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Milk: A Nutritive and Healthy Food? Consumer Perspective from French and Portuguese Participants

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Abstract: Milk from different animals is a staple food consumed since immemorial times all over the world. However, there is a lack of knowledge in the scientific literature about knowledge related to milk and its effects on nutrition and health. The objective of this study was to investigate consumers' knowledge about milk, its composition, and its effects on human health in two different countries. The study was conducted through a questionnaire survey in Portugal and France and involved 542 participants of whom 332 were French and 210 were Portuguese. For data analysis, we used basic statistics, parametric tests, tree classification, and factor analysis. The results showed that some sociodemographic variables significantly influenced the level of knowledge, namely country ($p < 0.001$), age ($p = 0.029$), and the dimension of the household ($p < 0.001$). Nevertheless, tree classification analyses revealed that other variables such as education, occupation, and body mass index showed some discriminating ability. Factor analysis retained 20 items of the 23 initially tested. The solution contained five factors, two of which had very good internal consistency (alpha values of 0.825 and 0.803). The mean scores for knowledge in practically all factors were consistently higher for the Portuguese as compared with the French sample. In conclusion, the level of knowledge about milk composition and its health effects differs according to several sociodemographic variables, particularly in what constitutes country differences.

Keywords: dairy products; milk consumption; healthy diet; consumer study; survey

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1. Introduction

Worldwide, there is a serious problem of malnutrition, and one of the most challenging problems facing the world's population is nutrient deficiency. This condition is sometimes designated as hidden hunger, and it is believed that nutrient deficiency affects about one third of the world population, with more than 2 billion people suffering from some form of nutrient deficiency. This problem is not only characteristic of developing countries, thus encompassing people suffering from chronic hunger or malnutrition as well as people who are overweight [1].

Nutritional deficiency of micronutrients like vitamins and minerals, has previously been considered of minor relevance or even ignored due to the absence of immediate clinical symptoms [2]. However, recent evidence has demonstrated the fundamental roles of these nutrients, whose deficiency impairs intellectual, cognitive, and physical development, causing illness and premature death, culminating in an expressive part of the world population (about one third) living in suboptimal physical and mental conditions [2].

As a result, the cost of hidden hunger for society is high, as it involves spending on health, social security, loss of labour productivity, and premature deaths, among others. Therefore, the great challenge of the modern world is no longer solely to feed the world's population, but to nourish it, promoting healthy diets [3].

Several types of reasons can be responsible for nutrient deficiency, including the availability of foods, particularly those with nutritional quality, the price, culture and tradition, low nutritional knowledge, and sensory preferences, among others [4–7]. However, studies have shown that consumers consider the nutritional quality of foods less relevant than other factors, such as taste or price [4–7]. In the studies by Darmon et al. [8] and Monsivais and Drewnowski [9], it was observed that food purchase was more influenced by price than by nutritional value. Similar results were found by Drewnowski et al. [10] and Ward et al. [11], clearly indicating that food prices can greatly affect the quality of diets, and this is transversal to different countries, even high-income ones, such as the United States, France, and Australia. The increase in the price of basic foodstuffs may restrict people's diets and generate major socioeconomic impacts and barriers to the sustainable development of countries worldwide.

According to Shlisky et al. [12], there is a great prevalence worldwide of dietary calcium deficiency, affecting approximately 50% of the world's population. This inadequate access to dietary calcium is global, and although populations in low- and middle-income countries are at greatest risk, many individuals in high-income countries also do not consume the amounts of calcium recommended for the good health functioning of the human body, namely for maintaining strong bones and controlling muscle and nerve function [13–17]. One other nutrient that is reported as problematic at the global level is vitamin D, a nutrient that is crucial for bone health in association with calcium but also has other health effects at the level of fatigue, mood and may also prevent some types of cancer [18–25].

Milk and dairy products provide important nutrients like calcium, phosphorus, magnesium, and proteins, essential for bone formation and repair [26–29]. Adequate consumption of these products throughout the whole lifecycle allows for maintaining bone density at adequate levels, protecting against diseases such as osteoporosis [26–29].

Research conducted by Siqueira et al. [30] using the methodology by Wenhold and Leighton [31] has demonstrated that it is possible to meet certain human nutritional requirements at low prices, and specifically that 30% of the daily needs of eight nutrients (protein, calcium, iron, fibre, vitamins A, C, D, and E) can be obtained through the consumption of milk, which is pointed out as one of the cheapest sources of nutrients as compared with other food products [30,32]. Whole milk can supply 30% of a healthy adult's calcium needs, and most dairy products meet an individual's needs at a low cost [30,32]. Dairy products also occupied the first positions in the ranking of the cost of vitamin D and obtained a good position in the ranking of protein and vitamin A [30,32]. With the same amount, consumers can acquire 30% of vitamin D by consuming pasteurized, whole, semi-skimmed, and skimmed milk; or powdered milk (skimmed and whole) [30,32].

Milk and dairy products contain a wide variety of nutrients, thus allowing consumers to intake appropriate amounts of nutrients and ingest foods of dietary quality. Health authorities across the world recognise the health benefits of dairy products and recommend their consumption as part of a balanced and healthy diet [33]. However, it is also a fact that misperceptions and a lack of knowledge about the benefits of dairy products are widespread, and that the promotion of some competing products makes some consumers unaware of the benefits of dairy products for human health [33]. The work by Florença et al. [34], exploring food myths and food facts, showed that some Portuguese consumers believe that milk is bad for their health. In recent years, movements against milk or against other dairy products have emerged, sometimes linked to vegan activism, which recommends excluding any food of animal origin from the diet. However, consuming milk is recommended even in adulthood, bringing countless health benefits, except in cases where the person is lactose intolerant or allergic to one of its proteins [35]. Some

commonly available non-dairy beverages are derived from almonds, cashews, coconuts, hazelnuts, hemp, oats, rice, and soy. Nevertheless, cow's milk has a higher nutritional value, possessing a higher protein content and quality compared with most of the non-dairy competing products, which in most cases have to be fortified with calcium and vitamin D, although their bioavailability is not established [35].

A study conducted in Denmark, the United States, and the United Kingdom [36] investigated adult consumers' knowledge and perceptions about milk fat content, focusing on country differences. They concluded that a higher percentage of participants from the United Kingdom and the United States considered milk fat to be either "healthy" or "very healthy" as compared to Danish consumers. However, consumers from all three countries recognized the nutritional benefits of milk fat. Finally, they observed that awareness of milk saturated fat was higher among participants from the United Kingdom as compared to the other participants.

Considering the nutritional relevance of milk and the importance of knowledge as one driver for food choice and milk consumption in particular, this work aimed to study the level of knowledge about milk, specifically its nutritional components and their health effects, in two different countries and also evaluate if the knowledge was influenced by some types of sociodemographic characteristics.

2. Materials and Methods

2.1. Instruments and Data Collection

This was a transversal descriptive study designed to gather information about milk consumption and knowledge. For this project, a questionnaire survey was planned, and a data collection instrument was prepared specifically for the study. The questionnaire consisted of four parts, as follows: I. sociodemographic data to characterize the sample; II. milk consumption habits; III. consumption and purchasing preferences; and IV. knowledge about the composition and health effects of milk. This last part of the questionnaire was the focus of the present study, and it contained 23 items for which the participants expressed their agreement on a 5-point Likert scale (1 = totally disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = totally agree) [37]. The Likert scale type of answer was chosen because it would help measure the level of agreement with certain sentences, thus measuring the degree of certainty or uncertainty of the participants towards the facts mentioned and consequently providing a richer kind of information than a yes/no response. Table A1 in Appendix A shows all items as they were presented to the participants. The items were developed specifically for this investigation and were prepared by members of the team from the two countries where the data collection would take place.

Before applying the questionnaire, the study was approved by the Ethics Committee of the Instituto Politécnico de Viseu with reference No. 11SUB/2020, from 18/11/2020. The survey was announced on social networks, and an invitation was also sent by email. All ethical issues were strictly obeyed according to international standards for studies with human participants, and the privacy of the participants' personal data was guaranteed, as was the possibility to stop participation at any moment before submitting the answers to the questionnaire. Only adult participants were included in the study for being able to provide self-consent to participate and who voluntarily agreed to participate in the study. The questionnaire was shared among the participating countries in English and then translated into the native languages (French and Portuguese) to be answered by individuals from these two countries. The data were collected from September 2020 until May 2021. The number of responses obtained was 543, of which 332 were from French participants and 210 were from Portuguese participants. Only one questionnaire (from a French participant) was not validated due to a high number of unanswered questions, resulting in 542 valid participations (332 French and 210 Portuguese).

2.2. Data Analysis

To analyse the data, basic descriptive statistics such as frequency, mean, and standard deviation were used. Also, parametric tests were used to identify differences between groups, namely the *t*-test for independent samples when it was intended to compare two groups and an Analysis of Variance (ANOVA) with Tukey's post hoc test to compare the mean values between three or more groups [38].

To analyse the results for knowledge, we calculated the indices for each of the 23 items, as the mean value between the scores of the participants. In this case, before the calculation, the items corresponding to false statements were revered (items It-6 and It-19). Also, the scale was readjusted to remove the effect of the responses with a score of 3 (indifferent). In addition to the calculation of the indices, the level of knowledge for each participant was also calculated as the average of all items. Finally, the level of knowledge was categorized into classes as follows: very low knowledge ($-2 \leq$ value < -1), low knowledge ($-1 \leq$ value ≤ 0), high knowledge ($0 <$ value < 1), and very high knowledge ($1 \leq$ value ≤ 2). The use of indices is frequently found in the literature as a way to quantify the intensity of knowledge or other measuring variables. The indices we used in this work were calculated as mean values, while other works can also use sum values instead of mean to express the indices, as in, for example, the work by Florença et al. [34], about food myths and food facts.

To analyse the comparative influence of the sociodemographic and anthropometric variables on the level of knowledge, a tree classification analysis was performed. To do so, the classification and regression trees (CRT) algorithm with cross-validation [39] was selected. The value for the minimum improvement step was set to 0.001, and the minimum number of cases for parent and child nodes was fixed at 20 and 10, respectively.

The scale was validated by means of factor analysis (FA), using the method of principal component analysis (PCA). This recognises if there is a grouping structure between the items considered. Nonetheless, prior to the application of FA, the data needs to be evaluated to confirm the possible suitability of applying this kind of statistical treatment. In this matter, the following steps were considered: (a) analysis of the correlation matrix between the variables to establish possible associations based on the values of the correlation coefficients; (b) calculation of the Kaiser–Meyer–Olkin (KMO) measure of the adequacy of the sample; and (c) carrying out Bartlett's test to evaluate the significance of the correlations between variables [40]. The following reference values were used to analyse the KMO: excellent for $0.9 \leq$ KMO ≤ 1.0, good for $0.8 \leq$ KMO < 0.9, acceptable for $0.7 \leq$ KMO < 0.8, tolerable for $0.6 \leq$ KMO < 0.7, bad for $0.5 \leq$ KMO < 0.6, and unacceptable for KMO < 0.5 [41].

The FA was applied to the items after reversing the false items (It-6 and It-19), so that the measuring scale would be uniform, i.e., a higher score corresponding to higher knowledge. The first step in the analysis consisted of verification of the suitability of the data to apply FA. After that, FA was applied with the extraction method by PCA and using Varimax rotation. The Kaiser normalization and Eigenvalues higher than 1 were used to establish the number of factors to extrac. The values of the communalities were used to identify the percentage of variance explained by the factors [40]. In the analysis, items with low factor loadings (an absolute value lower than 0.4) were excluded [42,43], because those have low relevance to the solution. The Cronbach's alpha (α) coefficient was used to assess the internal consistency of the factors obtained in FA [40,44]. The reference values for alpha considered were: acceptable consistency $-0.5 < \alpha < 0.7$, good consistency $-0.7 \leq \alpha < 0.8$, and very good consistency $-0.8 \leq \alpha \leq 1$ [45–47].

For all data treatment and statistical analyses, the software SPSS version 29 from IBM Corporation (Armonk, New York, NY, USA) was used, and a level of significance of at least 5% was considered ($p < 0.05$).

3. Results

3.1. Sociodemographic Characterization of the Sample

Table 1 presents the sociodemographic characteristics of the participants in the survey, considering the global sample and also separately for each of the countries. The results revealed that the majority of the participants were young adults (49.8%), with this class less represented in the Portuguese samples than in the French samples (percentages of 39.0% and 56.6%, respectively). In what concerns the distribution among sexes, the female participants were in higher numbers in all cases, representing 65.7% of the global sample, but evidencing differences between countries, with a much higher percentage of women in the Portuguese sample than in the French sample (81.0% and 56.0%, respectively). It is a common trend to find higher participation of women than men in questionnaire surveys, regardless of the topic, due to their higher disposition and will to participate. This is a characteristic of using convenience samples. They facilitate recruitment and data collection while not guaranteeing equal group representativeness [48]. Nevertheless, they allow obtaining good results in exploratory-type studies [49]. The majority of the participants were employed (51.5% of the global sample, and 62.9% and 44.3% in the cases of the Portuguese and French samples, respectively). In terms of education level, most participants had a university level of education (67.2%), the percentage of which was higher in the case of the French participants (78.0%) as compared to the Portuguese participants (50.0%). Finally, in terms of the household, most were composed of four or more persons, representing 33.0% of the global number of participants, but with some tendency for larger households in Portugal than in France, i.e., higher percentages of households with 3 or 4+ persons in Portugal (29.5% and 41.0%) as compared with France (18.1% and 28.0%).

Table 1. Sociodemographic characteristics of the participants.

Variables	Classes	France [N = 332] n (%) [1]	Portugal [N = 210] n (%) [1]	Global [N = 542] n (%) [1]
Age	Young adults (18–25 y)	188 (56.6)	82 (39.0)	270 (49.8)
	Adults (26–50 y)	92 (27.7)	100 (47.6)	192 (35.4)
	Senior adults (51 y or over)	52 (15.7)	28 (13.3)	80 (14.8)
Sex	Female	186 (56.0)	170 (81.0)	356 (65.7)
	Male	137 (41.3)	40 (19.0)	177 (32.7)
	Other	9 (2.7)	0 (0.0)	9 (1.7)
Occupation	Student or working student	157 (47.3)	53 (25.2)	210 (38.7)
	Employed	147 (44.3)	132 (62.9)	279 (51.5)
	Other (retired, unemployed)	28 (8.4)	26 (11.9)	53 (9.8)
Education	Up to secondary school	73 (22.0)	105 (50.0)	178 (32.8)
	University level	259 (78.0)	105 (50.0)	364 (67.2)
Household	Alone	99 (29.8)	14 (6.7)	113 (20.8)
	2 persons	80 (24.1)	48 (22.9)	128 (23.6)
	3 persons	60 (18.1)	62 (29.5)	122 (22.5)
	4 or more persons	93 (28.0)	86 (41.0)	179 (33.0)

[1] n is the number of respondents in each of the groups, and % is the valid percentage.

The sociodemographic characteristics of the sample are pivotal to being able to link the findings collected regarding knowledge about milk and its effects on human nutrition and health back to the different types of consumers, not only from different countries but also belonging to divers sociodemographic categories of sex, age, education, or household.

Table 2 presents the results for the anthropometric characteristics of weight, height, and body mass index (BMI). From Table 2, it is possible to conclude that weight varied from 41.0 to 145.0 kg with a mean value of 68.4 $\pm$ 15.5 kg considering the global sample, but with some differences between countries, with an average weight higher for the Portuguese participants (67.2 $\pm$ 13.4 kg). The height varied between 1.5 and 2.0 m, being

on average 1.7 ± 0.1 m, with a mean value equal for both countries. The BMI ranged in the global sample from 15.4 to 48.3 kg/m^2, with a higher value for the Portuguese sample (24.5 ± 4.2 kg/m^2). Table 2 also shows that the great majority of the participants in both countries are in the category of normal weight, according to the classification of the World Health Organization [50] (68.3% for the French sample and 63.8% for the Portuguese sample). Nevertheless, there is still a relevant percentage of participants who are overweight (19.0% of the global sample) or obese (10.4% of the global sample).

Table 2. Anthropometric characteristics of the participants.

Variable	France			Portugal			Global		
	n	Min–Max [1]	Mean ± SD [2]	n	Min–Max	Mean ± SD [1]	n	Min–Max	Mean ± SD [1]
Weight (kg)	331	41.0–145.0	69.1 ± 16.7	210	42.0–107.0	67.2 ± 13.4	541	41.0–145.0	68.4 ± 15.5
Height (m)	332	1.5–2.0	1.7 ± 0.1	210	1.5–1.95	1.7 ± 0.1	542	1.5–2.0	1.7 ± 0.1
BMI [3] (kg/m^2)	331	15.4–48.3	23.5 ± 4.6	210	17.8–39.6	24.5 ± 4.2	541	15.4–48.3	23.9 ± 4.5
BMI Classes [4]	**% of participants (N = 331)**			**% of participants (N = 210)**			**% of participants (N = 541)**		
Underweight	5.4%			1.9%			4.1%		
Normal weight	68.3%			63.8%			66.5%		
Overweight	16.9%			22.4%			19.0%		
Obesity	9.4%			11.9%			10.4%		

[1] Minimum and maximum values; [2] SD = Standard deviation; [3] BMI = Body Mass Index (BMI = weight/height^2); [4] Classes of BMI: Underweight = BMI < 18.5 kg/m^2, Normal weight = 18.5 ≤ BMI < 25.0 kg/m^2, Overweight = 25.0 ≤ BMI < 30.0 kg/m^2, Obesity = BMI ≥ 30.0 kg/m^2.

3.2. Level of Knowledge about the Consumption of Milk

The scores of the 23 items used to measure knowledge using a Likert scale varying from 1 to 5, have been recoded as a way to somehow neutralize the effect of the participants who did not manifest a valid opinion of agreement/disagreement, i.e., those participants who scored 3 "Neither agree nor disagree". This approach is current in scientific works since the midpoint of the Likert scale is the absence of expressing an opinion of agreement or disagreement, and we want to extract only opinions from participants that manifested agreement/disagreement regardless of their intensity (just agree/disagree or a more intense opinion of strongly agree/disagree). Additionally, the questions that were given as false statements (items It-6 and It-19) were reversed before recoding, and in this way, all items became uniform in the following scale for knowledge: −2 = very low knowledge, −1 = low knowledge, 0 = no expression of knowledge, 1 = high knowledge, and 2 = very high knowledge. After the recoding of the items, the indices were calculated for each of the items as the sum of the scores attributed by the participants. Table 3 shows the results for the indices considering the samples separately according to country, and Figure 1 presents the results for the indices by decreasing order of the values for the global sample.

Table 3 reveals some differences between the participants from both countries, but also some common trends regarding the facts that are of more common knowledge and those that are less known by the participants. For example, in both countries, the item for which the knowledge was higher was It-15 (sums of 259 and 198 for Portuguese and French samples), this being about the role of calcium in bone and tooth health. Also, It-1 comes on the top list in both countries, being second in Portugal (sum = 164) and third in France (sum = 188), which relates to the high nutritive value of milk. On the other end of the list appear items such as It-19 and It-12 for both countries, with very low scores, indicating the difficulty in identifying information about the need to continue consuming milk after the age of 30 years and the low vitamin A content of skimmed milk.

The results in Figure 1, relative to the global sample, confirm that item It-15 was the one with a higher index (sum = 457), revealing that people are well informed about this specific topic, i.e., the role of calcium as a fundamental micronutrient for the good formation of bones and teeth. Following this, the other two items with very high indices were items It-2 and It-1 (sums equal to 366 and 352, respectively), confirming the knowledge of the participants about the composition of milk in in terms of proteins, carbohydrates, lipids,

vitamins, minerals, and water, and therefore, its high nutritional value. On the other hand, the items for which people showed lower levels of knowledge were items It-19 and It-12, with very low scores (sums of 68 and 54, respectively). While It-19 was reversed for being presented to the participants in reverse order, It-12 was not reversed. These items relate to knowledge about the need to continue consuming milk after the age of 30 years and about the low content of skimmed milk in the fat-soluble vitamin A.

Table 3. Indices for knowledge calculated for each of the participating countries.

Item No.	Statement	INDICES FOR KNOWLEDGE	
		France (N = 238)	Portugal (N = 143)
It-1	Milk is a food with high nutritional value	188	164
It-2	Milk contains proteins, carbohydrates, lipids, vitamins, minerals, and water	210	156
It-3	Milk provides proteins of high biological value as they contain essential amino acids	129	122
It-4	The main proteins in milk are caseins and whey proteins	172	83
It-5	Lactose is the main sugar in milk	144	111
It-6	Lactose is directly absorbed by the body, without needing enzymes (REVERSED)	122	15
It-7	Whole milk has a fat content typically over 3.5%	61	42
It-8	Semi-skimmed milk has a fat content of around 1%	87	62
It-9	Skimmed milk has a maximum fat content of 0.5%	51	76
It-10	The main vitamins in milk are vitamins B_2, B_{12}, and A	102	88
It-11	Vitamin A is naturally present in milk fat	69	60
It-12	Skimmed milk has very small amounts of vitamin A	38	16
It-13	Milk is a good source of calcium and iodine	160	134
It-14	Milk provides minerals like potassium, zinc, phosphorus, and magnesium	71	105
It-15	Calcium is fundamental for the good formation of bones and teeth	259	198
It-16	Calcium-fortified milk is a great choice to meet daily calcium requirements for those who do not consume dairy products or other calcium-rich products	97	124
It-17	Vitamin D favours the body's absorption of calcium	146	123
It-18	Children, as they are in a phase of growth and bone and dental formation, need to ingest calcium, as well as vitamin A, B complex vitamins, and some minerals that are present in milk	165	152
It-19	Around the age of 30, the bone mass peak is reached, and therefore there is no problem if you stop consuming milk (REVERSED)	51	17
It-20	Women, during menopause, tend to lose calcium and, consequently, bone mass	134	159
It-21	Pregnant and breastfeeding women should consume specific amounts of calcium per day. At this stage, the need for B vitamins also increase	78	130
It-22	The elderly should increase their intake of micronutrients such as B vitamins, calcium, and iron. A great source of these micronutrients is milk	123	116
It-23	The intake of milk is advised at all stages of life	116	91

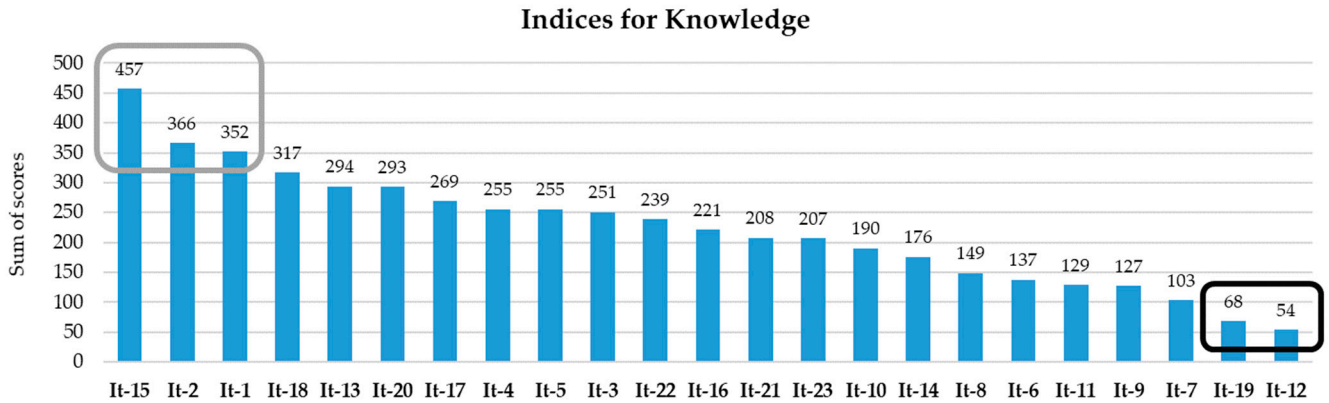

Figure 1. Indices for knowledge calculated for the global sample (In grey the highest values, and in black the lowest values obtained for the sum of scores).

Based on the scores of all 23 items, a mean score was computed for each of the participants. These values were then tested for differences between groups according to sociodemographic characteristics, and those results are shown in Table 4. According to the results of the statistical tests, significant differences were observed in only three cases for the variables country ($p < 0.001$), age class ($p = 0.029$), and size of the household ($p < 0.001$). For these cases, knowledge was higher for participants from Portugal (0.71 ± 0.52) as compared to France, for senior adults (0.75 ± 0.57) as compared with other age classes, and for people living in households composed of 4 or more people (0.71 ± 0.44). In all other cases, no significant differences were observed between groups based on sex, occupation, education level, or BMI.

Table 4. Knowledge about milk according to sociodemographic and anthropometric characteristics.

Variables	Classes	Level of Knowledge Mean [1] ± SD [2]	Significance [3]
Country [4]	France	0.51 ± 0.49	$p < 0.001$
	Portugal	0.71 ± 0.52	
Age [5]	Young adults (18–25 y)	0.54 ± 0.45 [a]	$p = 0.029$
	Adults (26–50 y)	0.59 ± 0.56 [ab]	
	Senior adults (51 y or over)	0.75 ± 0.57 [b]	
Sex [5]	Female	0.59 ± 0.50	$p = 0.217$
	Male	0.58 ± 0.53	
	Other	0.14 ± 0.20	
Occupation [5]	Student or working student	0.54 ± 0.44	$p = 0.374$
	Employed	0.61 ± 0.57	
	Other (retired, unemployed)	0.64 ± 0.47	
Education [4]	Up to secondary school	0.56 ± 0.49	$p = 0.510$
	University level	0.60 ± 0.52	
Household [5]	Alone	0.41 ± 0.43 [a]	$p < 0.001$
	2 persons	0.52 ± 0.57 [ab]	
	3 persons	0.59 ± 0.56 [ab]	
	4 or more persons	0.71 ± 0.44 [b]	
BMI [5,6]	Underweight (BMI < 18.5 kg/m^2)	0.46 ± 0.30	$p = 0.800$
	Normal weight (18.5 ≤ BMI < 25.0 kg/m^2)	0.59 ± 0.51	
	Overweight (25.0 ≤ BMI < 30.0 kg/m^2)	0.59 ± 0.56	
	Obesity (BMI ≥ 30.0 kg/m^2)	0.56 ± 0.44	

[1] Measurement scale: from −2 (very low knowledge) to 2 (very high knowledge). [2] SD = standard deviation. [3] Significance considered in all tests: $p < 0.05$. [4] T-test for independent samples. [5] ANOVA with a post hoc Tukey's test. The mean values with different superscripts are statistically significantly different. [6] BMI = body mass index.

3.3. Tree Classification of the Level of Knowledge

The level of knowledge was categorized into classes as follows: very low knowledge ($-2 \leq$ value < -1), low knowledge ($-1 \leq$ value ≤ 0), high knowledge ($0 <$ value < 1), and very high knowledge ($1 \leq$ value ≤ 2). This variable was used as input for the tree classification according to the sociodemographic and anthropometric variables (country, age class, sex, occupation, education, household, and BMI class), thus obtaining the tree in Figure 2. The tree has five levels deep and 21 nodes, of which 11 are terminal. Of the seven independent variables considered for the analysis, six were found to be explicative, meaning that all these influenced the level of knowledge and proved to have discriminating ability. Only the variable of sex was excluded from the tree classification. The risk estimate and the corresponding error of the estimate were 0.297 and 0.023 for resubstitution and 0.315 and 0.024 for cross-validation. The model can be considered feasible since there is an overall prediction capacity of 70.3% probability of correctly classifying the cases according to the class of knowledge. Considering the first node, which corresponds to the global sample, the results indicate that 69.0% of the participants have high knowledge and

nearly 20% (18.9% more precisely) have very high knowledge. The very first variable with discriminating ability was country, showing a higher percentage of French participants with a low level of knowledge. In the next level, while for the French participants the discriminating variable was household, for the Portuguese the discriminating variable was age class. In the third, fourth, and fifth levels of depth, other variables presented themselves as having discriminating capacity, namely education, in level 3 for both branches of the tree, BMI class, and occupation on both branches.

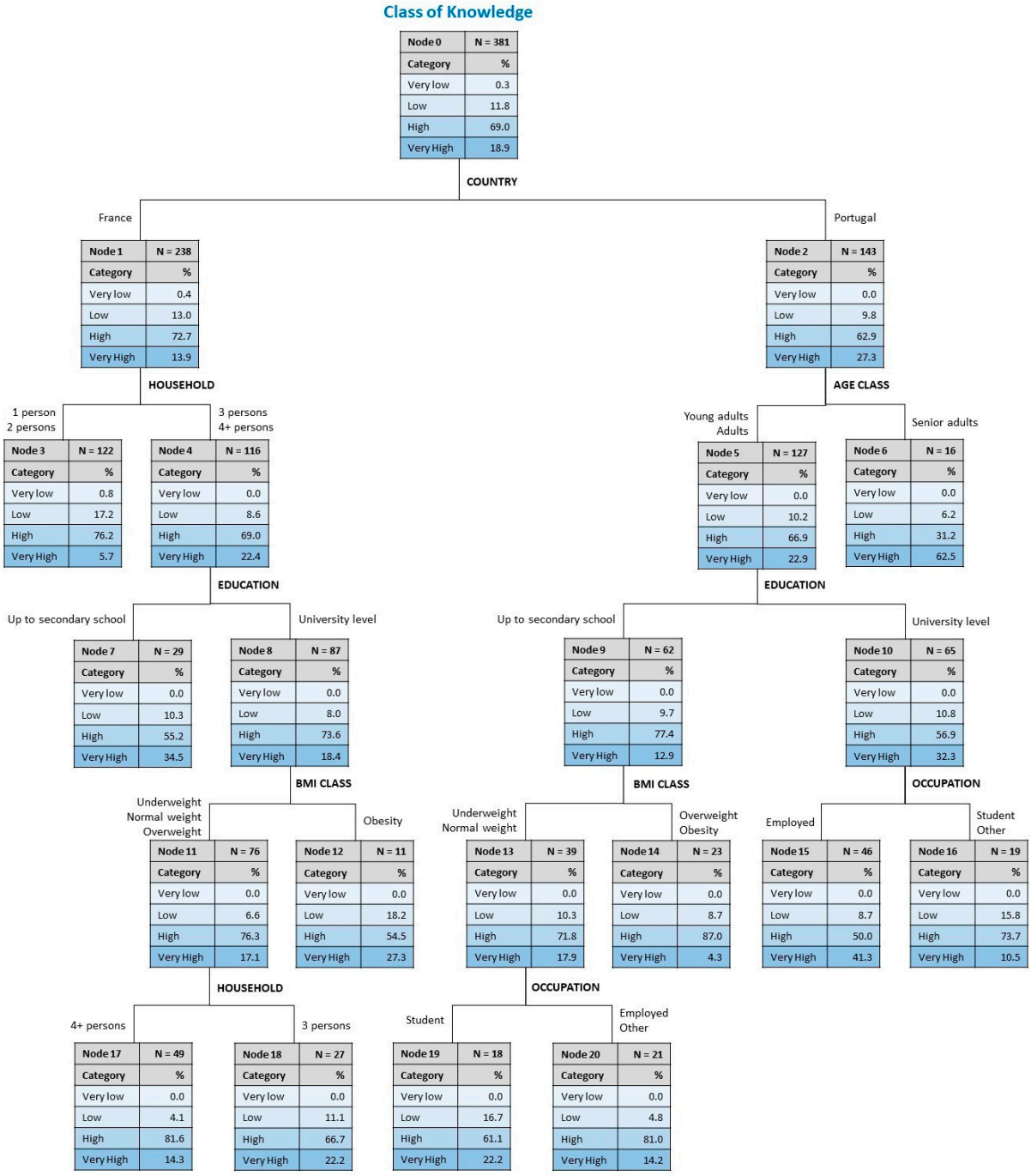

Figure 2. Tree classification for level of knowledge according to sociodemographic and anthropometric variables.

3.4. Scale Validation through Factor Analysis

The correlation matrix revealed some associations between the variables, with ten values above 0.5, with the highest correlation being found between items It-8 and It-9 (r = 0.638). The results of the correlation matrix provide one of the indicators that the data may be suitable for factor analysis (FA). The second indicator was provided by the results of the Bartlett's test, which were significant ($p < 0.0005$), thus leading to the rejection of the null hypothesis "H0: The correlation matrix is equal to the identity matrix". According to the reference values for the KMO [41], the value obtained of 0.905 is considered excellent, being a third indicator of the suitability of the data for the application of FA. The anti-image matrix showed that all the values of MSA (Measure of Sampling Adequacy) were around 0.5 or higher, confirming that all items were adequate to include in the analysis. The lowest value of MSA was found for a reversed item, MSA = 0.487 for item It-19, and the highest was MSA = 0.942 for item It-14.

The solution obtained by FA with PCA and Varimax rotation retained six components with eigenvalues higher than one, and this solution explained more than 50% of variance (VE = 62.0%). Practically all communalities were higher than 0.5, except for one item (It-14 had communality equal to 0.479), so out of the 23 variables, only one was excluded (item 14). The item with higher communality was It-19 (0.811, corresponding to 81.1% VE), and the item with the lowest variance explained by the solution was It-16 (communality = 0.506, 50.6% VE). The number of iterations to achieve conversion was ten, and in Table 5 are shown the results of the first solution obtained with FA. The validation of the solution was based on the calculated values of Cronbach's alpha (α), which measure the internal consistency of each factor [40]. The results in Table 5 show that in two factors, the internal consistency could improve by deleting specific items.

Based on the values of alpha in Table 5, it was observed that the internal reliability of the subscales would be improved if items It-6 and It-12 were excluded. Also, item It-14 was excluded based on the value of the communalities. Therefore, a second FA was produced, excluding those 3 items and considering in total only the 20 items. This solution, which explained 61.3% of the variance, corresponded to only five factors, with different compositions from the previous solution, and the value of KMO was 0.899. The results for the second FA are shown in Table 6. In all cases, the values of Cronbach's alpha did not improve by excluding items, so this was considered the final solution. The values of alpha were indicative of internal consistency, and they were considered good (factors F2 and F4) or very good (factors F1 and F3) [45–47].

Based on the scores of the subgroups of items in each factor, a mean score was computed considering the scores given by all participants and separated by country. Results are shown in Table 7. The mean scores for the items in factors F1, F2, F3, and F4 were always higher for the Portuguese participants than for the French. Only in the case of factor F5, the mean value of the French participants was higher than for the Portuguese. This indicated that the level of knowledge was higher among the Portuguese considering the group structure defined by the FA, only with the exception of item It.19, which coincided with factor F5.

Table 5. First solution obtained through factor analysis.

Factor	%VE [1]	Items	Loadings	Cronbach's Alpha (α)
F1	13.2%	It-17. Vitamin D favours the body's absorption of calcium	0.508	0.825 [2]
		It-18. Children, as they are in a phase of growth and bone and dental formation, need to ingest calcium, as well as vitamin A, B complex vitamins, and some minerals that are present in milk	0.631	
		It-20. Women, during menopause, tend to lose calcium and, consequently, bone mass	0.776	
		It-21. Pregnant and breastfeeding women should consume specific amounts of calcium per day. At this stage, the need for B vitamins also increase	0.734	
		It-22. The elderly should increase their intake of micronutrients such as B vitamins, calcium, and iron. A great source of these micronutrients is milk	0.653	
F2	12.3%	It-1. Milk is a food with high nutritional value	0.548	0.626 (with all items) 0.777 (if It-6 is deleted)
		It-3. Milk provides proteins of high biological value as they contain essential amino acids	0.536	
		It-6. Lactose is directly absorbed by the body without needing enzymes (REVERSED)	−0.432	
		It-13. Milk is a good source of calcium and iodine	0.590	
		It-15. Calcium is fundamental for the good formation of bones and teeth	0.529	
		It-16. Calcium-fortified milk is a great choice to meet daily calcium requirements for those who do not consume dairy products or other calcium-rich products	0.650	
		It-23. The intake of milk is advised at all stages of life	0.587	
F3	11.2%	It-2. Milk contains proteins, carbohydrates, lipids, vitamins, minerals, and water	0.745	0.707 [2]
		It-4. The main proteins in milk are caseins and whey proteins	0.654	
		It-5. Lactose is the main sugar in milk	0.620	
F4	10.8%	It-7. Whole milk has a fat content typically over 3.5	0.739	0.780 [2]
		It-8. Semi-skimmed milk has a fat content of around 1%	0.809	
		It-9. Skimmed milk has a maximum fat content of 0.5%	0.720	
F5	9.1%	It-10. The main vitamins in milk are vitamins B_2, B_{12}, and A	0.703	0.723 (with all items) 0.770 (if It-12 is deleted)
		It-11. Vitamin A is naturally present in milk fat	0.747	
		It-12. Skimmed milk has very small amounts of vitamin A	0.633	
F6	5.4%	It-19. Around the age of 30, the bone mass peak is reached, and therefore there is no problem if you stop consuming milk (REVERSED)	0.890	N.A. [3]

[1] VE = variance explained. [2] The value of alpha did not improve with the exclusion of items. [3] N.A. = Not applicable—single variable in the factor.

Table 6. Second solution obtained through factor analysis.

Factor	%VE [1]	Items	Loadings	Cronbach's Alpha (α)
F1	15.1%	It-17. Vitamin D favours the body's absorption of calcium	0.541	0.825 [2]
		It-18. Children, as they are in a phase of growth and bone and dental formation, need to ingest calcium, as well as vitamins A, B complex and some minerals that are present in milk	0.635	
		It-20. Women, during menopause, tend to lose calcium and, consequently, bone mass	0.749	
		It-21. Pregnant and breastfeeding women should consume specific amounts of calcium per day. At this stage, the need for B vitamins also increases	0.714	
		It-22. The elderly should increase their intake of micronutrients such as B vitamins, calcium, and iron. A great source of these micronutrients is milk	0.674	
F2	14.1%	It-1. Milk is a food with high nutritional value	0.648	0.777 [2]
		It-3. Milk provides proteins of high biological value as they contain essential amino acids	0.580	
		It-13. Milk is a good source of calcium and iodine	0.604	
		It-15. Calcium is fundamental for the good formation of bones and teeth	0.610	
		It-16. Calcium-fortified milk is a great choice to meet daily calcium requirements for those who do not consume dairy products or other calcium-rich products	0.659	
		It-23. The intake of milk is advised at all stages of life	0.539	
F3	14.0%	It-7. Whole milk has a fat content typically over 3.5	0.759	0.803 [2]
		It-8. Semi-skimmed milk has a fat content of around 1%	0.806	
		It-9. Skimmed milk has a maximum fat content of 0.5%	0.707	
		It-10. The main vitamins in milk are vitamins B_2, B_{12}, and A	0.558	
		It-11. Vitamin A is naturally present in milk fat	0.566	
F4	12.0%	It-2. Milk contains proteins, carbohydrates, lipids, vitamins, minerals, and water	0.732	0.707 [2]
		It-4. The main proteins in milk are caseins and whey proteins	0.677	
		It-5. Lactose is the main sugar in milk	0.705	
F5	6.1%	It-19. Around the age of 30, the bone mass peak is reached, and therefore there is no problem if you stop consuming milk (REVERSED)	0.862	N.A. [3]

[1] VE = variance explained. [2] The value of alpha did not improve with the exclusion of items. [3] N.A. = Not applicable—single variable in the factor.

Table 7. Mean scores for knowledge considering the items in each factor.

Factor	Group	N	Min	Max	Mean ± Standard Deviation
F1 (5 items)	France	238	1.00	5.00	3.54 ± 0.66
	Portugal	143	2.00	5.00	3.95 ± 0.74
	Global	381	1.00	5.00	3.70 ± 0.72
F2 (6 items)	France	238	1.50	5.00	3.66 ± 0.71
	Portugal	143	1.50	5.00	3.97 ± 0.67
	Global	381	1.50	5.00	3.78 ± 0.71
F3 (5 items)	France	238	1.00	5.00	3.31 ± 0.66
	Portugal	143	2.00	5.00	3.46 ± 0.71
	Global	381	1.00	5.00	3.37 ± 0.68
F4 (3 items)	France	238	1.00	5.00	3.74 ± 0.79
	Portugal	143	1.33	5.00	3.82 ± 0.81
	Global	381	1.00	5.00	3.77 ± 0.80
F5 (1 item)	France	238	1.00	5.00	3.21 ± 1.19
	Portugal	143	1.00	5.00	3.12 ± 1.26
	Global	381	1.00	5.00	3.18 ± 1.21

4. Discussion

According to the Food and Agriculture Organization (FAO), the consumption of dairy products differs significantly from region to region, depending on dietary habits, available milk processing technologies, market demand, social and cultural development, and level of product knowledge [51]. The per capita consumption of milk and dairy products exhibits higher rates in developed countries, while there is a discernible rise in demand for these products in developing countries (like East and Southeast Asia, Indonesia, and Vietnam) due to rising income levels and population growth, among other factors [51,52]. Projections for the European Union anticipate that per capita consumption will either remain stable or experience a decline in the ensuing decade [53]. Examining specific countries within the European context, France exhibits higher milk consumption than Portugal, notwithstanding their shared foods and culinary cultures [53].

Regarding milk on a global scale, most consumers continue to harbour a robustly positive perception regarding the inherent goodness of milk, acknowledging its substantial nutritional value [54]. In the context of Portuguese and French countries, knowledge about milk was assessed by evaluating respondents' scores on various statements concerning nutritive components and the impact of consumption on human health. Globally, all the respondents revealed that they are well informed about the nutritive value of milk. Moreover, Portuguese and French participants consider milk an important food that should be consumed at any age, extending beyond the age of 30. This discernment aligns with observations made among Turkish consumers, reflecting a recognition of the importance of lifelong milk consumption [54].

The heightened awareness observed in Portuguese and French respondents, evidenced by their notable understanding of milk's nutritive value, can be attributed to their elevated level of education, with 67.2% of participants attaining a high educational level. However, the French participants showed a higher level of knowledge than the Portuguese, which can be associated with a higher percentage of young adults and an elevated level of education observed among the French participants. The role of education in shaping one's dietary patterns is unquestionable, and a higher education or university studies contribute to this [55]. Therefore, knowledge of the nutritional richness of milk is also possible among people with higher studies. Considering that there is a positive link between choices and patterns of milk consumption and individuals' awareness and understanding of the nutritional composition and potential health impacts of milk, it is reasonable to anticipate that the French population would surpass the Portuguese population in terms of milk

knowledge. According to FAO [53], the per capita consumption of milk in 2020 was 201 kg and 139 kg, respectively, for France and Portugal.

The nutrient-rich composition of milk plays crucial roles in bone health, energy metabolism, muscle function, development, and maintenance of strong teeth, vitamin absorption, and overall well-being throughout the lifespan [56,57]. Additionally, milk exerts beneficial effects on the linear growth and body mass index (BMI) of adolescents [56,57].

Inadequate dairy intake has been cited as a primary reason for the high prevalence of insufficient calcium intake among populations [51]. In this study, participants express cognizance of the pivotal role played by calcium within milk, contributing indispensably towards meeting the body's calcium requirements. Similarly, calcium is perceived as an important milk nutrient by consumers in Denmark, the United Kingdom, and the United States [36]. In contrast, a questionnaire performed in west Sumatera revealed that the level of knowledge about the benefits of fresh cow milk is poor, but the knowledge is higher in aspects related to purchasing and usage. Moreover, fresh cow milk consumption depends on consumer product knowledge [58].

However, there exists a prevailing sentiment that the manifold attributes and advantages of this product inadequately align with contemporary lifestyles and expectations [59]. The influences of globalisation on eating habits have led to an increase in the variety of diets by including new foods, ingredients, and beverages that can contribute to a reduction in milk consumption. Individual preferences, dietary choices, cultural factors, and health considerations are other factors that contribute to changes in milk consumption patterns. In fact, the individual reasons for reducing milk consumption can be complex and multifaceted and can be influenced by lactose intolerance, allergies, perceptions of dietary preferences and choices of plant-based or vegan diets, perceptions about the healthiness of milk, availability and variety of non-dairy milk alternatives, environmental and ethical considerations, cultural habits, price, marketing, and misinformation, among others [54,60–65]. For instance, for the Russian population, the price and the information about milk coming from not enough reliable sources are the main significant factors in the decline in milk and dairy product demand and refusal [66]. Besides price, promotion is considered to be the most influential instrument in Kosovo consumers' decisions to buy dairy products, including milk [67]. In Europe and North America, the trend for demand for plant-based alternatives to traditional dairy products driven by concerns over animal welfare, environmental sustainability, and health shaping the global dairy industry has been associated with a discernible decline in the consumption of animal-derived milk products. However, it is crucial to emphasize that plant-based beverages, including almond, oat, rice, hazelnut, and coconut variants, often positioned in the market as healthy and sustainable substitutes for milk and dairy products, should not be considered as an alternative to milk. Rather, these beverages should be regarded as distinct products [68–70].

To enhance knowledge about milk, various programmes and initiatives can be implemented across different sectors, such as consumers, educators, healthcare professionals, and the dairy industry. The potential programmes can include educational campaigns, school nutrition programmes, healthcare professional training for the dairy industry, farm-to-table programmes, and consumer engagement programmes, among others [71].

Moreover, to encourage the adoption of liquid milk products characterized by enhanced nutritional profiles and environmental sustainability, information nudges—randomly dispensed messages featuring diverse content and details—can prove effective. For instance, the primary information preferences of Chinese consumers are carbon labels, with a notable emphasis on value, followed by nutrition claims, sustainable production declarations, and energy conservation certificates. Concurrently, the provision of nutrition-related details fosters an increased appreciation for nutrition claims among consumers. In contrast, the dissemination of environmental information contributes to elevating consumers' willingness to prioritize attributes aligned with environmental sustainability [72].

5. Conclusions

The results of this work showed that the highest level of knowledge was about calcium being fundamental for the good formation of bones and teeth, but also about the high nutritional value of milk and its composition in terms of proteins, carbohydrates, lipids, vitamins, minerals, and water. On the other hand, the lowest knowledge was found for the low content of vitamin A present in skimmed milk and the consumption of milk after the age of 30 as a way to maintain good bone health. The mean values for the level of knowledge were found to vary significantly according to some sociodemographic variables, such as country, age, and the dimension of the household, but not according to sex, education, occupation, or body mass index. However, a tree classification showed that to some extent all the variables had discriminating ability, and those that appeared on the first and second levels were precisely country, age class, and household, with education being a discriminating variable in the third level, and BMI and occupation only after the fourth level. Factor analysis was used to validate the scale, and the results showed that from the 23 initial items, the validated scale included only 20 items, distributed by five factors, with good or very good internal consistency in all cases. The mean scores for knowledge in all factors except one were always higher for the Portuguese sample as compared with the French sample. These conclusions are beneficial to understand how knowledge about milk can be improved in both countries to help achieve a better population nutrition status.

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Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the authors on request.

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Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

The items of the questionnaire are shown in Table A1.

Table A1. List of items and answering scale as presented to the participants.

Items	Totally Disagree 1	Disagree 2	Neither Agree Nor Disagree 3	Agree 4	Totally Agree 5
It-1. Milk is a food with high nutritional value					
It-2. Milk contains proteins, carbohydrates, lipids, vitamins, minerals, and water					
It-3. Milk provides proteins of high biological value as they contain essential amino acids					
It.4. The main proteins in milk are caseins and whey proteins					
It-5. Lactose is the main sugar in milk					
It-6. Lactose is directly absorbed by the body without needing enzymes (FALSE)					
It-7. Whole milk has a fat content typically over 3.5%					
It-8. Semi-skimmed milk has a fat content of around 1%					
It-9. Skimmed milk has a maximum fat content of 0.5%					
It-10. The main vitamins in milk are vitamins B_2, B_{12}, and A					
It-11. Vitamin A is naturally present in milk fat					
It-12. Skimmed milk has very small amounts of vitamin A					
It-13. Milk is a good source of calcium and iodine					
It-14. Milk provides minerals like potassium, zinc, phosphorus, and magnesium					
It-15. Calcium is fundamental for the good formation of bones and teeth					
It-16. Calcium-fortified milk is a great choice to meet daily calcium requirements for those who do not consume dairy products or other calcium-rich products					
It-17. Vitamin D favours the body's absorption of calcium					
It-18. Children, as they are in a phase of growth and bone and dental formation, need to ingest calcium, as well as vitamim A, B complex vitaminss, and some minerals that are present in milk					
It-19. Around the age of 30, the bone mass peak is reached, and therefore there is no problem if you stop consuming milk (FALSE)					
It-20. Women, during menopause, tend to lose calcium and, consequently, bone mass					
It-21. Pregnant and breastfeeding women should consume specific amounts of calcium per day. At this stage, the need for B vitamins also increases					
It-22. The elderly should increase their intake of micronutrients such as B vitamins, calcium, and iron. A great source of these micronutrients is milk					
It-23. The intake of milk is advised at all stages of life					

References

1. Sundaram, J.K.; Rawal, V.; Clark, M.T. *Ending Malnutrition—From Commitment to Action*; FAO—Food and Agriculture Organization of the United Nations: Rome, Italy, 2015.
2. FAO. *The State of Food and Agriculture 2013—Food System for Better Nutrition*; FAO—Food and Agriculture Organization of the United Nations: Rome, Italy, 2013.
3. FAO; IFAD; UNICEF; WFP; WHO. The State of Food Security and Nutrition in the World 2023: Urbanization, Agrifood Systems Transformation and Healthy Diets across the Rural–Urban Continuum. In *The State of Food Security and Nutrition in the World (SOFI)*; FAO, IFAD, UNICEF, WFP, WHO: Rome, Italy, 2023; ISBN 978-92-5-137226-5.
4. Lloyd, H.M.; Paisley, C.M.; Mela, D.J. Barriers to the Adoption of Reduced-Fat Diets in a UK Population. *J. Am. Diet. Assoc.* **1995**, *95*, 316–322. [CrossRef] [PubMed]
5. Glanz, K.; Basil, M.; Maibach, E.; Goldberg, J.; Snyder, D. Why Americans Eat What They Do: Taste, Nutrition, Cost, Convenience, and Weight Control Concerns as Influences on Food Consumption. *J. Am. Diet. Assoc.* **1998**, *98*, 1118–1126. [CrossRef] [PubMed]

6. Lennernas, M.; Fjellstrom, C.; Becker, W.; Giachetti, I.; Schmitt, A.; Dewinter, A.; Kearney, M. Influences on Food Choice Perceived to Be Important by Nationally-Representative Samples of Adults in the European Union. *Eur. J. Clin. Nutr.* **1997**, *51* (Suppl. 2), S8–S15. [PubMed]
7. Nestle, M.; Pollan, M. *Food Politics: How the Food Industry Influences Nutrition and Health*, 1st ed.; Revised and Expanded Tenth Anniversary; University of California Press: Berkeley, CA, USA, 2013; ISBN 978-0-520-27596-6.
8. Darmon, N.; Darmon, M.; Maillot, M.; Drewnowski, A. A Nutrient Density Standard for Vegetables and Fruits: Nutrients per Calorie and Nutrients per Unit Cost. *J. Am. Diet. Assoc.* **2005**, *105*, 1881–1887. [CrossRef] [PubMed]
9. Monsivais, P.; Drewnowski, A. The Rising Cost of Low-Energy-Density Foods. *J. Am. Diet. Assoc.* **2007**, *107*, 2071–2076. [CrossRef] [PubMed]
10. Drewnowski, A.; Monsivais, P.; Maillot, M.; Darmon, N. Low-Energy-Density Diets Are Associated with Higher Diet Quality and Higher Diet Costs in French Adults. *J. Am. Diet. Assoc.* **2007**, *107*, 1028–1032. [CrossRef] [PubMed]
11. Ward, P.R.; Mamerow, L.; Henderson, J.; Taylor, A.W.; Meyer, S.B.; Coveney, J. The Social Determinants of Food Purchasing Practices: Who Chooses Price-before-Health, Taste-before-Price or Organic Foods in Australia? *Food Nutr. Sci.* **2012**, *3*, 461–470. [CrossRef]
12. Shlisky, J.; Mandlik, R.; Askari, S.; Abrams, S.; Belizan, J.M.; Bourassa, M.W.; Cormick, G.; Driller-Colangelo, A.; Gomes, F.; Khadilkar, A.; et al. Calcium Deficiency Worldwide: Prevalence of Inadequate Intakes and Associated Health Outcomes. *Ann. N. Y. Acad. Sci.* **2022**, *1512*, 10–28. [CrossRef]
13. Liu, J.; Kang, H.; Wei, W.; Tu, R.; Goto, T.; Li, F.; Dai, H. Bioactive Calcium and Mangnesium Phosphate Bone Adhesive for Enhanced Vascularization and Bone Regeneration. *J. Mater. Sci. Technol.* **2023**, *164*, 246–257. [CrossRef]
14. Ali, M.; Lee, Y.; Ha, B.; Jung, J.; Lee, B.-R.; Kim, D.; Lee, M.-Y.; Kim, Y.-S. The Bone-Protective Benefits of Amino-Conjugated Calcium in an Ovariectomized (OVX) Rat Model. *Life Sci.* **2023**, *328*, 121927. [CrossRef]
15. Lu, T.; Zhu, Y.; Guo, J.; Mo, Z.; Zhou, Q.; Hu, C.Y.; Wang, C. MDFI Regulates Fast-to-Slow Muscle Fiber Type Transformation via the Calcium Signaling Pathway. *Biochem. Biophys. Res. Commun.* **2023**, *671*, 215–224. [CrossRef]
16. Zhang, L.; Zhou, M.-Y.; Kuang, S.-J.; Qin, X.-Y.; Cai, Y.-J.; Chen, S.-Z.; Li, S.-M.; Rao, F.; Yang, H.; Deng, C.-Y. Differential Role of STIM1 in Calcium Handling in Coronary and Intrarenal Arterial Smooth Muscles. *Eur. J. Pharmacol.* **2022**, *937*, 175386. [CrossRef] [PubMed]
17. Brown, D.A. Calcium Ions in Nerve Cell Function. *FEBS Lett.* **1993**, *316*, 199–200. [CrossRef]
18. Reis, A.R.; Santos, R.K.F.; dos Santos, C.B.; Santos, B.d.C.; de Carvalho, G.B.; Brandão-Lima, P.N.; de Oliveira e Silva, A.M.; Pires, L.V. Supplementation of Vitamin D Isolated or Calcium-Associated with Bone Remodeling and Fracture Risk in Postmenopausal Women without Osteoporosis: A Systematic Review of Randomized Clinical Trials. *Nutrition* **2023**, *116*, 112151. [CrossRef] [PubMed]
19. Wu, F.; Fuleihan, G.E.-H.; Cai, G.; Lamberg-Allardt, C.; Viljakainen, H.T.; Rahme, M.; Grønborg, I.M.; Andersen, R.; Khadilkar, A.; Zulf, M.M.; et al. Vitamin D Supplementation for Improving Bone Density in Vitamin D–Deficient Children and Adolescents: Systematic Review and Individual Participant Data Meta-Analysis of Randomized Controlled Trials. *Am. J. Clin. Nutr.* **2023**, *118*, 498–506. [CrossRef] [PubMed]
20. Munipalli, B.; Strothers, S.; Rivera, F.; Malavet, P.; Mitri, G.; Abu Dabrh, A.M.; Dawson, N.L. Association of Vitamin B12, Vitamin D, and Thyroid-Stimulating Hormone with Fatigue and Neurologic Symptoms in Patients with Fibromyalgia. *Mayo Clin. Proc. Innov. Qual. Outcomes* **2022**, *6*, 381–387. [CrossRef] [PubMed]
21. Ray, A.; Fisher, N.M. Vitamin D in Multiple Sclerosis: Effects on Functional Performance and Fatigue. *Arch. Phys. Med. Rehabil.* **2016**, *97*, e117. [CrossRef]
22. Huiberts, L.M.; Smolders, K.C.H.J. Effects of Vitamin D on Mood and Sleep in the Healthy Population: Interpretations from the Serotonergic Pathway. *Sleep Med. Rev.* **2021**, *55*, 101379. [CrossRef] [PubMed]
23. Murphy, P.K.; Wagner, C.L. Vitamin D and Mood Disorders among Women: An Integrative Review. *J. Midwifery Women's Health* **2008**, *53*, 440–446. [CrossRef]
24. Seraphin, G.; Rieger, S.; Hewison, M.; Capobianco, E.; Lisse, T.S. The Impact of Vitamin D on Cancer: A Mini Review. *J. Steroid Biochem. Mol. Biol.* **2023**, *231*, 106308. [CrossRef]
25. Cheema, H.A.; Fatima, M.; Shahid, A.; Bouaddi, O.; Elgenidy, A.; Rehman, A.U.; Oussama Kacimi, S.E.; Hasan, M.M.; Lee, K.Y. Vitamin D Supplementation for the Prevention of Total Cancer Incidence and Mortality: An Updated Systematic Review and Meta-Analysis. *Heliyon* **2022**, *8*, e11290. [CrossRef] [PubMed]
26. Fatchiyah, F.; Setiawan, B.; Suharjono, S.; Noor, Z. The Anti-Osteoporosis Effects of CSN1S2 Protein of Goat Milk and Yoghurt on a Complete Freund's Adjuvant-Induced Rheumatoid Arthritis Model in Rats. *Biomark. Genom. Med.* **2015**, *7*, 139–146. [CrossRef]
27. Lee, C.S.; Kim, B.K.; Lee, I.O.; Park, N.H.; Kim, S.H. Prevention of Bone Loss by Using Lactobacillus-Fermented Milk Products in a Rat Model of Glucocorticoid-Induced Secondary Osteoporosis. *Int. Dairy J.* **2020**, *109*, 104788. [CrossRef]
28. Bazarra-Fernandez, A. Children, Milk, Bone and Osteoporosis in Menopause. *Bone* **2009**, *45*, S102–S103. [CrossRef]
29. Matía-Martín, P.; Torrego-Ellacuría, M.; Larrad-Sainz, A.; Fernández-Pérez, C.; Cuesta-Triana, F.; Rubio-Herrera, M.Á. Effects of Milk and Dairy Products on the Prevention of Osteoporosis and Osteoporotic Fractures in Europeans and Non-Hispanic Whites from North America: A Systematic Review and Updated Meta-Analysis. *Adv. Nutr.* **2019**, *10*, S120–S143. [CrossRef] [PubMed]
30. Siqueira, K.B.; Binoti, M.L.; Nunes, R.M.; Borges, C.A.V.; Pilati, A.F.; Marcelino, G.W.; da Gama, M.A.S.; da Silva, P.H.F. Cost-benefit ratio of the nutrients of the food consumed in Brazil. *Ciênc. Saúde Coletiva* **2020**, *25*, 1129–1135. [CrossRef] [PubMed]

31. Wenhold, F.; Leighton, C. Dairy: Nutritional Value for Money for South African Consumers. *Bull. Int. Dairy Fed.* **2013**, *461*, 9–18.
32. Neiva, R. Leite: Fonte de Nutrientes Saudável e Econômica. *Balde Branco* **2017**, *53*, 26–27.
33. Leighton, C. Dairy Makes the World Go Round. *Dairy Mail* **2017**, *24*, 92–97. Available online: https://hdl.handle.net/10520/EJC-59ecf1cdd (accessed on 21 April 2024).
34. Florença, S.G.; Ferreira, M.; Lacerda, I.; Maia, A. Food Myths or Food Facts? Study about Perceptions and Knowledge in a Portuguese Sample. *Foods* **2021**, *10*, 2746. [CrossRef]
35. Singhal, S.; Baker, R.D.; Baker, S.S. A Comparison of the Nutritional Value of Cow's Milk and Nondairy Beverages. *J. Pediatr. Gastroenterol. Nutr.* **2017**, *64*, 799–805. [CrossRef] [PubMed]
36. Vargas-Bello-Pérez, E.; Faber, I.; Osorio, J.S.; Stergiadis, S. Consumer Knowledge and Perceptions of Milk Fat in Denmark, the United Kingdom, and the United States. *J. Dairy Sci.* **2020**, *103*, 4151–4163. [CrossRef] [PubMed]
37. Likert, R. A Technique for the Measurement of Attitudes. *Arch. Psychol.* **1932**, *22*, 5–55.
38. Guiné, R.P.F.; Florença, S.G.; Anjos, O.; Boustani, N.M.; Chuck-Hernández, C.; Sarić, M.M.; Ferreira, M.; Costa, C.A.; Bartkiene, E.; Cardoso, A.P.; et al. Are Consumers Aware of Sustainability Aspects Related to Edible Insects? Results from a Study Involving 14 Countries. *Sustainability* **2022**, *14*, 14125. [CrossRef]
39. Guiné, R.P.F.; Florença, S.G.; Ferrão, A.C.; Bizjak, M.Č.; Vombergar, B.; Simoni, N.; Vieira, V. Factors Affecting Eating Habits and Knowledge of Edible Flowers in Different Countries. *Open Agric.* **2021**, *6*, 67–81. [CrossRef]
40. Broen, M.P.G.; Moonen, A.J.H.; Kuijf, M.L.; Dujardin, K.; Marsh, L.; Richard, I.H.; Starkstein, S.E.; Martinez–Martin, P.; Leentjens, A.F.G. Factor Analysis of the Hamilton Depression Rating Scale in Parkinson's Disease. *Park. Relat. Disord.* **2015**, *21*, 142–146. [CrossRef] [PubMed]
41. Kaiser, H.F.; Rice, J. Little Jiffy, Mark Iv. *Educ. Psychol. Meas.* **1974**, *34*, 111–117. [CrossRef]
42. Stevens, J.P. *Applied Multivariate Statistics for the Social Sciences*, 5th ed.; Routledge: New York, NY, USA, 2009; ISBN 978-0-8058-5903-4.
43. Rohm, A.J.; Swaminathan, V. A Typology of Online Shoppers Based on Shopping Motivations. *J. Bus. Res.* **2004**, *57*, 748–757. [CrossRef]
44. Tanaka, K.; Akechi, T.; Okuyama, T.; Nishiwaki, Y.; Uchitomi, Y. Development and Validation of the Cancer Dyspnoea Scale: A Multidimensional, Brief, Self-Rating Scale. *Br. J. Cancer* **2000**, *82*, 800–805. [CrossRef]
45. Hair, J.F.H.; Black, W.C.; Babin, B.J.; Anderson, R.E. *Multivariate Data Analysis*, 7th ed.; Prentice Hall: Hoboken, NJ, USA, 2009; ISBN 978-0-13-813263-7.
46. Maroco, J.; Garcia-Marques, T. Qual a fiabilidade do alfa de Cronbach? Questões antigas e soluções modernas? *LaboratóRio de Psicol.* **2006**, *4*, 65–90. [CrossRef]
47. Davis, F.B. *Educational Measurements Their Interpretation*; Wadsworth Pub. Co.: Belmont, CA, USA, 1964.
48. Özdemir, R.S.; Louis, K.O.S.; Topbaş, S. Public Attitudes toward Stuttering in Turkey: Probability versus Convenience Sampling. *J. Fluen. Disord.* **2011**, *36*, 262–267. [CrossRef] [PubMed]
49. O'Hare, K.J.M.; Linscott, R.J. Measurement Invariance of Brief Forms of the Schizotypal Personality Questionnaire across Convenience versus Random Samples. *Schizophr. Res.* **2023**, *262*, 76–83. [CrossRef] [PubMed]
50. Ferrão, A.C.; Guiné, R.P.F.; Correia, P.M.R. Study of Consumer Acceptance about the Possible Commercialization of a Cheese with Berries. *Curr. Nutr. Food Sci.* **2019**, *15*, 185–195. [CrossRef]
51. Ozkan, G.; Gurbuz, I. Consumer Attitudes, Perceptions and Motivations towards Buying Open Milk in Turkey. *Sci. Pap. Ser. Manag. Econ. Eng. Agric. Rural. Dev.* **2023**, *23*, 2023.
52. Prasad, R. Historical Aspects of Milk Consumption in South, Southeast, and East Asia. *Asian Agri-Hist.* **2017**, *21*, 287–307.
53. OECD; Food and Agriculture Organization of the United Nations. *OECD-FAO Agricultural Outlook 2023–2032*; OECD-FAO Agricultural Outlook; OECD: Paris, France, 2023; ISBN 978-92-64-61933-3.
54. Can, B.A. Turkish Consumers' Perceptions of Organic Milk and the Factors Affecting Consumption: The Case of Kocaeli, Türkiye. *Sustainability* **2023**, *15*, 10044. [CrossRef]
55. Elmskini, F.Z.; Bouh, A.; Labyad, A.; Elghoulam, N.; Iraqi, H.; Mehdad, S.; Madkour, A.; Moufid, A.; Aabi, M.; Boutayeb, S.; et al. Increased Nutrition Knowledge and Adherence to the Mediterranean Diet Are Associated with Lower Body Mass Index and Better Self-Rated General Health among University Students. *Hum. Nutr. Metab.* **2024**, *35*, 200240. [CrossRef]
56. Samson, M.S.; Barba, C.V.; Africa, L.S.; Aguilar, J.S.; Paunlagui, M.M.; Rola, A.C.; Vigilla-Montecillo, K.R.; Saludes, T.A.; Barrio, A.N.D. Effect of Buffalo Milk Consumption on the Growth of 10 to 12 Years Old Schoolgirls in Magdalena, Laguna, Philippines. *Nutr. Metab. Insights* **2023**, *16*, 1–5. [CrossRef] [PubMed]
57. Donovan, S.M.; German, J.B.; Lönnerdal, B.; Lucas, A. *Human Milk: Composition, Clinical Benefits and Future Opportunities: 90th Nestlé Nutrition Institute Workshop, Lausanne, October–November 2017*; S Karger AG: Basel, Switzerland, 2019; Volume 00090, ISBN 978-3-318-06340-0.
58. Sillia, N.; Hellyward, J.; Noer, M. Relationship between Consumer Knowledge and Fresh Cow Milk Consumption in West Sumatera. *J. AGRISEP: Kaji. Masal. Sos. Ekon. Pertan. Dan Agribisnis* **2022**, *21*, 1–12. [CrossRef]
59. Șerban, I.C.; Dragomir, N.; Vidu, L. Study of Behavior of School Children on Milk Consumption in School Program. *Sci. Papers. Ser. D. Anim. Sci.* **2022**, *65*, 364–369.
60. Schröck, R. The Organic Milk Market in Germany Is Maturing: A Demand System Analysis of Organic and Conventional Fresh Milk Segmented by Consumer Groups. *Agribusiness* **2012**, *28*, 274–292. [CrossRef]

61. Uzundumlu, A.; Birinci, A.; Kurtoglu, S. Analysis of Factors Affecting Consumers in UHT Milk Consumption: The Case Study of Erzurum. *Turk. J. Agric. Food Sci. Technol.* **2018**, *6*, 1485. [CrossRef]
62. Mehmood, A.; Mushtaq, K.; Ali, A.; Hassan, S.; Hussain, M.; Tanveer, F. Factors Affecting Consumer Behavior towards Consumption of Fresh Milk. *Pak. J. Life Soc. Sci.* **2018**, *16*, 113–116.
63. Kurajdova, K.; Táborecká-Petrovičová, J. Literature Review on Factors Influencing Milk Purchase Behaviour. *Int. Rev. Manag. Mark.* **2015**, *5*, 9–25.
64. Lanfranchi, M.; Zirilli, A.; Passantino, A.; Alibrandi, A.; Giannetto, C. Assessment of Milk Consumer Preferences: Identifying the Choice Factors through the Use of a Discrete Logistic Model. *Br. Food J.* **2017**, *119*, 2753–2764. [CrossRef]
65. Pingali, P.; Boiteau, J.; Choudhry, A.; Hall, A. Making Meat and Milk from Plants: A Review of Plant-Based Food for Human and Planetary Health. *World Dev.* **2023**, *170*, 106316. [CrossRef]
66. Novokshanova, A.L.; Matveeva, N.O.; Nikityuk, D.B. Analysis of Milk Consumption and Dairy Products of the Russian Population Using an Online Survey. *Food Sci. Nutr.* **2023**, *12*, 933–942. [CrossRef] [PubMed]
67. Xhemili, N.; Rrustemi, V. The Impact of Marketing Mix Factors on the Consumption of Kosovar Milk and Its Products—Case Study Kosovo. *InterEULawEast: J. Int. Eur. Law Econ. Mark. Integr.* **2022**, *9*, 255–278. [CrossRef]
68. Islam, N.; Shafiee, M.; Vatanparast, H. Trends in the Consumption of Conventional Dairy Milk and Plant-Based Beverages and Their Contribution to Nutrient Intake among Canadians. *J. Hum. Nutr. Diet.* **2021**, *34*, 1022–1034. [CrossRef]
69. Moore, S.S.; Costa, A.; Pozza, M.; Vamerali, T.; Niero, G.; Censi, S.; De Marchi, M. How Animal Milk and Plant-Based Alternatives Diverge in Terms of Fatty Acid, Amino Acid, and Mineral Composition. *npj Sci. Food* **2023**, *7*, 50. [CrossRef]
70. Pérez-Rodríguez, M.L.; Serrano-Carretero, A.; García-Herrera, P.; Cámara-Hurtado, M.; Sánchez-Mata, M.C. Plant-Based Beverages as Milk Alternatives? Nutritional and Functional Approach through Food Labelling. *Food Res. Int.* **2023**, *173*, 113244. [CrossRef] [PubMed]
71. Silva, J.B.; Elias, B.C.; Mais, L.A.; Warkentin, S.; Konstantyner, T.; Oliveira, F.L.C. Factors Associated with Inadequate Milk Consumption Among Adolescents: National School Health Survey—Pense 2012. *Rev. Paul. De Pediatr.* **2020**, *38*, e2018184. [CrossRef] [PubMed]
72. Wang, H.; Chen, Q.; Katare, B. Nudging Chinese Consumers to Embrace Sustainable Milk Consumption: How Should Information Be Provided? *Agribusiness* **2023**, *39*, 1512–1534. [CrossRef]

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