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Abstract: The aim of this study was to determine egg consumption habits in Turkey. Questionnaires prepared to determine habits regarding egg consumption were supplied to 2241 families. Sampling sizes and sample addresses were provided by the Turkish Statistical Institute. Data obtained through the questionnaires were analyzed using SPSS. Of the families that participated in the study, 98% consume eggs and the number of eggs consumed per person was 158 per year. In addition, 67.82% of the eggs consumed were purchased from supermarkets and 62.40% of the consumers pay most of their attention to the production date. The eggs were most often consumed in the morning, at a percentage of 85.52%, and 70.28% of all of the eggs were boiled for consumption. Egg packaging has an impact on consumer choice at a rate of 67.46%, and eggs packaged in egg trays covered with plastic wrap are preferred at a rate of 58.26%. Eggs with deep yellow yolks were preferred by 81.20% of the families. It was also found that 72.42% of the families were not knowledgeable about organic eggs. It is generally believed that egg consumption will decrease at a rate of 36% in the event of an avian influenza epidemic, as was the case with a previous epidemic in Turkey and around the world. Moreover, 67.11% of consumers believe that government supervision of egg production is inadequate. Egg consumption is low in society. Effective promotion and advertising campaigns about the nutritional value of eggs for a healthy society should be organized to create well-informed consumers.

Key words: Egg, consumption, habit, packaging, survey

Introduction

The poultry sector in Turkey has now become highly developed with an industrial structure. In Turkey, there exists a total of 10,308 poultry enterprises with 16,379 production units. In these facilities, 864,545 t of eggs were produced in 2009. China ranks 1st in the world with an annual production of 23,871,200 t of eggs, and the United States ranks 2nd with 5,338,000 t. Turkey ranks 11th, with the above-mentioned production level. According to data pertaining to 2007, the annual per capita egg consumption was 17.41 kg in China, 14.29 kg in the US, 12.44 kg in the European Union, and 9.08 kg in Turkey, whereas the world average was 8.57 kg (1,2). Total protein consumption does

not constitute a problem in Turkey; however, several problems have been mentioned with regard to the quality of the protein consumed, and it was suggested that egg, milk, dairy, and meat consumption needs to be reconsidered, particularly in order to increase the amount of animal protein consumed (3). Egg, with the nutrients it contains, is significant for human nutrition. However, due to a common belief in society that eggs cause cardiovascular diseases because of the cholesterol they contain, the concern for egg cholesterol needs to be overcome (4). On the other hand, some recent studies have revealed that the cholesterol in some foods, such as eggs, do not contribute seriously to the cholesterol levels in human blood. It was also

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found that a healthy diet depends on consuming food low in saturated fat. In addition, it has been stated that the blood parameters of males who eat an egg every day did not indicate any cardiovascular risks; on the contrary, there was a decrease in their low density lipoprotein and total cholesterol levels (5). Related discussions agree that children and young people, as well as adults with no cardiovascular problems and other serious risks, can eat eggs. However, individuals with cardiovascular diseases, diabetic patients, those with hypercholesterolemia and serious risk factors, and those with a history of familial early atherosclerosis are recommended to keep their consumption of cholesterol below 200 mg per day (6).

When compared to the developments in the growing, breeding, and feeding layers of egg production, the consumer aspect of the issue has not been investigated in detail across Turkey up to the present day. Research carried out in order to determine the tendencies in society with regard to egg consumption were only local or limited to certain groups of people. It was reported in one of the studies carried out in Aydın Province that 23.70 kg of eggs were consumed per person per year and 25.80% of the people were aware of ecological eggs (7). In another study carried out in Şanlıurfa Province, it was found that 126 eggs were consumed per person per year, egg consumption increased in line with the increase in the level of household income, the eggs were generally consumed for breakfast, and they were mostly bought at supermarkets or local stores (8). The annual per capita egg consumption was 171 in a study carried out in Ankara Province. The same study revealed that the majority of consumers (79.62%) purchased eggs at supermarkets and that brown eggs were preferred at a rate of 59.6% (9–12). The aim of the present study was to determine egg consumption and related habits in Turkey.

Materials and methods

The research material consists of questionnaires with 33 questions, prepared in order to determine the preferences of consumers with regards to egg consumption. In order to be able to administer the questionnaires in a way that reflected the consumer profile in Turkey, sampling size and sample addresses were requested from the Turkish Statistical Institute

(TurkStat) and the addresses of 2244 families from approximately 61 provinces were determined by TurkStat, taking into consideration such factors as education and income levels. Data were collected by administering the questionnaires through face-to-face interviews to the individuals residing at these addresses. Three of the questionnaires were eliminated from analysis due to marking errors. Data obtained through the questionnaires were analyzed using descriptive statistics and frequency tables in SPSS 17.

General information for the individuals within the families that participated in the study, such as age groups, sex distribution, income and education level, and average size of the family, as well as the general household income, are shown in Table 1. The average

Table 1. General information about the families participating in the survey.

Age groups of the family members	Number of people
0–6	688
7–14	1012
15–17	523
18–25	1110
26–40	1959
41–64	2099
≥65	454
Total	7845
The average number of people per family	3.50
Sex distribution of the family members participating in the survey	
Female	3945
Male	3900
Educational status of family members participating in the survey	
Illiterate	767
Elementary	2849
Middle school	1194
High school	1771
University	1264
Sum of average monthly household income (TL)	1561.14

number of individuals in the families participating in the survey was 3.50 people per family, whereas the monthly total household income was 1561.14 Turkish liras (TL). Based on this amount, the per capita income might be estimated as 446.04 TL. It was found that a total of 7845 people were living at the addresses that participated in the survey. The age groups were determined according to school ages.

Results

After analysis of the data, the families participating in the survey were asked whether or not they consumed eggs. Their responses revealed that 98% of the families consume eggs, whereas 2% do not. The people who stated that they do not consume eggs (2%) mentioned the following reasons for doing so: a) health (54.50%), b) high prices (13.70%), and c) dislike for eggs (31.80%). The reasons mentioned by the people who do not consume eggs due to health problems are shown in Table 2. Among these reasons, medical advice comes first (41.70%). The second most important reason seems to be the fear of high cholesterol levels (33.30%).

Where the distribution of egg consumption within the family is concerned, it could be observed that the rate of egg consumption is 81.38% for the entire family. The distribution of egg consumption by family members is shown in Table 3. Children consume the most eggs (11.20%) among all of the family members.

The annual per capita egg consumption was first identified per week per family. Next, by dividing this number by family members, the per capita per week consumption was calculated. Based on this figure, the number of eggs consumed annually was 158 per capita.

Eggs are mostly (85.52%) consumed for breakfast, while a small amount of consumption (12.02%) is not constant but variable. Data indicating the distribution of egg consumption by meals are shown in Table 4.

Boiling is the most common (70.28%) way of serving eggs, while at a rate of 23.53%, omelet is the second most common. Data related to egg serving preferences are shown in Table 5.

The respondents were asked whether they were aware of the nutritional value of eggs and it was

Table 2. Reasons for not consuming eggs due to health problems.

Question: For what reason do you not consume eggs?	Number of people (N)	Rate (%)
Medical advice	10	41.70
My own decision	5	20.80
Cholesterol	8	33.30
Other	1	4.20
Total	24	100

Table 3. Distribution of egg consumption by family members.

Question: Who consumes the most eggs in the family?	Number of people (N)	Rate (%)
Children	246	11.20
Young people	90	4.10
The elderly	68	3.10
The sick	5	0.23
Everyone	1788	81.37
Total	2197	100

Table 4. Distribution of egg consumption by meals of the day.

Question: At which meals do you consume eggs?	Number of people (N)	Rate (%)
Breakfast	1879	85.52
Lunch	31	1.41
Dinner	23	1.05
Varies	264	12.02
Total	2197	100

Table 5. Egg serving preferences.

Question: How do you most often serve eggs?	Number of people (N)	Rate (%)
Boiled	1544	70.28
Omelet	517	23.53
At meals	53	2.41
In pastry	47	2.14
Other	36	1.64
Total	2197	100

found that 75.33% were aware of the fact that eggs are nutrient-dense; however, 24.67% of the respondents were not aware of the nutritional value of eggs.

It was also found that the most commonly consumed eggs after hen eggs were quail eggs (8.92%). The consumption rates for duck and turkey eggs were quite low. The consumption values of eggs of various birds are given in Table 6.

The data concerning how the eggs are obtained are given in Table 7. It was found that the eggs are purchased mostly from supermarkets (67.82%), from grocery stores (16.11%), from neighborhood bazaars (7.51%), and from direct sale from farms (4.32%) or are supplied by home production (4.23%).

The data concerning what consumers take into consideration while buying eggs are shown in Table 8.

Of the respondents, 62.40% stated that they pay attention to the production date when purchasing eggs, whereas 13.29% mentioned paying attention to the brand of the eggs and 10.74% pay attention to the size of the eggs.

Shell color is another factor that influences consumer choice. In this regard, 34.05% of the consumers were found to prefer white-shelled eggs, while 30.50% prefer brown-shelled eggs. On the other hand, 35.46% of the consumers do not pay attention to the color of the shell. However, a great proportion (70%) of those who stated a preference for white eggs (34.05%) insisted on their choice, while others (30%) reported that their choice might change. On the other hand, an even greater proportion (79%) of the respondents who stated a preference for brown eggs declared that their choice would not change, while others (21%) said their choice might well change.

Consumer preferences for various egg sizes are shown in Table 9. More than half of the respondents (58.58%) stated a preference for medium eggs and more than one-third (35.78%) for large eggs, whereas only a small proportion (2.59%) stated a preference for small eggs. However, others (3.05%) do not consider the size of the eggs to be important.

A great proportion (83.25%) of the consumers preferred to buy eggs that were produced in villages,

Table 6. Consumption of eggs from birds other than hens.

Question: Which eggs, other than those from hens, do you consume?	Number of people (N)	Rate (%)
Duck	9	0.41
Turkey	10	0.46
Quail	196	8.92
None	1982	90.21
Total	2197	100

Table 7. Distribution of egg supply locations.

Question: Where do you get eggs?	Number of people (N)	Rate (%)
Grocery store	354	16.12
Supermarket	1490	67.82
Neighborhood bazaar	165	7.51
Direct sale from farms	95	4.32
Home production	93	4.23
Total	2197	100

Table 8. Qualities of eggs taken into consideration while buying eggs.

Question: Could you name the qualities you consider while buying eggs?	Number of people (N)	Rate (%)
Brand	292	13.29
Color	95	4.33
Size	236	10.74
Date of production	1371	62.40
Price	109	4.96
Other	94	4.28
Total	2197	100

Table 9. Consumer preference of eggs by size.

Question: What size eggs do you prefer to buy?	Number of people (N)	Rate (%)
Large	786	35.78
Medium	1287	58.58
Small	57	2.59
Other	67	3.05
Total	2197	100

while 16.75% opted for eggs produced at an industrial egg production facility.

The majority (81.20%) of households prefer dark-colored egg yolks, while 8.74% prefer light-colored yolks. The remaining households (10.06%) do not care about the color of the yolk.

The most important factor in a household's desire for dark-colored egg yolks is their belief that eggs with dark-colored yolks are more delicious and have a high nutritional value; the rate of those who prefer them from a visual perspective was 10.26%. The distribution of the factors in a household's desire to have dark-colored egg yolks is given in Table 10.

More than half (60.95%) of the households prefer eggs with shells having a moderate thickness, while 24.31% opt for thick-shelled eggs and 14.75% prefer thin-shelled eggs. The egg consumption of 49.40% of the consumers varies depending on the season, while 50.60% reported no such change. Of those reporting a seasonal change in their egg consumption, 87.12% said that they prefer to consume eggs during the winter and 6.12% during the summer. Consumption rates during the other seasons remain equal to each other. The distribution of egg consumption by seasons is given in Table 11.

Egg packaging influences the decisions of 67.60% of the consumers, while 32.40% reported no such influence. More than half (58.26%) of the households interviewed said that they prefer egg trays covered with plastic wrap, while 19.71% percent indicated a preference for closed paperboard egg trays and 11.42% for transparent egg trays. The distribution of the packaging preferences of the consumers is given in Table 12.

When asked about their preferences for the size of egg trays, 48.75% of the consumers said that they prefer 30-egg trays, while 31.73% opted for 15-egg trays, 12.24% for 10-egg trays, and 7.28% for 6-egg trays.

The majority (72.42%) of the households indicated that they are aware of organic eggs, while 27.58% said that they are not knowledgeable about organic eggs. Of those who are knowledgeable about organic eggs, 37.62% said they are willing to pay 10% more for organic eggs, while 35.58% noted that they would pay 20% more and 17.82% said they are willing to pay 50% more. However, 18.98% stated they would not pay more for organic eggs. Given the high production inputs for organic eggs and the higher prices for such eggs, these consumer preferences about organic

Table 10. Factors in a household's desire to have dark-colored egg yolks.

Question: Why do you think a dark-colored egg yolk is important?	Number of people (N)	Rate (%)
I like it visually	183	10.26
It tastes good	905	50.73
I use it for cakes and pastries	29	1.63
It has a high nutritional value	667	37.39
Total	1784	100

Table 11. Distribution of egg consumption by season.

Question: In which season is egg consumption highest?	Number of people (N)	Rate (%)
Spring	34	3.11
Summer	67	6.12
Fall	40	3.65
Winter	954	87.12
Total	1095	100

eggs may change. The distribution of the consumers' readiness to pay more for organic eggs is given in Table 13.

Most (89.39%) of the households said that they are not knowledgeable about enriched eggs while 2.96% indicated that they know and prefer them, with 4.05% having no view and 3.60% expressing that such products are unnecessary. The types of eggs preferred by the households that prefer enriched eggs, as well as their rates, are given in Table 14.

Of those who reported a preference for enriched eggs, 27.30% said they are willing to pay 10% more

for such eggs, while 27.70% are willing to pay 20% more, 10.20% expressed a tendency to pay 50% more, and 34.80% said that they would not pay more for them.

The data concerning the effects of avian influenza and other diseases on egg consumption are given in Table 15.

While 53.71% of the consumers said that their egg consumption habits are not affected by such diseases, 36% reported that their consumption habits are affected. Only a small proportion (5.28%) of consumers indicated that they buy eggs of known

Table 12. Distribution of packaging preferences.

Question: Which form of egg packaging do you prefer?	Number of people (N)	Rate (%)
Open egg trays	140	6.37
Egg trays covered with plastic wrap	1280	58.26
Closed paperboard egg trays	433	19.72
Foam egg trays	44	2.00
Transparent egg trays	251	11.42
Other	49	2.23
Total	2197	100

Table 13. Consumers' willingness to pay more for organic eggs.

Question: How much more would you pay for organic eggs?	Number of people (N)	Rate (%)
10%	228	37.62
20%	155	25.58
50%	108	17.82
I would not pay more	115	18.98
Total	606	100

Table 14. Types of enriched eggs and their rates of preference.

Question: Which type of enriched eggs do you prefer?	Number of people (N)	Rate (%)
Selenium-enriched eggs	10	15.39
Omega 3-enriched eggs	50	76.92
DHA-enriched eggs	5	7.69
Total	65	100

Table 15. Effects of avian influenza and other diseases on egg consumption.

Question: Do avian influenza and other diseases affect your egg consumption?	Number of people (N)	Rate (%)
Yes. they do, as I do not buy eggs during and after that period	791	36.00
I only buy eggs of known brands	116	5.28
They do not, as I continue to consume eggs	1180	53.71
Other	110	5.01
Total	2197	100

brands in response to disease outbreaks, while 5.01% expressed no view.

The households interviewed were also asked whether they believe that the government conducts adequate inspections of egg production; 67.11% said that they find public supervision inadequate, while 23.87% believe such supervision to be adequate and 9.01% expressed no opinion.

Discussion

The lack of any previous study on egg production in Turkey makes it impossible for us to make a comparison in this section. Given the fact that the present study produced data that were representative of the consumer profile in Turkey, it can be said that 98% of people consume eggs. Moreover, it can be argued that recent studies showing that eggs are not harmful to human beings, but rather contain useful nutrients, played a role in boosting egg consumption. The remaining 2% avoid egg consumption mostly for health concerns. These concerns are mainly driven by the misconception that the cholesterol that eggs contain is harmful to human health (4) Based on the results of this study, it can be concluded that this misconception continues to negatively affect egg consumption to some extent. If society and scientists are sufficiently informed about the good effects of eggs on human health, we can assume that the rate of people who do not consume eggs will decrease.

The respondents were asked whether they were aware of the nutritional value of eggs, and it was found that 24.67% of the respondents were not aware. This rate seems to be quite high. If consumers are informed sufficiently about the nutritional value

of eggs, then we can expect that egg consumption will increase.

The rate of nonconsumption of eggs from birds other than the hen was 90.21%. Given this rate, it can be said that hen eggs dominate the market. In addition to hen eggs, quail eggs are also consumed. There are difficulties in accessing eggs of other birds such as turkeys and ducks, which are consumed at very low levels. These difficulties are considered as the main reason for the low consumption rates of these eggs.

Medium-sized eggs were preferred over large eggs, while 3.05% of the respondents did not care about egg sizes. Those surveyed were not very selective about the size of the eggs, provided that the egg sizes remain within normal values without exceeding the lower and upper limits. Egg trays covered with plastic wrap are the most preferred packaging type. The most important factor in this is that this type of packaging allows eggs to be seen from the outside.

The majority of the consumers (83.25%) prefer eggs produced in villages if they can reasonably believe in their authenticity. Some (16.75%) consumers expressed a preference for eggs produced in industrial egg production facilities. The high rate of preference for eggs from villages can be explained by the popular belief that such eggs are more naturally produced. Thus, it can be further suggested that people are particularly interested in naturally produced products. However, they are not sufficiently knowledgeable about organic and enriched eggs. Furthermore, even those who said that they are knowledgeable about these eggs are not inclined to pay more for these eggs.

Although a moderate thickness for the egg shell was reported to be the most popular shell thickness, the general impression of the interviewers is that consumers are not very selective about shell thickness.

Eggs are mostly procured from supermarkets. The main reason for this is the dominance of supermarkets as places for food supply. Consumers are mostly interested in the production date of the eggs that they buy. The high rate of such consumers implies that public awareness about food safety has increased. Eggs are consumed mostly in the morning and in the boiled form. This form of consumption is more common in Turkish society.

Eggs with dark-colored yolks are preferred because of the belief that they are more delicious and have higher nutritional values.

Due to the epidemics of avian influenza and other diseases occasionally seen in Turkey and around the world, egg consumption may drop dramatically. Due to such epidemics, 36% of consumers are inclined to stop consuming eggs, which in turn leads to marketing problems in the egg production sector, as well as the problems that may arise due to the lack of eggs as a valuable item for diets.

In Turkey, the annual per capita egg production is 158 eggs on average. This figure was 164 eggs in 2009, except for the eggs produced in villages, according to the data provided by the Egg Producers' Association (1), and it was 9.08 kg in 2007, based on Food and Agriculture Organization (FAO) data (2). The annual per capita egg consumption was reported to be 17.41 kg in China, 14.29 kg in the United States, and 12.44

kg in the European Union, whereas the world average was 8.57 kg (2). Based on these figures, it can be argued that the annual per capita egg consumption in Turkey is slightly higher than the world average, but considerably below the rates in developed countries.

Income levels and education levels of households do not have any significant effects on egg consumption amounts. Thus, it can be argued that eggs are traditionally part of the diet in all social groups. A large portion of the consumers surveyed believe that egg production facilities are not sufficiently inspected by public authorities. Efforts should be exerted to tackle this perception.

Egg producers should revise their production and marketing methods, taking into consideration the consumer demands. Egg consumption is low in society. Effective promotion and advertising campaigns about the nutritional value of eggs for a healthy society should be organized to create well-informed consumers. The negative perceptions that people have developed about eggs due to the cholesterol they contain have been eliminated to some extent, thanks to recent studies. It is important that similar studies should be conducted in future, as well.

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