

ANADOLU ÜNİVERSİTESİ

Mesleki Eğitim ve Uygulama Dergisi

CONSUMPTION OF BLOOD AS HUMAN FOOD AND DETERMINING IT'S ACCEPTABILITY IN TURKEY

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ABSTRACT

Blood consumption is common in some countries and its processed form can be an alternative food item. The aim is to create a resource on the benefits of blood as food, how it is consumed, collected and processed, and for what purposes it is used; and what the perspective is in Turkey. For this purpose, literature review and survey method were used. After developing the scale, different experts were consulted, several updates were made based on their feedback. The final version of the questionnaire was developed, and pilot studies was conducted. The developed scale was first piloted with 20 participants. Then, data was collected from 405 participants, but information from 388 of them was found to be usable for the survey. Then, the data was analyzed in the IBM SPSS Statistic 25 program, and since normal distribution could not be achieved, the gender classification was tested with the Mann Whitney U test, one of the non-parametric test groups, and the other classes were tested with the Kruskal Wallis test. While there were significant differences between gender, religion, occupation and age groups in the survey results, no significant differences were found in the analyses of education and income levels.

Key words: blood, food, nutrition, alternative food, sustainability

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İNSAN GIDASİ OLARAK KAN TÜKETİMİ VE TÜRKİYE'DEKİ KABUL EDİLEBİLİRLİĞİNİN BELİRLENMESİ

ÖZET

Kanın işlenmiş hali alternatif bir gıda maddesi olabilip bazı ülkelerde yaygın olarak tüketilebilmektedir. Bu çalışmayla gıda olan kanın faydaları, nasıl toplanıp işlendiği, tüketildiği, hangi amaçlarla kullanıldığı ve Türkiye'deki bakış açısının nasıl olduğuna dair bir kaynak oluşturulması hedeflenmiştir. Bu amaçla literatür taraması ve anket yöntemleri kullanılmıştır. Ölçek geliştirildikten sonra farklı uzmanlara danışılmış, geri bildirimleri doğrultusunda alakalı güncellemeler yapılmıştır. Anketin son hali oluşturularak pilot çalışmalar yürütülmüştür. Geliştirilen ölçekle ilk olarak 20 katılımcıyla pilot uygulama yapılmıştır. Ardından 405 katılımcıdan veri toplanmış ancak bunlardan 388'indeki veriler anket için kullanılabilir bulunmuştur. Veriler IBM SPSS Statistic 25 programında analiz edilmiş ve normal dağılım sağlanmadığı için cinsiyet sınıfı nonparametrik test gruplarından Mann Whitney U testiyle diğer sınıflar Kruskal Wallis testiyle sınanmıştır. Sonuçlar doğrultusunda cinsiyet, din, meslek ve yaş grupları arasında anlamlı farklılıklar bulunurken, eğitim ve gelir düzeyleri analizlerinde anlamlı bir farklılık bulunamamıştır.

Anahtar kelimeler: kan, yemek, besin, alternatif gıda, sürdürülebilirlik

INTRODUCTION

Humans, being one of 10 million living species, including 4000 mammals, are the only species to possess the biological equipment necessary to investigate themselves and the world around them. These investigations are carried out not only out of curiosity but also to obtain information as it improves living conditions and makes survival easier. Adapting based on knowledge is essential for every culture, and culture is an essential condition for the survival of the human species (Haviland et al., 2021:51). Although there are many definitions of culture, it may be described as a complex and cumulative force that influences both the daily and private lives of communities, shapes norms, and, through various factors, is itself subject to change (Yıldırım, 2024:17). Human beings have been involved in cultural activities since the day they started to walk on two legs and use their arms and hands (Akurgal, 2019:2). Since culture includes everything learned throughout life, it has the ability to change and is constantly changing. It gives meaning to reality, has adaptive roles and has integrative properties (Bates, 2018:47-50). The base of culture consists of the ideals, norms, values and assumptions that can be seen as common among people that guide the lifestyle and behavior of a particular society (Sandeep and Vinod, 2014). The elements that make up culture are classified as tangible and intangible elements; language, religion, clothing and geography can be given as examples. On

the other hand, it may not be clear to evaluate some cultural areas clearly as tangible and intangible culture. Some areas can be included in both classes because they carry both concrete and symbolic meanings. Eating habits are one of these classes (Yıldırım, 2024:19).

Nutrition, which is the most important human need, is the use of nutrients for growth, maintenance of life and preservation of health (Baysal, 1983:9). In order to protect health and improve the quality of life, the nutrients the body needs must be consumed consciously, in sufficient quantities and at appropriate times (Sönmez, 2020:211). However, there are many factors that affect the formation of nutrition in the short or long term. For example, with the deepening global financial crisis since late 2008, in addition to the increase in the world population, the number of unemployed and poor people has also increased. This has been a serious factor in aggravated access to food (Guliyev, 2019: 355). Some religious beliefs have led to the limited or abundant consumption of certain foods, or not consuming them at all. For example, in Buddhism, consuming any kind of meat is seen as cannibalism, regardless of where the meat comes from (Lévi- Strauss, 2017:111). According to the caste system in India, fruits and nuts are not subject to ritual contamination as long as they are intact, but when a coconut is broken or a banana is split, a Havik cannot take them from a lower caste member (Douglas, 2017:56). Either, food preferences and consumption patterns vary significantly across cultures, influenced by factors such as geography, socioeconomic status, and cultural traditions (Lindsey, 2024).

The limited resources, the fact that more production increases carbon and water footprints and therefore brings some drawbacks in terms of sustainability, and the restrictions that global warming will bring, have necessitated the reconsideration of food production from a different perspective. In this context, the strategies developed can be divided into two main categories: reducing food losses and waste; developing production strategies with new food sources (Andaç and Yılmaz Tuncel, 2023). In this context, plant-based meats, insects, various algae, and blood-based products have been developed as alternative food sources and introduced to diverse populations. While some of these alternatives have gained acceptance in certain communities, others have not become integrated into dietary practices.

CONCEPTUAL FRAMEWORK

Blood

Blood is a vital fluid composed of highly functional proteins such as hemoglobin, albumin and immunoglobulin and has a rich essential amino acid profile (Ramos Clamont et al., 2003). Proteins in plasma, which is part of the blood, can be divided into three main groups: albumin (up to 60%), globulins (40%) and fibrinogen (around 3%) (Pares et al., 2011). Hemoglobin, which is essential for transporting oxygen from the lungs to the tissues in the blood, contains 70% of the iron in the body (University of California San Francisco, 2021) and constitutes approximately 70% of the total blood protein (Tarte, 2011). Albumin, a protein made by the liver, allows the blood to flow without leaking to other tissues and also helps transport many substances in the body, including hormones, vitamins and enzymes (Medline Plus, 2021). Immunoglobulins are glycoprotein molecules that are produced from plasma cells and act as antibodies (URL1, 2021).

Blood collection methods and transportation

Although the consumption of blood as food is not uncommon, its consumption by some communities may be prejudiced. One of the reasons for the prejudices against its consumption is whether it is hygienically reliable. Some people avoid consuming foods that contain blood because they believe it contains harmful microorganisms, toxins, and toxic metabolites that are unsafe for human consumption. However, since analyses of animal blood protein samples never revealed detectable amounts of dioxin, concerns that blood might be a source of dioxin have been found to be largely groundless (Gatnau et al., 2001). The use of animal feed and unseparated blood and/or blood-derived proteins in the human food chain poses a very low food safety threat in terms of exposure to blood allergens and bloodborne pathogens. Any threats from their use are not greater threats than those from other animal-derived foods (Ofori and Hsieh, 2014). The study conducted by Churillo (2014) stated that dinuguan, a Filipino dish containing pig blood, contains acceptable levels of potassium and phosphorus. The Mapuche people consume Ñachi, a dish containing fresh animal blood and various vegetables, which is part of their culture (Merino, 2018). Ja Sanam, a traditional meal from Meghalaya, includes chicken blood, while Doh Sinam meal includes pork blood. Jeytein, a kind of blood sausage, is produced in the traditional cuisine of Manipur (Laskar, 2023: 18-23).

Duarte et al. (1999) stated in their study that it may be possible to include blood fractions in the human diet, especially to provide sources of iron and protein. In cases where liquid blood (plasma), which is a type of blood used in foods, is used as a component, only formulations in which heat treatment will be applied are permitted. However, when using the liquid version of blood, considering its rapidly deteriorating nature, additional precautions may need to be taken by mandating the HACCP system, which is a system that identifies, evaluates and controls hazards that are important for food safety (Food and Agriculture Organization, 1997; Ofori and Hsieh, 2012). The steps of the system include;

- A more detailed look at what was done, what could go wrong and what the risks are to food safety.
- Identifying all the critical control points that a business should focus on to ensure that risks are eliminated or reduced to safe limits.
- Deciding what action to take if something goes wrong.
- Making sure that procedures are followed and working.
- Keeping records to demonstrate that procedures are working (Farm Sustainability Assessment, 2021).

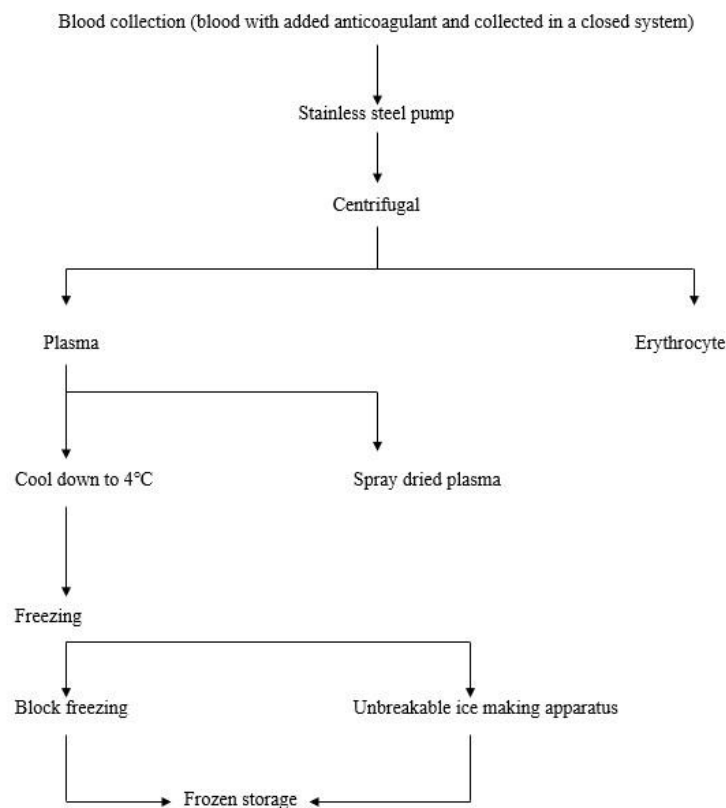
In addition, in terms of food safety, it is necessary for veterinarians to confirm that the blood to be processed for human consumption is free from conditions such as diseases, and the highest possible hygiene standards must be observed during the blood collection phase (Pares et al., 2011). There are basically two methods used for the collection process. One of these methods is the open system. Open collection systems cannot guarantee that there is no danger in the collected blood, and the blood collected with this method tends to have a high microbial load because it comes into contact with surface organisms such as carcasses, washing water, vomit, and feces (Ofori and Hsieh, 2014). It is thought that it would not be appropriate to use this method as it cannot comply with the mandatory hygiene standards and therefore cannot meet the HACCP principles.

The other method is the closed system. During killing, blood is collected in a hollow sealing knife connected to a flexible tube. The knives have disposable bags that hang from the tip of the blade and collect blood directly. While gravity is normally used to collect blood from animals, vacuum systems can be used to speed up the flow process. Blood is usually collected in bulk from several animals and then prepared for use when the carcasses concerned are

approved by veterinary examination as fit for human consumption (Lynch et al., 2017). This method ensures that the blood is collected hygienically and that the microbial count of the collected blood is low (Ofori and Hsieh, 2014) and immediate processing is considered more appropriate for health reasons (Gökalp and Yanar, 1986).

On the other hand, there are also points to be considered during the transportation phase. After collection, the blood is mixed with a certain amount of sodium citrate to prevent coagulation and stored in stainless steel tanks protected from contamination. When a tank is filled, a new sterile blade set and hose must be used to fill the next sterilized tank (Wisner Pedersen, 1988). It is important to cool the blood to 2 to 4°C as quickly as possible to minimise microbial growth that could cause blood deterioration (Lynch et al., 2017). After storage, blood can be stored and processed by freezing or drying. The drying/freezing process steps of Collected and stored blood may vary. Different examples can be given for these process steps.

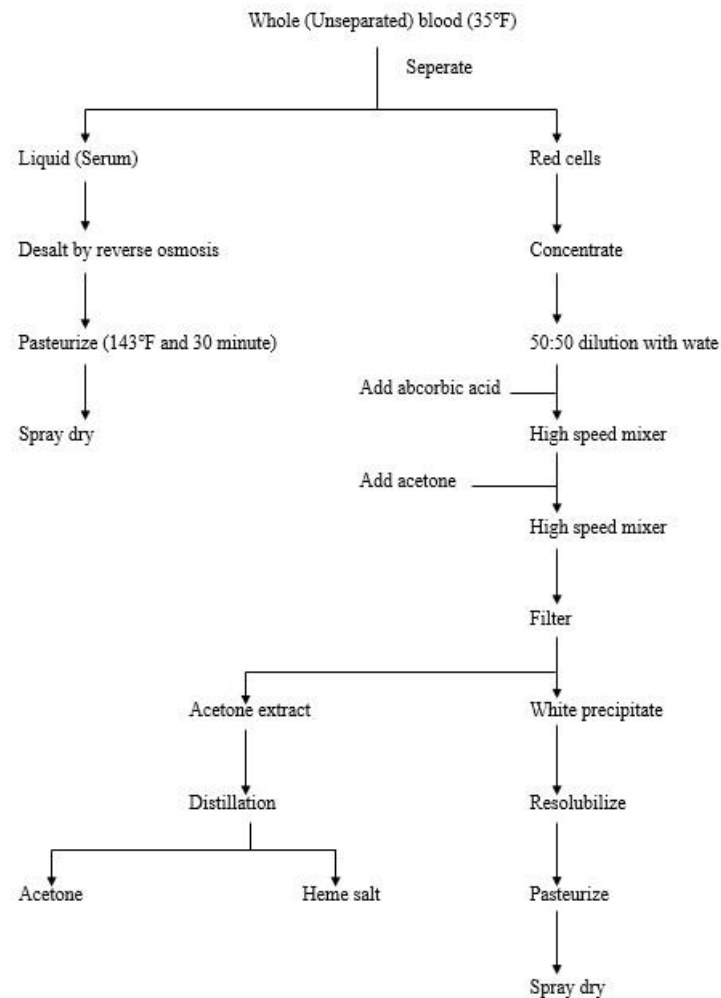
Figure 1. Processing stages of blood collected with a closed system and with anticoagulant added



Source: Adapted from Gökalp and Yanar, 1986.

The spray dried type, which can be obtained from processed blood and used in foods, can be produced by different methods, and different byproducts can also occur depending on the method. An example of the stages of obtaining spray dry blood is given in Figure 2.

Figure 2. Spray-Dry Processing Steps of Unseparated Blood



Source: Adapted from Dill, 1976.

Consuming blood as human food

Although some religions and cultures may approach blood consumption with caution due to the prejudices of their individuals or the philosophies they try to live by, blood is consumed as food in regions such as Asia, Europe and South America. Although the blood consumed is mostly obtained from cattle, horses, sheep and pigs can also be preferred (Karasz et al., 1976). Blood has long been consumed in rural areas in Europe and elsewhere, making many types of dishes such as puddings, pancakes, soups, blood sausages, and it is estimated that 10% of the

total blood produced in Swedish slaughterhouses is used for blood-containing foods (Wismer Pedersen, 1988). As another example- Germany (blood sausage Blutwurst), the United Kingdom (black pudding), France, all of Eastern Europe, Sweden, Finland, Spain, Portugal, Italy, Belgium, the Netherlands, Iceland- Europe produces a wide range of meat products containing blood (Pares et al., 2011). In Denmark, some of the blood in slaughterhouses is collected and from 100 kg of blood, 66 kg of plasma with 8% protein, 5.3 kg of protein and 33 kg of erythrocyte concentrate with 38% protein and a total of 12.5 kg of protein are obtained by centrifugation (Wismer Pedersen, 1988). This shows that blood consumption is not only an element of culinary culture in some regions, but also an element that can be added to nutrition outside of the kitchen.

Even though its consumption may not be desirable to some groups, it has some indirect positive effects. 36% of the agricultural products produced in the world are fed to animals, and 17-30% of these calories are returned to human consumption in the form of meat or milk. As a result, the calories in approximately 27% of agricultural products cannot be utilized, making it impossible for humans to consume them (Guliyev, 2019). Animal blood contains approximately 18% protein (Torres et al., 2002), As a result, ignoring it as waste and not using it leads to serious environmental pollution and causes the loss of a highly nutritional and functional by-product that is rich in iron and protein sources (Ofori and Hsieh, 2012). On the other hand, if they are consumed, positive environmental and nutritional results can be achieved, and some of the costs and efforts spent on wasted agricultural products can be compensated. In addition to its environmental and economic benefits, blood consumption provides high-quality protein and other nutritional sources for developing countries that cannot afford to buy meat containing high-quality protein and where protein deficiency due to undernutrition is a major problem (Ofori and Hsieh, 2014). Rosas Choo (2019) has shown that small amounts of blood, as an alternative for meat and poultry, also provide iron intake. Another finding is that blood can contribute to the intake of iron, which is a scarce nutrient in the diet of the population in various countries, and is especially essential for children, adolescents, women of childbearing age and pregnant women. Andago and others (2015) said cattle blood, including composite flours commonly consumed in Kenya and many developing countries, has great potential in improving the nutritional content of diets and has a great potential in the process of young children's transition from milk to solid food.

The method of consumption is not limited to a single method or form. Plasma can be consumed unseparated or as red blood cell protein, with different versions having different properties (Tarte, 2011). In addition to the different properties of consumable blood, the parts of the blood also have different qualities. The amount of protein and moisture in some blood types is described in Table 1.

Table 1. Amount of Protein and Moisture Contained in Blood Types.

	Protein (%)	Moisture (%)
Unseparated blood	17-18	75-82
Plasma	6-8	90-92
Cells	34-38	60-62
Dried plasma	70-95	5-10

Source: Adapted from Tarte, 2011.

Blood parts in different versions may have different properties, which makes it useful as an alternative food for various situations.

Food classes in which blood products are used

The environmental, nutritional and economic benefits derived from the use of animal blood, combined with recent advances in blood collection and processing techniques, has been made available in many areas for use in foods and dietary supplements to serve specific needs (Ofori and Hsieh, 2012). In addition to the benefits of being easily accessible and edible, blood proteins can be found in different forms, primarily liquid, frozen and dried (Alao et al., 2017). As a result of the literature review, the usage areas of blood products can be classified as sausage making, egg replacer, emulsifier, binder and bakery products.

Sausage

Although the ingredients used in making blood sausages, which are among the traditional meat products in many European countries, vary depending on the production region, their consumption is generally popular (Gasperlin et al., 2014). In the blood sausage class, varieties

such as Boudin Noir, Morcilla de Burgos, Krvavica, Blutworst can be given as examples. These products, which use blood in their production, may vary in terms of both their nutritional values and sensory characteristics. For example, Santos and other (2003) concluded that the traditional Spanish sausage Morcilla de Burgos contains the same amount of iron and protein as other European blood sausages, but differs from them by using higher amounts of onion and rice. Silva and others (2013) stated that smoked goat blood sausage is rich in high biological value proteins, amino acids, essential fatty acids and iron (26.65 mg/100 g) and has a sensory acceptance of more than 80%. Gasperlin's study (2014) showed that differences emerged in the analysis of Krvavica sausage produced in Slovenia when it was made by different producers. There are also some suggestions to improve different aspects of products made using blood. Pares and others (2011) recommended the use of dried, frozen or liquid plasma to improve the quality of products such as ham and cooked sausages, to prevent losses due to cooking, to ensure gelation, and to increase enhance ease of slicing and mouthfeel. In addition, they found it more appropriate to use hemoglobin (Hb), which has a remarkable nutritional value and a highly digestible organic iron content, in the production of black pudding. The fact that there are studies on the production and tasting of blood sausages, the normality of its consumption and the differences in its production show that it is an acceptable product for people.

Egg substitute and emulsifier

Studies have shown that blood can be an alternative to eggs due to its foaming feature. Penteado and others (1979) found that the best foaming agent was albumin, which was five times better than plasma and twice as good as globulin in foaming ability. Similarly, Pares and others (2011) concluded that the foaming capacity of plasma was as good as that of egg white when albumin predominated, since globins had a weak foaming capacity. Blood plasma foams lost nearly all of their initial foam within 30 minutes, while egg white samples kept more than 85% of their initial foam, according to research by Raecker and Jonson (1995). But compared to egg white, blood plasma was better at emulsifying oil.

The emulsifying and stability properties seen in blood proteins are also important in the food industry for the production of pate, sausage and mayonnaise (Silva and Silvestre, 2003). An advantage of this situation is that when used as emulsifiers, blood proteins such as hemoglobin also constitute a good source of heme iron and can be substituted for casein and eggs (Ofori and Hsieh, 2012). Containing heme iron provides an additional advantage because it has greater bioavailability than non-heme iron, making it more desirable to include in diets

(Torres et al., 2002). On the other hand, how the blood is processed and used affects its functionality. Pares et al. (2011) state that globin powder containing 95% protein can be used as an emulsifier in both hot and cold emulsions. Another analysis by Reaker and Jonson (1995) concluded that the freeze-dried blood sample produced large bubbles but its stability was poor, while small bubbles were observed in the dried blood sample. In addition, it can also be used as an alternative for some products in the 8 big allergen classes (milk, eggs, fish, shellfish, soy, wheat, peanuts and nuts). Although the same blood proteins are found in milk and meat, there are no reports of allergies resulting from the use of blood proteins as food in the literature (Ofori and Hsieh, 2014).

Binding

Both blood plasma and blood proteins can be used as binders in the meat industry. Although the performance of plasma proteins is not better than other binders, they can function as binders in meat systems due to their ability to form gels when heated (Ofori and Hsieh, 2012). Ramos Clamont et al. (2003) concluded in their analysis that porcine serum and albumin fraction are better than proteins used in the food industry (such as casein, egg albumin, soy proteins).

Bakery products

The inclusion of blood in bakery products is seen in different products. One of these is bread making. There are studies in the literature on the sensory evaluation of breads made with whey and/or blood instead of water. As a result, breads with added blood showed a lower volume than regular breads and emitted a liver-like odor during baking. However, this aroma disappeared after cooling, both in taste and smell, while the product exhibited different nutritional characteristics (Bates et al., 1974). Another product developed by Lee et al. (1991) was a cake made from bovine blood with spray-dried plasma added, and it was observed that it had 5-7% less rise than the egg white added version, but its hardness, cohesive structure and color were the same. Myhara and Krugel (1998) examined the cakes they made and agreed with Lee et al.'s conclusions on the version of the cake made with spray-dried plasma, but concluded that the version made with plasma protein had a darker crust and a granular texture.

There are also cookies made with blood added. Yousif et al. (2003) concluded that the addition of spray-dried blood (SDB) to biscuit flour increased the color intensity and

acceptability of the dough, aroma, flavor and texture intensity and acceptability, the intensity and acceptability of the aftertaste and the overall acceptability in sensory evaluation of the biscuits made with SDB. Valverde Espinoza and Mascco Tamariz (2021) developed a cookie to meet nutritional needs. In the evaluation of the quinoa cookie with added blood, it was revealed that the protein and iron constituting 25% of 50 grams of the cookie meet more than 100% of the daily iron needs of kindergarten and primary school children. In addition, it has been shown to help hematogenesis in women and children with iron deficiency. It is thought that such a product could be a useful supplement for nutrition and anemia for children with iron anemia, which is common especially in developing countries. Rosas Choo (2019) claimed that Chocochip he developed which contains sesame and blood was beneficial and harmless enough to be added to the diet of 6-month-old babies, and recommended that pregnant women, elderly people, cholesterol patients, adolescents and babies consume it because it is easily digestible, fat-free, low in calories and cost, an alternative to iron supplements.

As can be understood from the literature reviews, foods containing animal blood developed under certain conditions can be used for various nutritional purposes. However, the regulation in Türkiye does not include any explanation about consuming blood as food. The Turkish Food Codex does not contain any statement regarding the consumption of blood as food. In the 2. paragraph of the 3. clause of the Communiqué No. 2018/52 on Meat, Prepared Meat Mixtures and Meat Products, it is stated that the Communiqué does not cover salted or dried blood, salted or dried blood plasma. This statement shows that blood and blood products are not considered human food. In addition, known as the holy book of Muslims, in the Quran, the consumption of blood as food is prohibited in many verses (Bakara, 2:173; Maide, 5:3; En'am, 6: 145; Nahl, 16: 115). Although there is no official data on the Muslim population in Türkiye, it is estimated that the proportion of Muslims is not underpopulated. However, since it is not known whether religious prohibitions prevent the consumption of blood as food, this situation was questioned in the s questionnaire urvey study.

MATERIALS AND METHODS

Data collection

The developed questionnaire was first piloted with 20 participants. The data obtained and analyzed were collected between 20.02 2023 and 25.12. 2024. The questionnaire included sociodemographic characteristics, such as age (age range), gender (female, male), education

(primary school, secondary school, high school, bachelor's degree, postgraduate or higher degree), religion (Muslims, Deists, Atheists, Agnostics, Jewish, Christian), monthly income (very low, low, middle, high and very high), occupation (private sector, retirees, unemployed, government employees, contract personnel, freelance workers, the other category). The questionnaire used in the study was not taken or adapted from anywhere else. A 5-point Likert scale (1= fully agree, 5= totally disagree) was used.

Population

A survey, one of the quantitative research methods, was applied to measure the level of awareness and prejudice regarding the consumption of blood as food in Turkey. Quantitative research methods are methods of testing objective theories by examining the relationship between variables. These variables can usually be measured by measuring instruments, so that the digitized information can be analyzed using statistical procedures (Creswell 2017: 4). In order to implement the survey, ethical declaration permission dated 16.02.2023 and numbered E-11054618-302.08.01-165234 was obtained from the Ankara Hacı Bayram Veli University Ethics Committee. The Cronbach Alpha value of the current scale was found to be 0.702. The population of the study consists of Turkish citizens who are over 18 years of age, mentally competent, and the sample consists of citizens who meet these characteristics. In cases where the sample size consists of millions of people, it is accepted that a minimum of 384 people will be sufficient (bin Ahmad and binti Halim 2017; Gürbüz and Şahin 2016). For this purpose, data was collected from 405 participants, but information from 388 of them was found to be usable for the survey.

Data analysis

The data was processed in the IBM SPSS Statistic 25 program, and since normal distribution could not be achieved, the gender class was tested with the Mann Whitney U test, one of the non-parametric test groups, and the other classes were tested with the Kruskal Wallis test. Firstly the demographic characteristics of the participants were questioned in the questionnaire where age, sex, education level, monthly income, occupation and religious affiliations were examined. After the demographic distributions of the participants were explained with percentage, the results obtained from the Kruskal Wallis and Mann Whitney U tests were examined in separate tables. Then, the data results of the groups with significant differences between each other were shown with pairwise comparison diagrams.

RESULT

In the survey where age, sex, education level, monthly income, occupation and religious affiliations were examined. The results obtained from the questionnaire are given in Table 2.

Table 2. Demographic characteristics of the participants.

Class		%
Age	18-24	38.9
	25-35	40.7
	35+	20.4
Gender	Female	61.9
	Male	38.1
Education level	Primary school	2.8
	Secondary school	2.6
	High school	21.9
	University graduates	57.5
	Bachelor's degree or higher	15.2
Monthly income	Very low	12.1
	Low	22.2
	Medium	45.4
	High	19.1
	Very high	1.3
Occupation	Unemployed	31.7
	Public personnel	17.3

	Contract personnel	2.8
	Private sector employees	36.9
	Freelance workers	4.6
	Retirees	2.6
	Other category	4.1
Religion	Muslims	84.8
	Deists	6.2
	Atheists	7.2
	Agnostics	1.8
	Jews	0.0
	Christians	0.0

Data obtained from age, religion and occupation groups analyzed with the Kruskal Wallis test are given in Table 3.

Table 3. Kruskal Wallis Test Results obtained from age, religion and occupation groups

Null Hypotheses	Age	Religion	Occupation
	<i>Sig.</i>	<i>Sig.</i>	<i>Sig.</i>
The distribution of <i>Consuming blood as food is disgusting</i>	0.091	0.000	0.010
The distribution of <i>I do not consume blood due to my religious beliefs</i>	0.004	0.000	0.096
The distribution of <i>I do not consume blood because I think it is unclean</i>	0.271	0.000	0.060

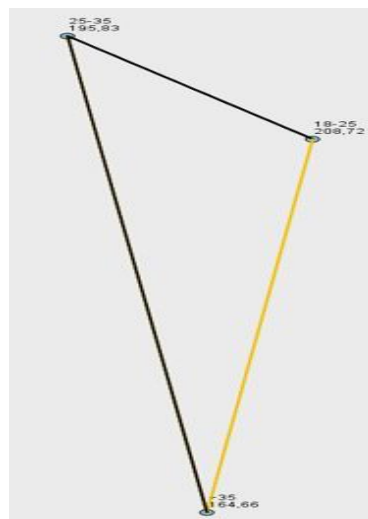
The distribution of <i>I do not consume blood because of my philosophy of life (veganism etc.)</i>	0.013	0.000	0.139
The distribution of <i>I know that blood can be used as a binder in pastries instead of eggs</i>	0.695	0.535	0.864
The distribution of <i>I do not consume blood under any circumstances</i>	0.000	0.000	0.111

Asymptotic significances are displayed. The significance level is 0.05.

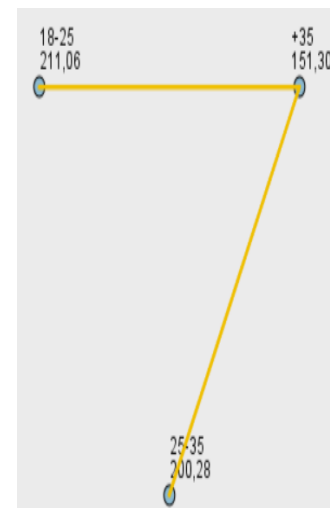
When age groups were analyzed, significant differences were found in the statements “I do not consume blood due to my religious belief”, “I do not consume blood due to my philosophy of life” and “I do not consume blood under any circumstances”. One of these statements contains unconditional prejudice, while the other two are reasons that can affect lifestyles. The groups between which the significant differences are obtained are shown in pairwise comparison diagrams. Graph 1 shows the pairwise comparisons obtained from the data sets “I do not consume blood due to my religious belief”, Graph 2 “I do not consume blood because of my philosophy of life (veganism etc.)” and Graph 3 “I do not consume blood under any circumstances”.



Graph 1



Graph 2

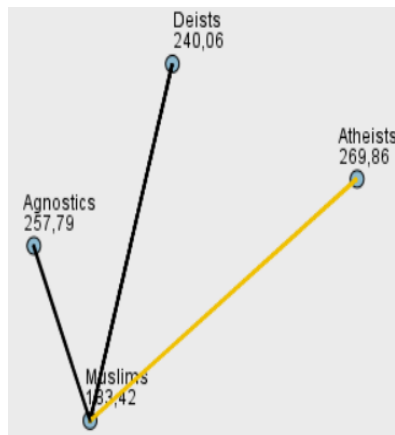


Graph 3

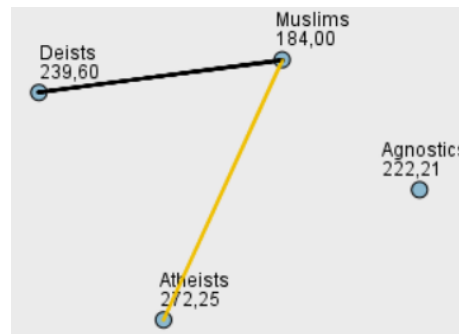
“pairwise comparison of *consuming blood as food is disgusting* in occupational class”, “pairwise comparison of *I do not consume blood because of my philosophy of life (veganism etc.)* in occupational class”, “pairwise comparison of *I do not consume blood under any circumstances* in occupational class”

In all 3 graphs, there were significant differences between the +35 age group and the other groups. In the expression “regardless of the conditions”, there was a significant difference between the +35 age group and the other groups, and in all 3 graphs, the 18-25 age group formed one branch of the significant differences.

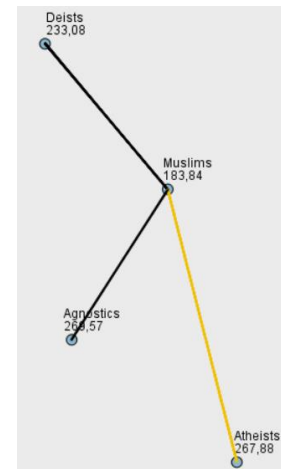
In terms of religion, there are significant differences in all statements except the statement "I know that blood can be used as a binder in pastries instead of eggs." The groups between which significant differences occur are shown in the pairwise comparison graphs obtained from the data sets “Consuming blood as food is disgusting” in Graph 4, “I do not consume blood because I think it is unclean” in Graph 5, “I do not consume blood under any circumstances” in Graph 6, “I do not consume blood because of my philosophy of life (veganism etc.)” in Graph 7 and “I do not consume blood due to my religious beliefs” in Graph 8.



Graph 4



Graph 5



Graph 6

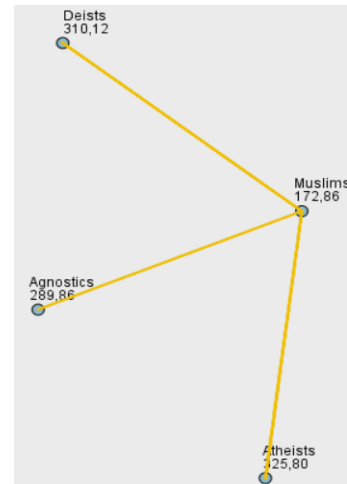
“pairwise comparison of *consuming blood as food is disgusting* in religion class”, “pairwise comparison of *I do not consume blood because I think it is unclean* in religion class”, “pairwise comparison of *I do not consume blood under any circumstances* in religion class”

All of the significant differences in the statements “Consuming blood as food is disgusting” in Graph 4, “I do not consume blood because I think it is unclean” in Graph 5, and

“I do not consume blood under any circumstances” in Graph 6 occurred between Muslims and Atheists.



Graph 7

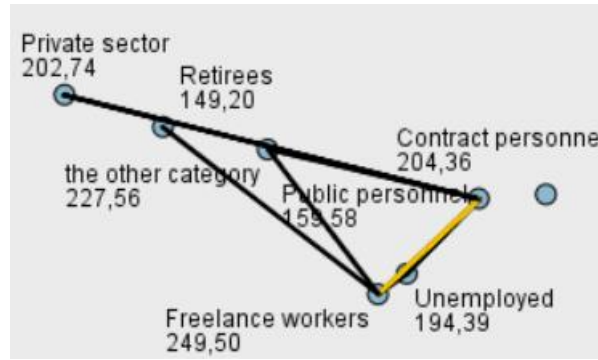


Graph 8

“pairwise comparison of *I do not consume blood because of my philosophy of life (veganism etc.)* in religion class”, “pairwise comparison of *I do not consume blood due to my religious beliefs* in religion class”

While the significant difference in the statement “I do not consume blood due to my philosophy of life (veganism etc.)” in Graph 7 occurred between Muslims, Deists and Atheists, the significant differences in the statement “I do not consume blood due to my religious belief” in Graph 8 occurred between Muslims, Deists, Atheists and Agnostics. Since there is a significant difference in the graphs, it shows that there is always a correlation between Muslim participants and other groups.

When occupational class was analyzed, a significant difference was found only in the statement " Consuming blood as food is disgusting". The groups where this significant difference is found are shown in Graph 9.



Graph 9

“pairwise comparison of *consuming blood as food is disgusting* in occupational class”

According to the pairwise comparative graph, there is a significant difference between the participants belonging to the public personnel and freelance groups.

The results of the Mann Whitney U test examining the results of gender class are given in Table 4.

Table 4. Mann Whitney Test Results obtained from gender groups.

Null Hypotheses	Gender
	Sig.
The distribution of <i>Consuming blood as food is disgusting</i>	0.029
The distribution of <i>I do not consume blood due to my religious beliefs</i>	0.016
The distribution of <i>I do not consume blood because I think it is unclean</i>	0.065
The distribution of <i>I do not consume blood because of my philosophy of life (veganism etc.)</i>	0.001
The distribution of <i>I know that blood can be used as a binder in pastries instead of eggs</i>	0.945
The distribution of <i>I do not consume blood under any circumstances</i>	0.121

Asymptotic significances are displayed. The significance level is .05.

In the results of the Mann Whitney U test, where gender was the independent variable, a significant difference was found in the statements " Consuming blood as food is disgusting ", " I do not consume blood due to my religious beliefs " and "I do not consume blood due to my philosophy of life". While two of the statements are closely related to belief and lifestyle, the other is a statement that includes prejudice regarding its consumption as food. This shows that there are differences between genders in terms of being loyal to belief and lifestyle in certain aspects.

DISCUSSION AND CONCLUSION

Global warming, productivity problems in agriculture and animal husbandry, and problems in accessing food in some countries also affect eating habits. These situations lead to the development or consumption of alternative products. These products and applications include the development of plant-based meats, the widespread consumption of certain insect species, and the processing and consumption of blood as food. While the history of making sausages containing blood dates back to ancient times, its use in the modern world has increased with the help of technological and scientific developments. Reducing the carbon footprint, eliminating iron deficiency in countries where red meat consumption is lower than it should be, and reducing costs in the food sector by processing blood and adding it to the content of products are examples of new areas of use.

Iron deficiency is the most important cause of anemia in Turkey (Akin et al., 2013). While the world average food inflation is 8.09% in 2023, it was determined as 65.5% in Turkey (Food and Agriculture Organization, 2024). This situation makes it difficult to consume the necessary nutrients. Studies have shown that improved blood-based foods can be beneficial in both eliminating iron deficiency and providing nutritional supplementation. However, in the survey study, no significant difference was found in relation to the statement "I know that blood can be used as a binder in pastries instead of eggs." 46.9% of the participants chose the “strongly disagree” option. This situation shows that the general population is not aware that blood can be used as food. Based on this result, it is thought that the product introduction process may be long if blood-based food is developed.

The significant differences in the results in the age class between the lower and upper age groups suggest that this indicates a disagreement due to generational differences. Two of these differences are due to lifestyle and one is due to unconditional prejudice. The fact that two of

the three groups are related to lifestyle also shows that social change progresses differently between generations.

Our study showed that there are significant differences in all statements except for the statement "I know that blood can be used as a binder in pastries instead of eggs". All significant differences were associated with Muslim participants. In this case, it is possible to talk about the influence of religion on the people's lifestyle, eating habits and prejudices. Like Muslims, in Buddhism and Hinduism, foods containing blood are not consumed. This is because they prioritize vegetarianism due to their belief in the possibility of reincarnation in animal form (Hamilton, 2000). Also in Judaism consumption of blood is strictly forbidden. Torah (Ankara; Dorlion Publisher, 2023, Lev. 17:13-14) states that since the life of all flesh is its blood the blood of animals to be eaten must be poured. However, as a result of the literature review, it has been observed that there is a lack of national/international survey studies that explain how effective religious barriers affecting the consumption of blood as food are in real life. It is thought that conducting research examining how much religious practices affect daily life and how much willing societies and generations this interaction will help provide information in this area.

On the other hand, the participation of more non-Muslim participants in similar studies would enable a better analysis of the data. Therefore, it is recommended that future studies on the subject should focus more on the religion category.

When it comes to the occupational classes, a significant difference was found between the government employees and freelancers groups in the item " consuming blood as food is disgusting ". In order to evaluate this significant difference better, further research is needed.

As a result of examining the gender category data, a significant difference was found between the statements " consuming blood as food is disgusting ", " I do not consume blood due to my religious beliefs " and " I do not consume blood because of my philosophy of life (veganism etc.)". While two of these are significant differences resulting from lifestyle, the other is a prejudice against consuming it as food. Based on this, it can be interpreted that the power of philosophies of life to influence daily life may vary based on gender.

When the analyses are evaluated, it can be said that while it is potentially possible for a part of the society to consume blood as food, it will be more difficult or impossible for another

part of the society. As a result of various developments in the world, many alternative foods have been developed and are being developed. It is thought that society should at least have an idea about this issue. According to the World Health Organization's (WHO) 2021 data on anemia in women and children, the prevalence in Turkey was determined as %25 (World Health Organization, 2024). This shows that one in every four children and women struggles with anemia. Iron anemia is more common in infants in Turkey than in other age groups (Erduran, 2010).

As a result of the literature review and the data obtained from questionnaire, it is understood that especially important for children and women to know that blood-based foods can be used for health purposes if necessary. In the data, a significant difference was found between genders in the classes of “consuming blood as food is disgusting”, “I do not consume blood due to my religious beliefs” and “I do not consume blood because of my philosophy of life (veganism etc.)”. This situation shows that there is a need to inform society. However, since the study sample did not include people that under the age of 18, the perspective of these people on the subject could not be examined. It is recommended that researchers who will study in this field conduct a questionnaire study that includes people under the age of 18 in order to fill the gap in literature.

A study revealing the society's perspective on the consumption of blood as food has not been conducted in Turkey before. However, this study is the first and only study to examine the perspective of Turkish society on the consumption of blood as food. In the study, the demographic characteristics of the samples were specified, their perspectives on the subject were questioned in the questionnaire and explained in the data analysis. Thus, the reasons participants consumed/did not consume food containing blood could be clarified. Data showed that there may be obstacles to the acceptance of foods containing blood by some parts of the population. Due to this, it is thought that the social equivalent of these types of products will be limited or consist of a certain audience. But it is important to conduct more studies on this subject that include more limited population in order to be able to speak more clearly about the implications on the subject. It will be important for dietitians, sociologists, gastronomy experts and health professionals to show interest in this subject in order to examine a social reality and to know a product that can be an alternative in terms of health and economy. In addition, the data obtained from the study enabled the other researchers to have hard data. In this way, it is believed that the study will guide relevant researchers to examine the subject more deeply.

Ethical declaration

Ethical declaration permission dated 16.02.2023 and numbered E-11054618-302.08.01-165234 was obtained from the Ankara Hacı Bayram Veli University Ethics Committee.

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