

Milk Drinking Patterns among Malaysian Urban Children of Different Household Income Status

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Abstract

Background: Milk consumption is popular in Malaysia especially among the younger ages. Nonetheless, there is a lack of quantitative data on milk consumption by children in Malaysia.

Methods: A cross-sectional study was undertaken on a sample of 749 children aged 1-10 years in the metropolitan areas of Kuala Lumpur. Approximately similar proportions of children were selected from low, middle and high household income categories. Socioeconomic background, dietary intake based on 24-hour recall and food records, were obtained for each child.

Results: Prevalence of milk drinking was highest among aged 1-3 years (90.6%) followed by 86.1% aged 4-6 years, and 73.7% among ages 7-10 years. The youngest age group consumed averagely 3.5 (3.1 – 3.8) cups (200ml/cup) of milk daily, exceeding the recommendation of 2-3 cups a day by the Ministry of Health, Malaysia. There were no significant differences in the mean amounts of milk consumed among ages 1-3 years from low to high income categories. Children aged 4-6 years consumed, on average, 2.2 (1.9 – 2.4) cups/day, which is within the MOH recommendation, while that for ages 7-10 years, at 1.07 (0.9–1.2) cups/day, is below the recommendation.

Conclusion: Parents of young children should be advised on the nutritional importance of providing foods from a variety of sources, so that the children obtain the right balance and mix of nutrients for optimum growth.

Keywords: Milk; Child; Parents; Malaysia

Introduction

Cow milk is well recognized as a highly nutritious food particularly rich in nutrients that are essential for bone mineralisation. Growing children with prolonged low intake of cow milk are associated with poor bone health [1]. A review of observational studies from well-nourished populations showed an association between milk intake and growth, suggesting that milk has a growth-stimulating effect even in situations where the nutrient intake is adequate [2]. A large cohort study of female subjects in United States also showed that intakes of dairy milk and yogurt were positively associated with height growth [3].

Over the decades, milk production in Asian countries has grown five folds since the early 1970s, exceeding 265 million tons in 2011 [4]. The Food and Agriculture Organization 65 (FAO) projects that the strongest gains in dairy production and consumption over the coming 66 decade will take place in Asia. In the Southeast Asian region, Malaysia ranked among the highest per capita consumption at 36.2 kg/person/year in 2009, compared with Thailand (21.8 68 kg/person/year) and the Philippines (13.2 kg/person/year).

Owing to a lack of quantitative data on milk drinking among Malaysian children, a study was conducted in 2011-2012 with the objectives of (i) determining the amounts and types of milk consumed by children aged 1-10 years; (ii) comparing the amounts of milk consumed by the children with the recommendation of the Malaysian Dietary Guidelines for 73 Children and Adolescents of the Ministry of Health (MOH) [5]; and (iii) comparing the amounts of milk consumed by the different age groups from low to high household income categories.

Methodology

Study areas and subjects

This cross-sectional study was carried out in the capital city of Kuala Lumpur and its urban suburbs. Subjects were male and female children aged 1 to 10 years. Children with physical disability or known health disorders (e.g. asthma, food allergies) were excluded.

The sample size was computed based on previous studies reporting 50% of Malaysian children (2-12 years old) who did not achieve the recommended level of energy intake, with a margin of error of 20%, 95% confidence level, and design effect of 2, the minimum number of children required was estimated as 50. This number was increased to a minimum of 450 to accommodate for the stratification according to age groups (1-3 years, 4-6 years and 7-10 years) and household income levels (low, middle and high) within each age group. Child care centres for children aged 1-3 years, kindergartens for 4-6 years, and primary schools for 7-10 years were purposively chosen within the study areas that were selected to represent households with low, middle and high household income levels [6]. The power for this study calculated for each age group based on the obtained sample size and average proportion of children not meeting the Malaysian Recommended Nutrient Intake (RNI) [7] was more than 0.9.

Dietary intake

Parents (or guardians in cases of children not taken care by parents) were interviewed to gather (i) demographic and socioeconomic background of the study child and his/her parents and households; and (ii) food and beverages consumed by children 1-3 years. For the latter, the parents were interviewed by trained research assistants for estimation of the children's food intake for 1 weekday using food recall (24 hour diet recall). In addition, parents were instructed to record foods taken by their children over 1 weekend (Sunday). A booklet containing pictures of common household measurements was explained to the parents to assist them in estimating food amounts. Parents were contacted on weekends to remind them about recording food intakes of their children. A nutritionist field supervisor routinely conducted random checks of food recalls and records from parents and the children for data recording quality.

The average intakes of energy and nutrients of the children for the two days (weekday and weekend) were computed for diet analysis. Dietary intakes of both days were found to be significantly correlated for energy ($r=0.49$; $p=0.000$) and key nutrients ($r=0.37$ to 0.69 ; $p=0.000$). Dietary intake was computed using the Nutritionist Pro software for energy and nutrients [8], which is based on the USDA Food Database [9]. As for food items that were not available in this food database, at least 2 recipes were obtained to compute energy and nutrient values. As for assessing intake adequacy, comparison of energy and nutrient intakes by age group and sex were made to the Malaysian RNI [7] and US Dietary Reference Intakes (DRI) [10] for nutrients not included in the Malaysian reference. Parents were interviewed on their child's milk drinking patterns at the time of the study including the types and flavours of milk (non-breast milk) consumed, and frequency of milk consumption in the past two weeks prior to the interview.

Statistical analysis

Data analysis was conducted using the Statistical Package for Social Sciences version 19.0 [11]. The one way ANOVA and Bonferroni post-hoc test were applied when comparing for significant differences across low, middle and high household income categories. Data are presented as mean, 95% confidence interval (CI) and range. Statistical significance was set at $p<0.05$.

Ethical approval

The research protocol including the Study Information Sheet and Informed Consent Form was approved by the Joint Committee for Research and Graduate Studies of the International Medical University, Malaysia. Before enrolment, the Study Information was explained to either the parent or guardian of the target child, and written consent was obtained in the presence of a witness.

Results

Socioeconomic background

The study sample comprised 749 children with approximately one-third each from low, middle and high monthly income households (Table 1). Out of the total, 24.2% were aged 1-3 years, 33.6% aged 4-6 years and 42.2% aged 7-10 years. The proportions of Malay, Chinese and Indian subjects reflected broadly the ratios of the major ethnic groups in the national population [12].

Approximately half of the parents had attained college or university education. The main occupations of the fathers in the low income category were drivers, security guards, and operating own businesses, while most of the mothers were housewives. In the middle income category, a significant proportion of the fathers were employed in technical and sales jobs, while almost half of the working mothers were office executives and teachers. Meanwhile in the high income category, the main occupations of the fathers were in management and professional positions, while most of the mothers were employed as teachers, lecturers, and administrative officers.

Milk consumption by age groups

Out of the total sample of children, 82.0% reported consuming milk at the time of the study. The highest percentage of milk drinkers was among those aged 1-3 years (90.6%) followed by 86.1% and 73.7% among ages 4-6 years and 7-10 years respectively.

Characteristics	N (%)	Mean ± SD
Children		
Age (years)		
1-3	181 (24.2%)	
4-6	252 (33.6%)	
7-10	316 (42.2%)	
Male	366 (48.9)	
Female	383 (51.1)	
Malay	446 (59.6)	
Chinese	234 (31.2)	
Indian	68(9.2)	
Birth weight (kg)		3.03 ± 0.53
Birth order		2.3 ± 1.6
Households		
Monthly income (RM)*		5057.49 ± 4064.66
Income levels**		
Low	239 (31.9%)	
Middle	259 (34.6%)	
High	251(33.5%)	
Size (Number of persons)		5.3±1.8
Father's age (years)		38.6 ± 6.4
Mother's age (years)		35.6±5.5
Father's formal schooling (n=718)		
^a Primary/Secondary	369 (51.4)	
Matriculation/College/University	349 (48.6)	
Mother's formal schooling (n=720)		
^a Primary/Secondary	351 (48.7)	
Matriculation/College/University	369 (51.3)	

*USD1.00=RM3.50

**Household monthly income level based on the 10th Malaysia Plan [7]

Low (< RM 2300)/month

Middle (RM 2300 – 5599)/month

High (> RM5600)/month

^aPrimary schooling (6 years); Secondary schooling (11 years)

Table 1: Characteristics of the study children and parents (N=749)

Among the children aged 1-3 years who consumed milk, the mean amount taken daily was 692.8 ml (95% CI: 622.5, 763.1ml) (Table 2). This is equivalent to 3.5 cups (3.1, 3.8) per day, which is higher than the recommendation of the Ministry of Health, Malaysia (MOH) [5]. The recommendation of MOH is to “consume 2 to 3 servings of milk and milk products every day, whereby 1 serving is equivalent to one cup of 200ml”.

The average amount of milk taken by ages 1-3 years is significantly higher than that of the older age groups. The mean volume of milk taken by ages 4-6 years was 429.6 ml (375.7, 483.5 ml), which is about 2.2 (1.9, 2.4) cups daily. Hence, this age group appears to be taking milk within the MOH recommendation of 2 to 3 cups a day. On the other hand, the oldest group of 7-10 years consumed, on average, 214.8 ml (187.6, 242.0 ml), or less than two cups per day (0.9, 1.2), thus, falling short of the MOH recommendation.

Not only the youngest age group consumed significantly more milk daily than the older ages, the former also had the highest percentage who drank milk on a daily basis. While 94.5% of the 1-3 year-old drank milk at least once daily, the proportion drops to 85.7% and 65.1% respectively for ages 4-6 and 7-10 years.

As to the types of milk preferred, nearly three-quarters of the 1-3 years-old and nearly half of the 4-6 years-old reported drinking growing up milk (GUM). According to milk companies, GUM is specially developed for ages 1-3 years, fortified with nutrients that meet the requirements of this age group. Most of the 1-3 years (95.1%) and majority of the 4-6 years (79.7%) preferred full cream milk, whilst all the children showed a preference for plain milk.

	1 – 3 years (n=164)	4 – 6 years (n=217)	7 – 10 years (n=233)
Amounts	Mean (95% CI)	Mean (95% CI)	Mean (95% CI)
Amount of milk consumed per day (ml)	692.8 ^a (622.5, 763.1)	429.6 ^a (375.7, 483.5) ^a	214.8 ^a (187.6, 242.0)
Cups of milk consumed per day (cup =200ml)	3.5 ^a (3.1, 3.8)	2.2 ^a (1.9, 2.4)	1.07 ^a (0.9, 1.2)
Patterns	N (%)	N (%)	N (%)
<i>Frequency of milk consumption</i>			
At least once daily	154 (94.5)	186 (85.7)	151 (65.1)
At least once a week	9 (5.5)	31 (14.3)	73 (31.5)
At least once a month	-	-	8 (3.4)
<i>Type of milk</i>			
Growing up milk(GUM)	121 (74.2)	97 (44.7)	49 (21.1)
Milk other than GUM	30 (18.4)	62 (28.6)	80 (34.5)
Fresh milk/processed milk*	5 (3.1)	41 (18.8)	96 (41.4)
Others (cultured; condensed; filled)	7 (4.3)	17 (7.9)	7 (3.0)
<i>Fat content</i>			
Full fat	155 (95.1)	173 (79.7)	145 (62.5)
Low fat	6 (3.7)	42 (19.4)	86 (37.1)
Skim milk	2 (1.2)	2 (0.9)	1 (0.4)
<i>Milk flavor</i>			
Plain	121 (74.2)	150 (69.1)	141 (60.8)
Honey	18 (11.1)	37 (17.1)	9 (3.9)
Chocolate	10 (6.1)	12 (5.5)	61 (26.3)
Vanilla	12 (7.4)	7 (3.2)	11 (4.7)
Others	2 (1.2)	11 (5.1)	10 (4.3)

*e.g. ultra high temperature (UHT) milk
 Mean intake values with the same alphabet in the same row indicates significant differences among the age categories, significance at p level <0.05

Table 2: Amounts and patterns of milk consumption by age groups (N=614)

Milk consumption according to household income

1-3 years

The association between milk consumption and household income was investigated, considering that dairy products in general are relatively expensive in Malaysia. The average daily amount of milk consumed by ages 1-3 years in the low, middle and high income households was close to 700 ml or about 3.5 cups per day (Table 3). There were no significant differences in the average amounts of milk consumed by this age group across the household income categories. Thus, regardless of household income, children aged 1-3 years daily consumed milk that exceeded the amounts recommended by the MOH [5].

Table 3 shows that children aged 1-3 years obtained about 50-63% of their requirement for energy from milk alone, depending on the household income category. It is also noted that the amount of fat derived from milk is about 50-80% depending on income category. Based on the average quantity of milk taken, the daily intake of protein, vitamin D, calcium, iron, vitamins B1 and B2 exceeded the recommended levels for ages 1-3 years. This result was evident for all household income levels.

	RNI *	Low Income (n= 63)			Middle Income (n= 53)			High Income (n= 48)		
		Mean	95% CI		Mean	95% CI		Mean	95% CI	
Milk intake (ml/day)		692.5	563.0	821.9	699.6	589.6	809.5	686.1	561.8	810.5
Energy (kcal)	male 980 kcal female 901 kcal	539.07	454.46	623.68	592.42	494.96	689.89	474.38	395.31	553.46
Protein (g)	17 g	18.63	15.42	21.84	21.06	17.70	24.42	18.15	14.86	21.44
Fat (g)	male 27-38 g female 25-35 g	19.37	15.78	22.97	19.72	16.36	23.07	17.12	13.92	20.32
Vitamin D (µg)	5 µg	6.52	5.10	7.95	7.95	331.91	501.96	4.72	3.77	5.68
Thiamin (mg)	0.5 mg	0.53	0.42	0.64	0.64	4.69	7.07	0.49	0.35	0.63
Riboflavin (mg)	0.5 mg	0.69	0.52	0.86	0.86	0.40	0.72	0.68	0.48	0.88
Calcium (mg)	500 mg	640.58	531.65	749.51	749.51	607.50	856.55	647.25	528.98	765.52
Iron (mg)	6 mg	6.16	4.66	7.66	7.66	5.30	8.44	5.27	3.99	6.55

* Recommended Nutrient Intake for Malaysia for ages 1-3 years (NCCFN, MOH 2005)
 There were no significant differences in the mean intakes of energy and nutrients shown among the children aged 1-3 years from different household monthly income categories.

Table 3: Energy and nutrients from mean daily intake of milk by 1-3 years according to household Income (N=164)

4-6 years

As mentioned above, children aged 4-6 years consumed averagely 1.9-2.4 cups daily, which is within the MOH recommendation of 2-3 cups a day [5]. When compared by household income levels however, the mean amounts of milk taken varied noticeably. Children from the low income households consumed 347.6 ml (265.5, 429.6) daily on average, which is significantly less than that consumed by those from the high income group (530.2 ml; 406.7, 653.7) (Table 4). Consequently, children from the high income category had intakes of energy, protein, fat and calcium that were significantly higher than those from the low income households. Nonetheless, unlike the age group of 1-3 years, milk intake alone does not meet the daily requirements of the 4-6 years-old for energy or any of the nutrients shown in Table 4.

	RNI *	Low Income (n= 64)			Middle Income (n= 79)			High Income (n= 74)		
		Mean	95% CI		Mean	95% CI		Mean	95% CI	
Milk intake (ml/day)		347.6 ^a	265.5	429.6	419.7	346.0	493.5	530.2 ^a	406.7	653.7
Energy (kcal)	male 1340 kcal female 1290 kcal	185.52 ^a	137.93	233.12	217.92	174.19	261.64	293.13 ^a	239.44	346.82
Protein (g)	23 g	6.50 ^a	4.84	8.17	7.83 ^b	6.24	9.41	10.87 ^{ab}	8.79	12.95
Fat (g)	male 30-45 g female 29-43 g	5.90 ^a	4.39	7.40	7.11 ^b	5.64	8.58	10.57 ^{ab}	8.44	12.71
Vitamin D (µg)	5 µg	1.90	1.35	2.45	1.60	1.18	2.01	2.58	1.80	3.36
Thiamin (mg)	0.6 mg	0.22	0.16	0.29	0.19	0.13	0.24	0.28	0.20	0.36
Riboflavin (mg)	0.6 mg	0.30	0.14	0.45	0.20 ^a	0.14	0.25	0.41 ^a	0.29	0.54
Calcium (mg)	600 mg	234.51 ^a	174.62	294.40	285.49 ^a	226.09	344.88	404.06 ^{ab}	324.59	483.53
Iron (mg)	6 mg	2.30	1.62	2.99	2.35	1.72	2.98	2.91	2.10	3.73

* Recommended Nutrient Intake for Malaysia for ages 4-6 years (NCCFN, MOH 2005)

Mean intake values with the same alphabet in the same row indicates significant differences among the household income categories, significance at p level <0.05

Table 4: Energy and nutrients from mean daily intake of milk by 4-6 years according to household Income (n=217)

7-10 years

The average amounts of milk consumed by this age group varied significantly between the low income (132 ml; 89.7, 174.5) and high income households (272 ml; 218.9, 324.9) (Table 5). As a result, the 7-10 years-old reportedly consumed significantly higher amounts of energy, protein, fat, vitamin D, vitamin B1 and vitamin D from milk alone than those from the low income households.

	RNI *	Low Income (n= 64)			Middle Income (n= 79)			High Income (n= 74)		
		Mean	95% CI		Mean	95% CI		Mean	95% CI	
Milk intake (ml/day)		132.1 ^a	89.7	174.5	214.2	175.9	252.4	271.9 ^a	218.9	324.9
Energy (kcal)	male 1780 kcal female 1590 kcal	62.45 ^a	39.51	85.38	109.07	85.74	132.40	138.63 ^a	110.06	167.20
Protein (g)	32 g	2.25 ^{ab}	1.40	3.09	4.43 ^a	3.48	5.38	5.45 ^b	4.38	6.52
Fat (g)	male 40-59 g female 35-53 g	2.29 ^a	1.38	3.20	3.97	3.14	4.81	4.86 ^a	3.86	5.85
Vitamin D (µg)	5 µg	0.40 ^a	0.16	0.63	0.59 ^b	0.35	0.82	1.27 ^{ab}	0.85	1.70
Thiamin (mg)	0.9 mg	0.05 ^a	0.02	0.07	0.06 ^b	0.04	0.09	0.14 ^{ab}	0.08	0.19
Riboflavin (mg)	0.9 mg	0.07	0.03	0.11	0.09	0.06	0.13	0.15	0.10	0.20
Calcium (mg)	700 mg	89.76 ^a	54.88	124.64	162.66	127.52	197.81	200.46 ^a	161.80	239.12
Iron (mg)	9 mg	0.66	0.29	1.03	0.78	0.46	1.11	1.34	0.91	1.78

* Recommended Nutrient Intake for Malaysia for ages 4-6 years (NCCFN, MOH 2005)

Mean intake values with the same alphabet in the same row indicates significant differences among the household income categories, significance at p level <0.05

Table 5: Energy and nutrients from mean daily intake of milk by 7-10 years according to household Income (N=233) Low Income (n= 45)

Discussion

This study revealed some noteworthy aspects about milk drinking habits of Malaysian urban young children not previously reported. First, children aged 1-3 years are reportedly consuming milk in excess of the amounts recommended by the Ministry of Health, Malaysia. This age group, on average, drank almost 700 ml or 3.5 cups of milk a day, which exceeds the recommended 2-3 cups a day (200ml/cup). Countries around the world recommend the equivalent of 1-2 cups a day, with the exception of Singapore which recommends 750 ml or 3.5 cups a day for ages 1-2 years.

Concern for excess reliance on milk alone is the lack of dietary diversity. There is much evidence world-wide showing the close association between dietary diversity and optimal nutritional status of young children. In Bangladesh, low dietary diversity was a significant indicator of micronutrient deficiencies and child malnutrition [13]. Similar reports of the close association between indicators of dietary diversity and adequacy intake of micronutrients of young children have been established in the Philippines, Cambodia and Nepal [14,15]. Young children are undergoing rapid growth and have a high requirement for the right mix of energy, macro and micronutrients.

As the majority of the young children favored full fat milk, the extra calories that they are getting from the milk they are drinking could lead to weight gain. This is a concern as childhood obesity is on the rise in Malaysia especially in urban areas. In the 1990s, a survey of almost 6,000 children aged 8-12 years from schools in Kuala Lumpur city in Malaysia reported overweight in 7.7% of the children sexes combined [16]. A study conducted in 2010- 2011 of over 3,400 urban children aged 1-12 years in Peninsular Malaysia reported a prevalence of 9.7 % overweight and 12.7% obese sexes combined [17].

Since 2005, both the American Academy of Pediatrics (AAP) and the American Heart Association (AHA) recommended that children drink low-fat milk or skim milk after age two [18]. While findings remain inconsistent on the association of milk intake and body weight increase [19], it is worthwhile to inform parents, especially those with overweight children or family history of obesity, that low-fat or skim milk provides the essential nutrients as full fat milk, but with less total fat, saturated fat, cholesterol and calories.

The high protein intake of the 1-3 years old from milk alone, exceeding the recommended daily intake of MOH, is a matter of concern in light of findings that relate high protein intake at infancy and early childhood with higher body fat and obesity in the first two years of life [20], and in later childhood [21, 22]. The hypothesis of adverse early high protein intake is linked to an increased secretion of insulin and insulin growth factor I triggering the multiplication and differentiation of pre-adipocytes [23].

The finding that the older children (7-10 years) are not consuming sufficient milk may also be a point of concern, especially if they are not getting enough calcium and other nutrients from other food sources essential for bone accretion during puberty. Puberty growth spurt is an important time for getting adequate nutrients to build peak bone mass. This is to protect against fracture risk in childhood and later in life [24].

Conclusion

The popularity of milk among young children in Malaysia may be attributed to the School Milk Programme introduced in 1985, as part of the government's initiative to encourage milk drinking amongst children. Plain or flavored milk (packs of 125 ml) are distributed free of charge three times a week during school days to primary school children aged 6-12 years from low income families. By 2011, the School Milk Programme was reaching out to more than 1.5 million pupils in 8,000 primary schools at a cost of [1] RM375 million [25].

As evidence here showed Malaysian urban children aged 1-3 years consuming milk in excess of the recommendation of the MOH, parents should be advised on the nutritional importance of providing their children with foods from a wide variety of sources, so that their children obtain the right balance and mix of nutrients for optimum growth and development. In contrast, the older children of 7-10 years on average consumed milk below the recommended amounts, and thus should be encouraged to increase their intake of dairy products and foods rich in nutrients essential for meeting bone mass demands during puberty.

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