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Development and Validation of a Nutrition Transition Diet Score for Adolescents in India

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Abstract

Background

Emerging research suggests changes in dietary patterns among adults and youth during the global nutrition transition, but there is no dietary score to measure the extent of nutrition transition that may be occurring.

Objective

To develop and validate an index-based Nutrition Transition Diet Score for adolescents in India.

Methods

An evidence-driven index-based apriori Nutrition Transition Diet Score for adolescents was developed and validated against an exploratory factor analysis (EFA) derived Diet Score. The EFA with varimax rotation was used to derive dietary patterns from answers to a validated food frequency questionnaire provided by 198 adolescents in Vijayapura, India. The evidence-driven index-based Diet Score among adolescents who were in the top quartile

(≥ 75 percentile) of the main dietary pattern were compared using diet score means to the rest of the group.

Results

The a priori index-based Nutrition Transition Diet Score (range 0 – 10) included six food groups: fried foods, sugar-sweetened beverages, dairy, fruits and vegetables, and bread, and four nutrients, namely total dietary fat, saturated fat, cholesterol, and simple sugars ([table 1](#)). The Spearman correlations between the index-based Diet Score and EFA-driven Diet Score was high ($r=0.68$, $p < 0.0001$). Among the adolescents, the mean evidence-driven index-based Nutrition Transition Diet Score was 4.7 ± 1.1 . The following three dietary patterns were identified using EFA: the transition 'westernized' pattern (factor loadings >4 for breads, fried foods, processed foods, sugar-sweetened beverages (fruits juices and carbonated beverages), and sweets and desserts), the animal-source pattern (factor loadings >4 for egg, lean meat, and red meat), and the traditional 'Indian' pattern (factor loadings >4 for grains, fruits and vegetables, dairy, sugar, traditional fried foods, and ghee) ([table 2](#)). The loading of traditional fried foods on both traditional and transition patterns indicate that as diets may become more 'westernized', this food group may continue to remain as one of the main components of the diet. The mean index-based Diet Score was significantly higher ($p < 0.0001$) among adolescents in the upper quartile of the transition pattern (score range: 4–8) when compared to the rest (score range: 1–6) ([table 3](#)). This shows that the evidence-driven index-based Nutrition Transition Diet Score is valid against an exploratory factor analysis (EFA) derived Diet Score for adolescents.

Conclusion

The validated index-based Nutrition Transition Diet Score can be used to measure nutrition transition among adolescents in India. To our knowledge, this is the first diet score to assess the extent of nutrition transition.

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Table 1. Components of the Index-based Nutrition Transition Diet Score

Components of the evidence-driven Nutrition Transition Diet Score	Criteria for Score 1 (Indicates Nutrition Transition)	Criteria for score 0 (Indicates no Nutrition Transition)

Components of the evidence-driven Nutrition Transition Diet Score	Criteria for Score 1 (Indicates Nutrition Transition)	Criteria for score 0 (Indicates no Nutrition Transition)
1. Processed foods	>30 g/d	< 30 g/d
2. Fried foods	>30 g/d	<30 g/d
3. Sugar-sweetened beverages	> 0 ml/d	< 0 ml/d
4. Dairy	> 500 g/d	< 500 g/d
5. Fruits and vegetables	< 400 g/d	> 400 g/d
6. Breads	> 25 g/d	< 25 g/d
7. Simple sugars	> 10% of total calories	< 10% of total calories
8. Fat, total	> 30% of total calories	< 30% of total calories
9. Saturated fat	> 10% of total calories	< 10% of total calories
10. Cholesterol	> 300 mg/d	< 300 mg/d

Table 2. Dietary patterns using exploratory factor analysis and their factor loadings among adolescents in South India (n=198)^a

Food group	Factor 1 'Transition Pattern'	Factor 2 'Animal foods pattern'	Factor 3 'Traditional Pattern'
Breads	0.42	—	—
Global Unhealthy Foods	0.61*	—	—
Global Healthy Foods	—	—	—
Processed Foods	0.61*	—	—
Snacks	—	—	—

Food group	Factor 1 'Transition Pattern'	Factor 2 'Animal foods pattern'	Factor 3 'Traditional Pattern'
Lean Meat	—	0.80*	—
Eggs	—	0.54*	—
Sweets and Desserts	0.46*	—	—
Dairy	—	—	0.48*

a Loading < 0.4 are designated with '—'.

* Factor loadings greater than 0.4.

Table 3. Intake of food groups (g/d) among adolescents with and without Nutrition Transition diets (n=198)

Food group (g/d)	Nutrition Transition diet group (n=49)			No Nutrition Transition diet group (n=149)			T-test
	Mean	SD	Median	Mean	SD	Median	
Breads	58.9	41.6	51.4	29.8	34.5	14.8	<.0001
Global Unhealthy Foods	67.9	53.6	50.4	15.4	22.1	8.5	<.0001
Global Healthy Foods	3.5	11.4	0.0	0.5	2.4	0.0	0.003
Processed Foods	59.3	35.5	53.4	25.3	20.2	19.6	<.0001
Snacks	59.1	40.1	52.6	31.2	32.7	22.2	<.0001
Fried Snacks	177.3	91.6	171.3	47.3	36.9	37.7	<.0001
Fried Traditional Food	37.6	23.9	31.6	19.1	15.7	14.2	<.0001
Sweets and Desserts	108.5	57.4	96.0	52.9	47.9	40.6	<.0001
Red Meat	5.7	11.3	0.0	4.1	9.8	0.0	0.33
Lean Meat	20.5	37.9	4.0	9.4	17.7	0.7	0.0058

Food group (g/d)	Nutrition Transition diet group (n=49)	No Nutrition Transition diet group (n=149)	T-test
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