

Using the Theory of Planned Behavior to Explain Intent to Consume Sugar-Sweetened Beverages among Secondary School Students

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Abstract

Background: The high prevalence of overweight and obesity in children is closely correlated with the increasing consumption of sugar-sweetened beverages (SSBs). The purpose of this study was using the theory of planned behavior (TPB) to explain intent to consume SSBs among secondary school students.

Materials and Methods: This descriptive-analytical (cross-sectional) study was conducted on 416 secondary school students selected using multi-stage cluster sampling. Data collection instrument was a three-part questionnaire including students' characteristics with 4 items; students' beliefs toward SSBs based on the TPB with 13 items; and the amount of daily consumption of SSBs and water with 2 items. The collected data were analyzed using descriptive and analytical tests, Pearson's correlation coefficient and linear regression in the SPSS (version 22.0).

Results: The results showed that the average age of the participants was 13.91 ± 0.78 years. The prevalence rate of overweight and obesity in students was reported 21.6%. The amount of SSB use among students was unsatisfactory (3.87 glasses per day), while daily water consumption was reported 1.75 glasses per day. In addition, the findings indicated that students' attitude and perceived behavioral control ($P < 0.001$) had a statistically significant association with intent to reduce consumption of SSBs, and those constructs explained 27% of variance of students' intention.

Conclusion: Among the variables related to the TPB, attitude and perceived behavioral control were effective factors on students' intention toward consumption of SSBs. Hence, by using the present findings, health care providers can plan, implement and evaluate suitable interventions to reduce the consumption of SSBs in students.

Key Words: Obesity, Student, Sugar, Sweetened Beverages, Theory of Planned Behavior.

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1- INTRODUCTION

The high prevalence of obesity in children, as a major health problem, is correlated with the poor quality of the consumed diets (1, 2), and a large increase in consumption of sugar-sweetened beverages (SSBs) (3-5). These beverages are obesogenic compared to other fatty foods due to lack of satiety in people (6). Therefore, children who consume high levels of SSBs cannot regulate the energy received from other foods and beverages. As a result, high total energy intake during the day leads to overweight and obesity of children (7), which in turn increase metabolic diseases such as metabolic syndrome, cardiovascular and cancer in adulthood (8). According to the harmful effects of excess sugar consumption on health, it is recommended that less than 10% of the daily energy be supplied by consuming simple sugars. For example, a person who needs 2000 kilocalories a day can supply less than 200 calories (about 50 gr) by sugar, but it has been reported that children receive about 8% of this recommended amount (less than 10%) through SSBs with the exception of other simple sugars (9).

The World Health Organization (WHO) introduces water as a safe, non-calorie and sugar-free drink instead of SSBs, but reports suggest that about 60 percent of children and adults consume two cups of water per day and roughly 13 percent of them do not use water at all during the day (10). Due to the low consumption of water by the people, there is a need to think about the replacement of SSBs with water (11). Obesity results from an imbalance in the body's sustained intake of energy. However, the true mechanism of this process and the strategy of preventing and treating obesity is still unknown. Overall, obesity is affected by the complex interactions of genetic factors, metabolism, and culture, environmental, economic, and behavioral factors (12). Since a large part

of the population is formed by children and their physical, psychological, and social health has specific importance. So desirable nutrition is essential for their health (13). Therefore, according to the above, attempts to change the nutritional behavior of adolescents including reducing the adoption of undesirable diet, can definitely help reduce the prevalence of obesity and other diseases in children (14).

To explain the behavior, there are several behavior change theories. One of those is the theory of planned behavior (TPB). The TPB is a cognitive theory that provides a useful framework for predicting and identifying health-related behaviors (15, 16). According to this theory, intention is the main determinant of behavior. The intent of the individual is influenced by three factors of attitude, subjective norms (social pressures for behavior), and perceived behavioral control (degree of difficulty or ease of doing behavior) (17).

The predictability of the TPB in many social and behavioral studies has been proven (18), and in particular, in choosing healthy dietary behaviors (15, 19-21). Based on the above, the researchers decided to design and test a study aimed at predicting intent to consume SSBs based on the TPB among secondary school students. The results of this research can help health care providers to design, implement and evaluate appropriate interventions for reducing the consumption of these obesogenic beverages among students.

2- MATERIALS AND METHODS

2-1. Study design and population

This descriptive-analytical (cross-sectional) study was carried out on 416 students of secondary schools in Khoy city, West Azerbaijan province, North West of Iran. The study samples were selected using multi-stage sampling method. First, Khoy city was divided into

two central and peripheral districts, then a list of secondary schools was extracted from the Khoy Education Department. Four boys' schools and four girls' schools were randomly selected from each district (total of 16 schools). Then, in proportion to the number of students studying at different levels of education in these schools, the study samples (416 students = 200 girls and 216 boys) were randomly selected and entered into the study using simple random sampling method.

2-2. Inclusion and exclusion criteria

The inclusion criteria for the present study were: Providing written consent of parents and school administrators for entering the students to the study, Lack of metabolic diseases and other problems in students that reflect their obesity according to medical history of diseases in participants. Unwillingness of student to take part in the study was considered as an exclusion criterium.

2-3. Measuring tools

The data collection tool was a self-reported-original questionnaire and was derived from a study entitled "The prediction of obesity-related behaviors using the TPB in the 7th and 8th grade students" by Ickes (22). This 19-item questionnaire was comprised of three parts: *Part 1*. Students' characteristics with 4 items [age, gender, academic year and body mass index (BMI)]. To calculate the BMI, a student's weight and height measurements are inserted into a formula to produce an index of the relationship between weight and height. *Part 2*. Subscales of the TPB including students' perceived attitude towards reducing the consumption of SSBs with 4 items, for example: "If I use water instead of SSBs, I'll lose my extra weight or maintain my own normal weight"; students' subjective norms with 4 items, for example: "My family's recommendations make me use water instead of SSBs"; students'

perceived behavioral control with 4 items, for example: "Eating sweetened beverages is more satisfying than drinking water"; and Intent to do behavior with 1 item.

Part 3. Students' consumption of SSBs and usual water was measured with 2 items. The study instrument was translated from English to Persian using a standard forward-backward translation technique (23). The original instrument was translated by a bilingual specialist who spoke and wrote fluently in both languages. The Persian version was then back translated into English by two independent bilingual professionals to monitor retention of the original meaning in the source language.

Next, the translators worked separately during the back-translation process, and then a final version of the Persian translation was prepared. The final Persian translation version was examined by a panel of Iranian experts including three health education specialists, two pediatric specialists, two midwifery specialists and three nutritionists (n=10 in total) to determine the cultural appropriateness and validity of the translated questionnaire. For this purpose, researchers applied Quantitative Content Validity (QCV).

The QCV was determined by Content Validity Ratio (CVR), and Content Validity Index (CVI). The expert panel including 10 academics scored each item using a 3-point Likert questionnaire including '3: essential', '2: useful but not essential', and '1: unessential' for calculating CVR. Then, the items with CVR 0.62 or above were selected according to Lawshe's table (24). The CVI was another approach taken for measuring content validity of the research questionnaire applied by researchers. In this approach, the panel of experts are asked to rate each item of the instrument in terms of relevancy and clarity and score each item from 1 to 4 with a four-point scale of 1=not relevant, 2=somewhat

relevant, 3=quite relevant, 4=highly relevant or 1=not clear, 2=needs some revision, 3=clear but needs minor revision, 4=very clear (25). A CVI score equal to 0.8 or higher indicated the appropriateness of the content validity (26). All items related to subscales of TPB were scored based on a 5-point Likert scale ranging from 1 "strongly disagree" to 5 "strongly agree". The scores of the sections of attitude, subjective norms and perceived behavioral control were finalized proportionate for 100. The reliability of the questionnaire was measured by Cronbach's alpha test on 30 students who were similar to the main population studied. Cronbach's alpha coefficient of the construct of attitude towards the consumption of SSBs, subjective norms, perceived behavioral control was 0.81, 0.74, and 0.77, respectively.

2-4. Data Analyses

The collected data were analyzed using descriptive statistics (such as frequency, mean and standard deviation), and inferential statistics (Pearson correlation coefficient and linear regression tests) using SPSS software version 22.0. P-value less than 0.05 was considered significant in all statistical analyses.

2-5. Ethical consideration

This manuscript was extracted from a proposal with the Code of Ethics (IR.UMSU.rec.1394.298) approved by the Ethics Committee of Urmia University of Medical Sciences. In addition, written consent was received from all participants and all the principals of the research ethics related to the Helsinki Statement were respected.

3- RESULTS

In this study, 416 students with an average age of 13.19 ± 0.78 were studied. Two hundred and sixteen of them (51.9%) were boys and the remaining (48.1%) were

girls. On average, daily intake of water in students was 1.75 glasses (each glass is equal to 250 ml), but the daily consumption of SSBs among the samples was estimated 3.87 glasses. The prevalence of overweight and obesity among the students was reported 21.6% (18.5% in girls, and 24.5% in boys). The overview of characteristics of the samples is presented in **Table.1**. The mean score of different constructs of the TPB about reducing the consumption of SSBs and its substitution with water has been shown in **Table.2**. As students' attitude toward low intent to consume SSBs had high mean score (62.29 ± 29.22) compared to other constructs of the proposed theory.

In order to determine correlation between the TPB variables and baseline characteristics factors with intent to reduce the consumption of SSBs and their replacement with usual water intake, we utilized Pearson correlation coefficient. The results of correlation analysis indicated that there was a positive and significant correlation between the TPB constructs and baseline characteristics with the intention to reduce the consumption of sweetened beverages ($p < 0.05$). Among these factors, students' perceived attitude had a strong significant correlation with their intention ($r = 0.423$, $p < 0.001$). More information regarding correlation among other constructs of TPB and the individual factors with the reduction of consuming SSBs and their replacement with water intake are presented in **Table.3**.

To determine the real predictors of intention to reduce the consumption of SSBs, regression analysis with stepwise method was used. In this regression analysis, the significant variables in correlation analysis were entered to the regression model. The regression results showed that students' attitude and perceived behavioral control were the ultimate predictors of intent to reduce consuming SSBs. These variables were

able to explain 27% ($R^2 = 0.267$) of the consumption of SSBs (Tables 4, 5).
variance related to the intention to reduce

Table-1: The baseline characteristics of the participants in two sex groups (n=416)

Variables	Female (n=200)	Male (n=216)	Total
Categorical variables	Number (%)	Number (%)	Number (%)
Academic year			
First	71(35.5)	75(34.7)	146(35.1)
Second	78(39)	85(39.4)	163(39.2)
Third	51(25.5)	56(25.9)	107(25.7)
BMI			
Less than 18.5(thin)	37(18.5)	32(14.8)	69(16.6)
18.5-24.9(Natural)	126(63)	131(60.6)	257(61.8)
25 and more (Overweight and obese)	37(18.5)	53(24.5)	90(21.6)
Continuous variables	Mean \pm SD	Mean \pm SD	Mean \pm SD
Age, year	13.90 \pm 0.78	13.92 \pm 0.77	13.91 \pm 0.78
Daily intake of water per glass (250 ml)	1.72 \pm 1	1.77 \pm 1.13	1.75 \pm 1.02
Daily intake of SSBs per glass (250 ml)	3.87 \pm 0.87	3.86 \pm 0.98	3.87 \pm 0.93

* SD: standard deviation; BMI: body mass index; ml: milliliter.

Table-2: The mean score of the TPB subscales towards SSBs in students (n=416)

Variables	*Mean \pm SD	Maximum	Minimum
Attitude	62.29 \pm 7.29	80	40
Subjective norm	57.76 \pm 6.68	75	35
Behavioral control	54.81 \pm 7.26	80	25
Intention	61.22 \pm 11.57	90	30

*The scores of the TPB subscales were finalized proportionate for 100; SD: Standard deviation.

Table-3: Results of correlation matrix between independent variables and dependent variable (n=426)

Variables		Age	BMI	Attitude	Subjective norm	Behavioral control	Intention
Intention	r	0.078	*-0.356	*0.423	*0.183	*0.379	1
	p	0.110	0.000	0.000	0.000	0.000	

*P < 0.01 is significant; r= Pearson Correlation Coefficient; BMI: Body Mass Index.

Table-4: The results of multivariate regression analysis in prediction of intent to reduce consumption of SSBs in students (n=416)

Criterion variable	Predictive variables	Correlation (R)	R ^{2*}	Adjusted R ^{2**}
TPB construct	Attitude	0.423	0.179	0.177
	Attitude and Perceived Behavioral Control	0.517	0.267	0.264

* R²: R-squared; **Adjusted R²: Adjusted R-squared.

Table-5: Results of multiple regression analysis on behavioral intention to reduce consumption of SSBs (n=416)

Model	Changes source	Non-standard coefficients		Standard coefficients	t- value	Significant level
		B	Std.Error	β		
1	Constant value	19.392	0.443	4.375	0.000
	Attitude	0.672	0.071	0.423	9.523	0.000*
2	Constant value	0.889	5.081	0.175	0.861
	Attitude	0.571	0.089	0.360	8.349	0.000*
	Perceived Behavioral Control	0.485	0.068	0.304	7.063	0.000*

*P<0.01 is significant (2-tailed); Std.Error: Standard Error; B: Unstandardized regression Coefficient; β : Beta coefficient.

4- DISCUSSION

The aim of this study was to investigate the psychological factors associated with the intention to reduce the consumption of SSBs in students using the TPB. According to the results of this study, the prevalence of obesity and overweight among students was 21.6% (18.5% in girls and 24.5% in boys), and consumption of SSBs such as lemonade, soda, tea with sugar, drinks made from fruit powder, and energy drinks, etc. was reported 3.87 glasses per day; while water consumption among students was 1.75 glasses per day. In fact, drinking SSBs is double water consumption, as a healthy drink, among students. The previous studies also confirm and support our findings. For instance, the study conducted by Van De Gaar et al., highlighted that children's SSBs consumption was 0.9 liter per day (27). It can be said that the consumption of SSBs has recently risen about 300 percent among students compared to over 20 years ago. In other words, about 50 to 85 percent of school children have a history of the consumption of SSBs at least once a day (28), which is consistent with our study. In order to increase the effectiveness of interventions to reduce the consumption of SSBs in children, it is necessary to identify the determinants of these beverages in this population (3). The findings of the current

study indicated that all variables of the TPB such as students' perceived attitude, subjective norm and perceived control had a significant positive correlation with the intention to reduce the consumption of SSBs and replacing SSBs with water. The attitude was the strongest and most effective construct on behavioral intention, and it alone explained 18% of variance of the intention to reduce the consumption of SSBs in students. Findings of Van De Gaar et al. and van der Horst et al., were in line with our study. They found that children's attitude plays a main role in reducing consumption of SSBs (27, 29). The behavioral control construct was the second construct of the theory of behavioral control that explained the behavioral intention of reducing the consumption of SSBs in students. Rezabhi Davarani et al. (2000) considered the perceived behavioral control as the most influential structure on the intention of healthy nutritional behaviors and emphasized the strengthening of this construct as an effective step to promote healthy nutritional behaviors (30). But in the study of Ickes, perceived behavioral control construct was considered a poor predictor of the replacement of consumption of SSBs with water in students (22). Contradictory results of studies may be due to the cultural, social and environmental differences of the studied populations (31).

Although there was a positive and significant correlation between subjective norm and intention to reduce the consumption of SSBs in students, this construct in model of regression analysis was not a predictive variable. Nevertheless, Van DiGar et al. in their study emphasized the positive impact of subjective norm on intention to use SSBs among children (27). Therefore, parents, as an important model, can play an effective role in shaping the attitudes and beliefs of children about their daily drinking and eating habits (32, 33). In other words, parents are involved in shaping the preferences and diet of their children in different ways (29); for example, the use of food as a reward for providing satisfaction of children (34), the control of the type and amount of food consumed by children (35-36), the influence of parents on the children's taste in choosing the taste of foods and access to SSBs with a large variety in the home can have a major impact on children's consumption of these beverages (29). Therefore, these factors should be considered in designing interventions in order to change children's nutritional behaviors (29). Zoellner et al. (37), and Renatha Pacific (38), also point out the importance of the TPB in describing the behavior of the consumption of sweetened beverages.

In sum, the TPB constructs were able to explain about 27 percent of variance of intention to reduce the consumption of SSBs among students. In addition to the TPB variables, some baseline characteristics such as BMI influence children's intention. The statistical analyses showed a significant negative correlation between BMI and intention to reduce the consumption of SSBs. It means that those with high BMI have a lower intention to reduce the consumption of SSBs. In a study by Collison and colleagues among students, it has been suggested that there is a positive

correlation between the BMI and the choice of consuming unhealthy dietary foods, such as receiving SSBs, and fast food. In this study, this relationship was reversed in relation to the selection of healthy diets such as milk, fruits and vegetables with the body mass index of students that is consistent with the study (39). However, it should be noted that children's tendency to SSBs can be affected by some non-behavioral factors such as availability, easy preparation of these drinks from the school buffets, the varied taste of these beverages, and advertising for the purchase of this beverage from mass media, etc. (40). It is hoped that by doing further studies in this field, informing the community and authorities, and designing beneficial policies and interventions, it would be possible to reduce the consumption of these sweet and harmful drinks.

4-1. Limitations of the study

The limitation of the study included self-reporting questionnaire. However, attempts were made to reduce this limitation by expressing the goals of the study and reassuring students about the confidentiality of their information.

5- CONCLUSION

According to the results of this study, it was found that the TPB predicts 27% of the variance of intention to reduce the consumption of SSBs in secondary school students. Attitude and perceived control were respectively the strongest predictors of the intention to reduce the consumption of SSBs and its replacement with usual water. Therefore, the results of this study can be beneficial to design, implement, evaluate appropriate interventions and strategies for reducing SSBs intake, control and prevention of overweight and obesity in children.

6- CONFLICT OF INTEREST: None.

7- ACKNOWLEDGMENT

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