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Original Research

Assessment of Food Safety Considering Food Misuse and Low-Quality Products: Study of the Quality of Tomato Paste Products Available in the Kabul Market

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Abstract

Food and nutrition insecurity in Afghanistan is one of the key crises that has challenged the lives of many Afghans, resulting in insufficient food, limited access to food, low-quality processed food products, food misuse, and food supply instability (1). The purpose of this research is to assess the food safety condition to understand the value and importance of food safety in the society in an effort to study food misuse by consumers and the lack of quality processed products. In this study, tomato paste, which is one of the most consumed products in Afghanistan and largely imported from overseas markets, has been selected. The study delves deeper into investigating the factors influencing consumers' choice of tomato paste and the quality of the tomato paste products. In this study through descriptive, cross-sectional method 384 individuals responsible for purchasing food items for their households were selected from across the Kabul city using the convenience sampling method. the data was analyzed using version 20 of the SPSS, a statistical analysis software. In ascertaining the quality of tomato paste products, the purposive sampling method among tomato paste brands available in the Kabul market was used. The analysis of these samples was conducted in the Middle East Testing Services (METS) L.L.C. laboratory. The results of the study of tomato paste quality show that the majority of products available in the country markets are of low quality and are contrary to the accepted and expected standards. This issue leads to the loss of one of the most important pillars of food safety and security in the country.

Keywords: Tomato paste, quality, domestic products, selection criteria of tomato paste, food safety, food security

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1. Introduction

Food and nutrition insecurity in Afghanistan is one of the pressing crises that has challenged the lives of many Afghans. Research has shown that Afghanistan has the second highest number of people living in emergency food insecurity. Currently, more than 16 million Afghans are dependent on foreign humanitarian aid and the number is expected to rise to more than 18 million people by the end of 2021 (3). One of the biggest factors driving food insecurity in Afghanistan is unhealthy nutrition in addition to insufficient food availability, limited access to food, low-quality processed food products, food misuse and food supply instability, which is caused by natural disasters that affected a great portion of the population (1).

Food safety[†] leads to a reduction in foodborne illnesses and food waste, an increase in production, access to the global market, food security,[‡] and ultimately improved public health. Therefore, we can say that there is a chain or direct relationship between food safety, food security, and public health. Food security is impossible to achieve without food safety and access to safe food is the main pillar of food security (5). It means that food and nutrition safety exists when everyone, at all times, has physical, social, and economic access to sufficient and nutritious food (in terms of quantity and quality) by observing the principles of hygiene and health care (6).

Considering that people's food choice has a direct impact on their healthy nutrition and choosing the right product or the right food is part of a healthy nutrition. Therefore, healthy nutrition and choosing the right quantity and quality of food are the most important factors affecting food safety.

In the literature review, we found that basic studies have not been conducted in the field of food selection criteria in the country. Considering the importance of food selection criteria and its direct impact on healthy nutrition, in this study, tomato paste, which is one of the most consumed products in the main food dishes of the Afghan people and is mostly available in the market as an imported product, has been selected. The criteria used by consumers in choosing tomato paste product has been studied throughout the study, which is one of the objectives of this research.

2. Research Aim

This study was initiated to seek solutions to the challenges in the national food sector including the existence of low-quality food products across the Kabul market. It further looks into the high use of these low-quality products among consumers

[†] **Food Safety**: Food safety means ensuring that the food consumed by the people of the society is completely healthy and free of any contamination; this contamination can be microbial, physical, or chemical.(4)

[‡] **Food Security:** Food security exists when all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life (4).

and the challenge of price competition between domestic products in Afghan markets and low-quality and cheap imported products.

In order to evaluate the current situation and define the research problem in this study, researchers met the relevant and responsible organizations in the sector, including the Ministry of Public Health, Ministry of Agriculture and Irrigation and Livestock, Afghanistan Food and Drug Administration (FDA), Afghanistan National Standards Authority (ANSA), the Food Safety Authority and the Food Quality Control Laboratories in Kabul. During these field trips and meetings, sufficient and comprehensive information was not provided to the researchers by representatives of the above organizations. In some cases, inquiries and requests from the researchers were never responded by these organizations.

We did not receive reliable and useful information due to the interference of the duties and the dispersion of data between the Ministry of Agriculture and Irrigation and Livestock, which is responsible for inspecting raw and dairy products, and the Ministry of Public Health, which is responsible for controlling the quality of processed food. Similarly, Food quality control laboratories and the Food Safety Authority did not provide us with the recorded information.

Afghanistan National Standards Authority (ANSA) did not cooperate in this regard, and according to authorities in this organization, only standardization was their responsibility, and the task of quality control was not part of their responsibilities. Researchers also failed to meet with the Food and Drug Administration (FDA) of Afghanistan as well as the Customs Department.

After consistent efforts and reviewing the current situation and considering the limited access the researchers had to authorities and reliable information, the overall main aim of the study was revised to be the assessment of the food safety condition in an effort to understand the value and importance of food safety in the society. Two aspects including the food misuse by consumers and low-quality processed products were also investigated. To be more specific, this research study tried to investigate the following two areas:

- The criteria used by consumers in choosing their tomato paste products
- The quality of tomato paste products

3. Materials and Methodology

This is a descriptive cross-sectional study, and the convenience sampling method has been used for data collection. Data has been collected from food consumers, especially those buying tomato paste products, across seven districts of Kabul. The questionnaire is designed in two parts containing 15 questions. In the first part, 4 out of 15 questions are related to the demographics of the individuals; in the second part, 8 out of 15 questions are related to criteria for selecting tomato paste product by consumers; and the last three questions are focused on finding out to what extent consumers use and trust domestic products.

According to the rules of testing the questionnaires, first 50 questionnaires were test-run in areas that did not include our main sampling areas. The

questionnaire was explained to each person for 5 to 10 minutes during the face-to-face interviews to prevent mistakes and misunderstandings. Participation in these interviews was entirely voluntary, and individuals could cancel the interview at any time or refuse to answer any specific questions. It should be noted that the reliability and validity of the questionnaire were calculated using SPSS data and statistical analysis software.

Sample Size

The sample size in this study, with a 95% confidence level and 5% margin of error and a total population of 2,843,550, has been obtained using the following formula (7)**:**

$$\mathbf{Z_{(95\%)} = 1.96}$$
$$\mathbf{P = 0.5}$$
$$\mathbf{e = 0.05}$$
$$\mathbf{N = 2843550}$$

$$\mathbf{n = \frac{\frac{z^2 * P(1-P)}{e^2}}{1+(\frac{z^2 * P(1-P)}{e^2 * N})} = \frac{\frac{1.96^2 * 0.5(1-0.5)}{0{,}05^2}}{1+(\frac{1.96^2 * 0.5(1-0.5)}{0.05^2 * 2843550})}}$$

$$\mathbf{n = \frac{\frac{0.9604}{0.0025}}{1+(\frac{0.9604}{7108.875})} = \frac{384.16}{1.00013} = 384}$$

Hence, the number of samples in this research is 384.

In the section of study focused on the quality of tomato paste product, several brands available in the country's markets have been selected by purposive sampling, and its various parameters have been tested in three sections, including its nutritional information, unacceptability (additive, preservative, color, starch) and chemical analysis.

4. Results and Findings

The first part of the results and findings is focused on evaluating the selection criteria:

The mean of the interviewees' age was 30 of which 80% were men, and 20% were women. The interviewees in this study were of five levels of education: 12.2% no formal education; 54.7% high school graduates or a degree below this level; 30.2% holding bachelor's degrees; 2.3% with master's degrees; and 0.3% had doctorate degrees.

This study has shown that families in the season of tomatoes (usually the summer months) make use of fresh tomatoes, and in the 9 months when their prices rise, the majority of the families use tomato paste products. According to the results of this evaluation, 75.5% of the families used tomato paste products and 24.5% of the families used fresh tomatoes at the time of the research (Sawar 1400 AH / May 2021).

The evaluation results of the tomato paste consumption in Kabul markets show that among the 290 families that use tomato paste, 13 of them who were responsible for family purchases did not mention the name of the tomato paste brand, and the rest of the numbers are listed in below Table 01.

Table 01: Consumption Evaluation of Available Tomato Paste in Kabul Market

Brand	Amount	Percentage
Hadia	217	78.6
Taimaz	29	10.5
Noras	11	4
Chin Chin	4	1.5
Boustan	3	1.1
Rob-e-Watani	3	1.1
Salem	2	0.7
T.T.K	1	0.4
Khurram	1	0.4
Dal Chin	1	0.4
Fakhrian	1	0.4
Mumtaz	1	0.4
Total	267	100

Selection criteria of tomato paste product have been evaluated in three sections considering the importance of each one of them. The first part is the criteria for selecting the tomato paste product (price and quality); the second part is the criteria related to sensory evaluation of the product (color, taste, smell, and density); and the third part is the criteria considered while buying a tomato paste product (production and expiration date, type of packaging, the brand of product and seller's opinion).

Questions in the first part were arranged in single-choice answers, and in the other two parts in multiple-choice format. The criteria of quality, color, production, and expiration dates have the highest numbers in the three sections of the criteria for selecting a tomato paste product. The results of this evaluation are listed in Table 02.

The results of this study also show that the majority of the consumers do not have enough information about the tomato paste's brand, production country, and whether it is an imported product or produced domestically**.**

Assessing the use of domestic products of tomato paste and the reasons for not using it shows that 90.7% of the consumers do not use domestic products. The majority of whom stated the lack of knowledge and awareness of domestic products as the main reason for not using them. Consequently, lack of trust in the quality of domestic products and their higher price in comparison to imported products in the markets have been stated as yet other reasons for not using domestic products. The evaluation also showed that only 9.3% of the interviewees used domestic products.

Table 02: Tomato paste product Selection Criteria

Selection Criteria	**Different**	**Amount**	**Percent**
Selection Criteria of Tomato Paste	Quality	254	87.3
	Price	36	12.4
Sensory Evaluation Criteria	Color	182	23
	Taste	177	32.1
	Odor	76	13.8
	Density	116	21
Criteria Considered When Buying Tomato Paste Product	Production and expiration date	259	52.4
	Packaging type	83	16.6
	Brand	90	18.3
	Seller's idea	62	12.7

The second part of the results and findings of the research is about studying the quality of tomato paste products available in the Kabul market:

As previously mentioned, in this study, various parameters across different tomato paste products have been tested, including nutritional information, unacceptability (additives, preservatives, and starch) and chemical analysis. These tested parameters are pH, protein, fat, carbohydrate, water, starch, and guar gum. Table 03 shows these parameters and their test method in this study.

Table 03: Tested Parameters and their Testing Methods

No.	Parameter	Unit	Test Method
1	pH	-	AOAC 981.12
2	Protein	g/100g	AOAC 920.152
3	Fat	g/100g	AOAC 991.36
4	Carbohydrates	g/100g	METS-IP 97
5	Water	g/100g	AOAC 970.59
6	Starch	-	Qualitative
7	Guar gum	%	HPLC

The acceptable limits of these parameters in tomato paste product according to the standards of the Food and Drug Administration (FDA) of the United States are stated as:

- According to the FDA tomato paste standards of the United States, the pH of tomato paste should be a maximum of 4.3.
- Starch is used as a preservative and additive to increase the density of tomato paste and is considered as an unacceptable substance whose presence in the paste product is not acceptable.
- Guar gum is one of the additives used in tomato paste to increase its density. The permissible limit of it is (0.5-1.0) %.
- The maximum standard percentage of water or moisture is (70%).

It should be noted that the use of additives in food is done according to special principles and within acceptable limits, and additives that are not suitable for use are considered unauthorized or unacceptable substances (8).

The standards and acceptable and unacceptable limits of these parameters in tomato paste products are shown in Table 04.

Table 04: The Acceptable and Unacceptable Limits of the Parameters in Tomato Paste.

Parameter	Acceptable Limit	Unacceptable Limit	Unit
pH	4.3	>4.3	-
Protein	4.3	<4.3	g/100g
Fat	0.1	>0.1	g/100g
Carbohydrates	19	<19	g/100g
Water	70	>70	g/100g
Guar gum	1-0.5	>1	%
Starch	Absence	Presence	-

The results of the study of tomato paste quality are listed in Table 05, which shows the results of the seven tested parameters across 5 brands of tomato paste product.

Table 05: The Results of the Study of the Tomato Paste Quality.

Tomato Paste Brand	Parameters						
	pH	Protein (g/100g)	Fat (g/100g)	Carbohyd rate (g/100g)	Water (g/100g)	Starch	Guar Gum (%)
Hadia	4.33	3.87	<0.1	17.99	73.5	Present	NT
Noras	4.46	4.71	<0.1	19.10	73.19	Absent	2.3
Taimaz	4.48	1.94	<0.1	19.54	73.25	Present	NT
Chin Chin	4.29	3.71	<0.1	18.95	74.58	Present	NT
Tabarok	4.48	3.98	<0.1	19.54	73.43	Present	NT

5. Discussion

As mentioned earlier, food choice has a direct impact on people's health and plays a key role in ensuring food safety. Food selection criteria can lead us to the right and quality products.

Inadequate knowledge of these criteria and not having information about food products cause an increase in the use of low-quality products among consumers.

As stated in the results and findings section, quality is prioritized as the most important criterion in choosing tomato paste, and price, after the quality, is considered as the second most important criterion. Similarly, in a study conducted in Herat province, Afghanistan, similar results show that quality is the most important factor in selecting tomato paste, and the price is the second important factor in buying such products (9).

Our findings from the criteria of sensory evaluation of the products show that color (33%), taste (32.1%), density (21%), and smell (13.8%) are ranked from first to fourth respectively. Accordingly, in a study in Iran, consumers, when consuming

tomato paste, believe that the paste should have good color (32.1%), and after the color, the taste, smell, and density respectively.

Similarly, the results of our study show that among the four criteria that are considered by consumers when buying a tomato paste product, the date of production and expiration (52.4%) is at the top of the list, followed by the brand of product, packaging type and seller's opinion about the products being sold. Accordingly, a study that shows similar results to our research endeavor indicates that 66.7% of consumers paid attention to its label when buying food products, especially the date of production and expiration (10).

According to the findings of our study and the above-mentioned studies, it is clear that in selecting tomato paste, quality, color, and production and expiration date are considered as the most vital criteria in choosing this product.

Studying the quality of the product, and comparing tables 04 and 05, shows that the parameters tested in these products in most cases do not comply with the set international standards and are not within the acceptable limits.

According to the findings of this study, *Hadia* tomato paste, which is the most used among consumers in Kabul and is believed to be the best tomato paste product in the market, in various cases such as the presence of starch, high level of water and low level of carbohydrate and protein is not within the accepted standards(11).

Likewise, the amount of protein (1.94 g/100g) in *Taimaz* tomato paste is much lower than the acceptable amount and has a higher level of pH and water. An unacceptable amount of starch is also seen in this product (12).

The results of the study show higher presence of guar gum (2.3%), an unacceptable substance of starch and a high level of pH in *Noras* tomato paste (13). *Chin Chin* and *Tabarok* tomato paste products also have a higher amount of water, a low level of protein and unacceptable amount of starch (14). The acidity (pH) of the *Tabarok* tomato paste has also been reported to be higher than the allowable limit (15).

These results indicate the use of low-quality products among consumers and the high availability of these products in the markets, as well as the lack of public awareness of the quality of food products. These factors lead to the loss of one of the most important pillars of food safety and security in the country.

6. Conclusion

In a country like Afghanistan, where the majority of the people face dire economic circumstances and low-level of education, the people have a sound realization of the importance of quality food products and do pay close attention to food safety at large. Product quality is considered as the most important criterion among consumers and people still pay more attention to the issue of production and expiration date, main brands of products, and the type of packaging when buying. Criteria of sensory evaluation are also of attention of the people so that they provide of quality products for themselves.

Bearing this in mind, people are trying to consider the criteria for choosing a product that will lead them to the right and quality product. But still, the use of low-quality products is greatly noticeable among the array of products available in the

market and among consumers. This could be due to two factors. First, a high percentage of low-quality products in the market, and second, people's misconception of the real quality and inadequate awareness of quality food products. To tackle this issue, it requires serious attention from the government and the responsible organizations in the field of food control and public awareness.

Also, despite the existence of domestic products and manufacturing companies that follow national and international standards, the use of imported products is much higher than domestic products. Therefore, the government and responsible organizations should pay serious attention to controlling food products in terms of quality and legitimacy, informing the country's population about quality and right quality products, as well as supporting domestic products and creating a culture of using these products consistently.

7. Research sponsor

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