vitamin C rich fruits and vegetables on regular basis are more compared to regular intake of green leafy vegetables at 46.43% and 50% respectively. More awareness campaigns regarding benefits of intake of vegetables especially green leafy vegetables can improve these percentages to a higher level.

Intake of regional and seasonal whole fruits over fruit juices is advised in adolescents by Indian Academy of Pediatrics. Children aged 5 to 18 years, are advised to limit intake of fruit juices to 250mL/day.^[13] A preference of fruit juices over fruits were noted in 52.98% of the early adolescents in contrast to the IAP guidelines, though intake of regional and seasonal whole fruits on regular basis was practiced by 75% of the study participants.

Physical activity and adequate sleep had a positive effect on fruits and vegetables intake among adolescents in several studies.^[7,14,15] However in our

study, only sleep had a statistically significant association with fruits and vegetables intake among early adolescents.

55.95% of the early adolescents included in the study preferred intake of fruits and vegetables in school settings. Studies have demonstrated that interventions in schools and positive peer influence improved fruits and vegetables consumption of adolescents.^[16,17] More educational and behavioural interventions at school level can help in improving fruits and vegetables intake among children and adolescents.

Parental intake, Easy availability of fruits and vegetables at neighbourhood and home have positive effects on improving fruits and vegetables intake among adolescents as demonstrated by several studies.^[7,11,18] Parental intake of fruits and vegetables and easy access to fruits and vegetables in neighbourhood had statistical significance with fruits and vegetables intake among early adolescents in the study. Parents have a major role to play in promoting fruits and vegetables intake among early adolescents by setting a good example to children and also by make fruits and vegetables readily available at home. The study is limited by the fact that data was collected by dietary recall technique which can result in recall bias. Also, nutritional biomarkers of fruits and vegetables intake which are more reliable and objective indicators of fruits and vegetables intake were not done in the study participants. Further studies with real time monitoring of fruits and vegetables intake with inclusion of nutritional biomarker studies. can help to mitigate these limitations.

CONCLUSION

Only 39.29% of the early adolescent consumed five or more servings of fruits and vegetables per day. 58.33% of the early adolescents preferred of fruits over vegetables. Statistical significance of fruits and vegetables intake was observed with gender, age, family type, maternal employment status, employment of cook at home, sleep duration, parental intake of fruits and vegetables and easy availability of fruits and vegetables in neighbourhood. Multi-level interventions targeting individual, family, environment, school and society will help to improve the fruits and vegetables intake among early adolescents.

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