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Original Article

Household Milk consumption and Its Socio-economic Associates in West Azarbayejan Province, North-west Iran

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ABSTRACT

Background and Objectives: According to the available evidence, consumption of milk and other dairy products among Iranians is far less than recommendations. The share of different milks (i.e., traditionally vs. industrially processed) and its associated variables are, however, neither consistent nor fully known in different Provinces.

Materials and Methods: This cross-sectional study was conducted to determine household milk consumption and its association with selected socio-demographic factors in West Azarbayejan Province, North-west Iran. A total of 650 households were selected from urban and rural areas in three major Azeri and Kurdish districts (i.e. *Urmia*, *Khoy* and *Mahabad*) using a multi-stage cluster sampling method. Data were collected using socio-economic and milk frequency questionnaires.

Results: The findings indicated that traditionally-processed milk (bulk) was the most common milk consumed at household level (62.5%). Mean of bulk milk consumption in urban and rural areas was 479±23 and 730±64 ml/wk per capita, respectively. It was also shown that establishment of the new food subsidization policy has decreased the mean of household milk consumption by approximately 3 l/wk in urban areas. Factor analysis detected a significant decrease in the higher tertiles of family size/ethnicity score consumption of both bulk and pasteurized milk, which resulted in decreased consumption of total milk.

Conclusions: Designing and implementation of alternative approaches, such as targeted milk subsidies for poor households or vulnerable age-groups should be considered.

Keywords: Household milk consumption, Milk processing method, Socio-economic variables, Iran.

Introduction

Food borne diseases are major public health challenges that affect millions of people each year all over the world. Home food preparation is an essential link in food chain. World Health Organization (WHO) has accordingly introduced “Five Keys to Safer Food” in 2001 to improve food safety among households. The initiative emphasizes on choosing processed foods, including pasteurized milk, as an effective safety measure (1-4).

West Azerbaijan Province, located in North-west Iran, is a major agricultural spot in the country, where high proportions of its households live in rural areas and rely on their livestock products. There is anecdotal evidence on high consumption of traditionally processed (i.e. bulk) milk both in the rural and urban areas in this province. Hypothetically,

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this can be a major risk factor with regard to food-borne diseases in the region. Despite the importance, accurate and updated information on this phenomenon and risk assessments are missing. Latest National Food Consumption Survey (2000-03) indicated that daily per capita consumption of milk in the Province was 41g (5), which was clearly less than current nutritional recommendations. Moreover, there was no precise data on the processing methods of milk and their safety hazards.

Inadequate consumption of milk or consuming contaminated milk both can negatively affect health status and result in serious challenges and diseases, especially among children and adolescents. Short- and long-term consequences such as food-borne infectious diseases (e.g., brucellosis and tuberculosis) due to consuming contaminated milk, and decreased linear growth, limited mental development, inadequate school performance and osteoporosis as a result of low consumption can impose heavy burdens on the health system (6-9). Both inadequate and unsafe consumption patterns can be associated with multiple socio-economic and cultural factors at household levels (6-7, 9-11). Moreover, social security systems are essential determinants, which affect food selection and consumption, especially among the poor. The food subsidization program, which was changed to general cash transfer in 2010, has been a major component of such a social system in Iran with explicit and implicit influence on the life quality as well as the nutritional status of Iranian households (12, 13). It can be argued that milk consumption has further dropped, especially among vulnerable groups, after this policy change.

The present study was designed to determine household milk intakes disaggregated based on processing method (mainly bulk vs. pasteurized), changes in milk consumption upon change in subsidization policy, and association between household milk consumption and socio-demographic variables in West Azarbayejan Province, North-west Iran.

Materials and Methods

This cross-sectional analytical study was carried out on 650 urban and rural households in West Azarbayejan Province during winter 2014. Using a multistage cluster random sampling method, households were selected from three counties of *Urmia* in center, *Mahabad* in the south, and *Khoy* in the north of the Province. Based on each county's population, 45 urban and 20 rural clusters, 10 households each, were randomly selected.

A demographic questionnaire including questions about age, sex, educational level, and occupational status of all family members, as well as the ethnicity of household's head, family size, household expenditures, residential information, and property ownerships was filled for each household. Milk consumption pattern was assessed by a face validated semi-quantitative milk frequency questionnaire, which included 10 questions which measured different types of milk consumption during the month prior to study and also their subsidy milk consumption were asked. Data were obtained through interviewing mothers by trained interviewers who were quite familiar with the local languages (i.e. Azeri or Kurdish). The pilot study was conducted on who were not the study subjects to 50 mothers identify the optimal format, and sequencing of the questions. Through the pilot study, the interviewers were trained to minimize inter-interviewer variation and increasing the homogeneity of interviewing. At the beginning of each interview, the aims of the study were explained for the mothers, and oral informed consent was obtained.

Investigating the association between socio-economic status (SES) and milk consumption patterns could not be made upon defining single demographic variable/criteria to categorize households. Therefore, a number of socio-economic variables were extracted by factor analysis as indicators of SES. Factor analysis detected three significant components for SES.

The sample was consequently divided into three categories (tertiles) according to the factors extracted. The first, second and third tertiles were considered as low, medium and high socio-economic groups, respectively, and their association with milk consumption was assessed.

Statistical analysis was done using the SPSS software (SPSS Inc, version 16). Chi-square test, Student's t and ANOVA, Tukey tests were used. Statistical significance was established at $P<0.05$.

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The study protocol was approved by Research Council and Institutional Review Board (14) at National Nutrition and Food Technology Research Institute (NNFTRI), Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Results

In total, 650 households were studied in West Azarbayejan Province (disaggregated as 61, 23 and 16% in *Urmia*, *Khoy* and *Mahabad* districts, respectively). Sample characteristics are shown in Table 1. As can be seen, the majority of participants had Azeri ethnicity. Most of them were 25-45 years, and their educational levels were primary and junior high school. The mean and standard deviation of family member in households was 4.32±1.85 in rural areas, 3.6±1.35 in urban areas, and 3.82±1.56 in overall. In most households, mothers were housewives, and the majority of households were owners of their housing property.

Average per capita milk consumption was 839 and 909 ml/wk in the urban and rural areas, respectively. The most common form of consumed milk was bulk milk (48 and 72% in the urban and rural areas, respectively), with the mean consumption of 479±23 and 730±64 ml/wk in urban and rural areas, respectively.

Table 1. Family characteristics of the subjects studied in West Azarbayejan Province.

Demographic variable	N (%)			
	Urban (n=1587)	Rural (n=825)	Overall (n=2412)	P value*
				< 0.0001
Ethnicity				
Azeri	1253 (79.0)	361 (43.8)	1614 (66.9)	
Kurdish	317 (20.0)	457 (55.4)	774 (32.1)	
Other	17 (1.1)	7 (0.8)	24 (1.0)	
				0.076
Gender				
Men	810 (51.1)	403 (48.8)	1214 (50.3)	
Women	777 (49.0)	422 (51.2)	1197 (49.7)	
				0.089
Age group(yrs)				
< 7	146 (9.2)	103 (12.5)	249 (10.3)	
7-18 years old	229 (14.4)	157 (19.0)	386 (16.0)	
18-25	252 (15.9)	121 (14.7)	373 (15.5)	
25 – 45	579 (36.5)	289 (35.0)	868 (36.0)	
45-65	296 (18.7)	101 (12.2)	397 (16.5)	
Over 65 years	85 (5.4)	54 (6.5)	139 (5.8)	
				< 0.0001
Education				
Illiterate	202 (12.7)	194 (23.5)	396 (16.4)	
Primary / junior school	489 (30.8)	341 (43.3)	830 (34.4)	
High school	144 (9.1)	81 (9.8)	235 (9.3)	
Diploma	426 (26.8)	98 (11.9)	524 (21.7)	
University	191 (12.0)	12 (1.5)	203 (8.4)	
				< 0.0001
Occupation				
Housewife	468 (29.5)	265 (32.1)	733 (30.4)	
Student	344 (21.7)	189 (22.9)	533 (22.1)	
Unemployed	101 (6.4)	35 (4.2)	136 (5.6)	
Retired	80 (5.0)	2 (0.2)	82 (3.4)	
Worker	74 (4.7)	117 (14.2)	191 (7.9)	
Employment/ Employer	124 (7.8)	16 (1.9)	140 (5.8)	
Manager	258 (16.3)	102 (12.4)	360 (14.9)	
				< 0.0001
Properties ownership				
Free	105 (6.6)	59 (7.2)	164 (6.8)	
Rental	362 (22.8)	10 (1.2)	372 (15.4)	
Owner	1120 (70.6)	756 (91.6)	1876 (77.8)	
				0.042
County				
Khoy	348 (21.9)	212 (25.7)	560 (23.2)	
Mahabad	242 (15.2)	151 (18.3)	393 (16.3)	
Urmia	997 (82.8)	462 (56.0)	1459 (60.5)	

*Chi-square test was used.

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As shown in Table 2, the mean consumption of bulk milk was significantly higher in the rural than in the urban areas. Consumption of pasteurized packaged milk and UHT milk was significantly higher in urban areas.

According to this study, subsidized milk was consumed by 55 and 20% of the urban and rural households of Azarbayejan Province, respectively, before the subsidization policy transition in Iran. Mothers in the urban areas declared that after establishment of new policies their household milk consumption has been reduced and reported a mean of 2.9±1.8 l/wk reduction while milk consumption was not significantly changed in the rural areas.

Determinants of household socio-economic status extracted by exploratory factor analysis are presented in Table 3. Factor analysis detected three significant components for SES that could explain 70% of variance in SES:

1. Educational level and occupational status/ expenditures/ housing appliance
2. Family size/ethnicity
3. Area of residency/district/property ownership

With increasing the family size and non-Azeri ethnicity, the second factor score increases; residency in the center of the Province, having house and ownership of more properties increase the third factor score.

The first factor comprises of four variables of education, occupation, total household expenses and housing appliances scores based on the factor loadings; it was named as the main socio-economic factor. The second factor combines family size and ethnicity scores. The third factor includes the residency and property ownership scores. With increasing the family size and non-Azeri ethnicity, the second factor score increases; residency in the center of the Province, having house and ownership of more properties increase the third factor score.

The mean consumption of different types of milk in the tertiles of three factors is shown in Table 4. At higher tertiles of ethnicity and family size score (Kurdish households and more populated families), consumption of both bulk and pasteurized milk was significantly lower than in Azeri and small families. However, milk consumption in the highest tertile of districts and property ownership (i.e., living in *Urmia* and being an owner) was higher compared to the first and second tertiles.

Table 2. Milk consumption in West Azarbayejan Province based on urban and rural areas

Type of milk	Mean ±SE (ml/per week)			P value*
	Urban	Rural	Total	
Bulk milk	478.62±22.60	730.36±64.44	564.25±26.62	< 0.001
Pasteurized plastic bag milk	176.02±22.64	49.26±9.31	132.63±15.27	<0.001
UHT packet milk	145.18±15.31	92.15±25.12	127.04± 13.25	<0.072
Pasteurized plastic bottled milk	14.12±3.53	0	9.28±2.33	<0.001

*T-test was used for comparison.

Table 3. Rotated Factor Matrix and factor loadings in the urban and rural households studied

Variable	Urban			Rural			Total		
	Factor1	Factor 2	Factor 3	Factor 1	Factor 2	Factor 3	Factor 1	Factor 2	Factor 3
Education score	0.063	0.788	-0.024	0.030	0.049	0.783	0.779	-0.116	0.056
Occupation score	-0.204	0.592	-0.086	-0.051	-0.043	0.776	0.633	0.009	-0.226
Expenses score	0.534	0.410	0.418	0.739	0.189	0.241	0.509	0.360	0.471
Housing equipment score	0.411	0.561	-0.074	0.042	0.727	0.181	0.495	-0.284	0.477
Family size score	0.152	-0.112	0.797	0.838	0.059	0.112	0.035	0.835	0.138
Ethnic score	-0.223	-0.057	0.735	0.613	-0.485	-0.072	-0.111	0.744	-0.175
Properties ownership score	0.626	0.262	0.088	0.071	0.717	-0.150	0.045	-0.037	0.717
County score	0.571	-0.041	-0.271	0.435	0.282	-0.142	-0.074	0.013	0.575
KMO *		0.591			0.529			0.578	

Extraction Method: Principal component analysis
Rotation Method: Varimax with Kaisar Normalization
*(Kaiser-Meyer-Olkin Measure of Sampling adequacy (MSA))
(Bartlett's Test of Sphericity) p<0.001 in urban, rural and Total.

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Table 4. Comparison of mean weekly consumption of milk in households based on different socio-economic status[1]

Mean milk intake (ml/week)	Tertiles of main socio-economic status*			Tertiles of ethnics and family size†			Tertiles of county and property ownership‡		
	1st	2nd	3st	1st	2nd	3rd	1st	2nd	3rd
Bottle pasteurized	2.9±1.6	10.7±4.6	8.0±3.7	17.8±5.8***	2.25±1.3	1.6±1.3	1.6±1.3**	5.9±3.4	14.0±4.8
Plastic bag	161.9±44.2	89.1±11.6	93.4±14.8	138.3±44.3	116.7±14.5	89.4±12.0	78.5±10.4	167.9±44.7	97.9±13.9
UHT	123.1±27.4	117.8±15.9	102.6±16.6	134.7±26.0	99.9±16	108.9±18.6	78.7±10.4	132.3±26.6	132.5±21.4
Bulk milk (9)	575.2±51.3	320.5±57.9	514.9±34.9	672.6± 45.3†	430.9±38.7	507.2±60.1	289.0±24.8***	499.6± 42.3***	821.5±67.8
Total	880.5±69.7	782.06±59.0	765.5±38.2	997.6± 64.4***	683.0±41.6	747.6±62.0	468.3±26.6***	830.0± 63.9***	1112.9±68.5

1.Tukey's test was used for comparison.
*Higher education, occupation, expenses, housing equipment
†Higher family size and Kurdish ethnicity.
‡living in *Urmia* and being an owner compared to others
**Significant difference between groups ($p<0.05$)
***Significant difference between groups ($p<0.001$)

Discussion

The results of the present study indicated that consumption of milk was approximately half a glass per day per capita (118 g/day). Although this amount was nearly three times more than the amount of milk consumption reported (i.e., 41 g/day) in West Azarbayejan, in the latest National Food Consumption Survey (1), it was much less than what is recommended as adequate, which is about 2-3 cups of milk and dairy products per day (15). Similar to our findings, Mirmiran et al. indicated that milk and dairy consumption was half of the recommended amounts in a Tehrani subjects (8). The findings of NHANES study also showed that mean consumption of milk was more than ¾ glasses per day (16). Low milk consumption is a multi-factorial phenomenon, and can be affected by socio-economic, cultural and geographical variables.

Our findings imply that the majority of consumed milk in both the urban and rural areas of West Azarbayejan was traditionally processed bulk milk. Consistent with these results, a survey by Mohammadi et al. showed that upon implementation of cash transfer policy, milk and dairy consumption reduced in low income households as a response to price changes (17). This would be an inevitable policy consequence unless appropriate compensational actions are taken by the government. For example, milk consumption in India has increased from 39 to 66 g/day in a five year period. In fact, the Indian government has significantly contributed to this process by reducing import rates, supporting dairy producers, and encouraging investments in this sector. Meanwhile, the relationship between income and milk consumption has clearly been shown among Indian families (18).

According to our study, consumption of pasteurized and UHT milk was higher among the urban households; bulk milk consumption was popular in the rural areas of West Azarbayejan Province. A study carried out in Pakistan indicated the same trend: in rural areas, the majority of individuals consumed bulk milk, but packaged milk was the main milk in urban areas (19). A different pattern could be seen in an industrialized country such as England where distributed milk was as pasteurized (87%) and UHT (8.7%) (20). Needless to emphasize on the role of environmental factors such as processing, storage, packaging, price and availability on milk demand.

Ethnicity also seems as an associated factor with milk consumption (21-23). Based on our findings, Kurdish households consumed less milk than Azeri families. That could be probably attributable to the cultural context and backgrounds, as Kurds have had nomads' ancestors that in their food culture, milk is instantly processed to other dairy products to increase its shelf life; their food pattern, therefore, is based on a wider variety of dairy products rather than milk itself. Other studies have revealed the potential effects of culture on food pattern evolution in a society. For example, as Bhaskaran et al. argued, adoption of no-meat vegetarian diet among Indians had made cow milk as the main source of animal protein in diet

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(70%). As a result, the main reason for high milk consumption among Indians might just be religious and cultural aspects (18).

In short, the amount of milk consumption in West Azarbayejan Province was significantly lower than daily recommended values with higher figures shown in rural areas. In the meantime, the data lacks information on consumption of other dairy products and milk containing dishes. This can seriously challenge any extrapolation about nutrient intakes, such as calcium, riboflavin and protein among the studied population. The most frequent consumed milk was bulk milk in both rural and urban areas, with more consumption in rural areas that may result from higher availability with less response to new subsidization policy in the country. In contrast, consumption of pasteurized and UHT milk was significantly higher in urban areas; this can justify decreased milk consumption among the urban households upon substitution of food subsidization with cash transfer policy. It should also be considered that milk consumption follows a seasonal variation, especially in rural areas where bulk milk consumption is higher. We may, therefore, suggest reassessing milk consumption in the same population during spring and summer seasons. Last but not the least, designing and implementation of compensational policies to increase milk consumption among low income and vulnerable population segments shall be prioritized.

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The authors declare that they have no competing interests.

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