

## A comparison of nutrition knowledge, attitudes and dairy consumption of school children according to age and gender

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### **Summary**

*Besides traditional nutrients, milk and dairy products contain some health promoting components. The aim of this study was to detect the frequency and preferences among dairy products in school children according to age and gender. The subjects were 234 healthy children at age 10-11 years and 14-15 years from two primary schools in Zagreb. Number of participants was well balanced according to age and gender. Dietary data were collected using specially designed food frequency questionnaire (FFQ). By additional questionnaire some anthropometric parameters as well as food preferences, attitudes and nutrition knowledge on milk and dairy products were collected.*

*According to the results the intake of milk is significantly different ( $p < 0.05$ ) to gender but not to age. 91 % children consume milk, 2.3 cups/day in average. Soft drinks, fruit juices, beverages and similar drinks are consumed more often than milk. Pudding and ice cream had the highest frequency among dairy products consumed. Milk and dairy frequency intake according to age and gender are still not significantly different. Children mostly consume fresh milk (68.7%). Girls at age 14-15 years consume light milk ( $\leq 1.6$  % fat) more than younger children and boys at the same age. 86 % of children is well informed about nutritional facts linked to milk and dairy products and they are mostly educate by parents.*

*Among anthropometric parameters a statistically significant difference ( $p < 0.05$ ) was observed in height with regard to gender, only among older children, and for both height and, weight and body mass indeks (BMI) with regard to age.*

*Key words: milk and dairy, children, nutritional habits, frequency*

### ***Introduction***

Food must contain all nutrients, as only adequate and well balance nutrition can prevent illness and to maintain adequate mental and physical development (Whitney et al. 1999; The American Dietetic Association, 1999). Factors other than health concerns, such as taste preferences, cultural norms, and food availability have influence on food choice (Hornack, et al. 1997; Glanz, 1998). Nutrient intakes aggregate in families, with the strongest association found between mothers and their children (Oliveira et al., 1992). Children's preferences for high-fat foods, total fat intakes have been positively associated with parental adiposity (Fisher et al., 1995). Health promotion interventions should begin before 6<sup>th</sup> grade as some evidence indicates that those children's food choices after that age become resistant to changes (Kelder et al., 1994).

Milk and dairy products contain a great number of essential nutrients such as essential amino acids, fat acids, vitamins and minerals, especially calcium (Whitney et al., 1999; Tratnik, 1998). Cadogan et al., (1997) show that supplementing the diets of adolescent girls with milk over 18 months produces a significant increase in bone mineral acquisition. Other studies have shown that calcium excretion rates increase with increasing protein intake and, generally result in negative calcium balance (Heaney, 1993; Linkswiler, 1981). Those products have also positive influence on human health especially because of fat content (Parodi, 1997), presence of alive microorganisms (Walker, 1998) and so called active peptides (Tirelli et al. 1997).

In childhood, especially in adolescent age, dietary calcium is usually in deficit because consumption of milk and dairy products decrease and consumption of soft drinks increase (Crawley and Summerbell, 1998).

The aim of this study was to detect at what school age the children have knowledge on milk and dairy products importance, how much and which products they mostly choose.

### ***Materials and Methods***

Investigation was carried out among 234 healthy children aged 10-11 years and 14-15 years from two primary schools in Zagreb. Parents were informed about the projects from the principals. Both genders participate in

this study: 112 boys and 122 girls. 52 % children were 10-11 years old, a 48 % were 14-15 years old (Table 1).

Table 1: Subjects defined by age and gender ( $x \pm SD$ )

Tablica 1: Ispitanici s obzirom na dob i spol ( $x \pm SD$ )

Parameters	Children					
	10-11 years			14-15 years		
	Boys	Girls	Mean	Boys	Girls	Mean
n	58	63	-	54	59	-
Age (years)	10.7±0.3	10.3±0.2	10.5±0.3	14.9±0.2	14.8±0.4	14.7±0.3
Weight (kg)	38.8±6.4	36.5±6.3	37.6±6.3	58.8±8.6	52.3±5.8	55.5±7.2
High (cm)	146.6±8.7	145.5±7.0	146.0±7.8	173.2±9.0	165.9±6.4	169.5±7.7
BMI * (kg/m <sup>2</sup> )	18.0±2.4	17.2±1.9	17.6±1.0	19.6±2.0	19.0±1.9	19.3±2.8

\* BMI= body mass index

For assessment of daily nutritional habits and average consumption frequency of milk and dairy products a specially food frequency questionnaire (FFQ) was designed (McDonald, 1991). It contained 15 questions and list of milk and dairy products with provided space for additional products that were not listed. Available frequencies of food consumption were from “once a week” to “once or more than once a day”. Quantities were described as units of serving (piece and cup).

Additional questioner was also provided to obtain some antropometric parameters; preferences and whey of choices among milk and dairy products as well as nutritional facts considering this group of products. From weight and height, the body mass index (BMI) was calculated. The survey was performed in the form of interviews.

Statistical analyses were performed by StatSoft, Inc. (Version 5.1, 1995) and included standard deviation (SD) and F-test (Davies, 1960). Statistical significance of differences according to age and gender was assessed with the F-test.

### **Results and Discussion**

This investigation was especially designed to give results on milk and dairy products frequency it's consumption in school children according to age

and gender (Tables 2-7) as well as food preferences (Tables 8 and 9). The results also contain the data on the influence of food choice (Table 10) and source of nutrition knowledge about milk and dairy products consumption in children (Table 11).

Table 2: Consumption and reasons for not consuming milk (n=234)

Tablica 2: Konzumiranje i razlozi za nekonzumiranje mlijeka (n=234)

Parameters	Children (% subjects)								
	10-11 years			14-15 years			Boys	Girls	Mean
	Boys	Girls	Mean	Boys	Girls	Mean			
Consume milk									
%	92.6	93.3	93.0	89.2	90.0	89.6	90.6	91.6	91.2
If not why?									
Taste	4.7	3.9	4.3	2.7	2.5	2.6	3.7	3.2	3.4
Smell	0	0	0	8.1	0	4.1	4.1	0	2.0
Others	2.7	2.8	2.7	0	7.5	3.7	1.6	5.2	3.4

Selection among the school children was done according to age and gender. Number of younger children was similar to older ones. Balance between genders was also well done (Table 1). Average age of younger children was 10.5 years and 14.7 years for older (Table 1).

Weight and height in younger children were not statistically significant different between genders, but statistical significant differences ( $p < 0.05$ ) were obtained with regard gender in group aged 14-15 years and age generally (Table 1). Average body mass index was significantly different ( $p < 0.05$ ) with regard to age (Table 1).

Table 3: Average daily consumption of milk in children (n=234)

Tablica 3: Prosječni unos mlijeka u djece (n=234)

Parameters	Children (cups/day)								
	10-11 years			14-15 years			Boys	Girls	Mean
	Boys	Girls	Mean	Boys	Girls	Mean			
x	2.6	2.3	2.5	2.6	1.8	2.2	2.6	2.0	2.3
SD	1.9	1.7	1.9	2.4	1.5	1.9	2.2	1.6	1.9
Min.	0	0	0	0	0	0	0	0	0
Max.	>6	>6	>6	>6	>6	>6	>6	>6	>6

Using specially designed food frequency questionnaire (FFQ) dietary data were collected. 91 % of children consumed milk and compared to age there

was no difference in milk consumption (Table 2). In total 9 % of children did not consume milk at all. Younger children mostly because of taste and older because of smell (Table 2).

Table 4: Average consumption of milk by breakfast in children (n=234)

Tablica 4: Prosječni unos mlijeka doručkom u djece (n=234)

Milk	Children (cups /week)								
	10-11 years			14-15 years			Boys	Girls	Mean
	Boys	Girls	Mean	Boys	Girls	Mean			
x	5.5	5.0	5.0	4.2	3.8	4.0	4.9	4.4	4.7
SD	2.5	3.1	2.7	2.8	2.7	2.7	2.7	2.9	2.8
Min.	0	0	0	0	0	0	0	0	0
Max.	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0

Average daily consumption of milk was 2,3 cups and that is under recommended 3 cups a day (Table 3). (Whitney et al., 1999). In that case adequate intake of calcium is hard to reach during the day (RDA, 1986; Regulation of the health accuracy of food, 1994; Whitney et al., 1999). Girls 14-15 years of age had the lowest intake of milk ( $1.8 \pm 1.5$  cups/day) (Table 3). The same situation was established for milk consumption by breakfast (Table 4). From table 5 it is obvious that children mostly consume 1-2 cups of milk per day, and among the boys it is 3 and more cups of milk per day consumed.

Table 5: Average daily consumption of milk in children (n=234)

Tablica 5: Prosječni unos mlijeka u djece (n=234)

Cup/ day	Children (% subjects)								
	10-11 years			14-15 years			Boys	Girls	Mean
	Boys	Girls	Mean	Boys	Girls	Mean			
<1	11.1	5.7	8.4	13.1	15.0	14.1	12.1	10.4	11.3
1-2	40.7	62.8	51.7	47.5	65.0	56.2	44.1	63.8	54.0
3-4	37.0	20.1	28.6	18.4	15.0	16.7	27.7	17.6	22.6
≥5	11.2	11.4	11.3	21.0	5.0	13.0	16.1	8.2	12.1

Average consumption of milk in school children was significantly different ( $p < 0.05$ ) according to gender, but not to age. Similar results were observed in other similar studies (Colić Barić et al., 2000; Crawley and Summerbell, 1998).

The frequency of dairy consumption in children is present in Table 6. Pudding and ice cream are consumed 4.9 times/week, and as in daily diet of hospitalised children have the highest frequency consumption (Panjkota Krbavčić et al., 1999). Different types of drinks are consumed more frequent than pudding and ice cream. Still higher number of examined subjects drink milk more than soft drinks what is also confirmed in similar studies (Colić Barić, et al., 2000).

Table 6: Average frequency of milk and dairy products consumption in children (n=234)

Tablica 6: Prosječna učestalost konzumiranja mlijeka i mliječnih proizvoda u djece (n=234)

Parameters	Children (time/week)								
	10-11 years			14-15 years			Boys	Girls	Mean
	Boys	Girls	Mean	Boys	Girls	Mean			
Milk (all types)									
x	4.2	3.8	4.0	3.5	3.0	3.2	3.9	3.4	3.6
SD	3.1	3.5	3.3	3.5	3.1	3.3	3.3	3.3	3.3
Min.	0	0	0	0	0	0	0	0	0
Max.	>9	>9	>9	>9	>9	>9	>9	>9	>9
Yogurt and similar products									
x	2.2	1.6	1.7	2.7	1.6	2.1	2.5	1.6	2.1
SD	2.1	2.0	2.1	2.9	2.3	2.6	2.5	2.2	2.4
Min.	0	0	0	0	0	0	0	0	0
Max.	>9	>9	>9	>9	>9	>9	>9	>9	>9
Cheese (all types)									
x	1.8	2.0	1.9	2.5	2.6	2.5	2.2	2.3	2.2
SD	1.5	1.9	1.8	3.2	2.7	2.9	2.5	2.3	2.4
Min.	0	0	0	0	0	0	0	0	0
Max.	>9	>9	>9	>9	>9	>9	>9	>9	>9
Pudding and ice cream									
x	5.1	5.5	5.3	4.6	4.2	4.4	4.9	4.9	4.9
SD	2.8	2.6	2.8	3.4	3.1	3.2	3.1	2.9	3.0
Min.	0	0	0	0	0	0	0	0	0
Max.	>9	>9	>9	>9	>9	>9	>9	>9	>9
Drinks (soft, fruit juice, etc.)									
x	5.1	4.9	5.0	5.5	4.5	5.0	5.3	4.7	5.0
SD	3.2	2.8	3.0	3.7	3.5	3.6	3.5	3.2	3.3
Min.	0	0	0	0	0	0	0	0	0
Max.	>9	>9	>9	>9	>9	>9	>9	>9	>9

All types of milk and spread cheese were highly preferred in contrast to yoghurt and hard cheese (Table 7). Compared to age and gender food preferences in children were significantly different ( $p < 0.05$ ).

Table 7: Consumption of milk, dairy products and beverages among children ( $n=234$ )

Tablica 7: Konzumiranje mlijeka, mliječnih proizvoda i napitaka u djece ( $n=234$ )

Products	Children (% subjects)								
	10-11 years			14-15 years			Boys	Girls	Mean
	Boys	Girls	Mean	Boys	Girls	Mean			
Milk	55.9	51.1	53.5	54.6	51.5	53.1	55.3	51.3	53.3
Chocolate milk	12.2	13.2	12.8	11.8	10.7	11.3	12.0	11.9	12.0
Yogurt	7.8	5.6	6.7	10.3	14.6	12.4	9.1	10.1	9.6
Cheese	5.8	3.3	4.5	6.6	8.3	7.5	6.2	5.8	6.0
Cheese spread	12.1	10.1	11.1	10.2	11.7	11.0	11.1	10.9	11.0
Pudding	6.2	16.7	11.4	6.5	3.2	4.8	6.3	10.0	8.1
Soft drinks	33.3	26.7	29.8	46.9	41.2	44.1	40.1	34.0	36.9
Fruit juice	29.6	33.3	31.6	16.8	19.0	17.9	23.2	26.1	24.7
Cedevita	37.1	40.0	38.6	36.3	39.8	38.1	36.7	39.9	38.4

Table 8: Consumption of different milks according to shelf life and share of fat in children ( $n=234$ )

Tablica 8: Konzumiranje mlijeka s obzirom na trajnost i udjel masti u djece ( $n=234$ )

Milk	Children (% subjects)								
	10-11 years			14-15 years			Boys	Girls	Mean
	Boys	Girls	Mean	Boys	Girls	Mean			
Fresh	79.5	68.5	74.0	70.8	56.0	63.3	75.2	62.2	68.7
UHT sterilized	20.5	31.5	26.0	29.2	44.0	36.7	24.9	37.8	31.3
3.3 % fat	38.6	21.2	29.9	33.3	15.0	22.9	36.0	18.1	27.0
2.8 % fat	40.5	35.1	37.8	33.3	25.0	28.5	36.9	30.0	33.5
≤1.6 % fat	20.9	43.7	32.3	33.3	60.0	48.6	27.1	51.9	39.5

This study have also evaluated consumption of milk regard to shelf life and contain of fat (Table 8). Children mostly consumed fresh milk. Take into

consideration age and gender statistically significant difference ( $p < 0.05$ ) was observed in milk consumption with regard to fat content (Table 8). Younger children as well as older boys consumed mostly milk with higher level of fat, while girls consume milk with  $\leq 1.6\%$  fat. That indicate that girls are concern about food intake even before puberty. Low consumption of milk in adolescent age is very common, which is result of nutritionist advises to adolescent to drink milk during the meals and when they are thirsty. According to this investigation children treat milk as food and not as drink (Table 9).

Table 9: Preferences among drinks in children ( $n=234$ )

Tablica 9: Preferencija u odabiru napitaka u djece ( $n=234$ )

Drinks	Children (% subjects)								
	10-11 years			14-15 years			Boys	Girls	Mean
	Boys	Girls	Mean	Boys	Girls	Mean			
Fruit juice	29.6	43.3	36.8	37.8	60.0	48.9	33.7	51.6	42.6
Soft drinks	25.9	30.0	28.1	35.1	22.5	28.8	30.5	26.3	28.4
Diluted juice	33.3	20.0	26.3	16.2	15.0	15.6	24.8	17.5	21.2
Milk	11.2	6.7	8.8	10.9	2.5	6.7	11.0	4.6	7.8

Food packages besides food quality have an influence on food choice among adults (Whitney, 1999). Because of that children were tested on the influence of milk and fruit juice packages and only 28.8% were attracted by package (Table 10).

Table 10: Influence of packages on food choice in children ( $n=234$ )

Tablica 10: Utjecaj pakovine na odabir hrane u djece ( $n=234$ )

Package	Children (% subjects)								
	10-11 years			14-15 years			Boys	Girls	Mean
	Boys	Girls	Mean	Boys	Girls	Mean			
Have influence	25.9	53.3	40.0	16.2	20.0	18.2	21.1	36.6	28.8
No influence	70.4	23.4	45.6	35.2	22.5	28.6	52.8	23.0	37.9
Very important	0	0	0	0	0	0	0	0	0
No meter	3.7	23.3	14.4	48.6	57.5	53.2	26.1	40.4	33.3

Children are highly depended upon external influences, so an education about balance and adequate daily diet is important. In this study children were well educated about role of milk in human nutrition as well as recommended intake of milk. Parents (71.6%) mostly educate children while the information



from television and newspaper on these subjects were more present than from school authorities (Table 11). Education about adequate nutrition and human health in our society obviously should be better.

*Table 11: Sources of information about milk and dairy products importance for children (n=234)*

*Tablica 11: Izvori informacija o važnosti mlijeka i mliječnih proizvoda za djecu (n=234)*

Sources	Children (% subjects)								
	10-11 years			14-15 years			Boys	Girls	Mean
	Boys	Girls	Mean	Boys	Girls	Mean			
Parents	77.8	79.9	78.9	54.1	75.0	64.6	66.0	77.4	71.7
Teacher	11.1	6.7	8.8	14.5	12.5	13.4	12.8	9.6	11.2
Friends	3.7	6.7	5.3	8.3	2.5	5.4	6.0	4.6	5.3
TV, radio, papers	7.4	6.7	7.0	23.1	10.0	16.6	15.2	8.4	11.8

### **Conclusions**

The aim of this study was to detect an influence of food choice and source of nutrition knowledge on milk and dairy products consumption in children's daily intake.

The subjects were 234 healthy children from the fourth (10-11 years) and the eighth (14-15 years) class in two primary schools in centre of Zagreb.

According to results on intake of milk is significantly different ( $p < 0.05$ ) according to gender but not to age. 91 % children consume milk, 2.3 cups/day an average. Soft drinks, fruit juices, beverages and similar drinks are consumed more often than milk, while pudding and ice cream had the highest frequency of consumption among dairy products. Milk and dairy frequency products with regard to age and gender is not significantly different.

Children mostly consume fresh milk (68.7%). More girls at age 14-15 years consume *light* milk ( $\leq 1.6$  % fat) than younger children and boys at the same age. Take into consideration age and gender statistically significant difference ( $p < 0.05$ ) was observed in milk consumption with regard to fat content. 86 % of children is well informed about nutritional facts linked to milk and dairy products and that information they mostly get from parents.

Among anthropometric parameters statistically significant difference ( $p < 0.05$ ) was observed in height with regard to gender, among older children, and in both high, weight and BMI with regard to age.

**USPOREDBA ZNANJA, PREHRAMBENOG PONAŠANJA I UNOSA  
MLIJEKA I MLIJEČNIH PROIZVODA DJECE ŠKOLSKE DOBI S OBZIROM  
NA DOB I SPOL**

**Sažetak**

*Mlijeko i mliječni proizvodi osim tradicionalnih hranjivih sastojaka sadrže i tvari koje povoljno utječu na zdravlje. Cilj ovog rada bio je utvrditi učestalost i vrste namirnica koje konzumiraju djeca, te način odabira navedenih proizvoda s obzirom na dob i spol. Istraživanjem je obuhvaćeno 234 zdrave djece dobi 10-11 godina i 14-15 godina iz dvije osnovne škole u Zagrebu. Unutar navedenog broja djece uravnotežen je bio broj s obzirom na dob i spol. Dijetetički podaci prikupljeni su pomoću posebno priređenih upitnika o učestalosti konzumiranja (FFQ) namirnica iz skupine mlijeko i mliječni proizvodi. Pomoću dodatnog upitnika prikupljeni su neki antropometrijski parametri (tjelesna masa i visina), te preferencije, prehrambeno ponašanje i stupanj prehrambene edukacije vezane uz mlijeko i mliječne proizvode.*

*Dobiveni rezultati ukazuju na statistički značajnu razliku ( $p < 0,05$ ) u konzumiranju mlijeka među djecom s obzirom na spol, ali ne i dob. Od ukupnog broja djece 91 % konzumira mlijeko, prosječno 2,3 šalice na dan. Sokovi, gazirana pića i slični napici češće se konzumiraju od mlijeka. Puding i sladoled imaju najveću frekvenciju konzumiranja od proizvoda iz skupine mlijeko i mliječni proizvodi. Ipak, učestalost konzumiranja namirnica iz ove skupine statistički se značajno ne razlikuje s obzirom na dob i spol. Djeca uglavnom konzumiraju svježije mlijeko (68,7%). Djevojčice dobi 14-15 godina konzumiraju light mlijeko ( $\leq 1,6$  % m.m.) više od svojih vršnjaka i mlađe djece. 86 % djece je dobro informirano o prehrambenim činjenicama vezanim za mlijeko i mliječne proizvode i uglavnom su educirani od strane roditelja.*

*Od antropometrijskih parametara statistički značajna razlika ( $p < 0,05$ ) utvrđena je za visinu, s obzirom na spol samo među starijom djecom, te za visinu, tjelesnu masu i BMI s obzirom na dob.*

*Ključne riječi: mlijeko i mliječni proizvodi, djeca, prehrambene navike, učestalost*

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