



PERCEPTION AND WILLINGNESS TO CONSUME HORSE MEAT IN ALGERIAN SOCIETY

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Abstract

This research aims to assess the perception of horse meat as well as the influence of the factors related to socio-demographic and economic context on its consumption willingness. Data was collected using a self-managed questionnaire via in-person interviews with 102 consumers of horse meat. According to the results, horse meat ranked fifth among consumers' top choices for red meat, behind sheep (85.3 %), beef (7.8 %), goat (2.9 %) and camel (2.9 %). A significant percentage of participants (65.7 %) expressed a favorable opinion towards horse meat and perceived it to be of good overall quality. The horse meat was primarily consumed for its perceived health and nutritional advantages (46.1 %). Horse meat was consumed occasionally only in particular scenarios, especially for some disease remedies like anemia. Except for the price, the analysis of influencing factors revealed that there were no significant effects ($p > 0.05$) on the intake willingness of horse meat based on gender, age, level of education, residence area, or income. This study offers a thorough understanding of the consumer opinions regarding horse meat and may be employed in developing strategies for boosting the acceptance of this meat among the consumers.

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Introduction

The dominance of red meat in diets, especially intensively farmed red meat, has raised alarms, owing to the damages caused to the environment as well as the well-being of all living creatures [1,2]. Thus, the multiple benefits of horse meat make it a game changer for mitigating the above-mentioned challenges [3]. In fact, horses are non-ruminant herbivores that release five times lower volumes of methane into the atmospheric layers in comparison to cattle (117.9 kg CH₄/dairy cow/year and 20.7 kg CH₄/horse/year), which makes it economical and eco-friendly to produce meat [4,5].

Regardless of its impressive nutritional excellence and other beneficial properties, horse meat consumption remains low across the world [6,7]. Lamri et al. [8] study indicated cultural resistance among Algerian people of Kabylia areas towards eating horse meat as they are totally against using horse meat as a food item. Likewise, the constrained trend of eating horse meat in France was witnessed to undergo a dramatic reduction by Sebbane et al. [9]. Consequently, the global market share of horse meat production remains at a mere 0.25 %, with an average consumption of just 0.10 kg per person per year [10].

On the other hand, the term acceptability entails the anticipated attributes of the meat, including its inherent sensory and organoleptic features, nutritional or ecological value, as well as extraneous properties like production management, costs, accessibility, and competitive positioning in the market [11,12]. The previous decade reflected a shift in people's perception of horse meat [13]. In fact, the Food and Agriculture Organization (FAO) reports a gradual rise of 7.57 % in horse meat production during 2010–2020 [14], with similar patterns exhibited by Algerian consumers in the recent past. Dramatically, the steady surge in the number of expert horse butchers in Algeria points towards a likely inclination of Algerian communities towards eating horse meat due to its nutritional richness, even among people who disregarded it earlier due to cultural constraints. Moreover, alternative red meats like sheep and beef are becoming increasingly expensive which makes them inaccessible for low-income people, thus increasing the Algerian consumers' inclination towards horse meat available at low prices.

It's worth noting that research on consumer perceptions and factors that affect them has been done more extensively on other animal meats than on horse meat. More specifically, there is a dearth of scientific research on horse meat

consumer perception and its influencing factors in Algerian society, which could be of great interest to consumers, producers, and those in charge of economic planning. Consequently, the main goal of this study is to determine the perception as well as to establish the influence of the factors related to socio-demographic and economic context on the consumption willingness of this meat among Algerian consumers.

Objects and methods

The study was carried out according to the guidelines of the Ethical Committee of the Faculty of Natural and Life Sciences of the University of El Oued, Algeria (Protocol number: 22/2023).

The investigation was conducted in three different districts of southeastern Algeria: El Oued, Biskra, and Ouargla. The first district is located at latitude 33°22'16.823" N and longitude 6°50'52.686" E, the second is located at latitude 34°51'0" N and longitude 5°43'59.999" E, and the third is located at latitude 31°56'60" N and longitude 5°19'0.001" E. The climate in these districts was semi-dry, with cold winters, scorching summers, and scarce rainfall, particularly during the coldest months of the year. The communities that residing in these regions were traditionally engaged in agricultural production and raising livestock, which included sheep, camels, and goats.

The participants in this study were interviewed via an organized, independently administered questionnaire to assess various aspects related to horse meat perception and consumption and possible affecting factors that relate to the socio-demographic and economic context. 297 participants were surveyed in person using face-to-face interviews. Besides, after data refining, only 102 surveys (34 for each province) were left usable for analysis due to the exclusion of those who had never eaten horse meat. The study participants were chosen at random with a wide range of demographic characteristics. At first, ten persons from each district were gathered as a focus group to gather information about horse meat consumption opinions. The effectiveness of the questionnaire was tested via a pre-test carried out on a focus group of 15 participants (five from each district). The questionnaire was initially written in French before being translated into Arabic language to make it more accessible. To ensure data quality, a unique code was assigned to every questionnaire to prevent duplicate or repetitive responses from similar respondents. The individuals who participate in the survey must meet the inclusion criteria of being at least 18 years old and having consumed horse meat at least once. After describing the study objectives briefly, volunteer participants were asked to get their verbal consent, and an anonymous questionnaire was utilized to ensure the privacy of respondents.

Open-ended and closed-ended (single-select, multiple-choice) questions are combined in the questionnaire. For fictional and polychromous concerns, which feature a wide range of options for respondents to select from,

closed-ended questions served as the best fit. However, open-ended questions were considered the best option for complex inquiries that necessitate further detailed elaboration from respondents beyond predefined categories, enabling them to freely express their thoughts and opinions. The final questionnaire consisted of 25 questions divided into two sections. The first section focused on the socio-demographic characteristics of the respondents, such as gender, age, educational levels, living area, and income, which were explored through a set of five questions. The second section composed of 20 questions was designed to assess the consumers' attitudes regarding horse meat, with questions focused on establishing the possible relationship between the socio-demographic and economic factors and the willingness of the respondents to consume horse meat.

The statistical evaluations were established via SPSS, Version 27.0 software. The descriptive statistics were performed to assess the survey data as frequencies and percentages. The Chi-square or Fisher test was used to examine the statistically substantial effects of the presumed socio-demographic and economic factors on horse meat consumption willingness. In all tests, a *p*-value of less than 0.05 was considered in statistical terms.

Results

Table 1 shows an overview of the demographic traits of the 102 participants. 53.9 % of respondents fell between the 18–30 age bracket, with 23.5 % aged between 31–40 years, and only 2.9 % of respondents' age exceeded 60 years. Regarding the gender group, the survey included 33.3 % (34) female and 66.7 % (68) male respondents. A significant number of respondents (63.7 %) held higher education qualifications and having a university degree. 46.1 % of participants earned an affordable income, besides 53.9 % of them indicated a lower income level. Most of the study participants (68.6 %) lived in rural areas, while, 31.4 % of respondents resided in urban localities.

Table 1. Demographic characteristics of the surveyed respondents

Variable	Groups	Frequencies, n	Proportion, %
Age (years)	18–30	55	53.9
	31–40	24	23.5
	41–50	15	14.7
	51–60	5	4.9
	Above 60	3	2.9
Gender	Male	68	66.7
	Female	34	33.3
Education	Primary	2	2.0
	Secondary	11	10.8
	Tertiary	23	22.5
	University	65	63.7
	None	1	1.0
Income	Acceptable	47	46.1
	Low	55	53.9
Residence	Rural	70	68.6
	Urban	32	31.4

Table 2 summarizes the respondents' opinions regarding horse meat. Evidently, sheep meat has been found to be the most preferred type of red meat, liked by a whopping 85 % of the respondents, leaving behind beef (8 %), goat (3 %), camel (3 %), and horse (1 %) meat. When the respondents were asked to rank their preferences, most of them (83.3 %) ranked horse meat at the last position out of the five meat types surveyed. Alternatively, despite 65.7 % of participants' belief in the favorable quality of horse meat, just 34.3 % expressed their willingness to eat horse meat. The nutritional and health features (46.1 %) and tenderness (32.4 %) were the two key factors that attracted people to horse meat consumption.

Table 2. Consumer beliefs regarding horse meat

Variable	Groups	Frequencies, n	Proportion, %
Which meat variety do you prefer?	Sheep	87	85.3
	Beef	8	7.8
	Goat	3	2.9
	Camel	3	2.9
	Horse	1	1.0
Which rank was taken by the horse meat among the others?	1st	1	1.0
	2nd	3	2.9
	3rd	1	1.0
	4th	12	11.8
	5th	85	83.3
Are you willing to consume the horse meat?	Yes	35	34.3
	No	67	65.7
How do you appreciate the horse meat?	Good	67	65.7
	Not good	35	34.3
What is the main factor driving your decision toward horse meat?	Tenderness	33	32.4
	Color	6	5.9
	Odor	8	7.8
	Flavor	8	7.8
	Nutritional and health attributes	47	46.1

The key potential therapeutic applications of horse meat are described in Table 3. Surprisingly, a large portion of respondents (87.5 %) believed that horse meat could be beneficial in curing certain health conditions, especially because of its high effectiveness in treating anemia. Additionally, the participants also reported the effective usage of horse meat in other treatments like improving growth and treating rheumatism, with significantly fewer proportions (3.4 % for each).

Table 3. Medical uses of horse meat

Use	Frequencies, n	Proportion, %
Immunity enhancement	1	1.1
Treating anemia	77	87.5
Growth improvement	3	3.4
Bone strengthening	2	2.3
Treating jaundice	1	1.1
Increased activity	1	1.1
Treating rheumatism	3	3.4

The consumption willingness of horse meat was examined through various socio-demographic and economic factors (Table 4). According to the findings of the factor analysis, socio-demographic attributes like gender, age, educational qualifications, region of living, and household income had no impact on the likelihood of consuming horse meat ($p > 0.05$). However, the cost factors exhibited a statistical significance as a deciding variable ($\chi^2 = 12.707$), which affected the consumers' willingness.

Table 4. Relationship between horse meat consumption willingness and socio-demographic and economic factors

Variable	Groups	Consumption willingness (Yes) n (%)	Consumption willingness (No) n (%)	Odds Ratio	(χ^2 ; F)	P-value
Gender	Male	24(35.3)	44(64.7)	1	0.087	0.768
	Female	11(32.4)	23(67.6)	0.876		
Age (years)	18–30	19(34.5)	36(65.5)	1	0.840	0.961
	31–40	8(33.3)	16(66.7)	0.947		
	41–50	6(40.0)	9(60.0)	1.263		
	51–60	1(20.0)	4(80.0)	0.473		
	Above 60	1(33.3)	2(66.7)	0.947		
	Secondary	5(45.5)	6(54.5)	1		
Education	Tertiary	6(26.1)	17(73.9)	0.423	2.682	0.665
	University	24(36.9)	41(63.1)	0.702		
	Primary	0(0.0)	2(100.0)	/		
	None	0(0.0)	1(100.0)	/		
Residence	Rural	23(32.9)	47(67.1)	1	0.210	0.647
	Urban	12(37.5)	20(62.5)	1.226		
Income	Acceptable	16(34.0)	31(66.0)	1	0.003	0.957
	Low	19(34.5)	36(65.5)	1.022		
Price	Cheap	29(48.3)	31(51.7)	1	12.707	0.000
	Expensive	6(14.3)	36(85.7)	0.178		
	No	1(7.1)	13(92.9)	0.122		

Discussion

Despite its health advantages and nutritional value over other red meats, horse meat occupied the last rank in the consumers' preference list and was the least popular type among the survey participants. However, our findings indicated that sheep is the most favored animal for domestic use. This dietary inclination may have arisen from the majority of respondents' perceptions of the better taste and appeal of sheep meat compared to the other meat forms included in our study.

This discovery aligns with Realini et al. [15] study outcomes, emphasizing taste as the key factor influencing consumers' meat preferences. Akin to this, prior research indicates that the primary reasons for consumers' readiness to consume sheep meat relate to its unique taste and texture as opposed to other animal meat forms [16,17]. Furthermore, consistent with our findings, Lamri et al. [8] conducted an online survey to assess meat-eating behaviors and choices in three provinces of the Kabylia areas of Algeria, revealing that horse and camel meats were deemed as less appetizing than chicken, beef, and lamb,

respectively. Furthermore, a poll conducted on Canadian customers by Popoola et al. [7] disclosed that 80 % of respondents were unaware of horse meat. Furthermore, Sebbane et al. [9] discovered that horse meat is consumed only in a few instances and infrequently by a small proportion of French people, and according to French national statistics (2021), horse meat consumption impacts only 7 % of French families contributing to merely 0.1 % of meat purchases [18].

Meanwhile most survey participants acknowledged horse meat's good quality, especially because it is packed with healthy nutrients, and can also be utilized to treat certain diseases, a comparable percentage of participants expressed an unacceptability for consuming horse meat. In contrast to other animal meat types studied herein, the very rare consumption of horse meat leads to its occasional consumption. This might be another determinant factor contributing to the dislike of horse meat across survey participants, thus lowering the per person consumption. Food neophobia, which refers to the avoidance of novel food items or unwillingness to taste them, can be justifying consumers' unusual tendencies toward horse meat [19].

Our study clearly shows that the most significant factor influencing customers' decision to eat horse meat corresponds to its health advantages and nutritional value. This finding was in accordance with earlier reports [20,21] that highlighted these traits as the key motivators for red meat eating.

Horse meat has even been touted by scientists as a useful food item and dietary staple, due to its immense chemical, physical, and nutritional features comparable or even superior to other meat types [10,22]. Further, due to its nutritional value, substituting beef with horse meat could result in lower volumes of meat consumption, as consumers may require less horse meat than beef to obtain equivalent nutrients such as iron [3]. Lamy et al. [3] reported that promoting horse meat consumption might be beneficial for populations with limited access to protein-rich sources, especially considering its nutritional excellence and affordability compared to other red meats.

Furthermore, Lamri et al. [8] stated that while deciding about consuming and purchasing red meat, they prioritize its nutritional features (63.5 %), followed by taste (51.9 %) and other attributes (43.1 %) like inquisitiveness and family customs. Furthermore, the earlier study indicated that 60 % of respondents expressed their willingness to purchase greater quantities of meat if supplementary details about its nutritional traits were shared with them.

In our study population, horse meat consumption was predominantly linked with its therapeutic application in curing anemia. Consistent with these results, Stanciu [22] observed that the high mineral and vitamin content of horse meat provides nutritionists with strong justifications for prescribing it to anemic patients. Additionally, Del Bò et al. [23] analysis pointed out that eating horse meat raises the level of polyunsaturated fats (PUFAs) in consumers' red blood cells, specifically modulating PUFAs, which are most

beneficial for maintaining nutritional adequacy and the guarding benefits. Additionally, their study demonstrated that horse meat enhances iron content and the omega-3 index by over 7.5 %. Furthermore, Del Bò et al. [23] highlight that being a rich source of iron, even a single serving of horse meat (175 g) fulfills approximately 33 % of the daily required iron intake. The notably lower cholesterol content of horse meat in contrast to other meat forms renders it particularly intriguing from a nutritional perspective [24]. Hence, consuming horse meat can prove to be advantageous for health, particularly among the sufferers of cardiovascular diseases. Interestingly, Pierre [25] highlighted the recommendation of consuming horse meat by the medical fraternity during the 19th and 20th centuries, considering its usefulness in combatting tuberculosis. Additionally, Nurdin [26] documented people's perception of horse meat as a cure for contaminating illnesses (tetanus) in addition to the usability of the fat content of horse meat in treating asthma, burns, and other conditions. Lee et al. [27] proposed the conventional usage of horse bones in managing bone diseases like bone fracture and arthritis, along with the use of its fat content in developing a skin ointment for dealing with various skin issues and healing wounds [27].

This study delved into the effects of socio-demographic factors, like gender, age categories, education qualifications, living regions, and family income, on the willingness to eat horse meat. The findings showed no major variations across the different categories. This finding can be attributed to the unpopularity of this meat form among the participants of our study, which implies that this meat is typically consumed for special purposes, like treating certain illnesses. At the same time, Lamri et al. [8] emphasized that the customs, cultures, lifestyles, and meat consumption patterns of the Algerian public have all contributed to the weak acceptance of horse meat. These findings conflict with other studies [3,9] performed on the horse meat consumers of France, recognizing socio-demographic parameters as significant variables that have a discernible impact on horse meat intake. Prior investigations showed a statistically lower likelihood of horse meat consumption in women as opposed to men.

Regarding the impact of education level, past researchers have observed an inverse correlation between the educational level and the likelihood of buying and eating horse meat. In contrast, younger individuals, who are 18–34 years old exhibited a greater reluctance to eat horse meat rather than other age populations involved in the survey [3]. However, as revealed through a poll held in 2015, the mean quantity of horse meat consumed by households with panelists of 18–44 years old was 18.5 percent and 18.7 percent lesser, respectively, in comparison to the households having subjects from 45 to 64 and above 65 age brackets. Furthermore, earlier findings also revealed a greater likelihood of meat consumption among households earning less than the poverty line [3]. The gender-based variances in preferences noted in preceding studies may be attributed to the fact that women are more emotionally sensitive than men, thus be-

ing more likely to absorb adverse information about meat production and consumption mechanisms [28]. This may also account for the modest tendency of horse meat consumption among the women participants of our research in contrast to men. While assessing consumer behaviors, past research has consistently pointed towards the differing perception held by the two genders regarding the significant ethical concerns linked with animal wellbeing and indicated higher animal-friendly attitudes among women instead of men [29,30]. Conversely, the study participants' willingness to consume horse meat remains largely unaffected, yet the participants holding university degrees exhibited a higher willingness to consume horse meat rather than the tertiary or primary degree holders or illiterate individuals, indicating the receptivity of higher educated people to tasting novel delicacies [31]. When customers are well-informed, they prioritize healthy and nutritional components in foods, thus favoring horse meat consumption [32]. A person's responsiveness while contemplating a deciding factor is influenced by the higher degree of education, which further expands their knowledge and information. Our study revealed an intriguing trend of willingness to consume horse meat that was little higher in middle-aged consumers instead of older or younger participants, which can be explained by the notion that the middle-aged participants embrace the responsibilities of household consumption inclusive of maintenance of family health. Their predominant role in daily purchases in comparison to other age groups may increase the suitability of horse meat from their perspective. As a result, the ability to discern the suitability of any product in terms of quality assists the participants of this age group in making logical choices while shopping. In addition, middle-aged individuals are categorized as adults owing to their buying expertise and reasonable approach to decision-making. Furthermore, the modest correlation between respondents' willingness to consume horse meat and their urban location noted in our study may be directly linked to the remarkable abundance of expert butchers trading this meat in urban marketplaces as opposed to rural regions.

Pricing was shown to exert a substantial effect on readiness to consume horse meat in the current study ($\chi^2 = 12.707$; $p < 0.001$). Overall, the consumers were more prepared to consume it if they perceived horse meat as economically priced. This might be attributed to individuals' choice of purchasing goods that do not have a detri-

mental impact on their household income as well as their purchase parity. This finding echoes the study outcomes of Lamri et al. [8], emphasizing that in the Algerian setting, meat prices continue to be significant determinants for consumers. In fact, the price was rated third among the crucial purchase determinants by the participants of the previous study, indicating freshness and tenderness at the first two ranks. Likewise, while evaluating horse meat intake in French communities, Lamy et al. [3] pinpointed the relatively higher price of horse meat as a potential barrier to growing consumption, particularly for households with lower socioeconomic status (with 16 % of the study population citing cost as an obstacle). Additional research focusing on Korean consumers found that the cost of horse meat was a significant factor that influenced consumers' purchase decisions adversely [33].

Additionally, recent research conducted in various nations has emphasized the significance of horse meat pricing for consumers and considered it a significant impediment to the purchase and consumption of this meat form [19,32]. Furthermore, consumers rank price as the second most important factor after taste, which shapes their purchase decisions of meat products [15]. On the contrary, Bernués et al. [34] highlighted the product price as the most critical factor shaping the purchase decisions of consumers. It goes without saying that, irrespective of the differences in the earlier research and their settings, the findings of all were in agreement that the cost of meat had a significant impact on customers' purchase decisions.

Conclusion

Our study highlighted the limited consumption of horse meat in contrast to alternative types of animal production. In the meantime, the enhanced supply and frequency of consumption can be accomplished through communication systems highlighting the health and nutritional aspects of horse meat, accompanied by wider distribution channels ensuring its accessibility in all meat markets at competitive pricing. It would also be beneficial to endorse ready-to-eat horse meat cuisines and their recipes. Additionally, if consumers' opinions of the quality attributes, particularly the favorable hedonic qualities of horse meat are improved, occasional consumers of horse meat may be persuaded to reconsider eating it.

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