

Preplanned Studies

Consumption of Milk and Dairy Products Among Junior High and Senior High School Students — China, 2016–2017

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Summary

What is already known about this topic?

Chinese dietary guidelines recommend an intake of milk and dairy products to be closely related to human health. Although the production capacity of dairy in China is strong, the per capita consumption of dairy products is not high.

What is added by this report?

This report showed that the consumption rate of milk and dairy products of junior high and senior high school students in China was 82.5% from 2016 to 2017. Only 44.1% of them consumed milk and dairy products every day. Only 20.4% of these students reached intake levels recommended by the *Dietary guidelines for Chinese residents (2016)*.

What are the implications for public health practice?

Milk and dairy products are a key food group in a healthy dietary pattern. To cultivate a healthy eating habit of including dairy for children and adolescents, the government, suppliers, schools, and parents need to cooperate together.

Junior high and senior high school students are in a period of rapid growth and development, and their requirements of nutrients are higher than that of adults. Milk and dairy products provide not only high-quality protein but also vital vitamins and minerals. The intake of milk and dairy products is closely related to human health (1–2). In 2017, China's milk production reached 36.55 million tons, which accounted for about 4.5% of global production, second only to India and the United States, and ranked third in the world (3). However, Chinese residents' milk consumption was relatively low. In 2017, China's per capita liquid milk consumption was 20.3 kg, which was about two-thirds of Japan, one-third of the United States, and one-fifth of the United Kingdom (4). This research aimed to analyze and describe the consumption of milk and dairy products of Chinese

junior high and senior high school students from 2016 to 2017 and to encourage increasing the consumption of milk and dairy products.

The data came from *China Nutrition and Health Surveillance (2016–2017)*. The survey was a cross-sectional study and used multistage stratified random sampling method (5). Overall, 269 surveillance points were selected from 31 provincial-level administrative divisions (PLADs). The consumption of milk and dairy products for Chinese junior high and senior high students in the past month were collected by questionnaires. Milk and dairy products were classified into four categories: liquid milk, milk powder, yogurt, and other milk products. SAS (version 9.4, SAS Institute Inc., Cary, NC, USA) was used to process the quantitative analyses. Chi-squared tests were performed to compare the consumption rate of milk and dairy products in different genders and areas, and on the composition ratio and the ratio of the recommended intake of dietary guidelines. Wilcoxon rank sum test was performed to test the differences of the consumption of milk and dairy products between different genders and areas. The protocol of this study was approved by the Ethical Committee of China CDC (201614).

A total of 28,451 junior high and senior high students were involved in the study, including 14,207 male students (6,808 in urban areas and 7,399 in rural areas) and 14,244 female students (6,781 in urban areas and 7,463 in rural areas). There were 13,589 (47.8%) students in urban areas and 14,862 (52.2%) students in rural areas. The average age of students was 14.9 ± 1.8 years.

Table 1 showed that the consumption rate of milk and dairy products among junior high and senior high school students were 82.5%, 81.4% for male students, and 83.7% for female students. The consumption rate was higher for female students than for male students ($P < 0.0001$). The rates in urban and rural areas were 88.3% and 77.3%, respectively, with urban areas being significantly higher than rural areas ($P < 0.0001$). In

TABLE 1. Consumption rate of milk and dairy products among Chinese middle and high school students in 2016–2017.

Types of milk and products	Gender				χ^2	P	Region				χ^2	P	Total	
	Male		Female				Urban		Rural				n	%
	n	%	n	%			n	%	n	%				
Liquid milk	8167	57.5	7918	55.6	10.4211	0.0012	8897	65.5	7188	48.4	845.4064	<0.0001	16085	56.5
Milk powder	692	4.9	926	6.5	35.2400	<0.0001	951	7.0	667	4.5	83.4034	<0.0001	1618	5.7
Yogurt	8091	57.0	9379	65.9	237.4309	<0.0001	9174	67.5	8296	55.8	409.3331	<0.0001	17470	61.4
Other milk products	552	3.9	714	5.0	21.2565	<0.0001	824	6.1	442	3.0	159.3793	<0.0001	1266	4.5
Total milk and products	11560	81.4	11919	83.7	26.2947	<0.0001	11996	88.3	11483	77.3	596.9972	<0.0001	23479	82.5

terms of the consumption rates of different types of dairy products, the consumption rates of liquid milk, milk powder, yogurt, and other milk products were 56.5%, 5.7%, 61.4%, and 4.5%, respectively. The consumption rate of liquid milk in male students was higher than that in female students ($P=0.0012$). Moreover, the consumption rates of milk powder, yogurt, and other dairy products in female students were higher than those in male students ($P<0.0001$). For all types of dairy products, their consumption rates in urban areas were all higher than those in rural areas ($P<0.0001$).

Milk and dairy products consumption was divided into 5 frequency groups: ≥ 1 time/day, 4–6 times/week, 1–3 times/week, <1 time/week, and non-consumption (Table 2). The percentages of different groups were 44.1%, 13.1%, 22.4%, 3.0%, and 17.3%, respectively. The highest percentage of frequency was ≥ 1 time/day. The percentages of frequencies of ≥ 1 time/day and 4–6 times/week were higher in urban areas (54.2%, 13.7%) than in rural areas (34.9%, 12.6%) ($P<0.0001$). The percentages of frequencies of 1–3 times/week, <1 time/week, and non-consumption were higher in rural areas (26.3%, 3.7%, 22.6%, respectively) than in urban areas (18.2%, 2.2%, 11.6%, respectively) ($P<0.0001$). At the frequency of ≥ 1 time/day, the percentages of liquid milk, milk powder, yogurt, and other dairy products were 27.6%, 2.1%, 18.7%, and 0.8%, respectively (Table 2).

Table 3 indicates that from 2016 to 2017, average daily consumptions of liquid milk, milk powder, yogurt, and other milk products of junior high and senior high school students who consumed dairy products were 173.7 g, 46.6 g, 102.7 g, and 27.0 g, respectively. The average daily consumptions of liquid milk, milk powder, and other milk products were higher in male students than in female students ($P<0.05$). The average daily consumptions of liquid milk, milk powder, and yogurt were higher in urban areas than in rural areas ($P<0.01$), while daily

consumption of other dairy products in rural areas was higher than that in urban areas ($P<0.0001$). Converting all consumption of dairy products to liquid milk consumption, junior high and senior high school students consumed the equivalent of 216.0 g of liquid milk per day, with male students (222.8 g/d) consuming more than female students (209.5 g/d) ($P<0.0001$), and those in urban areas (247.2 g/d) consuming more than those in rural areas (183.5 g/d) ($P<0.0001$).

From 2016 to 2017, 16.9% of all junior high and senior high school students' milk and dairy products consumption reached the recommended intake of *Dietary guidelines for Chinese residents (2016)*, of which 17.2% were male students and 16.5% were female students, and 22.7% in urban areas and 11.5% in rural areas, with urban areas higher than rural areas ($P<0.0001$). For students who consumed dairy products, 20.4% of them reached the recommended amount; 21.2% of them were male students and 19.6% of them were female students, where the proportion of male students was higher than that of female students ($P<0.01$); 25.7% in urban areas and 14.9% in rural areas, where the proportion of urban students was higher than that of rural students ($P<0.0001$).

DISCUSSION

This study presented that from 2016 to 2017, the consumption rate of milk and dairy products among Chinese junior high and senior high school students was 82.5%; the consumption rates in urban areas and rural areas were 88.3% and 77.3%, respectively. One study showed that in 2006, the consumption rate of dairy and dairy products among 12–17 year-old teenagers in 9 PLADs of China was 13.68%. The consumption rates among 7–17 year-old students were 38.33% in urban areas and 4.65% in rural areas (6). In comparison to ten years ago, although using different

TABLE 2. The distribution of milk and dairy products consumption frequency among Chinese middle and high school students in 2016–2017.

Types of milk and products	Consumption frequency	Gender				χ^2	P	Region				χ^2	P	Total	
		Male		Female				Urban		Rural				n	%
		n	%	n	%			n	%	n	%				
Liquid milk	≥1 time/day	4,172	29.4	3,673	25.8	51.9510	<0.0001	4,845	35.7	3,000	20.2	1,171.6262	<0.0001	7,845	27.6
	4–6 times/week	976	6.9	961	6.8			1,101	8.1	836	5.6			1,937	6.8
	1–3 times/week	2,742	19.3	2,958	20.8			2,702	19.9	2,998	20.2			5,700	20.0
	<1 time/week	327	2.3	393	2.8			306	2.3	414	2.8			720	2.5
	Don't consume	5,990	42.2	6,259	43.9			4,635	34.1	7,614	51.2			12,249	43.1
Milk powder	≥1 time/day	273	1.9	330	2.3	39.4260	<0.0001	351	2.6	252	1.7	101.7397	<0.0001	603	2.1
	4–6 times/week	47	0.3	78	0.6			78	0.6	47	0.3			125	0.4
	1–3 times/week	316	2.2	424	3.0			458	3.4	282	1.9			740	2.6
	<1 time/week	89	0.6	134	0.9			109	0.8	114	0.8			223	0.8
	Don't consume	13,482	94.9	13,278	93.2			12,593	92.7	14,167	95.3			26,760	94.1
Yogurt	≥1 time/day	2,474	17.4	2,854	20.0	237.5455	<0.0001	3,087	22.7	2,241	15.1	546.9763	<0.0001	5,328	18.7
	4–6 times/week	818	5.8	930	6.5			987	7.3	761	5.1			1,748	6.1
	1–3 times/week	4,135	29.1	4,867	34.2			4,484	33.0	4,518	30.4			9,002	31.6
	<1 time/week	691	4.9	748	5.3			634	4.7	805	5.4			1,439	5.1
	Don't consume	6,089	42.9	4,845	34.0			4,397	32.4	6,537	44.0			10,934	38.4
Other milk products	≥1 time/day	103	0.7	120	0.8	23.3586	0.0001	130	1.0	93	0.6	162.2505	<0.0001	223	0.8
	4–6 times/week	31	0.2	30	0.2			31	0.2	30	0.2			61	0.2
	1–3 times/week	289	2.0	376	2.6			428	3.2	237	1.6			665	2.3
	<1 time/week	171	1.2	235	1.7			279	2.1	127	0.9			406	1.4
	Don't consume	13,613	95.8	13,483	94.7			12,721	93.6	14,375	96.7			27,096	95.2
Total milk and products	≥1 time/day	6,292	44.3	6,264	44.0	43.4343	<0.0001	7,369	54.2	5,187	34.9	1,357.4860	<0.0001	12,556	44.1
	4–6 times/week	1,756	12.4	1,975	13.9			1,865	13.7	1,866	12.6			3,731	13.1
	1–3 times/week	3,145	22.1	3,236	22.7			2,479	18.2	3,902	26.3			6,381	22.4
	<1 time/week	384	2.7	465	3.3			294	2.2	555	3.7			849	3.0
	Don't consume	2,630	18.5	2,304	16.2			1,582	11.64	3,352	22.55			4,934	17.3

TABLE 3. Daily consumption of milk and dairy products by junior high and senior high school students — China, 2016–2017 (g/d).

Types of milk and products	Number of students consumed	Gender				χ^2	P	Region				χ^2	P	Total	
		Male		Female				Urban		Rural				Mean	SD
		Mean	SD	Mean	SD			Mean	SD	Mean	SD				
Liquid milk	16,085	183.3	150.5	163.9	134.8	76.64	<0.0001	189.2	149.3	154.6	133.0	334.78	<0.0001	173.7	143.3
Milk powder	4,054	47.8	56.3	45.5	55.7	5.40	0.0201	48.3	56.8	43.7	54.4	10.94	0.0009	46.6	56.0
Yogurt	17,470	105.5	117.2	100.2	105.9	3.74	0.0532	107.0	111.2	97.9	111.2	55.54	<0.0001	102.7	111.3
Other milk products	1,266	29.5	42.8	25.1	40.5	8.98	0.0027	23.0	35.7	34.6	49.9	21.43	<0.0001	27.0	41.6
Total	23,479	222.8	222.4	209.5	216.1	34.76	<0.0001	247.2	234.1	183.5	197.5	832.79	<0.0001	216.0	219.3

Abbreviation: SD=standard deviation.

methods, the consumption rate of milk and dairy products of junior high and senior high students in this study was higher. Consistent with another study (7),

this study shows that the consumption rate of liquid milk and yogurt of Chinese junior high and senior high school students was relatively high, while the

consumption rate of milk powder and other milk products was low. In 2006, the consumption rate of yogurt among children and adolescents aged 7–17 in China was only 18% of that of fresh milk (6). The rapid growth of yogurt consumption, on the one hand, may be related to the popularity of diverse flavors (8). On the other hand, for those who have lactose intolerance, yogurt is a good substitute for milk (9). According to surveys, the incidences of lactase deficiency among Chinese children aged 3–5, 7–8, and 11–13 were 38.5%, 87.6%, and 87.8%, respectively. The incidences of lactose intolerance were 12.2%, 32.2%, and 29%, respectively (1).

This study indicated that 44.1% of junior high and senior high school students consumed milk and dairy products every day. Daily consumption rate among urban students (54.2%) was significantly higher than that of rural students (34.9%). The results of “*China Nutrition and Health Surveillance (2010–2013)*” showed that the daily consumption of milk and dairy products of children and adolescents aged 6–17 was 39.2%, with 52.3% in urban areas and 24.6% in rural areas (10). In comparison, daily consumption rate of milk and dairy products of Chinese junior high and senior high school students has increased in the past five years, especially in rural areas. However, there still remains a gap between the *Dietary guidelines for Chinese residents (2016)* and the estimated current dairy intake of Chinese students.

According to the *Dietary guidelines for Chinese residents (2016)*, consuming 300 mL milk or equivalent dairy products daily should be ensured for school-age children. This study estimated that from 2016 to 2017, the average consumption of liquid milk among Chinese junior high and senior high students who consumed milk and dairy products was 216.0 g/d, with 247.2 g/d in urban areas and 183.5 g/d in rural areas. A relevant study showed that the average daily milk consumption of children and adolescents aged 7–17 in urban and rural areas in 2006 was 78.03 g and 7.47 g, respectively (6). The results of “*China Nutrition and Health Surveillance (2010–2013)*” presented that the intake of milk and dairy products of Chinese children and adolescents aged 11–17 was about 40–60 g/d in urban areas and 10–20 g/d in rural areas. The highest proportion reaching the recommended amount of Dietary Guidelines was 2.5% in the urban 11–13-year-old group, and the lowest was 0.5% in the rural 14–17-year-old group (11). Although the dietary survey method used in this paper differed from the above two studies, the consumption of milk products

among middle and high school students in China has still likely increased in the past decade. However, there remains a gap between recommended consumption and the actual consumption.

The intake of milk and dairy products of Chinese junior high and senior high school students may be affected by regional economies, family incomes, nutritional knowledge, and eating habits (6). In 2000, 7 ministries, including the Ministry of Agriculture and the Ministry of Education, jointly promoted the Chinese Students Drinking Milk Program. In 2019, the State Council officially announced the *Opinions on Implementing the Healthy China Action*. It has become a national strategy and a social consensus for children to keep drinking milk every day. Considering the lunch prepared by the school, it is more reasonable to encourage both families and school teachers to pay attention to the consumption of milk and dairy products for teenagers. It is recommended that suppliers should develop milk and dairy products with diverse flavors to meet the taste needs of teenagers. Lactose free milk should also be provided for those who are lactose intolerant.

This study had some limitations. First, due to the sampling design of this study, the samples did not cover the students in the highest grades of junior high and senior high school, which could affect the randomness of the sampling. Second, the consumption of milk and dairy products adopted the method of FFQ retrospective survey, which had a certain recall bias.

Acknowledgment: Research staff from local CDCs and respondents in the survey.

Conflicts of interest: No conflicts of interest.

Funding: National Key Research and Development Project (2018YFC1603103); National Health Commission of the People’s Republic of China Medical Reform Major Program: China Nutrition and Health Surveillance (2016–2017).

doi: 10.46234/ccdcw2021.271

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Submitted: July 21, 2021; Accepted: November 04, 2021

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