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Research article

Urban consumers' attitudes and willingness to pay for functional foods in Iran: A case of dietary sugar

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Abstract: Growing concerns for the incidence of incurable diseases and high costs of health care have attracted consumers to functional foods in the world. These foods are characterized with health improvement, lower risk of disease incidence and less health hazards. The present work examined consumers' attitude and willingness to pay for dietary sugar in Rasht city, Iran. The studied sample included 125 citizens of Rasht in spring and summer of 2016 whose size was determined by Mitchell and Carson approach. Results of contingent valuation method on the basis of one-and-one-half-bound choice model revealed that the descriptive variable of bid had negative, statistically significant impact on the acceptance of bid by participants. In addition, the descriptive variables of respondent's age, educational level, family size, monthly income of the family, record of diabetes in family, healthy purchase attitude, and attitude towards the benefits of dietary sugar had positive, significant influence on bid acceptance. Participants expressed their willingness to pay 35.59% extra for dietary sugar as compared to conventional sugar.

Keywords: contingent valuation method; Functional food; one-and-one-half-bound choice model (OOHB); interval of standard deviation from the mean (ISMD); willingness to pay (WTP)

1. Introduction

The high occurrences of diet-related diseases such as obesity, cancer, diabetes and cardio-vascular diseases has prompted consumers to turn their attention to the consumption of foods which reduces the likelihood of such diseases occurring [1]. Consumers' growing attention to health, diet and nutrients has resulted in a growing trend of demand for functional foods around the world. The term *functional food* was first introduced in Japan in 1985 and it is, by definition, a food or ingredient which is, in addition to its nutritional property, processed in a way to benefit consumer health [2]. In Japan, it is identified as FOSHU—Foods for Specified Health Use, and it must be approved by the Minister of Health and Welfare after submission of comprehensive scientifically-based evidence in support of the properties of such foods when consumed as part of a normal diet [3]. Although there is no consensus on the definition of functional foods, it is generally characterized by features such as improved health, lower risk of disease incidence and less health hazards [4]. Functional foods' basic features include it being a conventional food composed of naturally occurring components which may enhance well-being and health and/or reduce the risk of disease, provide health benefits which may improve one's quality of life through improving one's physical, psychological and behavioural performances [5].

Well-known food processing brands widely use the term *functional* in naming their products as an advertising tool [6]. The functional food industry has grown considerably in the last three decades with the sales of functional food in the US alone increasing from $11.3 billion in 1995 to $18.5 billion in 2001 and $49 billion in 2010 [7]. The UK, Germany, France, Netherlands and Italy are the main markets for functional food in Europe [8]. The market share of functional food has increased from one percent in 2000 to five percent in 2013 showing that consumers are beginning to understand the positive relationship between health and proper food diet [9]. High demand for functional foods has also increased among the elderly and the increased costs of health care in many provide a good reason for the affluence of functional food market [10].

Japan is the first country that legally and comprehensively defined functional food and is one of the most developed markets for this type of food in the world, while most countries still lack the legal frameworks for the monitoring and assessment of these foods [11]. Policy-makers face two important issues in the development of these products; firstly, factors underpinning consumers' willingness for these products and secondly, distrust for the existence of the market for these products in future [12]. Therefore, it is very important to study consumers' perceptions and understandings of functional foods and to evaluate the demand for these products in the future.

The recent decades have witnessed a high prevalence of obesity, diabetes, and cardiovascular diseases throughout the world resulting in increased interest and use of low-calorie, or the so-called dietary, sweeteners in foods and beverages because of their low calorie and glycemic index [13]. This prompted food producers to embark on new product development to meet consumers' demand for healthier foods. Although sugar substitution in foods and beverage is not economical, the use of additives to improve nutritional status of foods is a main driver of the production of new products [14]. As consumers became more aware the impact of different diets on health, many consumers have modified their diet toward further healthy foods. In Iran, the demand of functional foods and the opportunities of development on the market seem to be quite favorable and the awareness of the consumers is relatively high. Moreover, Low-sugar products have become a huge trend in the food industry of Iran because food legislations move towards sugar reduction in food products.

Given the scarcity of literature in this field, researchers have recently begun to focus on consumers' demands, attitudes and preferences for functional foods.

Hu et al. studied consumers' perception and willingness to pay (WTP) for canola oil in Japan [15]. The authors reported that consumers expressed a higher WTP for organic or functional feature but lower WTP for genetically modified oils.

On the other hand, Markosyan et al. investigated consumers' WTP for apples enriched with antioxidants using contingent valuation method [16]. Their findings suggest that consumers' awareness of the possible health benefits of this product had positive, statistically significant impact on their WTP. Also, it was found that consumers were willing to make 7−10 percent extra payment for the apples enriched with antioxidants as compared to conventional apples.

Tra et al. investigated diabetics' WTP for two functional foods including diabetes milk and bone health milk in Vietnam [17]. Their findings indicate that 96 percent of respondents expressed a higher WTP for bone health milk than for conventional milk. They were also willing to pay 117−300 percent extra for this milk. Also, 95 percent of their sample expressed a WTP for diabetes milk rather than for conventional milk and a willingness to pay 200−500 percent extra for this kind of milk.

In an evaluation of WTP for functional foods in southern Chili, revealed that among 400 respondents, 59.8 percent expressed a high WTP for functional foods that prevent diseases or improve body performance [18]. Also, 14.5 percent expressed their high WTP for the functional foods that only improve body performance. However, 25.7 percent showed no WTP for functional foods.

Vecchio et al. investigated Italian consumers' willingness to pay (WTP) for conventional, organic and functional yogurts in two different information treatments [19]. Findings reveal that providing additional information through a specific health claim increases consumer's perceived value of the functional yogurt, while for the organic counterpart additional information on organic regulation does not add much to the premium. Moreover, our study shows that specific socio-demographic variables (as gender, age, presence of kids in the household and the need to follow a specific diet) positively affect WTP for functional and organic yogurts.

While functional foods are accepted and consumed easily in the USA, and are popular in most European countries, relatively little is known about how it is viewed in Iran [20]. Given Iran's high potential for the production of functional foods like dietary sugar and the novelty of their production in this country, the present study contributes to the existing literature regarding consumers' willingness to pay for functional foods, particularly dietary sugar of which production planning and marketing is of high importance.

2. Materials and Methods

Contingent valuation method (CVM) is a common method to measure willingness to pay (WTP) for goods and services. The first empirical use of this method dates back to Davis's work in 1963 [21]. In this approach, respondents are asked to express the amount of money they would be willing to pay for a certain item or service or willingness to accept (WTA) to give up a good rether than deducing the prices from what is observed in the markets [22,23].

2.1. One-and-One-Half-Bounded Dichotomous Choice

A recent interesting approach to infer data in CVM studies is the use of

one-and-one-half-bounded dichotomous choice (OOHB). In this approach, the respondent is offered with a range of bids $\left[B_i^D\ ,\ B_i^U\right]$ from the beginning, in which B_i^D is the lower bid and B_i^U is the higher bid. The interviewer randomly picks one of these two bids and asks interviewee to express his/her willingness to pay. The second bid is only offered if required; i.e. if the lower bid (B_i^D) is randomly drawn as the starting bid, three outcomes are possible due to respondent's response and the probability of offering a higher bid, that is, {no (N)}, {yes-no (YN)}, and {yes-yes (YY)}. Also, if the highest bid (B_i^U) is randomly drawn as the starting bid, three outcomes are possible due to respondent's response and the probability of offering a lower bid, that is, {yes (Y)}, {no-yes (NY)}, and {no-no (BB)}. Whilst an individual knows his/her WTP (Ci), it is a random variable with a certain cumulative distribution function (CDF) for observer. The variable is shown as $G\left(C_i\ ;\theta\right)$, where θ expresses distribution function that can be estimated on the basis of responses to CVM. These parameters are a function of vector variables Xi, appeared on the left side of $G\left(C_i\ ;\theta\right)$ [24]. Then, the probability functions corresponding to these responses are as follows [24]:

$$\pi_i^N\ =\ \pi_i^N\ \equiv pr\left\{C_i\ \le B_i^D\ \right\}=G\left(B_i^D\ ;\theta\right) \tag{1}$$

$$\pi_i^{YN}\ =\ \pi_i^{NY}\ \equiv pr\left\{\ B_i^D\ \le\ C_i\ \le B_i^U\ \right\}=G\left(B_i^U\ ;\theta\right)-G\left(B_i^D\ ;\theta\right) \tag{2}$$

$$\pi_i^{YY}\ =\ \pi_i^Y\ \equiv pr\left\{\ B_i^U\ \le C_i\ \right\}=1-G\left(B_i^U\ ;\theta\right) \tag{3}$$

According to the responses, the log likelihood function using the OOHP approach will be as follows [24]:

$$\begin{aligned}\ln\ L^{OOHB}\left(\theta\right)=\sum_{i=1}^{N}\left\{d_i^Y\ \ln\left[\ 1-G\left(B_i^U\ ;\theta\right)\right]\right\}+d_i^{NY}\ \ln\left[\ G\left(B_i^U\ ;\theta\right)-G\left(B_i^D\ ;\theta\right)\right]\\ +\ d_i^{NN}\ \ln\left[\ G\left(B_i^D\ ;\theta\right)\ \right]\end{aligned} \tag{4}$$

where, $\mathrm{d}_\mathrm{i}^\mathrm{Y}=1$ if the questions start with B_i^D and the response is (yes, yes) or if the questions start with B_i^U and the response is (yes); otherwise, $\mathrm{d}_\mathrm{i}^\mathrm{Y}=0$. Also, $\mathrm{d}_\mathrm{i}^\mathrm{NY}=1$ if the questions start with B_i^D and the response is (no, yes) or the questions start with B_i^U and the response is (no, yes); otherwise, $\mathrm{d}_\mathrm{i}^\mathrm{NY}=0$. Finally, $\mathrm{d}_\mathrm{i}^\mathrm{NN}=1$ if the questions start with B_i^D and the response is (no) or if the questions start with B_i^U and the response is (no, no); otherwise, $\mathrm{d}_\mathrm{i}^\mathrm{NN}=0$.

2.2. Sampling, instrument and data collection method

Sample size was determined by Mitchell and Carson's method, in which sampling is based on the principle that instead of minimizing the absolute value of WTP estimated through actual WTP in CVM, the bias percent of WTP estimated through actual WTP of the population should be minimized [25,26]. In this case, it is necessary to have an initial estimation of the coefficient of variation of WTP values. So, the following equation is used to calculate the coefficient of variation (V) [25]:

$$V\ =\frac{\delta}{TWTP} \tag{5}$$

where, δ is the standard deviation of WTP values expressed in pretest sample (30 people) and *TWTP* is the actual WTP. After determining the coefficient of variation ($\hat{V}$) on the basis of the pretest samples responses, sample size can be found by Mitchell & Carson [24]:

$$n = \left\lceil \frac{t \times \hat{\delta}}{d \times RWTP} \right\rceil^2 = \left\lceil \frac{t \times \hat{V}}{d} \right\rceil^2$$

Where, n is the sample size, t is the t-student value, *RWTP* is the WTP revealed by pre-test, and d is the difference between RWTP and TWTP in percent. The value of d is determined by researcher and shows how much bias from actual WTP in percent is accepted for the researcher. The acceptable value of d is 0.05−0.3 in valuation studies [24]. According to the results of the pre-test in the present study, the followings were considered: $\hat{V}$ = 0.57, d = 0.1, and t-statistic = 1.96. So, the sample size was estimated to be 125 participants who were the consumer of conventional sugar product.

A questionnaire was used to collect the data for the study. It comprised three main sections: Section 1 requested participants' demographic and socio-economical information, Section 2 requested responses regarding participants' intention or attitude towards functional foods, and Section 3 solicited participants' valuation of dietary sugar.

The validity of the questionnaire was measured by estimating content, face and factor validity. Two experts on functional foods and three academic professors were requested to examine the questionnaire and provide feedback on its face and content validity. Based on their feedback modifications were made to the questionnaire to satisfy the face and content validity. Thereafter, the questionnaire was administered to 30 Rasht citizens to complete as part of the pre-testing of the questionnaire. The Cronbach's alpha reliability coefficient was estimated to be 0.74 for attitude items of the questionnaire, implying an acceptable reliability [27].

The bids are designed in the OOHB approach by the method introduced by Boyle et al. known as complementary random numbers [21]. Accordingly, considering the bids proposed by respondents in the initial sample (30 people) to the open-end question about valuation of dietary sugar, five bid intervals including (5−25), (15−50), (20−70), (25−80) and (40−150) were selected for higher WTP for dietary sugar than for conventional sugar, and the sample size was equally distributed among these bids.

3. Results and Discussion

3.1. Socio-demographic information

Of the participants that completed the questionnaire, there were 66 percent male and 34 percent female. Their age ranged from 18 years to 72 years with the mean age being 29.54 years (SD = 12.88). Fifty two percent of the participants were in the 18−24 years age bracket. The average number of members per family was four members with the minimum number per family being two members and the highest being 7 members. Most (54%) participants' educational level was a B.Sc. degree. The mean monthly income of families was 40.06 M IRR (SD = 18.35). The lowest monthly income was found to be 10 M IRR and the highest one was 120 M IRR.

An examination of the family head's occupation in the studied sample revealed that five percent were expert, 69 percent were self-employed, 15 percent were civil servants, and 11 percent were laborers. Among the participants, 51percent responded that they knew nothing about functional foods and dietary sugar before studying the brochures of the questionnaire, and 49 percent stated that they were aware of functional foods. Also, 75 percent were not aware of the dietary sugar retailers in city, whilst 25 percent did know where they could purchase dietary foods.

Forty eight percent of the participants responded to having cases of diabetes in their family. Table 1 presents participants' most important demographic features.

Table 1. Participants' demographic features

Demographic feature	Frequency	Percent
Gender		
Male	82	66
Female	43	34
Age (years)		
18-24	65	52
25-34	33	26
35-44	9	7
45-54	8	6
55-64	7	6
≥ 65	3	2
Family size		
2	14	11
3	19	15
4	41	33
5	30	24
6	12	10
≥ 7	9	7
Educational level		
Illiterate	0	0
Under-diploma	7	6
Diploma	20	16
Associate degree	14	11
Bachelor's degree	68	54
Master's degree	15	12
Ph.D.	1	1
Family income		
< 19.99 M IRR*	5	4
20−39.99 M IRR	50	40
40−59.99 M IRR	49	39
60−79.99 M IRR	18	14
> 80 M IRR	3	2

*32000IRR ≈ $1US

3.2. Expenditure share of foods

The study of the share of foods and beverage in total monthly expenditure of the families revealed that the highest frequency was 42 percent for 40−50 percent category.

In terms of the share of candy, ice-cream, sweet beverage, and sugary food in total monthly foods and beverage expenditure, the highest frequency was found to be 64 percent for the category of 20−30 percent.

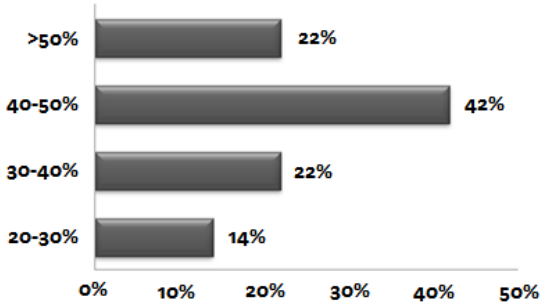

Figure 1. The share of foods and beverage in total monthly expenditure of the studied families

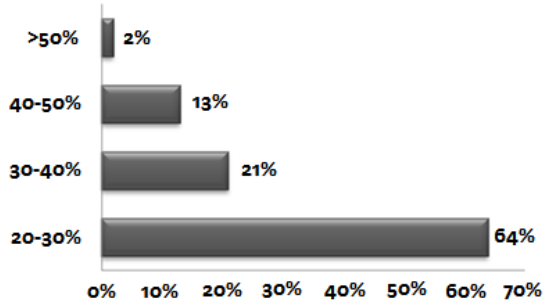

Figure 2. The share of candy, ice-cream, sweet beverage, and sugary food in total monthly foods and beverage expenditure in the sample families

3.3. Participants' attitudes towards functional food

In order to examine participants' attitudes towards functional foods, three attitude components, namely *general purchase* component, *healthy purchase* component, and the component of *attitude towards benefits of dietary sugar* were evaluated. Five items were designed for *general purchase* component, five items for *healthy purchase* component, and seven items for the component of *attitude towards the benefits of the dietary sugar*. The score of each participant was calculated for each component on the basis of his/her response to each item. Then, each participant's attitudes towards each component were divided into four categories of low, moderate, high and very high according to their score using the method of interval of standard deviation from the mean (ISDM). Table 2 presents the participants' responses to the items related to general purchase component.

The items in the general purchase component were scored on a five-point Likert scale ranging from "not important at all" to "extremely important". Among these items 'When buying sugar, how important is its taste, quality and freshness to you?" received the highest rate of importance from respondents (M = 4.12). According to ISDM equation, respondents were categorized into four groups given the mean importance M = 3.62 and SD = 0.85. Results revealed that 49.6% of respondents had good to high importance of general purchase of dietary sugar.

With regard to the healthy purchase component, items were scored on a five-point scale ranging from 1 (completely disagree) to 5 (completely agree). Among these items, 'It is important to me to know the sugar is healthy when buying "had the highest rate of agreement from respondents' point of view.

The five-point scale designed for the items related to the attitude towards the benefits of the dietary sugar included ‘completely disagree’ through ‘completely agree’. The responses given by participants to the items were used to calculate their scores. Then, ISDM indicated that 13.6% of participants (17 people) had low, 17.6% (22 people) had moderate, 61.6% (77 people) had high, and 7.2% (9 people) had very high attitude. Participants’ responses to items related to their attitude towards the benefits of the dietary sugar are summarized in Table 4.

Table 2. Percentage of participants’ responses to the items related to general purchase component

Item	Not important at all	Not important	Neutral	Important	Extremely important	Mean	SD
When buying sugar, how important is its price to you?	13.5	38.1	19.8	26.6	7.1	3.30	1.16
When buying sugar, how important is its taste, quality and freshness to you?	4	4	7.1	45.2	39.7	4.12	0.99
How important is access to sugar purchase to you?	3.2	18.3	24.6	41.3	12.7	3.42	1.03
When buying sugar, how important is good packaging to you?	7.1	6.3	16.6	44.4	24.6	3.74	1.12
How important is it to you to know the location of sugar factory?	5.6	18.3	22.2	36.5	16.7	3.41	1.14

M = 3.62, SD = 0.85

Table 3. Percentage of participants’ responses to items related to healthy purchase component

Item	Completely disagree	Disagree	Neutral	Agree	Completely agree	Mean	SD
It is important to me to know the sugar is healthy when buying.	0	4	8.8	54.4	38.2	4.16	0.75
I think sugar is a healthy food item.	13.6	34.4	28	20	4	2.66	1.07
Having the label of dietary on sugar is important to me	3.2	11.2	34.4	40	11.2	3.45	0.95
When buying, it is important to me to know if the sugar is dietary.	4.8	10.4	36.8	40	8	3.36	0.95
When buying, it is important to me to know the kind of sweetener used in (natural or artificial) sugar production	3.2	7.2	41.6	33.6	14.4	3.49	0.94

M = 3.42, SD = 0.61

3.4. Contingent valuation results

In this study logistic regression, also known as logit regression was used for the multivariate analysis to investigate valuation of dietary sugar by the participants. This is a useful tool for estimating the theoretical model in this study model and has been used widely in empirical

studies [28-30]. Emanating from the literature review the following descriptive variables were used in valuation model: bid (BID) and respondent's age (AGE), gender (GEN), educational level (EDU), family size (FMS), monthly family income (MFI), record of diabetes in family (FDR), share of foods and beverage in total monthly expenditure (SFB), share of candy, ice-cream, sweet beverage and sugar items in total monthly foods and beverage expenditure (SCS), general purchase attitude (GPA), healthy purchase attitude (HPA), and attitude towards benefits of dietary sugar (ABD).

Table 4. Percentage of participants' responses to items related to attitude towards the benefits of the dietary sugar

Item	Completely disagree	Disagree	Neutral	Agree	Completely Agree	Mean	SD
I think dietary sugar and conventional sugar have no difference in taste and flavor.	5.6	22.4	63.2	7.2	1.6	2.77	0.73
I think dietary sugar is healthier.	0	15.2	16	48	20.8	3.74	0.96
I think dietary sugar can reduce the risk of diabetes.	2.4	10.4	21.6	52	13.6	3.64	0.93
I think non-dietary sugar has no danger and has no difference with dietary sugar in nutritional value.	1.6	16.8	29.6	41.6	10.4	2.58	0.94
I think we need healthy food for healthy life. So, dietary production units, like dietary sugar, should be developed.	4.8	7.2	9.6	40.8	37.6	3.99	1.09
Informing people about the benefits of dietary sugar and the dangers of conventional sugar can improve willingness to consume dietary sugar.	2.4	10.4	12.8	47.2	27.2	3.86	1.01
I think the price difference of dietary and non-dietary sugar is reasonable.	2.4	16.8	32	40.8	8	3.35	0.94

M = 3.42, SD = 0.61

The bids used in questionnaires were designed by Boyle et al.'s approach based on valuation open-end responses in initial sample which included 30 questionnaires [21]. Accordingly, the dependent variable was designed on the basis of participants' responses (acceptance or rejection of bid for dietary sugar's prices higher than that of conventional sugar) to five bid series including (5−25), (15−50), (20−70), (25−80), and (40−150). Table 5 includes results for the fitting of the Logit model.

Table 5. Results of the Logit model fitting for the valuation of the dietary sugar

Variable	Regression coefficient	SD	z-statistic	Prob. level
BID	−0.077***	0.011	−6.79	0
AGE	0.047**	0.21	2.18	0.03
GEN	−0.628	0.516	−1.22	0.224
EDU	0.735***	0.265	2.77	0.006
FMS	0.305*	0.183	1.67	0.094
MFI	0.031*	0.016	1.92	0.055
FDR	0.9*	0.514	1.75	0.08
SFB	−0.288	0.235	−1.22	0.221
SCS	0.169	0.33	0.51	0.61
GPA	0.026	0.265	0.1	0.922
HPA	0.735**	0.324	2.27	0.023
ABD	1.5***	0.388	3.88	0
Intercept	−9.72***	2.33	−4.17	0

***, ** and * show significance at the 1%, 5% and 10% statistical level

The value of likelihood ratio was 197.67 for the fitted Logit regression. So, the general significance of the fitted regression is accepted given its probability level of 0. Also, the Pseudo determination coefficient was 57.42 percent for the fitted regression, indicating that the included descriptive variables accounted for as high as 57 percent of the variation of bids acceptance/rejection (dependent variable). Also, model correct classification statistic was found to be 88.4 percent, showing a high generalizability and predictive power of the model. AIC and BIC statistics were found to be 172.6 and 218.4 for the model, respectively.

The results reveal that the descriptive variable of bid had a negative, statistically significant impact on the bid acceptance/rejection. Furthermore, participants' age, educational level, family size, monthly income of the family, record of diabetes in family, healthy purchase attitude and attitude towards the benefits of dietary sugar influenced bid acceptance/rejection positively and significantly. The marginal effect and elasticity of the descriptive variables are presented in Table 6.

Table 6. Marginal effect and elasticity of the fitted Logit model for valuation of dietary sugar

Variable	Marginal effect	Z-statistic	Prob. level	Elasticity	Z-statistic	Prob. Level
BID	−0.007***	−13.28	0	−2.73***	−6.29	0
AGE	0.004**	2.27	0.02	0.799**	2.23	0.03
GEN	-0.057	−1.23	0.22	−0.108	−1.15	0.25
EDU	0.067***	2.96	0.003	1.7***	2.81	0.005
FMS	0.028*	1.71	0.08	0.75*	1.69	0.09
MFI	0.003**	1.97	0.05	0.59**	1.96	0.05
FDR	0.081*	1.8	0.07	0.184*	1.87	0.06
SFB	−0.026	−1.24	0.22	−0.43	−1.21	0.23
SCS	0.015	0.51	0.61	0.135	0.52	0.6
GPA	0.002	0.1	0.92	0.033	0.1	0.92
HPA	0.067**	2.37	0.02	0.894**	2.31	0.02
ABD	0.136***	4.42	0	1.564***	3.96	0

***, ** and * show significance at the 1%, 5% and 10% statistical level

Since the regression coefficients of GEN, SFB, SCS and GPA were not statistically significant; simultaneous omitting of mentioned variables was tested. The calculated statistic was 2.7, given its probability level of 61%, the simultaneous omitting (null hypothesis) is accepted for these coefficients.

The expected willingness to pay extra per kg dietary sugar was found to be 35.59% as compared to conventional sugar after removing insignificant regression coefficients. So, the participants expressed willingness to pay 35.59% extra for each kg dietary sugar as compared to conventional sugar. Given that more than half the sample (51%) knew nothing about functional food prior to this study, this is a remarkable finding. One may infer from these results that the higher the literacy level of participants the higher would be their willingness to pay for functional foods. Also, a high percentage of the sample people (75%) were ignorant of the location of dietary sugar retailers suggesting that functional foods were not adequately marketed.

4. Conclusions and recommendations

It is of crucial important for the development of functional food industries to know consumers' motives and attitudes towards the consumption of these foods and the factors underpinning the enhancement of their consumption. For the first time, this study investigated Iranian urban consumers' attitudes and WTP for a well-known functional product (dietary sugar). Given the health benefits of functional foods, their production has some advantages, on which basis the government support can be attracted resulting in their profitability. We found that the EWTP per kg of dietary sugar was 35.59% more as compared to conventional sugar. This finding confirmed the previous studies results [31-33] that consumers' purchase and pay more for foods that possess healthful characteristics' that can prevent disease like diabetes. As mentioned in other studies [32-34] consumers' health concerns is an important driver of functional food purchase. In this study healthy purchase attitude (HPA) and attitude towards benefits of dietary sugar (ABD) have direct and significant effect on WTP for dietary sugar and also, considerable marginal effects and elasticities. These findings are in line with previous researches [9,35,36,] that pointed out healthiness concerns as the most frequently motivation for functional food consumption. So, introducing, extending and advertising the health benefits and advantages of dietary sugar will boost its purchase in Iran market.

Considering the impact of attitude variables especially general health concerns on consumers' WTP, training courses can be held to enhance public knowledge and insight about these products and the health hazards of the consumption of industrial foods, which will in turn pave the way for the adoption of the functional foods, particularly dietary sugar. Therefore, food health-oriented public advertisements can help the development of the use of these products and the improvement of public health. It is very important in functional foods marketing strategy to create specific markets and exhibitions for the functional foods and to provide functional food shelves in supermarkets and public places like schools and restaurants to make it possible for consumers to compare the quality of these products.

Our study shows that specific socio-demographic variables include age (AGE), educational level (EDU), family size (FMS), monthly family income (MFI), record of diabetes in family (FDR) positively affect WTP for dietary sugar. Numerous studies have already demonstrated the impact of socio-demographic variables on the WTP for functional foods [9,37-39]. Our findings confirmed these studies highlight that families with more children have more positive attitudes towards functional foods. Considering these characteristics would help food industry in Iran to target and develop goal consumers' population, properly.

Also, it may be useful for government bodies interested in designing public health programs. In terms of marketing strategies, functional foods need to be promoted with the aim of making them much more visible and recognizable to final consumers, in order to avoid confusion with other generic health foods, such as light or diet products.

Conflict of interest

All authors declare no conflicts of interest in this paper.

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