

Perception of food quality among Saudi consumers

Mohammad Abdulrahman Alshuniaber

Food Sciences and Nutrition Department, College of Food and Agriculture Sciences, King Saud University, Riyadh, KSA

Corresponding Author: Mohammad A. Alshuniaber, Food Sciences and Nutrition Department, College of Food and Agriculture Sciences, King Saud University, Riyadh, Saudi Arabia. Email: malshuniaber@ksu.edu.sa

Received: 22 June 2024; Accepted: 27 August 2024; Published: 29 October 2024

© 2024 Codon Publications



ORIGINAL ARTICLE

Abstract

Consumers' perceptions of quality of food products increase their purchasing likelihood. This study provides a framework for exploring consumers' perceptions of food quality for food product development and food marketing strategies by providing vital information related to consumer behavior and food choice. It establishes a method for measuring food quality perceptions through a validated questionnaire. It was found that adult consumers in Riyadh City, Saudi Arabia, perceive intrinsic food characteristics higher than of extrinsic food characteristics. Characteristics related to product safety, nutritional value, and sensory attributes were the most highly valued aspects. Sociodemographic factors such as age, marital status, education, occupation, income, and work/study in the food field were found to affect Saudi consumers' perceptions of food quality. Furthermore, marital status, education, occupation, and income were the major classification factors for perception trends. Food identity and processing, food health prosperity, food safety and presentation, and food sensory attributes were the major qualities perceived by Saudi consumers.

Keywords: consumer preference; extrinsic characteristic; intrinsic characteristics; food quality; food quality dimension; quality perception; willingness to pay

Introduction

Food is a complex commodity with numerous measurable and/or perceivable characteristics or attributes. Food quality is determined by both consumers and producers interchangeably. Producers are responsible for translating consumer requirements into product criteria through product design and development (Hansen, 2005a). Ethnicity, local taste, and previous experience—among others—are motivations for consumers to purchase and/or repurchase food (Thogerson *et al.*, 2017). Several studies on different regions have established an association between food characteristics and consumer purchasing decisions (Basri *et al.*, 2016; Wong *et al.*, 2018). Notably, food prices may significantly affect consumers' expected eating quality and expected naturalness of food products. When other quality stimuli are absent, food prices strongly

affect consumers' choices (Hansen, 2005b). Therefore, it is important to understand consumers' perceptions of food characteristics for the production of suitable food products. Such results should be considered in food manufacturing, product development, and food trade.

The intrinsic and extrinsic characteristics of foods are known to affect consumer preferences and their purchasing and dining experiences. Intrinsic and extrinsic quality attributes can be positively perceived by consumers; as a result, consumers' loyalty levels would be higher (Espejel *et al.*, 2009). Another study examined the perceptions of urban consumers of several food quality attributes, including price, safety, packaging, and labeling of four liquid products; the research argued that price was the most significant attribute affecting consumer choice, followed by food safety. The heterogeneity of consumer

judgment is correlated with the socioeconomic status of consumers (Silv *et al.*, 2012). Another study categorized food consumers—based on subjects' responses—into two groups: organoleptic criteria-driven and production, place-, and method-driven consumers. The socio-demographic and behavioral differences between the two groups of consumers have affected their perceptions of quality and appear to affect their purchase choices and dietary patterns (Mascarello *et al.*, 2015).

It was found that freshness was the most cited food attribute by respondents when they surveyed the quality of fresh meat, fruits, and vegetables. The respondents perceived several quality attributes, including cleanliness, safety, nutritional value, and Halal (credence cue). However, implicit cues (i.e., food safety) were the most important cue based on the data analysis (Chamhuri and Batt, 2015). Other attributes, such as being “native,” may affect consumer preferences. Consumers' preferences and Willingness to Pay (WTP) were found to be greater for food claimed to be “native” than for other food varieties (Palma *et al.*, 2015).

Consumers interlink food quality and safety aspects and believe that both food quality and safety are important attributes. Consumers also link traceability to both quality and safety; they also pay more attention to food quality during food shopping (van Rijswijk and Frewer, 2008). Research has shown that, among other quality attributes, food hygiene is the most significant attribute for consumers, and they tend to consume more food at home for hygienic and taste reasons (Zaibet *et al.*, 2004). Another study revealed that the majority of consumers are willing to pay more for safe approved food products, especially animal products. Food safety was communicated to the subject by demonstrating “intensified inspection,” which increases consumers' WTP (Rohr *et al.*, 2005).

As food labels are a major feature of food packaging, providing information to consumers on the label or menu would empower their food selection and purchasing decisions. Consumers may be motivated to buy functional foods that carry appropriate health claims. Another study illustrated that using evocative descriptions in menu names created more positive comments about the food. Food items with descriptive names were rated more appealing, caloric, and tasty than their regularly named counterparts (Wansink *et al.*, 2005). Research has shown that when nutrition information is displayed to customers, it leads to higher food quality ratings (satisfaction) and significantly greater intentions to repurchase than when food is displayed without nutrition information (Cranage *et al.*, 2004).

The health claims of food products with a positive health image are positively rated. Older consumers and

consumers who trust the food industry are more likely to buy functional foods than younger consumers and those who do not trust the food industry (Siegrist *et al.*, 2008). On the other hand, quality-conscious consumers were found to negatively perceive functional risk for Store Brand (SB) food products. However, retailers may need to ensure that functional risk from their products is dismissed to improve consumers' perceptions and make their products more appealing to quality-conscious consumers (Rubio *et al.*, 2014).

Some food ingredients, such as chemical food additives, hydrogenated fat, and high-fructose corn syrup, could be perceived as a risk and influence consumer acceptance and/or preference. Consumer risk and benefit perceptions of food additives significantly influence consumer acceptance. Consumers and risk perceptions are influenced by consumers' preferences for natural food products and their trust in and knowledge of regulations (Bearth *et al.*, 2014). Furthermore, consumers who fear specific ingredient(s) may exaggerate risk perception; thus, the presence of such ingredients in a food would negatively affect their rating. However, manufacturers should ensure effective communication of ingredients' background and history, which may reduce food fears (Wansink *et al.*, 2014).

Food naturalness is a crucial food attribute for the majority of consumers worldwide. However, consumers define and measure naturalness differently. Food naturalness can be classified into three categories: origin (plantation and breeding), processing (technology and ingredients), and final product properties (Roman *et al.*, 2017). A study assessed the effect of clean-label food (fresh natural food with minimum additives and processing) sold at convenience stores on consumers' WTP. The influence of knowledge factors and involvement factors on WTP were considered. However, a clear food label stating ingredients was deemed important for consumers to identify healthy food choices. The study classified respondents into two clusters: high WTP (22.77%) and low WTP (77.23%). It was found that those under the high WTP cluster were willing to pay up to 14.06% more for clean-label food, while low WTP cluster were willing to pay up to 4.35% more (Hsu *et al.*, 2023).

One study investigated consumers' perception of the degree of processing based on the “NOVA” food processing classification system and their perception of healthiness based on the “Nutri-Score” label, which shows nutritional value. They studied 27 different foods and found that consumers have a negative association with the degree of food processing, and they use the degree of processing as a cue in their evaluation of the healthiness of food products. There was a negative association between the degree of processing and healthiness (Hassig *et al.*, 2023).

Food packaged in sustainable packaging has a more positive quality perception than food packaged in conventional packaging (Magnier *et al.*, 2016). A study on 1204 adults revealed that there is a significant relationship between sustainability-related perceived consumer effectiveness (PCE) and WTP for sustainable food. The study illustrated that freshness, healthiness, price, and ease of obtaining food were important influencing attributes that ranked “very important” or “rather important” for 95.3, 80.3, 79.9, and 78.1% of the respondents, respectively. Moreover, locality was an important factor and was perceived to be significantly greater in the 35–39 age group (70% important or very important) (Kovacs and Keresztes, 2022).

According to the Saudi General Authority for Statistics (GAS), in 2021, the population of Saudi Arabia was estimated to be 30.78 million. The population in the Riyadh area exceeded 8.17 million per capita, which represented approximately 26.5% of the Kingdom's population. The Saudi population in the Riyadh area is estimated to be approximately 4.34 million (approximately 53%) (GAS, 2023). The average age at first marriage in Riyadh was 25.3 years for males and 20.4 years for females (GAS, 2018). The average monthly salary of Saudis in Riyadh city in 2019 was estimated to be 7030 SR (~1875 USD) (GAS, 2019).

Saudi Arabia is the largest food market in the Middle East and North Africa (MENA region) with an average food volume per capita of around 443.3 kg in 2023. The revenue of the food market in Saudi Arabia was estimated at around 57.83 billion USD, while only 2.7 billion USD from out-of-home revenue. Vegetables, bread and cereals, and dairy products were the most consumed food products in Saudi Arabia (Statista, 2024). Market research was conducted on 1000 adult Saudis nationwide to measure the effect of the COVID-19 pandemic on Saudi food habits and attitudes. The results illustrate that 53% of Saudis have become more conscious about healthy eating after the COVID-19 pandemic, while 48% of Saudis are eating a healthy diet. Cooking at home became more attractive as 67% of Saudis stated that they are eating more at home, while 69% stated they will continue to rely on home-cooked meals. It was found that 50% of consumers are buying a larger variety of food per trip, while 51% stated they are buying different food brands than what they are used to (Ipsos, 2020).

This study aimed to assess which food quality characteristics are most important for Saudi consumers living in Riyadh City, Saudi Arabia. It seeks to understand how Saudi consumers perceive food quality by measuring their perceptions of various food quality characteristics. It investigates the influences of sociodemographic factors

on food quality perceptions. Such information is deemed crucial for identifying and understanding consumers' behavior, particularly regarding food choices. The results can be utilized for informing regulatory, quality control, product development, and/or marketing strategies. However, to achieve this objective, the study implements a repeatable procedure using a validated informative questionnaire that comprises food quality characteristics that ordinary consumers can perceive and express.

Materials and Methods

Population of interest and sociodemographic characteristics

The targeted population of this study was Saudi adults residing in Riyadh City, Saudi Arabia. However, to ensure that only relevant responses were collected, the questionnaire's sociodemographic section included two filtering questions about city of residence and nationality.

Six common sociodemographic factors (gender, age, education, marital status, occupation, and income) were examined to assess their impact on consumers' perceptions of food quality. Additionally, it was assumed that perception might be influenced by consumers' roles in household food preparation or shopping and their study or work in the food industry. Thus, a total of eight sociodemographic factors were considered.

Preparing questions list

Considering that consumers' knowledge of food chemistry and processing is often limited, this questionnaire employs general food quality characteristics that are considered perceivable and expressible by ordinary consumers. Therefore, the questionnaire was generally developed using relevant questions from the literature to ensure its validity, clarity, and comparability with findings from other studies. Other questions were added to enhance the questionnaire's completeness and ability to achieve the study objectives. The resulting list comprised 20 questions, each highlighting one major food quality characteristic. The list was then reviewed, and all questions were consistently rephrased to better align with the study's purpose, promote clarity, facilitate data analysis, and minimize acquiescence response bias. All questions were presented as informative and affirmative sentences formulated to highlight food quality characteristics in a positive tone.

The questions were categorized based on their relationship to food composition into intrinsic and extrinsic characteristics. Each group was further divided into two

subgroups: product-related and process-related characteristics. Additionally, characteristics were categorized into six groups based on the product's safety, usability, sensory attributes, nutritional value, processing, and presentation. Table 1 illustrates the questions as they appeared in the end-user questionnaire.

Experimental design and questionnaire preparation

The study is a cross-sectional one-sample random test with a statistical significance level of 5% ($\alpha = 0.05$) and a standard error ($SE \pm 2$). Based on the categorization of food quality characteristics, the questionnaire was designed to be structured, encompassing four sections (Table 1). However, to minimize subject bias, all questions were presented without sectioning during questionnaire administration. Subsequently, the questionnaire was translated into Arabic.

Participants were asked to express their agreement with the statements using a five-point Likert scale: (1) "strongly disagree"; (2) "disagree"; (3) "neutral"; (4) "agree"; and (5) "strongly agree." The study calculates the average score (AS) for each characteristic and each group of characteristics to quantify the intensity of perception. Since the AS is based on a five-point Likert scale, perception intensity could be classified into five categories. High perceived characteristics ($4.2 < AS \leq 5$) significantly affect consumer choice; moderate perceived characteristics ($3.4 < AS \leq 4.2$) considerably affect consumer choice; low perceived characteristics ($2.6 < AS \leq 3.4$) have a minor/negligible effect on consumer choice; and nonperceived characteristics ($1 \leq AS \leq 1.8$) are assumed to have no effect on consumer choice.

Questionnaire validation

The questionnaire underwent several validation processes, including expert validation, face validation, test/retest, and other statistical validation (Aithal and Aithal, 2020; Baliwati *et al.*, 2023). The experts' opinions were sought to confirm the questionnaire's content validity, including its relevance, fitness for purpose, clarity, and ability to achieve the study objectives. Twelve expert reviewers were planned to conduct a revision. The reviewers were instructed to identify unsuitable, irrelevant, unclear, or redundant questions.

Subsequently, a pilot study (Face Validation) was conducted on 20 randomly selected potential participants to assess language clarity, question comprehension, and the time required to complete the questionnaire. Furthermore, a test-retest procedure was conducted with 18 participants in the pilot study. Pearson's correlation test was applied to the scores obtained from the first and second tests. The Pearson's correlation coefficient was 0.597, indicating a strong positive correlation between the two tests and supporting the questionnaire's reliability.

Spearman's rho test assessed the correlation between food quality characteristics (i.e., dependent variables). At a significance level (α) of 0.01 and a sample size (N) of 20, all 20 characteristics exhibited statistically significant positive correlations. Additionally, Cronbach's alpha test was performed to evaluate the internal consistency (i.e., reliability) of the food quality characteristics. The alpha coefficient for the 20 questions was 0.845, indicating a high level of internal consistency among the 20 questions. This result demonstrates the suitability and reliability of the questionnaire.

Table 1. Questionnaire questions.

Intrinsic		Extrinsic	
Product-related questions	Process-related questions	Product-related questions	Process-related questions
High-quality food should have an appealing aroma and appearance	High-quality food should be free from natural and manufacturing faults	High-quality food should have a higher price than its counterparts	High-quality food should be handled in a sanitary environment
High-quality food should be tasty	High-quality food should be organic	High-quality food should have a reputable brand and appear in commercials	High-quality food should be produced by certified institution
High-quality food should contain important nutrients	High-quality food should be natural	High-quality food should be convenient for storage and preparation	High-quality food should be processed
High-quality food should be healthy	High-quality food should be fortified	High-quality food should have a longer shelf-life than its counterparts	High-quality food should always be available in the market
High-quality food should be fresh and in season	High-quality food should be free from residues and contaminants	High-quality food should be produced or manufactured locally	High-quality food should be packaged attractively with food label on it

The analysis of variance (ANOVA) examined the variation within and between groups' means. The results revealed statistically significant differences within-group means ($P = 0.000$) for all four quality characteristics and statistically significant differences between groups' means ($P = 0.000$). This finding implies that each food characteristic contributes to overall variation and can be perceived differently and independently based on sociodemographic factors. Therefore, sociodemographic characteristics exert a significant influence on quality perception.

Survey administration and data analysis

The final questionnaire was designed for user-friendly, self-administered, electronic completion using Google Forms® (Alphabet Inc. "Google Inc.," Mountain View, California, USA), adhering to online survey best practices. To minimize nonresponse bias due to incomplete questionnaires, all questions were set as mandatory, preventing participants from skipping or leaving questions blank. The survey was conducted from March 25 to April 10, 2023, targeting ordinary food consumers in Riyadh, Saudi Arabia. A link to the electronic questionnaire was distributed via social media platforms such as emails, Twitter®, Facebook®, and WhatsApp® to reach potential participants.

The resulting data were exported from Google Forms to Microsoft Excel® 360 (Microsoft, Redmond, WA, USA) to facilitate data transfer to analytical platforms, data quality checks, data table creation, and descriptive analysis. Descriptive analysis was employed to statistically describe the respondents' sociodemographic characteristics (independent variables) and the distribution of sample responses (dependent variables). Subsequently, the data were exported to SPSS® software Version 22 (SPSS Inc., Chicago, Illinois, USA) for further analysis.

Results and Discussion

Respondent analysis

While the exact number of questionnaire recipients cannot be determined, 1582 responses were received. After filtering responses and conducting data quality checks, 889 responses were deemed valid for analysis. A descriptive analysis of the respondents revealed their sociodemographic characteristics. Table 2 indicates that male consumers are predominantly responsible for food purchasing, while female consumers are primarily responsible for food preparation. This finding aligns with previous research suggesting that prevailing societal norms restrict men's involvement in food preparation

at home, indicating that food preparation roles remain mainly related to women (AlOtaibi *et al.*, 2014; Baig *et al.*, 2019a, 2019b).

Perception intensity of food quality characteristics

Perception intensity can be deduced from the average score (AS) for each food quality characteristic. The standard deviation (SD) reflects the extent of variation in perception among consumer groups. The results show that the overall mean AS for all 20 characteristics was 3.82 ($SD \pm 1.0$), indicating a moderate perception of food quality among Saudi adults. Table 3 illustrates that all characteristics were perceived by Saudi adults, with eight characteristics (40%) being highly perceived. Only three characteristics were at the "perception threshold." Logically, no quality characteristic was "not perceived" because all the characteristics were derived from the literature and validated before they were considered in this study.

Moreover, intrinsic food quality characteristics were more important for Saudi consumers. The AS for intrinsic food quality characteristics, encompassing both product-related and process-related aspects, was 4.35, while the AS for extrinsic food quality characteristics was 3.29. Similarly, process-related food quality characteristics, both intrinsic and extrinsic, were found to be more important for Saudi consumers. The AS for process-related characteristics was 4.1, while the AS for product-related characteristics was 3.54.

Furthermore, characteristics related to product safety (superscripted by number 1) were found to be the most highly perceived (total AS = 4.67), indicating the awareness of Saudi consumers regarding food safety and nutritional quality. This result agrees with the findings of Almagrabi (2023) who reported that 43.9% of participants considered food safety when making food choices, while 67.3% were willing to pay more for approved safe food products (Almagrabi, 2023).

Nutritional prosperity characteristics (superscripted by number 3) were the second most important factor for Saudi consumers (total AS = 4.25), suggesting that Saudi consumers appreciate food nutritional quality. This result is supported by the findings of Alissa (2024), who revealed that Saudi participants performed above average (with an average of 1.5 points out of 3) in their knowledge, attitude, and practice of healthy food choices. The composite variable (average score) was 2.40, which is significantly greater than the average, indicating increased perceptions of healthy food choices. The study illustrated that the participants had adequate knowledge and positive attitudes about healthy food choices; however, practicing

Table 2. Respondents' sociodemographic analysis (n = 889).

Sociodemographic characteristic	No. (%)	Sociodemographic characteristic	No. (%)
Gender		Occupation	
Male	647 (72.8)	Student	67 (7.5)
Female	242 (27.2)	Private sector employee	136 (15.3)
Age		Public sector employee	478 (53.8)
< 18	8 (0.9)	Freelancer	64 (7.2)
18–25	78 (8.8)	Unemployed	144 (16.2)
26–35	197 (22.2)	Monthly Income (SR)	
36–45	287 (32.3)	Less than 3000	110 (12.4)
46–55	199 (22.3)	3001–6000	54 (6.1)
56–65	103 (11.6)	6001–11,000	140 (15.7)
> 65	17 (1.9)	11,001–16,000	229 (25.8)
Marital Status		16,001–28,000	244 (27.4)
Single	131 (14.7)	More than 28,000	112 (12.6)
Married no kids	64 (7.2)	Responsibility for food at home	
Married with kids	670 (75.4)	Buy and prepare food	145 (16.3) ^a
Widowed/divorced no kids	10 (1.1)	Buy food	403 (45.3) ^b
Widowed/divorced with kids	14 (1.6)	Prepare food	46 (5.2) ^c
Education		Sometimes help buy or prepare	223 (25.1) ^d
Doctoral	89 (10.1)	Not involved at all	72 (8.1) ^e
Master	158 (17.8)	Do you work/study in the food field	
Bachelor	461 (51.7)	Yes	152 (17.1) ^f
High school	167 (18.8)	No	737 (82.9) ^g
Intermediate school or less	14 (1.6)		

^a42 (29%) male + 103 (71%) female

^b388 (96.3%) male + 15 (3.7%) female

^c1 (1.2%) male + 45 (97.8%) female

^d153 (86.6%) male + 70 (13.4%) female

^e63 (87.5%) male + 9 (12.5%) female [contribute 3.7% out of total female subjects]

^f122 (80.3%) male + 30 (19.7%) female

^g525 (71.2%) male + 212 (28.8%) female

healthy food choices was lower (Alissa, 2024). Notably, the results of this study, along with those of Alissa (2024), may explain the findings of Sabur *et al.* (2019). Their study illustrated that only 1.53% of participants (out of 590 participants) met the recommendation of the Saudi Ministry of Health given on its national dietary guidelines. However, 34.7% of participants stated that they preferred healthy food, 18.8% preferred unhealthy food, and 46.5% preferred both types of food (Sabur *et al.*, 2019).

Sensory attributes (superscripted by number 2) were found to be the third most important factor for Saudi consumers (total AS = 4.24). Recent research on international consumers also revealed the same results, indicating that food sensory attributes substantially affect consumers' decisions regarding purchasing (Mascarello *et al.*, 2015; Brecic *et al.*, 2017). On the other hand, characteristics related to product processing were moderately

perceived by Saudi adults, with AS = 3.65. Finally, characteristics related to product usability and presentation were found to have low perception with AS = 3.27 and 3.13, respectively.

Effect of sociodemographic characteristics

Nonparametric variance analysis tests (Kruskal–Wallis and Mann–Whitney) were conducted to assess the significance of differences in independent variables by mean rank. Tables 4 and 5 demonstrate that Saudi consumers perceive food quality characteristics differently based on their sociodemographic factors. However, “gender” ($P = 0.077$) and “food-related role at home” ($P = 0.223$) were found to have no significant impact on food quality perception. These results imply that Saudi males and females perceive food quality characteristics similarly

Table 3. Average scores (AS) of quality characteristics.

	Product-related characteristics	AS (Mean ± SD)	Process-related characteristics	AS (Mean ± SD)
Intrinsic	Appealing (aroma and appearance) ³	4.09 ± 1.14 ^b	Free from natural/manufacturing faults ²	4.71 ± 0.7 ^a
	Tasty ³	4.08 ± 1.22 ^b	Organic ⁵	4.07 ± 1.12 ^b
	Nutrients' availability ⁴	4.72 ± 0.68 ^a	Natural ⁵	4.36 ± 0.97 ^a
	Healthiness ⁴	4.55 ± 0.84 ^a	Fortification (vitamin and minerals) ⁴	3.48 ± 1.24 ^b
	Freshness and seasonality ³	4.55 ± 0.77 ^a	Free from residues and contaminants ¹	4.89 ± 0.42 ^a
	GROUP OVERALL	4.4 ± 0.57^a	GROUP OVERALL	4.3 ± 0.59^a
	Price (higher than others) ⁶	2.54 ± 1.32 ^d	Sanitation (in processing and handling) ¹	4.84 ± 0.5 ^a
Extrinsic	Reputation (branding and advertising) ⁶	2.71 ± 1.41 ^c	Certification (competence of producer) ¹	4.28 ± 1.04 ^a
	Convenience (storage and preparation) ²	2.59 ± 1.33 ^d	Processed (manufactured food) ⁵	3.10 ± 1.42 ^c
	Shelf-life (longer shelf-life) ²	2.52 ± 1.34 ^d	Availability in market ⁶	3.37 ± 1.37 ^c
	Origin (produced/manufactured locally) ⁵	3.05 ± 1.39 ^c	Packaging design and labeling ⁶	3.91 ± 1.28 ^b
	GROUP OVERALL	2.68 ± 0.99^c	GROUP OVERALL	3.9 ± 0.77^b
^a High perception [4.2 < AS ≤ 5] ^b Moderate perception [3.4 < AS ≤ 4.2] ^c Low perception [2.6 < AS ≤ 3.4] ^d Perception threshold [1.8 < AS ≤ 2.6] ^e Not perceived [1 ≤ AS ≤ 1.8]			¹ Product safety characteristics (AS = 4.67) ² Product usability characteristics (AS = 3.27) ³ Product sensory attributes (AS = 4.24) ⁴ Product nutritional prosperity characteristics (AS = 4.25) ⁵ Product processing characteristics (AS = 3.65) ⁶ Product presentation characteristics (AS = 3.13)	

and that food-related roles within the household have no significant influence on consumers' perception of food quality characteristics. Additionally, these findings were confirmed by parametric one-way ANOVA between and within groups for each sociodemographic characteristic, and the results corroborated the findings of the nonparametric analysis.

From Table 5, specialization in the food field (study or work) was found to have a significant impact on Saudi consumers' perceptions of food quality characteristics. Interestingly, consumers who do not work or study in the food field exhibited

a greater perception of food quality (total AS = 4.13) than those who do (total AS = 3.89). One possible explanation for this finding is that the amount of food-related knowledge available to people specializing in food could make them more critical in evaluating food quality.

Furthermore, a post hoc test was conducted as an exploratory multicomparison test to examine significant differences among mean ranks using the least significant difference (LSD) method. This test helps identify specific sociodemographic groups with significantly different perceptions of food quality from other groups. The LSD analysis revealed that the perceived quality characteristics of the 46–55 age group were greater than those of the other age groups (total AS = 3.94) but differed significantly from the four age groups (Table 6).

Similarly, when the effect of marital status was explored, "Single" consumers were found to have the least perception (total AS = 3.68) of food quality, their perception was significantly different from individuals with children (regardless of whether they were married/divorced/widowed) (Table 7). This finding provides evidence that parenthood significantly affects consumers' perceptions.

Table 4. Kruskal-Wallis test.

	Chi-square	df	Asymp. Sig.
Age	17.653	6	0.007
Marital status	14.461	4	0.006
Education	45.090	4	0.000
Occupation	16.682	4	0.002
Income	15.556	5	0.008
Food-related role at home	5.691	4	0.223

Table 5. Mann-Whitney test.

	Mann-Whitney U	Wilcoxon W	Z	Asymp. Sig. (2-tailed)
Gender	72,266.5	281,894.5	-1.767	0.077
Work/study in food field	41,990.5	53,618.5	-4.866	0.000

Table 6. LSD post hoc test for age.

Mean (I)	Mean (J)	Mean difference (I-J)	Sig.
46–55	< 18	0.16534	0.012
	18–25	0.18332	0.015
	26–35	0.21351	0.000
	36–45	0.14840	0.004

Table 7. LSD post hoc test for marital status.

Mean (I)	Mean (J)	Mean difference (I-J)	Sig.
Married with kids	Single	0.15508*	0.004
Divorced/widowed with kids	Single	0.33822*	0.032

Education was found to play a significant role in food quality perception. Consumers with education levels “less than high school” (total AS = 4.18) and “high school” (total AS = 4.02) were found to have different perceptions of food quality characteristics. There was also a significant difference in perception between consumers with a “Bachelor” degree (total AS = 3.82) and consumers with a “Master” degree (total AS = 3.63) (Table 8). This interesting finding suggests that education may play a complex role in how people evaluate and perceive food quality. While consumers with lower education levels may have a greater perception of food quality, consumers with higher education levels may be more critical of food quality. One possible explanation for this finding is that consumers with less education may be more likely to rely on traditional cues of food quality, such as appearance, taste, and smell. On the other hand, consumers with higher education levels are more likely to be exposed to information about the potential negative impacts of food production and processing, which could make them more critical of food quality.

The occupation was found to significantly impact consumer perception of food quality. Compared with those in other consumer groups, consumers in the “unemployed” group (total AS = 3.96) were found to have a significantly greater perception of food quality characteristics (Table 9). One possible explanation for this interesting finding could be the extra time that “unemployed” people have to spend on food shopping and/or dining. Moreover, the “students” (total AS = 3.68) had the lowest perception of food quality, but their perception was not significantly different from that of employed consumers in either the “government sector” or “private sector.” The “student” group also had a significant difference in quality perception compared with the “freelancer” group.

Income was found to significantly affect consumers’ perception of food quality. Consumers with a national

Table 8. LSD post hoc test for education.

Mean (I)	Mean (J)	Mean difference (I-J)	Sig.
Less than high school	Bachelors	0.35883*	0.016
	Masters	0.54471*	0.000
	Doctorate	0.45273*	0.004
High school	Bachelors	0.20242*	0.000
	Masters	0.38829*	0.000
	Doctorate	0.29631*	0.000
Bachelor	Masters	0.18588*	0.000

Table 9. LSD post hoc test for occupation.

Mean (I)	Mean (J)	Mean difference (I-J)	Sig.
Unemployed	Student	0.27347*	0.001
	Private sector	0.15556*	0.020
	Government sector	0.16288*	0.002
Freelancer	Student	0.23744*	0.015

Table 10. LSD post hoc test for income.

Mean (I)	Mean (J)	Mean difference (I-J)	Sig.
6001–11,000	Less than 3000	0.16922*	0.018
	16,001–28,000	0.21421*	0.000
	More than 28,000	0.20696*	0.004
11,001–16,000	16,001–28,000	0.12295*	0.017

average income of “6001–11,000 SR” had the highest perception (total AS = 3.96); however, this value was not significantly different from that of the consumer group with an income of “11,001–16,000 SR” (Table 10). High-income consumers in the “16,001–28,000 SR” and “> 28,000 SR” groups were found to have the lowest food quality perceptions.

Cluster analysis

Cluster analysis was conducted to partition participants based on their responses to evaluate different perception trends. The nonhierarchical cluster analysis (*k*-means) was performed based on 20 questions and resulted in two clusters: cluster 1 contained 478 cases (53.77%), while cluster 2 contained 411 cases (46.23%). The Euclidean Distance was 4.686 (distance between final cluster centers), indicating significant dissimilarity between the two clusters. The contingency of sociodemographic characteristics between the two clusters was examined using a

chi-square test to compare cluster characteristics. The two clusters differed significantly from each other in terms of sociodemography, except for "gender" ($P = 0.46$) and "food-related role at home" ($P = 0.23$), which were not significantly different between the clusters.

Furthermore, binary logistic regression was performed for each cluster to characterize the clusters and identify their significant sociodemographic factors. This analysis enabled the assessment of the extent to which the sociodemographic variables influenced the likelihood of belonging to Clusters 1 or 2. Overall, it was found that five major sociodemographic characteristics can be used

to predict a participant's affiliation with Cluster 1 or 2 (Table 11). These characteristics can be considered the primary factors that significantly impact Saudi consumers' perceptions of food quality.

Additionally, to understand how food quality characteristics influence previously identified consumer groups (i.e., clusters), a regression F -test was performed. This test helps assess the impact of each characteristic in forming clusters. A higher F -value indicates a stronger influence of a characteristic on creating the clusters, while a larger cluster mean square indicates greater variation between clusters' means (Table 12).

Table 11. Binary logistic regression for clusters.

Variable	Wald	P	B Cluster 1	B Cluster 2
Marital status "Married with kids"	4.619	0.03	-0.845	4.691
Education "High school"	5.896	0.015	1.704	5.896
Education "Intermediate or less"	3.983	0.046	1.435	3.983
Occupation "Unemployed"	6.457	0.011	-1.184	6.457
Income "6001 – 11,000 SR"	3.837	0.05	-0.670	3.837

Table 12. Regression F -test based on dependent variables.

	Final cluster centers		Cluster		Error		F	Sig. *
	Cluster 1	Cluster 2	Mean Square	df	Mean Square	df		
Appealing (aroma & appearance)	3.7	4.6	165.107	1	1.127	887	146.495	0.000
Tasty	3.6	4.6	237.667	1	1.222	887	194.535	0.000
Nutrients availability	4.6	4.8	5.556	1	0.461	887	12.063	0.001
Healthiness	4.4	4.7	19.990	1	0.690	887	28.976	0.000
Freshness and seasonality	4.4	4.7	28.082	1	0.562	887	49.984	0.000
Free from natural/manufacturing faults	4.6	4.8	4.470	1	0.488	887	9.157	0.003
Organic	3.8	4.4	72.139	1	1.179	887	61.184	0.000
Natural	4.2	4.6	29.732	1	0.905	887	32.839	0.000
Fortification (vitamin and minerals)	3.0	4.1	248.210	1	1.269	887	195.560	0.000
Free from residues and contaminants	4.9	4.9	0.926	1	0.174	887	5.326	0.021
Price (higher than others)	2.0	3.1	271.649	1	1.429	887	190.125	0.000
Reputation (branding & advertising)	1.9	3.6	627.143	1	1.299	887	482.886	0.000
Convenience (storage & preparation)	1.8	3.5	616.843	1	1.081	887	570.843	0.000
Shelf-life (longer shelf-life)	1.8	3.4	540.355	1	1.185	887	455.875	0.000
Origin (produced/manufactured locally)	2.4	3.8	442.782	1	1.446	887	306.206	0.000
Sanitation (in processing & handling)	4.8	4.9	2.783	1	0.246	887	11.335	0.001
Certification (competence of producer)	4.0	4.6	89.322	1	0.987	887	90.522	0.000
Processed (manufactured food)	2.3	4.0	633.774	1	1.317	887	481.337	0.000
Availability at Market	2.6	4.2	583.362	1	1.223	887	476.947	0.000
Packaging Design & labeling	3.4	4.5	231.888	1	1.393	887	166.498	0.000

(*) F tests should be used only for descriptive purposes because the clusters have been chosen to maximize the differences among cases in different clusters. The observed significance levels are not corrected for this and thus cannot be interpreted as tests of the hypothesis that the cluster means are equal.

Principals Component Analysis (PCA)

The Kaiser–Meyer–Olkin (KMO) test was conducted to assess the data's suitability for factor analysis. The KMO value of 0.856 indicates that the sample size is adequate for factor analysis. Bartlett's test of sphericity was also performed to evaluate the suitability of the data matrix for factor analysis. The significance of the test ($P = 0.000$) indicates the presence of sufficient correlation among variables, which is essential for the effectiveness of factor analysis. After confirming the data's suitability for factor analysis, PCA was conducted using the "Varimax with Kaiser normalization" rotation method.

PCA was performed to identify and quantify the sources of variation and to reduce variability from 20 variables to four factors that explained a total of 51.1% of the variance (Table 13). These components represent four major quality factors based on consumer perspectives, each encompassing a group of empirically and mutually correlated quality characteristics. Factor 1, accounting for 20% of the variance, comprised 8 quality characteristics related to "food identity and processing." Factor 2, accounting for 14.3% of the variance, comprised 6 quality characteristics

related to "food healthiness and prosperity." Factor 3, accounting for 8.7% of the variance, comprised 4 quality characteristics related to "food safety and presentation." Factor 4, accounting for 8.1% of the variance, comprised 2 quality characteristics related to "food sensory attributes." These four factors can be considered the major criteria used by Saudi consumers to assess food quality characteristics.

Conclusion

This study aimed to establish a repeatable and informative procedure for measuring consumers' food quality perception to infer and understand consumers' behavior and food choice. The study measured the food quality perception of adult Saudi consumers residing in Riyadh City, Saudi Arabia. It revealed that product safety, nutritional prosperity, and sensory attributes were the most perceived among Saudi consumers, with AS of 4.67, 4.25, and 4.24, respectively. Product processing was moderately perceived, with AS = 3.65; while product usability and presentation were found to have low perception with AS of 3.27 and 3.13, respectively.

Table 13. Principal component analysis: rotated component matrix*.

	Component			
	1	2	3	4
Appealing (aroma & appearance) ³				0.838
Tasty ³				0.815
Nutrients availability ⁴		0.626		
Healthiness ⁴		0.686		
Freshness and seasonality ³		0.522		
Free from natural/manufacturing faults ²		0.497		
Organic ⁵		0.697		
Natural ⁵		0.738		
Fortification (vitamin and minerals) ⁴	0.494			
Free from residues and contaminants ¹			0.548	
Price (higher than others) ⁶	0.599			
Reputation (branding & advertising) ⁶	0.724			
Convenience (storage & preparation) ²	0.741			
Shelf-life (longer shelf-life) ²	0.704			
Origin (produced/manufactured locally) ⁵	0.587			
Sanitation (in processing & handling) ¹			0.695	
Certification (competence of producer) ¹			0.557	
Processed (manufactured food) ⁵	0.672			
Availability in the market ⁶	0.657			
Packaging design & labeling ⁶			.510	
Total Variance	20%	14.3%	8.7%	8.1%

*Extraction method: Principal Component Analysis; *Rotation method: Varimax with Kaiser Normalization.

*Rotation converged in 9 iterations.

Among the eight sociodemographic factors studied, only gender and food-related roles at home were found to have no significant effect on food quality perception. Moreover, there were two major trends in food quality perception among Saudis. Marital status, education, occupation, and income were key classification factors for food quality perception trends. Additionally, “food identity and processing,” “food healthiness prosperity,” “food safety and presentation,” and “food sensory attributes” were the four major aspects of food quality based on Saudi consumers' point of view.

Acknowledgment

The author extends his sincere appreciation to the Department of Food Sciences and Nutrition, College of Food and Agriculture Sciences, King Saud University for support.

AI Declaration

I acknowledge the use of Google Gemini (<https://gemini.google.com/>) to improve grammar and clarity of the original text. The output was then further modified to better represent my writing style and to ensure context.

Conflict of Interest Disclosure

The author declares that he has no conflicts of interest to disclose.

Authors' Contribution

This work was solely authored by Mohammad Alshuniaber, with no other contributions to disclose.

References

- Aithal, A. and Aithal, P., 2020. Development and validation of survey questionnaire & experimental data—A systematical review-based statistical approach. *International Journal of Management, Technology, and Social Sciences*. 5(2): 233–251. <https://doi.org/10.5281/zenodo.4179499>
- Al Otaibi, N. and Yasmeen, K., 2014. Saudi consumer's shopping behavior: Descriptive analysis. *Journal of Sociological Research*. 5(2): 75–94. <https://doi.org/10.5296/jsr.v5i2.6641>
- Alissa, N., 2024. What are the perceptions of healthy food choices? A cross-sectional study from Saudi Arabia. *Italian Journal of Food Science*. 36(2): 195–204. <https://doi.org/10.15586/ijfs.v36i2.2506>
- Almaghrabi, M., 2023. Assessing public interest, risk perceptions, and awareness of food safety in Saudi Arabia: A cross-sectional study. *Food Control*. 151: 109810. <https://doi.org/10.1016/j.foodcont.2023.109810>
- Baig, M., Al-Zahrani, K., Schneider, F., Straquadine, G. and Mourad, M., 2019a. Food waste posing a serious threat to sustainability in the Kingdom of Saudi Arabia—A systematic review. *Saudi Journal of Biological Sciences*. 26(7): 1743–1752 <https://doi.org/10.1016/j.sjbs.2018.06.004>
- Baig, M., Gorski, I. and Neff, R., 2019b., Understanding and addressing waste of food in the Kingdom of Saudi Arabia. *Saudi Journal of Biological Sciences*. 26(6): 1633–1648. <https://doi.org/10.1016/j.sjbs.2018.08.030>
- Baliwati, Y., Diana, R., Martianto, D., Sukandar, D. and Hendriadi, A., 2023. Development and validation of a social impact questionnaire for household food waste. *MethodsX*. 11: 102499. <https://doi.org/10.1016/j.mex.2023.102499>
- Basri, N., Ahmad, R., Anuar, F. and Ismail, K., 2016. Effect of word of mouth communication on consumer purchase decision: Malay upscale restaurant. *Procedia-Social and Behavioral Sciences*. 222: 324–331. <https://doi.org/10.1016/j.sbspro.2016.05.175>
- Bearth, A., Cousin, M. and Siegrist, M., 2014. The consumer's perception of artificial food additives: Influences on acceptance, risk and benefit perceptions. *Food Quality and Preference*. 38: 14–23. <https://doi.org/10.1016/j.foodqual.2014.05.008>
- Brečić, R., Mesić, Ž. and Cerjak, M., 2017. Importance of intrinsic and extrinsic quality food characteristics by different consumer segments. *British Food Journal*. 119(4): 845–862. <https://doi.org/10.1108/bfj-06-2016-0284>
- Chamhuri, N. and Batt, P., 2015. Consumer perceptions of food quality in Malaysia. *British Food Journal*. 117(3): 1168–1187. <https://doi.org/10.1108/BFJ-08-2013-0235>
- Cranage, D., Conklin, M. and Lambert, C., 2004. Effect of nutrition information in perceptions of food quality, consumption behavior and purchase intentions. *Journal of Foodservice Business Research*. 7(1): 43–61. https://doi.org/10.1300/J369v07n01_04
- Espejel, J., Fandos, C. and Flavián, C., 2009. The influence of consumer involvement on quality signals perception. *British Food Journal*. 111(11): 1212–1236. <https://doi.org/10.1108/00070700911001040>
- General Authority for Statistics. Annual statistical report: Chapter 11: Labor market and social protection—Average monthly wage (salary) of employed persons (15 years and above) by region, sex & nationality 2019 A.D. 2019. [cited 2024 Jun 15]. Available from: <https://www.stats.gov.sa/ar/1017>
- General Authority for Statistics, 2018. Databases: Social classification of Saudi population. [cited 2024 Jun 15]. Available from: <https://www.stats.gov.sa/ar/1039>
- General Authority for Statistics, 2023. SaudiCensus 2010–2022. [cited 2024 June 15]. Available from: <https://portal.saudicensus.sa/portal/public/1/15/101462?type=TABLE>
- Hansen, T., 2005a. Understanding consumer perception of food quality: The cases of shrimps and cheese. *British Food Journal*. 107(7): 500–525. <https://doi.org/10.1108/00070700510606909>
- Hansen, T., 2005b. Rethinking consumer perception of food quality. *Journal of Food Products Marketing*. 11(2): 75–93. https://doi.org/10.1300/J038v11n02_05
- Hassig, A., Hartmann, C., Sanchez-Siles, L. and Siegrist, M., 2023. Perceived degree of food processing as a cue for perceived

- healthiness: The NOVA system mirrors consumers' perceptions. *Food Quality and Preference*. (110): 104944. <https://doi.org/10.1016/j.foodqual.2023.104944>
- Hsu, J., Sung, C. and Tseng, J., 2023. Willingness-to-pay for ready-to-eat clean label food products at convenient stores. *Future Foods*. (7): 100237. <https://doi.org/10.1016/j.fufo.2023.100237>
- Ipsos, 2020. Food trend 2020: The changing food habits & attitudes of consumers in Saudi Arabia during the pandemic. [cited 2024 Aug 01]. Available from: https://www.ipsos.com/sites/default/files/ct/news/documents/2020-12/food_trends_2020_-_ksa.pdf
- Kovacs, I. and Keresztes, E., 2022. Perceived consumer effectiveness and willingness to pay for credence product attributes of sustainable foods. *Sustainability*. 14: 4338. <https://doi.org/10.3390/su14074338>
- Magnier, L., Schoormans, J. and Mugge, R., 2016. Judging a product by its cover: Packaging sustainability and perceptions of quality in food products. *Food Quality and Preference*. 53: 132–142. <https://doi.org/10.1016/j.foodqual.2016.06.006>
- Mascarello, G., Pinto, A., Parise, N., Crovato, S. and Ravarotto, L., 2015. The perception of food quality. Profiling Italian consumers. *Appetite*. 89: 175–182. <https://doi.org/10.1016/j.appet.2015.02.014>
- Palma, M., Collart, A. and Chammoun, C., 2015. Information asymmetry in consumer perceptions of quality-differentiated food products. *Journal of Consumer Affairs*. 49(3): 596–612. <https://doi.org/10.1111/joca.12053>
- Röhr, A., Lüddecke, K., Drusch, S., Müller, M. and Alvensleben, R., 2005. Food quality and safety—Consumer perception and public health concern. *Food Control*. 16(8): 649–655. <https://doi.org/10.1016/j.foodcont.2004.06.001>
- Roman, S., Sanchez-Siles, L. and Siegrist, M., 2017. The importance of food naturalness for consumers: Results of a systematic review. *Trends in Food Science & Technology*. 67: 44–57. <https://doi.org/10.1016/j.tifs.2017.06.010>
- Rubio, N., Oubiña, J. and Villaseñor, N., 2014. Brand awareness—Brand quality inference and consumer's risk perception in store brands of food products. *Food Quality and Preference*. 32: 289–298. <https://doi.org/10.1016/j.foodqual.2013.09.006>
- Sabur, A., Alsharief, L. and Amer, S., 2022. Determinants of healthy food consumption and the effect of Saudi food related policies on the adult Saudi population, a National Descriptive Assessment 2019. *Current Research in Nutrition and Food Science*. 10(3): 1058–1076. <https://doi.org/10.12944/CRNFSJ.10.3.21>
- Siegrist, M., Stampfli, N. and Kastenholtz, H., 2008. Consumers' willingness to buy functional foods. The influence of carrier, benefit and trust. *Appetite*. 51(3): 526–529. <https://doi.org/10.1016/j.appet.2008.04.003>
- Silv, W., Udugama, J. and Mudalige, U., 2012. Consumer perceptions on quality attributes of liquid food products: An empirical analysis based on urban households. *The Journal of Agricultural Sciences*. 7(2): 85–96. <http://doi.org/10.4038/jas.v7i2.4409>
- Statista, 2024. Food market revenue in Saudi Arabia from 2019 to 2029. [cited 2024 Aug 01]. Available from: <https://www.statista.com/forecasts/1456808/saudi-arabia-food-market-revenue>
- Thøgersen, J., Pedersen, S., Paternoga, M., Schwendel, E. and Aschemann-Witzel, J., 2017. How important is country-of-origin for organic food consumers? A review of the literature and suggestions for future research. *British Food Journal*. 119(3): 542–557. <https://doi.org/10.1108/bfj-09-2016-0406>
- Van, Rijswijk W. and Frewer, L., 2008. Consumer perceptions of food quality and safety and their relation to traceability. *British Food Journal*. 110(10): 1034–1046. <https://doi.org/10.1108/00070700810906642>
- Wansink, B., Tal, A. and Brumberg, A., 2014. Ingredient-based food fears and avoidance: Antecedents and antidotes. *Food Quality and Preference*. 38: 40–48. <https://doi.org/10.1016/j.foodqual.2014.05.015>
- Wansink, B., van Ittersum, K. and Painter, J., 2005. How descriptive food names bias sensory perceptions in restaurants. *Food Quality and Preference*. 16(5): 393–400. <https://doi.org/10.1016/j.foodqual.2004.06.005>
- Wong, S., Hsu, C. and Chen, H., 2018. To buy or not to buy? Consumer attitudes and purchase intentions for suboptimal food. *International Journal of Environmental Research and Public Health*. 15(7): 1431. <https://doi.org/10.3390/ijerph15071431>
- Zaibet, L., Bachtta, M., Lajimi, A. and Abbassi, M., 2004. Consumers' perception of food product quality in Tunisia. *Journal of International Food & Agribusiness Marketing*. 16(2): 165–178. https://doi.org/10.1300/J047v16n02_10