



Original Research Article

DETERMINANTS OF DIETARY PRACTICES AND TOBACCO RELATED BEHAVIORS AMONG SCHOOL-GOING ADOLESCENTS OF URBAN JODHPUR: APPLICATION OF THEORY OF PLANED BEHAVIOR

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ABSTRACT

Background: Adolescents are specifically vulnerable to adoption of poor dietary practices and tobacco use. This cross-sectional study explored the determinants of dietary and tobacco behaviors using theory of planned behavior (TPB).

Materials and Methods: This is cross sectional assessment of a cluster randomized interventional study performed in secondary and senior secondary government schools of urban Jodhpur. A total of 1224 study participants of aged 13 to 17 years were required for the study. A structured data collection tool was developed and checked for internal consistency.

Results: Approximately two third participants (61.4%) consumed healthy foods, half (48%) limited unhealthy foods, and only few (6.8%) reported ever use of tobacco. Mean scores for attitude, subjective norms (SN), perceived behavioral control (PBC), and intention were higher for consuming healthy foods and avoiding tobacco compared to limiting unhealthy foods. After adjusting for socio-demographic and TPB constructs, interactive association of SN and PBC (OR=1.060) was significant for consumption of healthy foods; interaction of intention with SN (OR=0.938) and PBC (OR=1.062) for limitation of unhealthy food. Tobacco avoidance was determined only by intention (OR=65.748).

Conclusion: Interaction among TPB constructs significantly determine healthy behavior and tobacco avoidance among school adolescents.

Keywords: Adolescent, Diet, healthy foods, unhealthy foods, Tobacco, Theory of planned behavior.

INTRODUCTION

Non-communicable diseases (NCDs) are responsible for more than 70% of deaths globally.^[1] Preventive strategies are always better and more effective in the control of NCDs including cancers. A number of common modifiable risk behaviors have been identified for these NCDs. One-third of the cancer deaths can be attributed to tobacco use, and approximately 20% to obesity.^[2]

Numerous harmful chemicals like tar and formaldehyde in tobacco products including smokeless forms, have a high potential for damaging genetic material and initiating the process of carcinogenesis.^[3] Preference for specific food items has a substantial impact on health.^[4] The benefits of including healthy foods like fruits and vegetables rich in dietary fiber to prevent NCDs have been reported in hundreds of scientific publications.^[5] Also, the harmful effect of unhealthy foods like fast foods & fried food items increases the risk of cardiovascular

diseases, obesity and cancers of the gastrointestinal tract and breast.^[6]

Theory of planned behavior (TPB) is one of the well-known models to record personal behavior and the associated factors.^[7] TPB, a cognitive theory based on assumptions that most of the conscious behaviors are rational and are goal-oriented, establishes the association of attitudes & perceptions with behavior where the intention is a connecting link. Intentions directly affect the behavior, and the intention is affected by attitude, subjective norms (SN), and perceived behavioral control (PBC) over the behavior.^[7] TPB has been successfully used in multiple studies to assess the intention and behavior of individuals towards fruits and vegetables and fast food items.^[8,9]

Adolescence is the age of habit formation, exploration of prohibited behaviors, and inadequate understanding of the long-term implications, putting them at a higher odds of adopting unhealthy lifestyle than any other age group.^[10] The global youth tobacco survey (GYTS), India reported 15.5% of the non-smokers in adolescent age group were likely to start smoking in next year and various studies have reported a mean age of tobacco initiation at around 12 years in India.^[11] Similarly, National Noncommunicable Disease Monitoring Survey, India reported higher unhealthy and energy dense food consumption, in addition to lack of health choices and easy availability of tobacco in the school environment.^[12]

The determinants of dietary and tobacco consumption behaviors among this specific and vulnerable population have not been largely studied in India. The schools, with possibility to reach most of the adolescent age group population, makes them a suitable study setting for assessing behavior of this specific age group. The current study assessed the dietary and tobacco consumption behaviors, and its determinants among school going adolescents using theory of planned behavior.

MATERIALS AND METHODS

Study Design and setting: Current study is the baseline assessment, of a school-based cluster randomized interventional trial, conducted from February 2019 to July 2019. Jodhpur city is the headquarters of second largest district of the state of Rajasthan with a population of more than 1 million, with an area of 423 sq. km and having 68 government schools with classes till at least 10th standard.^[13]

Study participants: A sample size of 1024 students was estimated for the cluster randomized trial with 8 clusters in each arm at 80% power, intra cluster correlation coefficient of 0.03, and 10% non-response.^[14] This sample size was adequate for cross sectional study also (N=999, with prevalence of current tobacco use at 14.6%, relative error of 15% at 95% CL).^[15] To include adolescent of age 13 to 17 years, we enrolled all students from classes 8th to

10th standard from 16 of the 68 government secondary and senior secondary schools in urban Jodhpur. Permissions were obtained from DEO-Secondary Education, and individual school authorities.

Data collection tools: The environment of schools and their immediate surroundings was assessed for compliance with tobacco prohibition legislation, “The Cigarettes and Other Tobacco Products Act, 2003 (COTPA)”, with an observational checklist.

A self-administered questionnaire was developed for capturing behavior and its determinants, after piloting among students of class 8th to 10th in government school not included in study sample. The questionnaire included sociodemographic details, questions for assessment of behaviors and its determinants from TPB towards a) consumption of healthy foods (fruits and vegetables) daily, b) limiting consumption of unhealthy foods (fried food, fast food, packed food, and sugar sweetened beverages or SSB) to maximum twice a week, and c) avoiding use of tobacco in any of its form (smoking and smokeless). Each of these behaviors had questions for assessing TPB constructs.

The behavior of past one week was recorded for dietary practices with dichotomous question. The intention towards dietary behaviors was assessed by a statement “I want to adopt... (target behavior)” on paired adjective agree-disagree. Tobacco use was recorded as frequency of use in lifetime with intention as a true-false dichotomous question.

Attitude was assessed by its cognitive and affective components with one question for each followed by adjective pair good-bad. For cognitive attitude, question was framed as “How will be adopting (target behavior) for health”, and affective behavior as “How would you like to adopt the... (target behavior). A composite score of attitudes was calculated as sum the scores of affective and cognitive components.

SN or normative beliefs were assessed as injunctive norms by statement “My friends and family members support (target behavior)”, and descriptive norms as “Most healthy people practice (target behavior)” followed by agree-disagree adjective pair. For behavior of avoiding tobacco, one more statement was asked for assessing descriptive norm as “Those, who want to stay healthy, refuse tobacco products when offered” with an agree-disagree pair. A composite score reflected the overall SN of an individual.

PBC was assessed as self-control and self-efficacy in adopting healthy behavior. Control over behavior was assessed as “Adopting (target behavior) depends on me”, and efficacy as “I am confident in adopting (target behavior)” on agree-disagree adjective pair. Composite score of these components was taken as measure of PBC.

Ethical considerations: Ethical clearance was obtained from Institutional Ethical Committee of All India Institute of Medical Sciences, Jodhpur. Consent was taken from parents or guardians, and the ascent was obtained from the adolescent students.

Confidentiality of the participants and their information were ensured.

Statistical analysis: Data analysis was performed using SPSS version 23.0 with an alpha level of 0.05. Internal consistency of the tool was assessed as Cronbach's alpha. Descriptive information of sociodemographic variables, scores of TPB constructs were analyzed by calculating means and frequencies. Few of the participants did not respond or did not know the education or occupation of parents and were excluded in the analysis with these variables. Variables found to be significant in bivariate analysis were included in logistic regression applied in 3 steps with only significant sociodemographic variables in model 1, adding constructs of TPB in model 2, and interaction among these constructs in model 3.

RESULTS

A total of 1224 students participated from 16 randomly selected government secondary and senior secondary schools in urban Jodhpur. [Figure 1] Of all 16 schools, administrator of only 5 schools was aware of COTPA, and its provisions related to educational institutes, and only 2 of these tried to enforce the same in and around the school premises. Nine schools had displayed tobacco prohibition sign boards at either entrance of school or each building block or at common hall. Tobacco selling shops were

present within 100 yards of 9 schools. Tobacco use (presence of discarded remains) was evident in 9 schools.

Mean age of students enrolled in study was 15.44 years (+1.21). Majority (874, 71.4%) were from age group of 14 to 16 years, and most were in 9th standard (552, 45.1%). Almost three fourth of the sample were female (73%). Fathers of 79.3% students were educated up to either secondary school or below compared to 91% mothers. Occupation of majority of fathers (77.1%) were of unskilled / semiskilled / skilled nature, whereas 82.4% mothers were either housewife or unemployed. [Table 1]

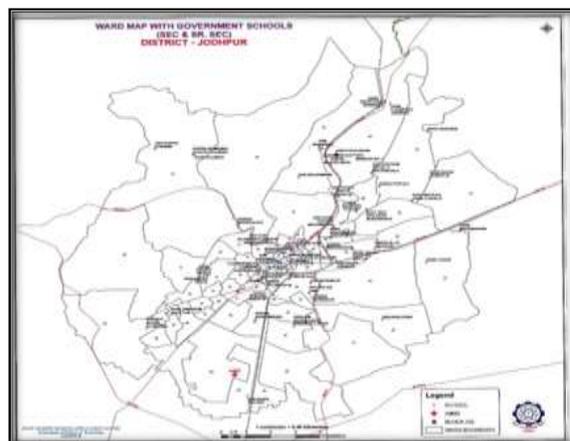


Figure 1: Distribution of government secondary and senior secondary schools in urban Jodhpur.

Table 1: Sociodemographic characteristics of students and their distribution by specific behaviors.

Variable	All students (N=1224)	Consumed fruits and vegetables daily ^c	Limited fried and fast food & packed food and SSB ^c	Never used tobacco in any form ^c
Age in years, Mean (SD)	15.44 (1.21)	15.42 (1.21)	15.43 (1.18)	15.41 (1.21)*
Gender, n (%)				
Male	330 (27.0)	174 (52.7)*	138 (41.8)*	279 (84.5)*
Female	894 (73.0)	578 (64.7)*	449 (50.2)*	862 (96.4)*
Education of father, n (%)				
Illiterate	180 (14.7)	105 (58.3)	82 (45.6)	163 (90.6)
Primary school	239 (19.5)	149 (62.3)	122 (51.0)	222 (92.9)
Middle school	238 (19.4)	140 (58.8)	110 (46.2)	228 (95.8)
Secondary school	314 (25.7)	200 (63.7)	147 (46.8)	297 (94.6)
Senior secondary and above	198 (16.2)	127 (64.1)	95 (47.0)	179 (90.4)
Do not Know / Did not respond ^a	55 (4.5)			
Education of mother, n (%)				
Illiterate	452 (36.9)	255 (56.4)*	217 (48.0)	413 (91.4)
Primary school	293 (23.9)	191 (65.2)*	120 (41.0)	274 (93.5)
Middle school	227 (18.5)	151 (66.5)*	120 (52.8)	217 (95.6)
Secondary school	142 (11.6)	91 (64.0)*	71 (50.0)	131 (92.2)
Senior secondary and above	56 (4.6)	37 (66.0)*	27 (48.2)	54 (96.4)
Do not Know / Did not respond ^a	54 (4.4)			
Father's occupation^b, n (%)				
Unskilled/Semiskilled	430 (35.1)	249 (57.9)	202 (46.9)	399 (92.8)
Skilled	514 (42.0)	326 (63.4)	237 (46.1)	487 (94.7)
Clerical/ Semi-professional/ Professional	229 (18.7)	149 (65.0)	120 (52.4)	209 (91.2)
Do not Know / Did not respond ^a	51 (4.2)			
Mother's occupation^b, n (%)				
Unemployed/Housewife	1009 (82.4)	623 (61.7)	486 (48.2)	945 (93.7)
Unskilled/Semiskilled	60 (4.9)	38 (63.3)	29 (48.3)	54 (90.0)
Skilled	95 (7.8)	57 (60.0)	45 (47.4)	88 (92.6)
Clerical/ semi-professional/ Professional	26 (2.1)	18 (69.2)	14 (53.8)	24 (92.3)
Do not Know / Did not respond ^a	34 (2.8)			

a Do not Know / Did not respond is not included in analysis
b Classification of occupation is according to Gazette of India-E/801/2010/001
c Denominator of the proportion is the row value from column of all students

The TPB questionnaire had good internal consistency (Cronbach's alpha 0.761) with all 28 items of questionnaire. The questions assessing TPB constructs for specific target behavior were acceptable (0.686 for 9 items assessing consumption of healthy foods, 0.678 for 9 items assessing limiting unhealthy foods, and 0.615 for 10 items assessing tobacco avoidance).

Dietary practices and tobacco related behaviors

Among all students, majority reported consuming fruits (70.8%) and vegetables (82.3%) daily in the past one week and nearly two third (61.4%) students consumed both. Consumption of fried or fast food was limited to maximum twice a week by 62.2% students, whereas the limiting of packed foods and SSB was reported by 59.3%. Nearly half (48%) of the students reported limiting fast food, fried foods, packed food and SSB consumption to maximum twice a week.

Only few students reported use of tobacco ever (83, 6.8%). Smoking tobacco ever was reported by 65 (5.3%) students. Of these, majority reported smoking only once in lifetime (35, 53.8%), followed by more than once but not currently smoking (26, 40%). Ever use of smokeless tobacco products was reported by 63 (5.1%) students, with majority (41, 65.1%) reporting use of it only once in lifetime and about one fourth (18, 28.6%) more than once.

Current use of tobacco in any of its form was reported by six students, of which two were consuming both smokeless and smoking forms, two only smokeless and two were only smoking. Among current users of

only one form of tobacco, one from each smoking and smokeless users reported as past user of other form as well.

Constructs of TPB

For dietary behaviors, the mean scores of TPB constructs were higher for consuming healthy foods compared to limiting unhealthy food consumption. Mean scores of TPB constructs for tobacco avoidance were favorable for all domains. (Figure 2)

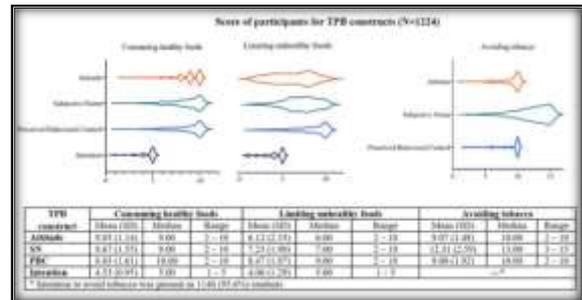


Figure 2: Kernel density plot of responses of participants for questions on TPB constructs

Determinants of behaviors

Bivariate analysis revealed that all three targeted behaviors were significantly different among the participants for gender, attitude, PBC and intention. Influence of education of mother was significantly different for healthy food consumption, and age was a significant covariate for tobacco use. SN was found to have significant difference only for dietary behaviors. [Table 1, Table 2]

Table 2: Scores of TPB constructs for specific target behaviors, mean (SD) (N=1224)

TPB Construct	Have you consumed fruits and vegetables daily			Have you limited fried and fast food & packed food and SSB			Have you used tobacco in any form		
	Yes	No	p ^a	Yes	No	p ^a	Never	Ever	p ^a
Attitude	9.19 (1.02)	8.77 (1.27)	<0.001	6.59 (2.30)	5.69 (2.26)	<0.001	9.11 (1.45)	8.43 (1.76)	0.001
SN	8.85 (1.50)	8.36 (1.59)	<0.001	7.55 (1.86)	6.93 (1.90)	<0.001	12.34 (2.59)	11.92 (2.66)	0.153
PBC	9.07 (1.46)	8.45 (1.75)	<0.001	8.79 (1.65)	8.17 (2.00)	<0.001	9.05 (1.89)	8.31 (2.19)	0.004
Intention	4.59 (0.87)	4.42 (1.04)	0.002	4.49 (1.14)	3.85 (1.40)	<0.001	1079 (94.6)#	67 (80.7)#	<0.001 ^b

#Intention to never use tobacco was measured as dichotomous variable and is shown as n (%)
 a Independent student t-test is used
 b Chi-square test is used
 PBC: Perceived Behavioral Control, SN: Subjective Norm

Regressing sociodemographic variables revealed significant role of female gender in determining consumption of healthy foods (B= 0.541, OR 1.717), limiting unhealthy foods consumption (B= 0.339, OR 1.404), and tobacco product avoidance (B= 1.583, OR 4.869). Tobacco avoidance declined significantly with increase in age (B= -0.335, OR 0.716). Education of mother up to primary (B= 0.341, OR 1.406) or middle school (B= 0.366, OR 1.442) was a significant influencer for healthy food consumption. After adjusting for demographic factors, attitude of participants significantly determined all three target

behaviors (Consuming healthy foods: B= 0.202, OR 1.224; Limiting unhealthy foods: B= 0.135, OR 1.144; Tobacco avoidance: B= 0.157; OR 1.170). Perceived control (PBC) of participants significantly determined both diet related behaviors (Consuming healthy foods: B= 0.141, OR 1.151; Limiting unhealthy foods: B= 0.116, OR 1.123), but intention was significant determinant only for limiting unhealthy food consumption (B= 0.129; OR 1.137). Tobacco avoidance was also significantly associated with intention of participants (B= 1.220; OR 3.388). In model 3 the consumption of healthy foods was

significantly higher for female participant (B= 0.375; OR 1.456), of those with educated mothers till primary school level (B= 0.375; OR 1.455), and interactive association of SN and PBC (B= 0.058; OR 1.060). Interactive association of intention with PBC (B= 0.060; OR 1.062) significantly determined limitation of unhealthy foods but was found to be

reversed for SN*Intention (B= -0.64; OR 0.938). Lower age (Increasing age B= -0.351; OR 0.704), female gender (B= 1.508; OR 4.517) and those with intention (B= 4.186; OR 65.748) had significant higher tobacco avoidance. No significant interactive association was identified for tobacco avoidance. [Table 3]

Table 3: Determinants of behaviors among students.

Determinants	Consuming fruits and vegetables daily in last one week ¹			Limiting fried & fast food and packed food & SSB to maximum twice in last one week ²			Never used tobacco in any form ³		
	B	OR	p	B	OR	p	B	OR	p
Step 1. Sociodemographic determinants									
Age	-	-	-	-	-	-	-0.335	0.716	0.002
Gender (Male=0)	.541	1.717	<0.001	.339	1.404	0.009	1.583	4.869	<0.001
Education of mother	-	-	.116	-	-	-	-	-	-
Primary school	.341	1.406	.029	-	-	-	-	-	-
Middle school	.366	1.442	.033	-	-	-	-	-	-
Secondary school	.285	1.330	.155	-	-	-	-	-	-
Senior secondary and above	.317	1.373	.291	-	-	-	-	-	-
R ²	0.030			0.007			0.118		
Step 2. Constructs of TPB									
Age	-	-	-	-	-	-	-0.364	0.695	0.001
Gender (Male=0)	.399	1.491	.004	.265	1.303	0.051	1.510	4.525	<0.001
Education of mother	-	-	.198	-	-	-	-	-	-
Primary school	.355	1.426	.027	-	-	-	-	-	-
Middle school	.295	1.343	.093	-	-	-	-	-	-
Secondary school	.233	1.262	.256	-	-	-	-	-	-
Senior secondary and above	.228	1.256	.454	-	-	-	-	-	-
Attitude	.202	1.224	.001	0.135	1.144	<0.001	0.157	1.170	0.028
SN	.066	1.068	.147	0.067	1.069	0.059	-	-	-
PBC	.141	1.151	.001	0.116	1.123	0.002	0.064	1.066	0.260
Intention	-.005	.995	.945	0.129	1.137	0.016	1.220	3.388	0.001
R ²	0.081			0.094			0.167		
Step 3. Interaction of TPB constructs									
Age	-	-	-	-	-	-	-0.351	0.704	0.001
Gender (Male=0)	.375	1.456	.007	.255	1.291	.063	1.508	4.517	<0.001
Education of mother	-	-	.176	-	-	-	-	-	-
Primary school	.375	1.455	.020	-	-	-	-	-	-
Middle school	.294	1.342	.096	-	-	-	-	-	-
Secondary school	.223	1.250	.277	-	-	-	-	-	-
Senior secondary and above	.211	1.235	.489	-	-	-	-	-	-
Attitude	.265	1.303	.400	-.082	.921	.620	-0.195	0.823	0.526
SN	-.442	.643	.237	.183	1.201	.317	-	-	-
PBC	-.545	.580	.156	-.218	.804	.136	-0.373	0.689	0.219
Intention	.741	2.099	.221	.048	1.050	.870	4.186	65.748	0.047
Attitude*SN	.000	1.000	.992	.015	1.015	.286	-	-	-
Attitude*PBC	.032	1.032	.414	.011	1.011	.523	0.066	1.068	0.064
Attitude*Intention	-.076	.927	.240	.004	1.004	.877	-0.240	0.787	0.242
SN*PBC	.058	1.060	.021	.008	1.008	.709	-	-	-
SN*Intention	.006	1.006	.885	-.064	.938	.049	-	-	-
PBC*Intention	-.015	.985	.683	.060	1.062	.017	-0.154	0.857	0.290
R ²	0.091			0.108			0.176		
PBC: Perceived Behavioral Control, SN: Subjective Norm									
Significant results are marked in bold									

DISCUSSION

Limited studies from India and other south-east Asian countries have explored TPB constructs for determining dietary and tobacco behavior among school going adolescents.

Our study's findings were comparable to study conducted by Khabaz et al. where daily fruit

consumption and limitation of unhealthy foods consumption was present in majority participants.^[16]

Higher consumption of daily fruit and vegetable intake (61.4%) among our study participants as compared to Boucher et al,^[17] (25.6%) may be attributed to difference in dietary preferences of concerned populations. Mean scores for attitude, SN and PBC towards healthy dietary choices were

desirable and comparable to other studies.^[17,18] Mean scores of TPB constructs for limiting unhealthy foods were towards neutral side also previously reported by Ma et al., Sharifirad et al., Dunn et al., and Seo et al.^[8,9,19,20]

Prevalence of current tobacco users (smoking and non-smoking products) was lower compared to other studies from India.^[15,21] This could be due to differences in socio-cultural factors, higher proportion of females in the study, and differences in the study tools.¹⁵ However, measures in our study are used previously and have shown good reliability and validity.^[22]

Sociodemographic variables and interaction of the TPB constructs were included to overcome limitations as explained by Sniehotta et al,^[23] Preference of healthy diet and avoidance of tobacco by females is reported previously.^[24] Role of gender can be explained by differences in beliefs and perceptions in food selection,^[25] and social unacceptability of tobacco for females.^[26] Increasing age had significant predictive association with decrease in tobacco avoidance or increasing tobacco use similar to available evidence from published literature.^[26] Students with literate mothers reported better consumption of healthy foods. This positive effect of literacy of mother is consistent with findings of Comprehensive National Nutrition Survey, India.^[27]

The dietary practice of consuming healthy food was significantly determined by interaction between PBC and SN while for limiting unhealthy food consumption was determined by interaction of intention with SN and PBC. PBC*Intention had beneficial effect whereas the SN* Intention had harmful effect on limiting unhealthy foods. Interaction of self-perception and intention for dietary behavior is previously discussed.^[8] This shows that the interplay of the TPB constructs has more importance than individual constructs and is required to be studied further in future research. In current study, SN does not significantly predict the behaviors individually but play significant role by interacting with PBC and intention. This must be explored in future research while designing and evaluating intervention models for adolescents.

Intention alone with age and female gender significantly determined tobacco avoidance. Contrasting the dietary behaviors, antecedents of intention from TPB framework (attitude, SN, and PBC) were not associated with tobacco avoidance. Limited role of beliefs of the adolescents must be interpreted in background of stigma related to tobacco use among adolescents along with other social and environmental factors.^[26] Intention as an important predictor of tobacco avoidance is previously reported.^[28] Future research need to explore adolescents 'intention in behavioral models while factoring for tobacco related socio-cultural practices. Influencing role of attitude, SN and PBC among adolescents for predicting healthy food consumption as compared to limiting unhealthy

foods is an important area to be validated through future research.

This study being a cross-sectional analysis, the causal nature of the TPB constructs towards dietary and tobacco related behavior cannot be determined. Our study included participants only from urban government schools, limiting the generalizability of the results. Nevertheless, the current study findings provide essential insights for developing intervention models as the study group represents a large population sub-group. In the present study, inclusion of more girls as compared to boys was observed. Preference of low cost government schools for education of girls might explain higher enrolment of girls in selected government schools, previously reported by Annual Status of Education Report 2019 and Bandyopadhyay.^[29,30] Self-reporting and dichotomous nature of assessment of behavior in current study might under-estimate actual consumption of unhealthy foods by participants.^[8] Despite these limitations our study is one among few in India assessing predictors of dietary and tobacco related behaviors using theoretical framework of a behavior change theory among large sub-group of school going adolescents.

CONCLUSION

Our study shows that consuming healthy and avoiding unhealthy food is practiced only by approximately half of the school going adolescents. Role of subjective norms, perceived behavioral controls, and intention along with their interaction predicts dietary behavior and must be considered while designing future intervention. Tobacco avoidance was high among the adolescents. Increase in age, male gender and intention were observed to be significant predictors and must be targeted to prevent the use of this habit-forming substance. Role of interaction between TPB constructs along with socio-demographic and environmental factors has potential to generate greater understanding of behavioral patterns among adolescents and must be explored in future research.

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