

# Prevalence and characterization of supplement use among healthy children and adolescents in an urban Japanese city

Nagisa Mori, Masaru Kubota\*, Shoko Hamada, Ayako Nagai

Department of Human Life and Environment, Nara Women's University, Nara, Japan;  
\*Corresponding Author: [masaru\\_kubota@chime.ocn.ne.jp](mailto:masaru_kubota@chime.ocn.ne.jp)

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## ABSTRACT

Although there are numerous studies on the use of supplements in children and adolescents from western countries, only a small number of studies have been conducted in Asian countries. This study was planned to determine the use of supplements and their association with lifestyles in healthy Japanese children and adolescents. This is a community-based cross-sectional study conducted in a Japanese urban city, Nara, in 2008. A total of 681 children and adolescents aged between 3 and 17 years were enrolled. The parents were asked to complete a questionnaire on the use of supplements among their children. Demographic information, health and nutrition status of children as perceived by parents, sleep duration, and a family history of supplement use were also collected. A total of 20.4% of children and adolescents are presently using (in the past one month) or have used (in the past one year excluding the past one month) supplements. The types of supplements most commonly used were minerals, followed by vitamins and blueberry extracts. Univariate analysis indicated that supplement use was associated with older age, poor perception of health status, shorter sleep duration, and a positive family history of supplement use. Multiple logistic regression analysis showed that age and a positive family history affected supplement use. Given the approximately 20% of prevalence of supplement use in Japanese children and adolescents, there is a need for further research to examine the supplements' effectiveness and safety.

**Keywords:** Supplement; Child; Adolescence; Japan; Lifestyle

## 1. INTRODUCTION

The use of supplements is expanding rapidly because of a growing worldwide awareness of health promotion [1]. The actual prevalence of supplement use differs greatly from country to country, presumably due to the diversity of cultural, nutritional, and economic conditions. A series of nationwide surveys in the United States indicated that the rates of supplement use in adults aged 18 years or older ranged from 32 to 52% [2-5]. In European [6,7] and Asian [8,9] countries, the reported rates were lower, *i.e.* approximately between 15 and 30%. These reports have also identified the characteristics of supplement users from cultural, economic, and nutritional points of view. In contrast, little is known about the prevalence of supplement use in children and adolescents except in the United States, where as high as approximately 30-50% of children and adolescents have been reported to use supplements [10-13]. Small cohort studies from Europe showed that the frequencies of supplement use were 25.8% for German children and adolescents [14], and 37-50% for Finnish children aged 2 and 3 years [15]. The only comprehensive report on supplement use in children in Asian countries, as far as we know, was the investigation carried out by the National Institute of Health and Nutrition in Japan, which found that 15% of preschool children used supplements [16]. However, this survey only targeted preschool children. Therefore, the purpose of the present study is to determine the prevalence of supplement use in healthy Japanese children and adolescents, and to consider the relationships between supplement use and demographic and lifestyle factors.

## 2. MATERIALS AND METHODS

### 2.1. Study Design and Subjects

This study was done in Nara city from April to May in 2008. Nara is an urban city in Japan with a population of

approximately 370,000. Among them, the approximate population of children and adolescents aged between 3 and 17 years was 45,000. The request for participation in the present study was first sent to several kindergartens or schools nearby. After obtaining consent by the principal, enrolled kindergartens or schools were decided by random selection. The questionnaire that we devised for the present study was distributed to the parents of the participants through their kindergartens or schools. The parents were then asked to complete the questionnaire at home. A "supplement" was defined as a preparation that provides various kinds of food substances in the form of either tablet, capsule, powder, liquid or jelly [17]. 975 questionnaires were distributed, and responses were obtained from 736 parents (recovery rate: 75.5%). After responses with incomplete answers or those involving reported supplements that did not meet the definition given above, such as the over-the-counter medicines, were excluded, a total of 681 children and adolescents aged between 3 and 17 years were available for analysis. These included 142 preschool children (3-6 years), 125 students in the 4<sup>th</sup> grade (9-10 years) and 109 students in the 6<sup>th</sup> grade of elementary school (11-12 years), and 180 students in the 3<sup>rd</sup> grade (14-15 years), and 125 in the 2<sup>nd</sup> grade of senior high school (16-17 years). There were 326 males and 355 females. We obtained consent from all parents beforehand to use their children's data in our study. This project was approved by the ethical and epidemiological committee at Nara Women's University.

## 2.2. Questionnaire

First, it was asked whether the child was given any type of supplement in the past one month (present use) or the past one year excluding the past one month (past use). Also, data on types of used supplements, and the family history of supplement use were collected. Demographic features, parents' perceptions of children's health status and balance of diet, and average sleep hours per day in the past one month were requested.

## 2.3. Statistics

Difference in supplement use according to age was examined by one-way analysis of variance (ANOVA). After the present and past users were combined into total users, the association of supplement use with demographic features and various lifestyle elements was evaluated; the chi-square test was used to determine associations with sex and family history, and the Kruskal-Wallis test was used for age, health status, balance of diet, and sleep hours. Multiple logistic regression analysis for prediction of children's supplement use was performed by including variables of age, gender, health

status, food status, sleep hours, and family history of supplement use. In the analysis, age and sleep hours were categorized as indicated in Table 2. A statistical analysis was made using "StatMate III" (ATMS, Tokyo, Japan). P values less than 0.05 were considered significant.

## 3. RESULTS

### 3.1. Supplement Use

**Table 1** indicates the numbers of samples and supplement users in relation to the age of the participants. A total of 139 children (20.4 %) had experience using supplements, including 72 (10.6%) present users, and 67 (9.8%) past users. In addition, the prevalence of total users tended to increase with an increase of age ( $p < 0.001$ ). There was no gender difference between supplement users and non-users.

### 3.2. Association of Supplement Use with Demographic Features and Lifestyles

Univariate analysis indicated that supplement use was associated with age, health status, sleep duration, and family history. However, multiple logistic regression analysis revealed that only age and family history of supplement use were associated with supplement use (**Table 2**).

### 3.3. Types of Used Supplements

The types of supplement most frequently used were minerals including iron, calcium, and zinc 54 (37%), followed by vitamins including multi-vitamins, vitamin B and vitamin C 42 (29%), and blueberry extracts 23 (16%) (**Figure 1**). As far as side effects were concerned, only one case with a rash after receiving blueberry extracts was reported.

**Table 1.** Numbers of subjects and supplement users.

Age	Total number	Supplement user		Total
		Present	Past	
4-6 yr	142	4 (2.8%)	7 (4.9%)	11 (7.7%)
9-10 yr	125	7 (5.6%)	10 (8.0%)	17 (13.6%)
11-12 yr	109	16 (14.7%)	4 (3.7%)	20 (18.3%)
14-15 yr	180	27 (15.0%)	32 (17.8%)	59 (32.8%)
16-17 yr	125	18 (14.4%)	14 (11.2%)	32 (25.6%)
Total	681	72 (10.6%)	67 (9.8%)	139 (20.4%)

**Table 2.** Association between supplement use and demographic or lifestyle factors.

	Supplement use			p value	$\beta$ coefficient [95%CI]#	p value
	Number	(-)	(+)			
Total number (%)	681	542 (79.6)	139 (20.4)			
Gender				0.78	0.29 [-0.12~0.72]	0.17
Male	326 (47.9)§	258 (47.6)	68 (48.9)			
Female	355 (52.1)	284 (52.4)	71 (51.1)			
Age				<0.001*	0.11 [0.03~0.19]	<0.01
3-6 yr	141 (20.7)	133 (24.5)	8 (5.8)			
9-10 yr	125 (18.4)	108 (19.9)	17 (12.2)			
11-12 yr	109 (16.0)	88 (16.2)	21 (15.1)			
14-15 yr	180 (26.4)	121 (22.3)	59 (42.4)			
16-17 yr	126 (18.5)	92 (17.1)	34 (24.5)			
Health status				<0.01**	0.15 [-0.21~0.52]	0.41
Good	485 (71.2)	401 (74.0)	84 (60.4)			
Moderate	169 (24.8)	119 (21.9)	50 (36.0)			
Poor	27 (4.0)	22 (4.1)	5 (3.6)			
Sleep duration				<0.001**	0.28 [-0.61~0.04]	0.08
< 6 hrs/day	46 (6.8)	29 (5.4)	17 (12.2)			
6 to < 7 hrs/day	216 (31.7)	154 (28.4)	62 (44.6)			
7 to < 8 hrs/day	185 (27.2)	148 (27.3)	37 (26.6)			
8 hrs/day $\leq$	234 (34.3)	211 (38.9)	23 (16.6)			
Balance of diet				0.11	0.35 [-0.03~0.72]	0.07
Good	334 (49.0)	275 (50.7)	59 (42.4)			
Moderate	325 (47.7)	249 (45.9)	76 (54.7)			
Poor	22 (3.3)	18 (3.4)	4 (2.9)			
Family history of supplement use				<0.001**	1.94 [1.46~2.42]	<0.001
Negative	351 (51.5)	326 (60.1)	25 (18.0)			
Positive	330 (48.5)	216 (39.9)	114 (82.0)			

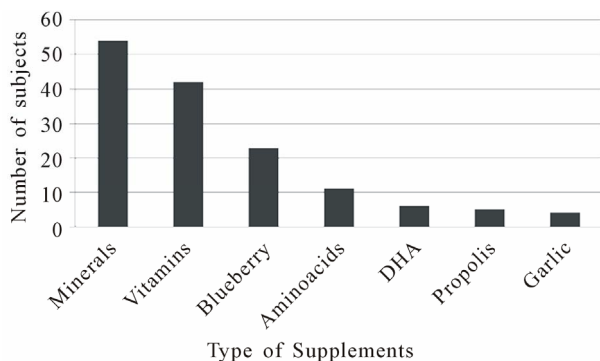
§ Numbers in parentheses indicate percentages. \*Chi-square test. \*\*Kruskal-Wallis test. # Logistic analysis.

#### 4. DISCUSSION

Complementary and alternative medicine has become popular throughout developed countries as the public's health awareness has increased [18]. Supplements belonging to the category of functional foods play a central role in alternative and complementary medicine [18,19]. Although functional foods or supplements have not been fully defined, these compounds are thought to beneficially affect various functions in the body and to bring

about an improvement of health or well-being [19]. Therefore, the purposes of their use are twofold: 1) the promotion or maintenance of health status, and 2) the treatment of certain disorders related to shortages of specific nutrients, especially in developing countries.

There have been numerous studies on the prevalence of supplement use in healthy adult populations. The results of surveys differ depending upon the definition of supplements, time of studies, and methods of surveys. In addition, the regulation of health claims by official



**Figure 1.** Types of supplements used in the present study. Multiple answers were allowed. Bars indicate the total number of each supplement users. Minerals included multi-minerals, calcium, iron and zinc. Vitamins included multi-vitamins, vitamin A, vitamin D, and ascorbic acid.

organization should be taken into consideration. In Japan, for example, supplement-type foods are not allowed to present health claims except “food with nutrient function claims”. In the United States, however, health claims are well regulated by the Food and Drug Administration through provisions of the Food, Drug, and Cosmetic Act. Such difference may have an effect on the attitude of supplement consumers [20]. In the United States, a series of National Health and Nutrition Examination Survey (NHANES) demonstrated that the prevalence of supplement use in adults in the past two decades has ranged from 32.4 to 52% [2,4,5]. There is a slight increasing trend with time. In these reports, supplement use was mainly investigated in adults aged 18 years and over during the past one month. Surveys from other countries have reported lower prevalence: 22% for men and 33% for women in Sweden [7], 11% for men and 16.4% for women in Japan [8], and 21.8% for men and 32% for women in Korea [9]. Notably, these reports involved older populations or different observation periods. In spite of the difference in prevalence found among the surveys, these surveys have postulated that similar demographic or lifestyle factors can be used for predicting supplement use. Female gender, older age, higher education, higher income, and good self-reported health were found to be associated with higher use of supplements [2-9]. Association of positive lifestyle factors with supplement use is regarded to reflect the characteristics of supplement users [21].

An earlier study by Kovar in 1981 demonstrated that 36% of children aged less than 18 years used vitamin or mineral supplements within the past two weeks [22]. Subsequent studies in the United States involving subjects of almost the same age group have shown similar prevalence rates of 31.8-34% [12,13]. These values were

not very different from those of European reports [14,15]. In a recent Japanese study targeting preschool children, the rate of supplement use was 15% [16]. Demographic or lifestyle factors associated with supplement use in children were consistent with those in adults. However, no gender difference was found in most studies [12, 14-16]. In addition, a positive family history of supplement use, especially supplement use by the mother, had an influence on children’s use [10,16,23].

Our study is, as far as we know, the first cross-sectional study involving children aged 3-17 years in an Asian country. The overall prevalence of supplement use was 20.4% which was slightly higher than that found in the report by Sato *et al.* [16]. The difference is presumably due to the age of the subjects. Older age and a positive family history were associated with higher supplement use. Notably, a good lifestyle and a balanced diet, even if these were determined only according to the parent’s perception, were found to be not associated with supplement use. Types of supplements commonly used in this study were minerals and vitamins. This finding is consistent with previous studies in children and adolescents [10-16]. Third-ranked supplement, blueberry extracts, is thought to be specific to Japan. The reason for its wide use is presumably the expectation that it has an effect on visual acuity as advertised through mass media [24], since the percentage of myopia in students is high in Japan [25]. Concerning adverse effects, Timbo *et al* reported that 4% of supplement users experienced adverse effects [26], but only one case was reported in this study.

There are several weaknesses in the present study. First, generalization of our results as the representative of children and adolescents in Japan should be careful because of the limited number of subjects. Second, the parent’s ability to accurately differentiate various supplements was quite uncertain. In order to minimize this problem, a direct interview method should be introduced. Finally, important information about home income and parent’s education level was not included. We omitted such questions because we were afraid that including them would cause a decrease in the response rate [16]. In spite of these weaknesses, we believe our present study to be important for understanding the present status of supplement use in children and adolescents, and in establishing future plans of supplement use. Majority of supplement users expect to receive adequate information about the supplements they are using, expect the participation of the authorities and the safety of supplement [27]. For these purposes, the future involvement of professionals such as doctors, dietitians, co-medical staffs, nutrition representatives as advisers of supplement use is necessary.

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