Original Article

Dairy Product Consumption among Adults and Determining the Population-Attributable Risk of Common Non-Communicable Diseases: A Population-Based Cross-Sectional Study

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Abstract

Background: Over the past decade, Iranian households have experienced a decline in dairy product consumption. This study aimed to evaluate the population-attributable risk of prevalent non-communicable diseases related to dairy product consumption.

Methods: This cross-sectional analytical study involved 628 adults over 18 years old in Hamadan City in 2021. Clusters were selected based on comprehensive urban health centers. The standardized Iranian version of the food frequency questionnaire was used. Participants were categorized into 3 levels of dairy product consumption: >1 serving per day, 1–2 servings per day, and ≥3 servings per day.

Results: The mean age of the 628 participants was 38.05 (SD: 12.5), with 42.36% being male. Cheese (54.5%), yogurt (39.7%), and milk (30.4%) were consumed most frequently. The prevalence of insufficient dairy product consumption was 48.6%, higher than that reported in previous studies. Insufficient dairy product consumption was associated with hypertension (9.3%), cardiovascular disease (5.6%), and osteoporosis (5.1%).

Conclusion: Individuals with lower education levels, female gender, lowest quartile of socioeconomic status, and those diagnosed with cardiovascular disease were more likely to have insufficient dairy product consumption. Insufficient dairy product consumption was associated with hypertension, cardiovascular disease, and osteoporosis.

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Introduction

The importance of milk and other dairy products has led to their inclusion as a subcategory of human development indicators.[1, 2] Dairy product consumption, which increases protein, calcium, and essential vitamin intake, is directly correlated with societal health and advancement.[3, 4] Official statistics from the past decade indicate that Iran's per capita dairy consumption remains below 50 kg, lower than the global average.[5] In contrast, most European countries, particularly Western Europe, consume over 200 kg of milk per person annually.[5]

Socioeconomic factors significantly impact dairy consumption in Iranian society. A recent study revealed that the implementation of a price liberalization plan reduced urban household consumption.[7]

Nutritionists have identified numerous side effects of inadequate dairy consumption, including osteoporosis, metabolic syndrome, impaired vision, infectious diseases, and sleep disorders, among others.[3, 8-10]

Numerous studies have investigated the relationship between dairy product consumption and the risk of non-communicable diseases. A systematic review and meta-analysis found that higher total dairy product intake was associated with a lower risk of cardiovascular disease (CVD). Specifically, individuals with the highest dairy consumption had a 13% reduced risk of CVD compared with those with the lowest consumption.[11]

The impact of dairy product consumption on the risk of type 2 diabetes mellitus (T2DM) has been extensively studied. A prospective cohort study published in the American Journal of Clinical Nutrition observed that increased low-fat dairy consumption was linked to a reduced risk of T2DM in women. Another comprehensive Swedish investigation found a decreased T2DM risk among individuals consuming fermented dairy products, like yogurt. Nonetheless, the association between dairy intake and T2DM risk may vary depending on the specific dairy products consumed and overall dietary patterns.[12, 13] In general, previous research has provided valuable insights into the population risk of common non-communicable diseases associated with dairy product consumption. While some associations, such as the reduced risk of CVD with higher dairy intake, have been consistently observed, others remain inconclusive and warrant further investigation. When interpreting these findings, it is crucial to consider individual differences, overall dietary patterns, and potential confounding factors.[12]

This study aimed to investigate the prevalence of dairy product consumption and its associated factors among adults in Hamedan City. Additionally, it sought to determine the population-attributable risk for common non-communicable diseases based on a population-based cross-sectional study.

Methods

This cross-sectional study involved 628 adults over 18 years old in Hamadan City in 2022. Participants were selected using random cluster sampling. Clusters (n=10) were chosen based on comprehensive urban health centers (n=26), and the number of samples allocated to each center was proportional to the population it served. Adults over 18 years old who could answer the questions were included in the study. Individuals with mental disorders that hindered their ability to participate were excluded.

To calculate the sample size, we used the results of a study by Shokrvash et al,[7] who reported a 14.2% prevalence of sufficient daily dairy consumption. With a maximum acceptable error of 0.042 at a 95% confidence level and a design effect of 1.5, the final sample size was determined to be 628 participants.

To assess dairy product consumption, we employed the standardized Iranian version of the FFQ14 questionnaire. The participants were asked about the frequency of consumption (daily, weekly, monthly, yearly) for 5 dairy products: milk, yogurt, doogh, curd, and cheese. The questionnaire also inquired about the daily amount of dairy products consumed (in servings). The respondents were categorized into 3 dairy consumption levels: <1 serving per day, 1–2 servings per day, and ≥3 servings per day.

To measure socioeconomic status, we utilized an asset-based assessment method. The following common assets were included: a personal car (not used for income generation), personal computer, smartphone, internet access, refrigerator, dishwasher, washing machine, vacuum cleaner, microwave oven, and LCD/LED TV. Each asset was assigned a value of 1.

The Wealth Index was created using Principal Component Analysis (PCA) based on the mentioned assets. PCA is a dimension reduction technique that condenses many variables into a smaller number of components containing the highest level of information.[15] The first component explains the largest variance among model variables and is considered the Wealth Index. The participants were classified into 4 groups based on the PCA results, ranging from the lowest quartile (1st quartile) to the highest quartile

(4th quartile) of socioeconomic status.

Weight (in kg) and height (in cm) variables were self-reported, and body mass index (BMI) was calculated using the formula weight/height^2. Additionally, the participants were asked about their self-reported history of common non-communicable diseases, such as hypertension, cancer, diabetes, osteoporosis, and CVD.

The χ^2 test was used to compare dairy product consumption at a 95% confidence interval. The independent *t*-test was utilized for quantitative variables, while ANOVA was employed to compare quantitative variables between more than 2 groups. Additionally, a logistic regression model was utilized to examine the relationship between factors associated with high dairy product consumption.

A multiple logistic regression model with a 95% confidence level was applied to estimate adjusted odds ratios. Important confounding factors, such as age, gender, and BMI, among others, were included in the model.

To calculate the population-attributable risk, we needed the prevalence of high dairy product consumption, which was estimated based on the results of this study. Relative risks were extracted from systematic reviews examining the association between dairy product consumption and common non-communicable diseases, such as hypertension, cancer, diabetes, osteoporosis, and CVD, through self-reports. The population-attributable risk was computed using Levine's formula.[16] Finally, Stata 16 software (StataCorp, College Station, TX, USA) was used for data analysis.

This study (contract ID: 14010130651) was approved by the institutional ethics committee (IR.UMSHA.REC.1400.961).

Results

In this population-based cross-sectional study, 628 adults over 18 years of age were included, with an 89% participation rate. According to our findings, 14.6% of adults (n=92) consumed <1 serving of dairy products per day, 33.9% (n=213) consumed 1–2 servings per day, and 51.4% (n=323) reported ≥3 servings of dairy products per day.

The mean age of individuals with the highest dairy product consumption was higher than that in the lowest consumer group (38.7 vs 36.8 y; *P*=0.447). Men had higher dairy product consumption than women (53.38% [142/266] vs 50.0% [181/362]; *P*=0.037). The highest BMI was observed in the group consuming >3 portions (25.9 vs 25.1 and 25.0; *P*=0.016) (table 1).

The percentage of adults with academic education was higher in the group with the highest dairy product consumption (50.5% vs 62.9% vs 50.5; *P*=0.082). We also investigated the quantity and frequency of the consumption of various dairy products. Cheese, yogurt, and milk were the most frequently consumed daily (54.5%, 39.7%, and 30.4%, respectively). Detailed information on weekly, monthly, and

Table 1. The demographic characteristics of the study population

Variable	Categories of Dairy Products			P
	<1 serving per day n=92 (14.6%)	1–2 servings per day n=213 (33.9%)	≥3 servings per day n=323 (51.4 %)	
Age (y)**	33.06 ±20.06	36.20 ±14.23	39.33 ±18.56	0.246
BMI (weight in kg/height in m^2)	25.01±4.71	25.12±4.35	25.93±4.42	0.016
Gender				0.037
Male	47 (51.1)	77 (36.1)	42 (44.0)	
Female	45 (48.9)	136 (63.9)	181 (56.0)	
Marriage				0.242
Single	17 (18.5)	25 (11.7)	40(12.4)	
Married	75 (81.5)	188 (88.3)	283 (87.6)	
Education				0.082
0-5 (y)	21 (23.1)	34 (16.0)	70 (21.3)	
6-12 (y)	24 (26.2)	45 (21.1)	72 (22.4)	
>12 (y)	46 (50.5)	134 (62.9)	180 (55.9)	
Socioeconomic Status				0.082
1st quartile	30 (33.7)	66 (31.6)	71 (22.3)	
2nd quartile	14 (15.7)	44 (21.1)	88 (28.0)	
3rd quartile	22 (24.7)	51 (41.4)	84 (26.3)	
4th quartile	23 (25.8)	48 (23.0)	76 (23.8)	
Hypertension	3 (3.3)	5 (2.3)	9 (2.8)	0.896
Cancer	0 (0.0)	0 (0.0)	6 (1.9)	0.057
Diabetes	1 (1.1)	5 (2.3)	11 (3.4)	0.445
Osteoporosis	2 (2.2)	3 (1.4)	8 (2.5)	0.749
Cardiovascular disease	9 (9.9)	2 (3.4)	5 (1.6)	<0.001

*The independent t-test was used for quantitative variables. ANOVA was utilized to compare quantitative variables between more than 2 groups. The χ^2 test was employed for categorical variables.
**The age variable did not have a normal distribution, and the median (IQR) and the Kruskal-Wallis test were used instead.

yearly consumption is provided in Table 2.

According to the multivariable logistic regression model results, no significant association was found between increasing age and high dairy product consumption (OR, 1.00; 95% CI, 0.99 to 1.02; *P*=0.220).

Women were found to have lower odds of high dairy product consumption than men, although this relationship was not statistically significant (OR, 0.95; 95% CI, 0.68 to 1.34; *P*=0.796).

A direct relationship was observed between increasing BMI and high dairy product consumption, with overweight adults having higher odds of optimal consumption than normal-weight adults, although this relationship was not statistically significant (OR, 0.95; 95% CI, 0.63 to 1.43;

P=0.823). The same trend was observed for obese adults compared with normal-weight adults (OR, 1.04; 95% CI, 0.52 to 2.07; *P*=0.899). Another direct relationship was found between higher education levels and high consumption of dairy products (eg, academic vs illiterate: OR, 2.59; 95% CI, 0.79 to 9.32; *P*=0.145) (Table 3). The results also revealed a direct relationship between higher socioeconomic status and high consumption of dairy products (eg, 4th quartile/1st quartile: OR, 1.15; 95% CI, 0.58 to 2.27; *P*=0.687) (Table 3).

In this study, we calculated the population-attributable risk using Levine's formula. The prevalence of exposure (unfavorable dairy product consumption) was estimated at 48.6%. Our results indicated that 9.3% of hypertension, 5.6% of CVD, and 5.1% of osteoporosis cases could be

Table 2. The frequency of dairy product consumption among the adults*

Dairy Product	Daily	Weekly	Monthly	Yearly	No consumption
Milk	191 (30.4)	212 (33.8)	58 (9.2)	9 (1.4)	158 (25.2)
Yogurt	249 (39.7)	248 (39.5)	41 (6.5)	4 (0.6)	86 (13.7)
Doogh	51 (8.1)	172 (27.4)	108 (17.2)	13 (2.1)	248 (45.2)
Curd	17 (2.7)	174 (27.7)	174 (27.7)	22 (3.5)	241 (38.4)
Cheese	342 (54.5)	146 (23.2)	34 (5.4)	4 (0.6)	102 (16.2)

*Data are presented as n (%).

Table 3. The association between demographic factors and high consumption of dairy products

Variable	Bivariate Logistic Regression			Multiple Logistic Regression		
	OR$_c$*	95% CI	P	OR$_a$**	95% CI	P
Age (per 1 year)	1.00	[0.99, 1.02]	0.153	1.00	[0.99, 1.02]	0.220
Gender (Male/Female)	0.87	[0.63, 1.19]	0.402	0.95	[0.68, 1.34]	0.796
Marriage (Married /Single)	1.15	[0.79, 1.69]	0.443	0.89	[0.50, 1.58]	0.710
BMI (kg/m²)						
Overweight/normal	1.09	[0.77, 1.53]	0.609	0.95	[0.63, 1.43]	0.823
Obese/normal	1.35	[0.83, 2.18]	0.222	1.04	[0.52, 2.07]	0.899
Socioeconomic Status						
2nd quartile/1st quartile	2.05	[1.35, 3.22]	0.002	1.71	[0.99, 2.96]	0.051
3rd quartile/1st quartile	1.55	[1.00, 2.41]	0.048	1.15	[0.58, 2.27]	0.687
4th quartile/1st quartile	1.44	[0.92, 2.26]	0.104	0.78	[0.29, 2.12]	0.633
Education						
Elementary/Illiterate	2.80	[0.79, 9.87]	0.107	3.55	[0.97, 12.99]	0.055
Diploma/Illiterate	2.08	[0.61, 7.24]	0.247	2.82	[0.77, 10.32]	0.117
Academic/Illiterate	2.00	[0.59, 6.76]	0.265	2.59	[0.79, 9.32]	0.145

*OR$_c$, Crude odds ratio
**OR$_a$, Adjusted OR

Table 4. The Pop AR of high dairy product consumption on common non-communicable diseases

Type of Disease	RR*	P$_{exposure}$†	Pop AR%‡	Reference Study
Diabetes type 2	0.94	0.486	2.8	Gao 2013 [17, 18]
Cardiovascular disease	0.88	0.486	5.6	Qin 2015 [11]
Cancer	0.97	0.486	1.4	Soedamah-Muthu 2012 [9]
Hypertension	0.79	0.486	9.3	Malmir 2020 [19]
Osteoporosis	0.89	0.486	5.1	Bermejo 2019 [20]

*RR, Relative risk;
†P$_{exposure}$, Prevalence of exposure

$$\text{‡\%Pop AR} = \frac{P_e(RR-1)}{P_e(RR-1)+1} \times 100$$

Pop AR, Population-attributable risk

attributed to unfavorable dairy product consumption (Table 4). For instance, regarding osteoporosis, if the entire general population discontinued their unfavorable dairy product consumption, 4.3% of osteoporosis cases in society could potentially be prevented.

Discussion

This population-based cross-sectional study included 628 adults over 18 years of age, with an 89% participation rate. The prevalence of dairy product consumption <1 serving per day was 14.65%. A study utilizing data from the Korean National Health and Nutrition Examination Survey (n=7173) reported a 15.54% prevalence of insufficient dairy product consumption.[21] In a 2020 study by Babaali et al,[22] a high prevalence of insufficient calcium intake (91.6%) was observed in Shiraz City. Furthermore, Ayatollahi[23] revealed that 35.7% of women had insufficient calcium intake. In contrast, our study found that 50% of women reported sufficient dairy product consumption, potentially due to inflation-related price increases compared with previous studies.

Although women in our study reported higher dairy product consumption, this relationship was not statistically significant in the multivariable regression model, aligning with findings from several other studies.[10,24] In our study, the mean age of high dairy product consumers was higher than that of low consumers and non-consumers. The multivariable logistic regression model indicated a direct, albeit nonsignificant, relationship between increasing age and high dairy product consumption. Multiple studies have reported a direct association between age and optimal dairy product consumption,[25,26] while others have found an inverse relationship.[23]

Furthermore, we observed a significant inverse relationship between education level and dairy product consumption in our study. Highly educated individuals have access to more accurate information sources and are more likely to choose healthier dietary patterns and adopt better lifestyle choices.[25-27] Although adults with optimal dairy product consumption in our study had higher BMI values, the multivariable model showed a nonsignificant inverse relationship between BMI and optimal dairy product consumption. Whereas a recent systematic review also reported no significant association between dairy product intake and BMI, some studies have identified a statistically significant relationship between these variables.[28,29] Using Levine's formula, we calculated the population-attributable risk for common chronic and non-communicable diseases in this study. The prevalence of exposure (high dairy product consumption) was estimated at 48.6%. The highest population-attributable risk was associated with hypertension at 9.26%. A recent meta-analysis by Heidari

et al[30] (2021) found an inverse relationship between total dairy products, low-fat dairy products, milk, and fermented dairy products with hypertension risk. Conversely, cheese, yogurt, and high-fat dairy products showed no association with hypertension risk.

The second-highest population-attributable risk was observed for CVD at 5.55%. A systematic review and meta-analysis by Qin et al[11] found an inverse significant relationship between dairy consumption and the risk of stroke and chronic CVD. Additionally, a study by Panagiotakos et al[31] reported a statistically significant inverse relationship between dairy product intake and reduced serum levels of inflammatory factors.

The third-highest population-attributable risk was associated with osteoporosis. A review study by Huncharek et al[32] (2008) demonstrated that increased calcium intake through dairy products, with or without vitamin D, was significantly associated with increased bone mineral density. Although cross-sectional studies have reported an inverse relationship between dairy product intake and osteoporosis, this finding has not been corroborated in cohort studies.[19,33]

The fourth-ranked population-attributable risk was associated with cancer. A study by Aune et al[34] (2011) found a significant inverse relationship between the intake of milk and other dairy products (excluding cheese) and the risk of colorectal cancer. However, Wang et al[35] discovered a direct association between increased dairy product consumption and the risk of stomach cancer. In agreement with the former study, Yuan et al[36] (2019) reported a significant inverse relationship between milk and other dairy product intake and oral cancer incidence.

In this study, the prevalence of insufficient dairy product consumption was 48.6%, higher than that reported in previous studies. This increase might be attributed to economic inflation and the significant rise in the price of milk and other dairy products over the last decade in Iran. We observed that women and adults with higher education levels reported higher dairy product consumption. Insufficient consumption of milk and other dairy products was associated with hypertension, CVD, and osteoporosis, which could potentially be mitigated by optimal dairy product intake.

As the first population-based study in Hamedan City to estimate the prevalence of the consumption of various dairy products, this research provides valuable insights. Notably, considering the lack of subject sensitivity, the participation rate in this study was favorable.

Our study uniquely calculated the attributable risk of dairy consumption, providing novel insights that have not been previously reported. The attributable risk serves as a crucial index for prioritizing disease prevention interventions within the healthcare system. The foremost limitation of our study was the potential recall bias associated with using the standard Food Frequency Questionnaire (FFQ) tool to estimate consumption frequency. Another limitation was

the focus on the total amount of dairy consumption without considering the fat content in dairy products, which could impact the development of CVD. Future studies should investigate this aspect in greater detail. We have included these limitations in the discussion section.

Moreover, we found that individuals aged 75 and above were less likely to visit urban comprehensive service centers due to the need for third-level rehabilitation services. Health centers are primarily utilized by families with children under 6 requiring vaccinations, expectant mothers, and younger elderly individuals (aged 60 to 75 years). As a result, the overall incidence of hypertension, CVD, cancer, diabetes, and osteoporosis may be underestimated in our study.

Conclusion

In this study, the prevalence of insufficient dairy product consumption was 48.6%, which is higher than that reported in previous studies. Insufficient dairy product consumption was associated with hypertension (9.26%), CVD (5.55%), and osteoporosis (5.07%).

Acknowledgments

References

1. Thorning TK, Raben A, Tholstrup T, Soedamah-Muthu SS, Givens I, Astrup A. Milk and dairy products: good or bad for human health? An assessment of the totality of scientific evidence. Food Nutr Res 2016;60:32527.

2. Lindström J, Aittola K, Pölönen A, Hemiö K, Ahonen K, Karhunen L, Männikkö R, Siljamäki-Ojansuu U, Tilles-Tirkkonen T, Virtanen E, Pihlajamäki J, Schwab U. Formation and Validation of the Healthy Diet Index (HDI) for Evaluation of Diet Quality in Healthcare. Int J Environ Res Public Health 2021;18:2362.

3. Larsson SC, Crippa A, Orsini N, Wolk A, Michaëlsson K. Milk Consumption and Mortality from All Causes, Cardiovascular Disease, and Cancer: A Systematic Review and Meta-Analysis. Nutrients 2015;7:7749-7763.

4. Ness AR, Smith GD, Hart C. Milk, coronary heart disease and mortality. J Epidemiol Community Health 2001;55:379-82.

5. Roustaee R, Eini-Zinab H, Ghodsi D, Mehrparvar Hosseini E, Omidvar N, Hosseini H, Hosseini Mousavi SO, Rafiee H. A 30-year trend of dairy consumption and its determinants among income groups in Iranian households. Front Public Health 2024;12:1261293.

6. Wolf CA, Malone T, McFadden BR. Beverage milk consumption patterns in the United States: Who is substituting from dairy to plant-based beverages? J Dairy Sci 2020;103:11209-11217.

7. Shokrvash B, Salehi L, Hariri Akbari M, Ebrahimi Mamagani M, Nedjat S, Asghari M, Majlessi F, Montazeri A. Social support and dairy products intake among adolescents: a study from Iran. BMC Public Health 2015;15:1078.

8. Soedamah-Muthu SS, Ding EL, Al-Delaimy WK, Hu FB, Engberink MF, Willett WC, Geleijnse JM. Milk and dairy consumption and incidence of cardiovascular diseases and all-cause mortality: dose-response meta-analysis of prospective cohort studies. Am J Clin Nutr 2011;93:158-171.

9. Soedamah-Muthu SS, Verberne LD, Ding EL, Engberink MF, Geleijnse JM. Dairy consumption and incidence of hypertension: a dose-response meta-analysis of prospective cohort studies. Hypertension 2012;60:1131-1137.

10. Fontecha J, Calvo MV, Juarez M, Gil A, Martínez-Vizcaino V. Milk and Dairy Product Consumption and Cardiovascular Diseases: An Overview of Systematic Reviews and Meta-Analyses. Adv Nutr 2019;10(suppl_2):S164-S189.

11. Qin LQ, Xu JY, Han SF, Zhang ZL, Zhao YY, Szeto IM. Dairy consumption and risk of cardiovascular disease: an updated meta-analysis of prospective cohort studies. Asia Pac J Clin Nutr 2015;24:90-100.

12. Aune D, Norat T, Romundstad P, Vatten LJ. Dairy products and the risk of type 2 diabetes: a systematic review and dose-response meta-analysis of cohort studies. Am J Clin Nutr 2013;98:1066-1083.

13. Fung TT, Schulze M, Manson JE, Willett WC, Hu FB. Dietary patterns, meat intake, and the risk of type 2 diabetes in women. Arch Intern Med 2004;164:2235-2240.

14. Asghari G, Rezazadeh A, Hosseini-Esfahani F, Mehrabi Y, Mirmiran P, Azizi F. Reliability, comparative validity and stability of dietary patterns derived from an FFQ in the Tehran Lipid and Glucose Study. Br J Nutr 2012;108:1109-1117.

15. Vyas S, Kumaranayake L. Constructing socio-economic status indices: how to use principal components analysis. Health Policy Plan 2006;21:459-468.

16. Szklo M, Nieto FJ. Mesurin¬g Assocaition Between Exposuers and outcomes. In: Szklo M, ed. Epidemiology: Beyond the Basics. 2th ed. Baltimore: Jones & Bartlett Publishers; 2014. p. 83-84.

17. Gao D, Ning N, Wang C, Wang Y, Li Q, Meng Z, Liu Y, Li Q. Dairy products consumption and risk of type 2 diabetes: systematic review and dose-response meta-analysis. PLoS One 2013;8:e73965.

18. Xi B, Huang Y, Reilly KH, Li S, Zheng R, Barrio-Lopez MT, Martinez-Gonzalez MA, Zhou D. Sugar-sweetened beverages and risk of hypertension and CVD: a dose-response meta-analysis. Br J Nutr 2015;113:709-717.

19. Malmir H, Larijani B, Esmaillzadeh A. Consumption of milk and dairy products and risk of osteoporosis and hip fracture: a systematic review and Meta-analysis. Crit Rev Food Sci Nutr 2020;60:1722-1737.

20. Bermejo LM, López-Plaza B, Santurino C, Cavero-Redondo I, Gómez-Candela C. Milk and Dairy Product Consumption and Bladder Cancer Risk: A Systematic Review and Meta-Analysis of Observational Studies. Adv Nutr 2019;10(suppl_2):S224-S238.

21. Lee HJ, Cho JI, Lee HS, Kim CI, Cho E. Intakes of dairy products and calcium and obesity in Korean adults: Korean National Health and Nutrition Examination Surveys (KNHANES) 2007-2009. PLoS One 2014;9:e99085.

22. Babaali E, Rahmdel S, Berizi E, Akhlaghi M, Götz F, Mazloomi SM. Dietary Intakes of Zinc, Copper, Magnesium, Calcium, Phosphorus, and Sodium by the General Adult Population Aged 20-50 Years in Shiraz, Iran: A Total Diet Study Approach. Nutrients 2020;12:3370.

23. Ayatollahi SM. Nutritional assessment of lactating women in Shiraz in relation to recommended dietary allowances. East Mediterr Health J 2004;10:822-827.

24. Lago-Sampedro A, García-Escobar E, Rubio-Martín E, Pascual-Aguirre N, Valdés S, Soriguer F, Goday A, Calle-Pascual A, Castell C, Menéndez E, Delgado E, Bordiú E, Castaño L, Franch-Nadal J, Girbés J, Chaves FJ, Gaztambide S, Rojo-Martínez G, Olveira G.

Dairy Product Consumption and Metabolic Diseases in the Di@bet.es Study. Nutrients 2019;11:262.

25. Dror DK, Allen LH. Dairy product intake in children and adolescents in developed countries: trends, nutritional contribution, and a review of association with health outcomes. Nutr Rev 2014;72:68-81.

26. Touvier M, Méjean C, Kesse-Guyot E, Vergnaud AC, Hercberg S, Castetbon K. Sociodemographic and economic characteristics associated with dairy intake vary across genders. J Hum Nutr Diet 2011;24:74-85.

27. Moreira PA, Padrão PD. Educational and economic determinants of food intake in Portuguese adults: a cross-sectional survey. BMC Public Health 2004;4:58.

28. Abreu S, Santos R, Moreira C, Vale S, Santos PC, Soares-Miranda L, Marques AI, Mota J, Moreira P. Association between dairy product intake and abdominal obesity in Azorean adolescents. Eur J Clin Nutr 2012;66:830-835.

29. Zemel MB, Richards J, Mathis S, Milstead A, Gebhardt L, Silva E. Dairy augmentation of total and central fat loss in obese subjects. Int J Obes (Lond) 2005;29:391-397.

30. Heidari Z, Rashidi Pour Fard N, Clark CCT, Haghighatdoost F. Dairy products consumption and the risk of hypertension in adults: An updated systematic review and dose-response meta-analysis of prospective cohort studies. Nutr Metab Cardiovasc Dis 2021;31:1962-1975.

31. Panagiotakos DB, Pitsavos CH, Zampelas AD, Chrysohoou CA, Stefanadis CI. Dairy products consumption is associated with decreased levels of inflammatory markers related to cardiovascular disease in apparently healthy adults: the ATTICA study. J Am Coll Nutr 2010;29:357-364.

32. Huncharek M, Muscat J, Kupelnick B. Impact of dairy products and dietary calcium on bone-mineral content in children: results of a meta-analysis. Bone 2008;43:312-321.

33. Matía-Martín P, Torrego-Ellacuría M, Larrad-Sainz A, Fernández-Pérez C, Cuesta-Triana F, Rubio-Herrera MÁ. 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 May 1;10(suppl_2):S120-S143.

34. Aune D, Lau R, Chan DSM, Vieira R, Greenwood DC, Kampman E, Norat T. Dairy products and colorectal cancer risk: a systematic review and meta-analysis of cohort studies. Ann Oncol 2012;23:37-45.

35. Wang S, Zhou M, Ji A, Zhang D, He J. Milk/dairy products consumption and gastric cancer: an update meta-analysis of epidemiological studies. Oncotarget 2017;9:7126-7135.

36. Yuan J, Li W, Sun W, Deng S. Milk and dairy products consumption and the risk of oral or oropharyngeal cancer: a meta-analysis. Biosci Rep 2019;39:BSR20193526.