WILLINGNESS TO PAY FOR IODINE BIOFORTIFIED TOMATO FRUITS AMONG HYPERTENSIVE PATIENTS IN SELECTED HOSPITALS IN OGUN STATE, NIGERIA

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ABSTRACT

The biofortification of crops with iodine have been proposed as a strategy for improving human nutrition. Hypertensive patients in three distinct groups of consumers were identified, and their willingness to pay for iodine biofortified tomato fruits was modelled using Contingent Valuation Method (CVM) under double bounded dichotomous choice approach. Results from the socioeconomic characteristics of the respondents revealed a mean age of 55 years implying that most of the respondents were middle-aged. There were more female (72.08%) than male (27.92%) respondents and 65.83% were married. The results clearly show a lack of knowledge (43%) of iodine biofortified tomato fruits. It was also revealed that 76% of the respondents are willing to pay a premium for iodine biofortified tomato fruits. Although, the proportion of the respondents who were willing to pay generally decreases with increase in price. Also, the respondents were willing to pay a mean amount of ₦673.30 per kg. This means that the respondents would pay around 25% higher for iodine biofortified tomato fruits than the conventional ones. It is concluded that the bid price ($p<0.05$), prior knowledge ($p<0.05$), health concern ($p<0.01$), dependency ratio ($p<0.01$), households size ($p<0.1$), income ($p<0.01$) and education ($p<0.01$) were significant factors influencing respondents' willingness to pay for iodine biofortified tomato fruits. Therefore, policy issues aimed at encouraging consumers' willingness to pay for iodine biofortified tomato fruits should focus on promoting awareness programmes aimed at developing a domestic market for the biofortified tomato.

Keywords: GMO Product, Choice Model, Contingent Valuation, Premium Price, Payment Vehicle Designing

INTRODUCTION

Iodine is a trace element used in the synthesis of thyroid hormones (Arthur and Beckett, 1999). It is naturally present in fish, eggs, meat, dairy products, and, to a lesser extent, in grains, fruits, and vegetables. For an adult, the recommended daily allowance (RDA) for iodine is 150 µg (Institute of Medicine, Food and Nutrition Board, 2001), a very minute quantity. Nevertheless, its deficiency is one of the most serious public health issues worldwide and nearly one-third of the human population still has an insufficient iodine intake (Andersson *et al.,* 2012). This is due

mainly to the fact that iodine deficiency is largely related to the environment.

Inadequate iodine intake impairs the thyroid function, with the onset of a wide spectrum of disorders negatively affecting growth and development. All age groups can be susceptible, and in cases of severe deficiency, damage to the foetus, perinatal and infant mortalities, endemic goitre, irreversible mental retardation and brain damage can occur (Delange, 2000; Zimmermann *et al.,* 2008). Such problems are widespread in all the world's least industrialized nations, with South Asia and sub-Saharan Africa particularly affected (Zimmermann, 2009). However, even in developed countries some groups of people remain at risk, especially children and pregnant women, resulting in minor cognitive and neuropsychological deficits (Haddow *et al.,* 1999). The main strategy for controlling and preventing iodine deficiency is the universal fortification of salt with iodine (Andersson *et al.,* 2010). "Universal" is the key word in this strategy because it highlights that all the salt consumed by the population should be iodized, including salt used in food processing and for animal feed. This strategy has been implemented by many countries over the past few decades and has dramatically reduced the prevalence of iodine deficiency worldwide (Zimmermann, 2009; Andersson *et al.,* 2010). However, a boost to the consumption of iodized salt is becoming increasingly untenable, as it conflicts with other important public health objectives, such as prevention of cardiovascular diseases among others. Other strategies have been adopted, including the addition of iodine to oils, bakery products, or even to drinking water, but none of these alternatives has proved effective by itself as a means of preventing iodine deficiency.

According to World Health Organization (WHO), the widespread of hypertension is highest in the African region at 46% of adult aged 25 years and above and its complications constitute about approximately 25% of the emergency medical admissions in urban hospitals in Nigeria (Ekere *et al.,* 2005). In accordance with recommendations by the World Health Organization (WHO, 2013), attempts have been made to reduce daily consumption of table salt by one and half, this could also lead to a substantial reduction in iodine supply in the diet.

Recent studies have proposed tomato as a possible vegetable for iodine biofortification programs. Both its widespread distribution and possible consumption as a fresh fruit make it a good target crop for a fortification study with positive result in terms of effective iodine accumulation within the fruits, the edible part of the plant (Landini *et al*., 2011). So many countries have introduced iodine into the diet through iodized salt; this method was ineffective due to the excess consumption of salt, which has led to a global increase in cardiovascular diseases including hypertension.

The use of iodized salt is the only strategy being used in Nigeria to overcome iodine deficiency. But the increased consumption of iodine salt contradicts with other health issues like cardiovascular diseases in many countries. Due to this, the World Health Organization (WHO, 2013) developed "The Global Strategy on Diet, Physical Activity and Health (2008-2013)". One of the main

objectives of this strategy is to minimize the use of salt and effective ways should be developed for iodine in food chain. So, the recent alternative approach adopted is the biofortification of edible plant parts with micro-nutrients. Plants have the ability to uptake micro-nutrients from nutrient rich soils with minimum uptake of anti-nutrient.

The biofortification of edible crops, based on the production of micronutrient-rich plants destined for human consumption, is a more recent alternative approach to controlling mineral malnutrition, especially in poor countries (Nestel *et al.*, 2006). Biofortified crops may contain higher amounts of specific micronutrients due to their improved ability to take up and accumulate them or through a lower content of anti-nutrient compounds. These crops can be obtained by selecting superior genotypes through the use of traditional breeding or modern biotechnology. Alternatively, improved agronomic approaches can be developed and applied (White and Broadley, 2009).

Increased bioavailability of micro-nutrients, especially in crops, which can be consumed freshly like tomatoes, is considered as the best strategy against malnutrition problems in developing countries like Nigeria. Vegetables have more ability to uptake and store iodine in its edible parts than the grain crops. Tomato (*Solanum lycopersicum*) is an important vegetable crop of the world, including Nigeria. This crop supplies both fresh fruits and many processed products like sauces, paste, juice and powder. Tomato fruit is full of nutrition having lycopene, α-carotene, vitamin C, flavonoids and hydroxyl cinnamic acid derivatives. Due to the presence of anti-oxidants properties, its consumption protects against cancer and cardiovascular diseases.

Iodine Enriched Tomatoes is a type of tomatoes which has been biofortified with an adequate level of iodine to reduce various health issues arising from the deficiency of iodine. Iodized enriched tomatoes have proved effective in combating health issues such as hypertension. Tomatoes have a high tolerance to a high level of iodine stored in both the vegetative tissues and fruits at concentrations that are more than sufficient for the human diet. (Landini *et al*., 2011).

Production and marketing strategies of organic foods and other GMOs are determined principally by consumer beliefs, attitudes, responses and the willingness to pay a price premium. Consumers' demand for organic products have received some attention in the consumer choice literature. Various authors have employed different techniques such as contingent valuation (Misra*et al.*, 1991; Boccaletti and Nardella, 2000; Gil *et al.* 2000; Krystallis and Chryssohoidis, 2005), choice experiments (Wang and Sun 2003; Stolz *et al.* 2011) and hedonic pricing approach (Nouhoheflin *et al.*, 2004). In contingent valuation surveys, hypothetical markets are set up in which consumer willingness to pay for products are solicited by asking respondents to value the products contingent on the available market. Where market prices already exist for the product, contingent valuation surveys tend to focus on the premiums that consumers are willing to pay for the product. Some contingent valuation surveys have employed the single-bounded approach where individuals are offered only one bid to pay or reject (Haghiri *et al.*, 2009). The doubled-

bounded approach employed in this study is often used extensively in valuing non-market goods because it incorporates more information on individual's WTP. Also, it provides more efficient estimates and tighter confidence intervals (Hanemann *et al.,* 1991).

Estimating willingness-to-pay (WTP) from contingent valuation studies using dichotomous choice (DC) questions is an increasing technique (Bateman and Turner, 1992). However, Hanemann *et al.,* (1991) demonstrated that, using maximum likelihood solutions with double-bounded DC strategy is statistically more efficient technique than a single question. In other words, eliciting whether a respondent is willing to pay a higher bid if he/she respond "yes" to the initial bid, or willing to pay a lower amount if they respond "no", provides a more accurate information which, if the bid selection strategy is correct reduces the variance of estimated WTP (Kanninen, 1991).

Specific techniques in CVM include payment cards, bidding games, open–ended and dichotomous choice. This study used double bounded dichotomous choice contingent valuation method (DBDC-CVM) because it has more efficiency as well as more information than single bounded approach (Hanemann *et al*., 1991). Some of the recent studies that employed double bounded choice include Ara (2002), Rodríguez *et al*. (2007), Abdullah and Jeanty (2011) and Claudy *et al*. (2011). This study therefore examines willingness to pay for iodine biofortified tomato fruits among hypertensive patients in Ogun State, Abeokuta, South west, Nigeria using double bounded dichotomous choice Contingent Valuation Method (DBDC-CVM).

This study aims to provide insights on Hypertensive patient's acceptance of, and willingness-to-pay (WTP) for Genetically Modified (GM) crop with enhanced micro-nutrient like iodine.

The aim of this study is to shed light on consumers' perception about iodine biofortified tomato fruits and their willingness to pay for iodine biofortified tomato fruits among hypertensive patients in selected hospital in Ogun State, Nigeria. More specifically, (i) describe levels of awareness towards iodine biofortified tomato fruits; (ii) assess consumers' willingness to pay (WTP) for iodine biofortified tomato fruits; and (iii) identify factors influencing consumers' willingness to pay (WTP) for iodine biofortified tomato fruits.

MATERIALS AND METHODS

This study was conducted in selected Hospitals in Abeokuta. Abeokuta is the Capital of Ogun State in South West Nigeria with Latitude: 7°09′20″ N and Longitude: 3°20′42″ E. As of 2005, Abeokuta and the surrounding area had a population of 593,140. The city is known for its traditional style of hand-woven cotton cloth known as "Adire" which is dyed with locally produced indigo. Federal Medical Centre, Idi-Aba, Sacred Heart Hospital, Lantoro and State hospital, Ijaye were purposive selected. These hospitals have a tripartite mandate of training, research and service delivery. It also serves as a referral center for primary and secondary public health institutions as well as missionary and private hospitals in Ogun State and neighboring South Western States of Nigeria. This study was a hospital-based,

cross-sectional descriptive study conducted on 240 hypertensive patients between May and July 2019. These hypertensive patients had been on out-patient treatment for hypertension in the selected hospitals for at least 1 year. The eligibility for the study was determined, and consent was taken. The pretesting was done to find out how the questionnaire would interact with the respondents and ensure that there were no ambiguities. The necessary adjustment was made after the pretest. Structured questionnaire was used to elicit information on respondents' socioeconomic characteristics, level of awareness of iodine biofortified tomato fruits and willingness to pay for iodine biofortified tomato fruits. Descriptive statistics such as mean, frequency counts and percentages as well as charts were used to describe and summarize the data from the socio-economic characteristics of the subjects. It was also used to describe the health behaviour and habits of patients.

To elicit consumers' willingness to pay for iodine biofortified tomato fruits, contingent valuation method was applied, which help to find out how willingness to pay responds to hypothetical prices as used by Mitchell and Carson (1989). CVM has widely expanded into many fields such as recreation, hunting, water quality (Mitchell and Carson, 1989) to health economics, transportation, safety and cultural economics (Venkatachalam, 2004). Double bounded dichotomous choice contingent valuation method (DBDC-CVM) was used for this study because it has more efficiency as well as provides more information than single bounded method (Hanemann *et al*., 1991). Many recent researches had also deployed double bounded choice including Ara (2002), Rodríguez *et al*. (2007), Abdullah and Jeanty (2011) and Claudy *et al*. (2011).

Using double bounded approach, respondents were asked two questions. Question format was "Are you willing to pay certain amount of money for iodine biofortified tomato fruits?". Each question has two choices: yes or no. If "yes" in the first question, higher amount of bid was given in the second question; otherwise, lower amount with "no". Therefore, one of four abilities of a respondent can be:

1. Yes–Yes (YY), 2. Yes–No(YN), 3. No–Yes (NY), 4. No–No (NN).

According to Hanemann *et al.* (1991) and Hai *et al.* (2013) and Adekunle *et al.* (2016), the probability of answering "Yes" for both questions is expressed as:

$$Pr_{yy}(B, B^u) = Pr[B \leq WTP, B^u \leq WTP] \quad (1)$$

$$= Pr[B \leq WTP / Bu \leq WTP] Pr[B^u \leq WTP] \quad (2)$$

$$= PrB^u \leq WTP = 1 - F(B^u) \quad (3)$$

Where,

Pr_{yy} = the probability of answering "Yes" "Yes"

B = the price in the first question

B^u = higher price in the second question

WTP = Willingness to Pay

F = Cumulative Distribution function (CDF)

The probability of answering "Yes" followed by "No" in question (2) is:

$$Pr_{yn}(B, B^u) = Pr[B \leq WTP < B^u] = F(B^u) - F(B) \quad (4)$$

Similarly, probabilities for answering "No–Yes" and "No –No" are:

$$Pr_{ny}(B, B^d) = Pr[B^d \leq WTP < B] = F(B) - F(B^d) \quad (5)$$

$$Pr_{nn}(B, B^d) = Pr[B > WTP, B^d > WTP] = F(B^d) \quad (6)$$

Where,

B^d= lower price in the second question

Thus, the four potential outcomes can be represented as binary-valued indicator variables: $Pr_{yy}, Pr_{yn}, Pr_{ny}$ and Pr_{nn}, where these equal one denotes the occurrence of that particular outcome and zero denotes otherwise (Hanemann, *et al.* 1991; Bateman, *et al.* 2002):

Pr_{yy}= the respondent responds 'Yes' to the first bid Pr_{yy} (B_i) and 'Yes' to the second bids with higher amount (B_i^u), denoted as 'YY', and their WTP lies in,$B_i^u < WTP < \infty$

Pr_{yn}= the respondent responds 'Yes' to the first bid (B_i) and 'No' to the second bids with higher amount (B_i^u), denoted as 'YN', and their WTP lies in,$B_i < WTP < B_i^u$

Pr_{ny}= the respondent responds 'No' to the first bid (B_i) and 'Yes' to the second bids with lower amount (B_i^d), denoted as 'YN', and their WTP lies in,B_i^d<WTP<B_i

Pr_{nn}= the respondent responds 'No' to the first bid (B_i) and 'No' to the second bids with lower amount (B_i^d), denoted as 'NN', and their WTP lies in 0<WTP<B_i.

The maximum likelihood estimation is employed to estimate the likelihood of responses. Given a sample of 240 respondents, where B_i, B_i^u, B_i^d are bids used for the i[th] respondent, the log–likelihood function was specified as:

$$lnL = \sum_{1}^{n} \{yy_i lnPr_{yy}(B_i, B_i^u) + yn_i lnPr_{yn}(B_i, B_i^u) + ny_i lnPr_{ny}(B_i B_i^d) + nn_i lnPr_{nn}(B_i B_i^d)\} \quad (7)$$

Where,

yy, yn, ny and nn are dummy variables. In order to elicit WTP, standard double bounded model (Hanemann *et al.*, 1991) is used. Therefore, WTP is generally expressed by the function:

$$WTP_{ij} = \alpha + {}_{\sigma}Bid_{ij} + \lambda X_i + \varepsilon_{it} \quad (8)$$

Where,

α= intercept of the model

Bid = proposed price (hypothetical price) given to respondents

σ = the coefficient of Bid

X_i = the vector of socioeconomic variables which are:

Prior Knowledge (Yes=1, No=0)

Health Concern (Health related =1, Not health related=0))

Dependency Ratio (Number of Dependents)

Age (years)

Gender (Male=1, Female=0)

Household Size (Number of persons per household)

Monthly Income (Naira/Month)

Years of Education (Number of years of Schooling)

λ = the coefficients of X_i

i = individual patient (ith)

Payment Vehicle Designing (Designing Bid Amount)

In this study, designing hypothetical prices (bids) to apply double bound dichotomous was based on the questionnaire pretest and the prices of the conventional tomatoes in the markets (₦500/kg). Bidding system was used in Table 1. Each consumer was asked for answering one of four random bids set below to minimize the bias of starting bids. Table 1 presents the distribution of the double-bounded WTP responses for the iodine biofortified tomato fruits. In terms of the different structure of bid prices of 50 % and 25 %. The bid designs captured the WTP ranges quite well. The proportion of the respondents who were willing to pay the bid generally decreased with increases in price.

This is confirmed by the fact that the higher starting bid price was less likely to generate a "Yes/Yes" response and more likely to produce a "No/No" response. Figure 1 present the structure of the bidding system used for this study.

TABLE 1. DICHOTOMOUS CHOICE QUESTIONNAIRE FOR ELICITING WTP

Conventional price (₦/Kg)	First bid (₦/Kg)	Second bid (₦/Kg)	
		Higher amount	Lower amount
₦500	₦750 (50% of ₦500)	₦800	₦625 (25% of ₦500)
₦500	₦800	₦850	₦550

Source: *Field Survey, 2019*

RESULTS AND DISCUSSIONS

Socioeconomic characteristics of the Respondents

Table 2 present the socioeconomic variables of the respondents. The modal age range of the respondents was 36 – 50 years. The overall mean age was 55 years implying that most of the respondents were in their middle age and are in their active age. There were more female (72.08 %) than male (27.92 %) respondents with male : female ratio of 1:3. Majority of the respondents (65.83%) were married with 76.67 % marriage of the monogamous type. About 69.17 % have between 4-6 household sizes with mean household size of 5 persons. Majority (75.75 %) of the respondents had secondary and tertiary education and 34.58 % were civil servant while 27.50 % were artisan. It was revealed that 55.00 % received a monthly income of above ₦50, 000 ($138.88) with mean monthly income of ₦77, 500 ($215.28). With this amount, it is assumed that respondents should respond positively in paying a price premium for the iodine biofortified tomato fruits. For 36.67 % of the respondents, the cause of their Hypertension is unknown. They reported that the Doctor diagnose this primary hypertension type after analyzing your blood pressure after three or four visits. About 21.66 % of the respondents have resistant hypertension because they are aged, obese or are suffering from diabetes or kidney ailments.

TABLE 2. SOCIOECONOMIC CHARACTERISTICS OF RESPONDENTS

Characteristics	*Frequency*	*Percent (%)*	*Characteristics*	*Frequency*	*Percent (%)*
Age (years)			***Marriage Type***		
Below 35	32	13.33	Monogamy	184	76.67
36-50	154	64.17	Polygamy	56	23.33
51 and above	54	22.30	***Household size***		
Mean age (55 years)			1-3	16	7.00
Gender			4-6	166	69.17
Male	67	27.92	7 and above	58	24.16
Female	173	72.08	Mean household size (5)		
Marital status			***Religion***		
Single	12	5.00	Christianity	121	50.52
Married	158	65.83	Islam	88	36.67
Divorced	22	9.17	Traditional	31	12.92
Widowed	48	20.00	***Monthly Income***		
Types of Hypertension			Less than ₦50,000	108	45.00
Primary	88	36.67	₦51,000- ₦100,00	77	32.08
Secondary	66	27.50	₦100,001- ₦150,000	17	7.08
Malignant	34	14.17	₦151,000- ₦200,000	25	10.42
Resistant	52	21.66	Above ₦200,001	13	5.00
Level of Education			Mean (₦55,500)		
No formal	30	12.50	**Primary Occupation**		
Primary	45	18.75	Civil Servants	83	34.58
Secondary	62	25.83	Artisans	66	27.50
Tertiary	103	42.92	Trading	40	16.67
			Unemployed	23	9.58
			Retired	28	11.67

Field Survey, 2019

Awareness of the Iodine Biofortified Tomato Fruits

Table 3 revealed that about 74.58% reported having no prior knowledge (heard) of iodine biofortified tomato fruits. The respondent's percent of the "seen, eaten" reported 2% and 1% respectively. While, 22% were aware of nutritive value of the iodine tomato fruits.

TABLE 3. KNOWLEDGE AND AWARENESS OF RESPONDENTS ABOUT IODINE BIOFORTIFIED TOMATO FRUITS

Measures	**Frequency**	**Percent**
Prior knowledge		
Yes	61	25.42
No	179	74.58
Seen *Iodine Biofortified Tomato Fruits* before		
Yes	5	2.08
No	235	97.92
Eaten *Iodine Biofortified Tomato Fruits* before		
Yes	3	1.25
No	237	98.75
Aware of nutritive value		
Yes	52	21.67
No	188	78.33

Source: *Field survey 2019*

Willingness to Pay for Iodine Biofortified Tomato Fruits

The characterization of the WTP of respondents showed in Figure 1 revealed that 76 % of the respondents were willing to pay for iodine biofortified tomato fruits. However, the price acceptance chart in Figure 2 shows that the willingness to pay of respondents reduced with an increase in price. This is shown in the model expression within the chart. The model expression specifies a negative relationship between the acceptance level and price level. From the model, it can be inferred that for every 1 % increase in price of iodine-enriched tomatoes, there is a corresponding 0.47% decrease in acceptability by respondents. This is very significant because respondents have been informed on the health benefits of iodine biofortified tomato fruits as an alternative of table salt. The proportion of the respondents who were willing to pay the bid generally decreased with increases in price. This is confirmed by the fact that the higher starting bid price was less likely to generate a "Yes/Yes" response and more likely to produce a "No/No" response.

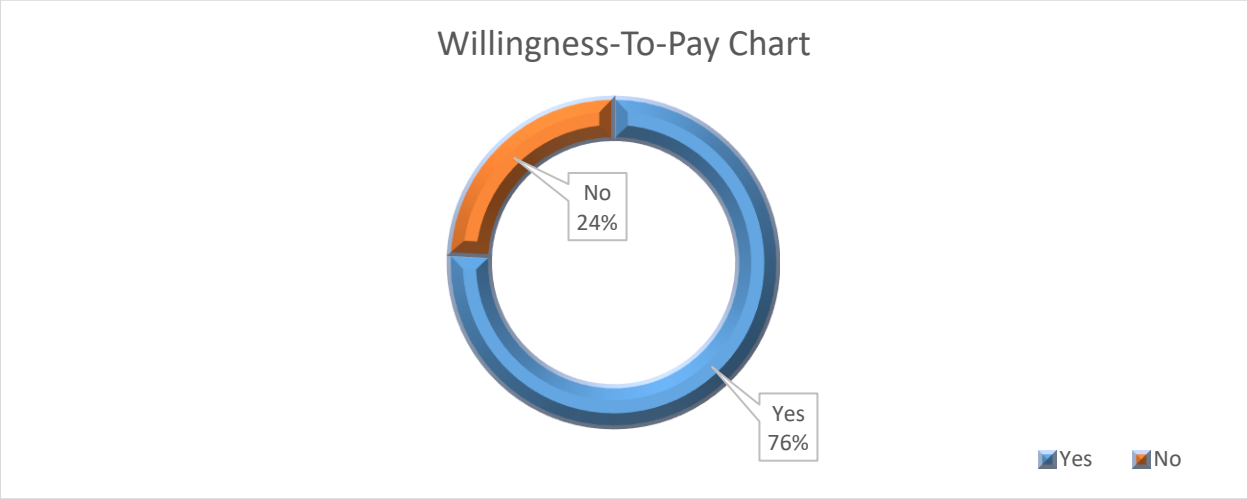

FIGURE 1: WILLINGNESS TO PAY DICHOTOMOUS RESPONSE
Source: *Field Survey, 2019*

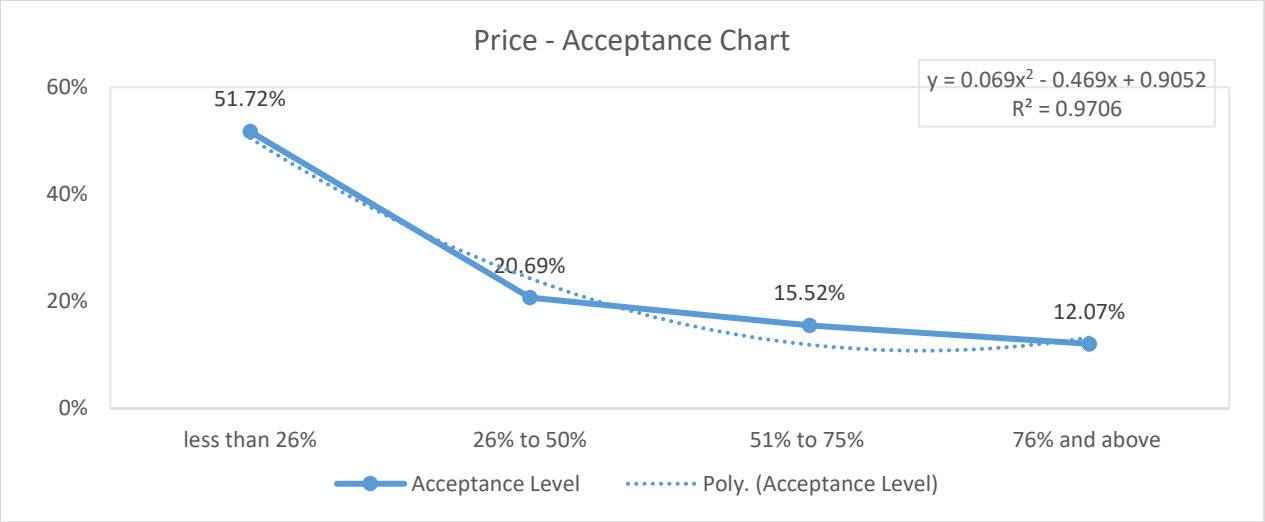

FIGURE 2: PRICE - ACCEPTANCE CHART
Source: *Field Survey, 2019*

Mean/median Willingness to Pay for Iodine Biofortified Tomato Fruits

The result of the mean/median WTP in Table 4 shows that respondents were willing to pay an average amount of ₦673.3/kg ($1.87) for the iodine biofortified tomato fruits. This means that consumers would pay around 18% higher for the iodine biofortified tomato fruits than conventional ones sold in the markets.

TABLE 4. RESULTS OF THE MEAN WILLINGNESS TO PAY FOR IODINE BIOFORTIFIED TOMATO FRUITS

	WTP (₦/kg)	Lower bound (₦/kg)	Upper Bound (₦/kg)
Mean	673.30	543.75	740.21
Median	670.39	540.93	778.47
95% CI of mean WTP (±₦/kg)	675.56 - 672.89 ±3.06		

Note: 95% Confidence interval of the WTP mean is calculated by using estimated parameters
Unit price of conventional tomato fruits per Kg is ₦500
Source: *Field Survey, 2019*

Determinants of Willingness to Pay for Iodine Biofortified Tomato Fruits

The logit regression result of the factors that influence respondents' willingness to pay for iodine biofortified tomato fruits is presented in Table 5. The log likelihood function in significant. In order to evaluate the performance and goodness of fit of the models, Wald test by Kanninen and Khawaja (1995) was used. The Wald tests for the iodine biofortified tomato fruits which was also significance at $p<0.01$ show that explanatory variables were generally suitable.

The results show that the bid price ($p<0.05$), prior knowledge ($p<0.05$), health concern ($p<0.01$), dependency ratio ($p<0.01$), households size ($p<0.1$), income ($p<0.01$) and education ($p<0.01$) were significant factors influencing respondents' willingness

to pay for iodine biofortified tomato fruits. The bid price, dependency ratio and household were negative and this is in conformity with the *apriori* expectation. The implication of this is that as the bid price increases, the respondents willing to pay decreases.

The respondents' willingness to pay for iodine biofortified tomato fruits was positively related to prior knowledge. This result suggests that the higher the respondents' prior knowledge, the more likely they were willing to pay a premium price for iodine biofortified tomato fruits. This result implies that the more respondents perceived quality and health benefits from iodine biofortified tomato fruits than conventional table salt, the more likely they were willing to pay a premium price.

The health concern coefficient was positive, which indicates that respondents who were more health conscious and more interested in the quality of food consumed, were more willing to pay a premium price for iodine biofortified tomato fruits. Batte *et al.* (2007) and Adekunle *et al.,* (2016) also found that health-concern was an important determinant of the willingness to pay for organic products and leafy vegetables which contained high proportions of organic content. Thus, this study concludes that respondents who engaged in health-conscious behaviours (e.g., considering quality of life when making purchases), were more willing to pay a premium price for iodine biofortified tomato fruits.

The dependency ratio and household size coefficients were negative, indicating that households with higher dependency ratio and household size were less likely to pay more for iodine biofortified tomato fruits than households without children and lower dependency ratio. This is consistent with Huang, Kan and Fu (1999) findings that consumers with young children were less likely to pay a premium price for safer food (hydroponically grown vegetables). A possible explanation is that families with children tend to have lower levels of disposable income with which to pay a premium price for organic products.

TABLE 5. RESULTS FROM LOGIT REGRESSION MODEL

Parameters	Coefficient	Standard error
Constant (α)	1.254	1.002
Bid (σ) (X_1)	-.385**	.182
Prior Knowledge (X_2)	.460**	.226
Health Concern (X_3)	.514***	.103
Dependency Ratio (X_3)	-.381***	.118
Age (X_5)	.511	.376
Gender (X_6)	-.232	.318
Household Size (X_7)	-.148*	.082
Monthly Income (X_8)	0.272***	.083
Years of Education (X_9)	.122***	.016
Number of Observation (240)	240	
Log likelihood	-511.45	
Wald chi2 (10)	290.52***	

*Note: *p<0.1, **p<0.05, ***p<0.01 denote significant at 10, 5 and 1% respectively*

Source: Field Survey, 2019

CONCLUSION AND RECOMMENDATION

This study assessed consumers' willingness to pay for iodine biofortified tomato fruits. It was revealed that 76 % of the respondents are willing to pay a premium for the iodine biofortified tomato fruits. However, the proportion of the respondents who were willing to pay the bid generally decreased with increases in price. On the average, respondents were willing to pay ₦673.30 for biofortified tomato fruits which is 18% higher than the conventional tomatoes' market price.

It is concluded that the bid price, prior knowledge, health concern, dependency ratio, households' size, income and education were significant factors influencing respondents' willingness to pay for iodine biofortified tomato fruits. Therefore, policy issues aimed at encouraging consumers' willingness to pay iodine biofortified tomato fruits should focus on increasing widespread awareness as it is important both in the prevention and in the treatment of several diseases.

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