

## Factors Influencing the Consumption of Calcium-Rich Foods among Adolescents

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### Abstract

The purpose of this study was to identify factors influencing the consumption of calcium-rich foods among adolescents. A total of 96 adolescents divided into twelve focus groups were investigated during April to May 2000 in Busan. Focus group discussions were audio-taped, transcribed and analyzed using a grounded theory approach. Key factors influencing the consumption of calcium-rich foods were taste, food type, body image, and family. Motivators among the factors were taste, food type, body image, health, family and perception, and barriers were taste, food type, location, friends, price, weather and lactose intolerance. Taste, food type, location and weather were found to be both motivators and barriers of consumption of calcium-rich foods according to circumstances. Some of these factors varied in importance by gender and age. Younger adolescents were more strongly influenced by taste and family than older ones. Older adolescents were strongly influenced by body image, convenience and perception. These findings could be used as a guideline for adolescents to consume calcium-rich foods.

**Key words:** calcium-rich foods, adolescents, consumption, factors

### INTRODUCTION

In recent years, calcium has been identified as a nutrient of potential concern for adolescents. Achieving a high value for peak bone mass is thought to protect against bone loss and the development of osteoporosis later in life (1), and acquisition of bone mineral density proceeds rapidly during adolescence (2,3). Calcium intake during adolescence is critical to develop adequate bone mass to prevent or minimize future bone fracture risk (4). However, calcium intake of adolescents is well below recommended values (5-9). Adolescents in our country also appear to be at high risk for low dietary calcium intake (10), but there is little data to assist our adolescents in increasing dietary calcium intake even though there is some data from studies conducted in foreign countries (7-9,11). So, it is necessary to identify factors that influence the consumption of calcium-rich foods among adolescents in our country.

Many factors are thought to influence behavior, including cognitive, personal, and environmental factors (12). Important personal factors for youth include knowledge about health, value placed on health, and self-efficacy, cognitive factors include incentives and reinforcement and environmental factors include parental influence and support, cultural norms and expectations, opportunities and barriers, and peer and adult role mo-

dels (13). Associative conditioning also influences food behavior. In other words, association of foods' sensory characteristics with physiologic consequences and with social context influences foods selected (14). The factors influencing the intake of calcium-rich foods among Asian adolescents in Hawaii were parents' encouragement, food association, body image and hot weather. Hot weather was a particularly important factor for girls (11).

Focus group interviews, one type of qualitative research methodology, have recently received attention in the field of nutrition research. The qualitative research methodology provides more in-depth information that might not be obtained from the quantitative research method. The focus group interview is a qualitative data-gathering technique in which eight to twelve subjects (15,16), who are representative of the intended audience (17), are brought together to discuss the topics introduced by a trained investigator (18). The goal of focus group interview is to stimulate discussion among group members that will enable researchers to gain insights from the participants' knowledge and experience (15). Group interviews are descriptive, focusing on words rather than on numbers. They describe the "what" and "why" of a problem, placing emphasis on the quality of the responses rather than on their ability to be quantified (19).

Grounded theory was selected as an appropriate analytic methodology for this study. Grounded theory is

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a highly systematic research approach for the collection and analysis of qualitative data for the purpose of generating explanatory theory that furthers the understanding of social and psychological aspects of human behavior (20). The objective of grounded theory is the development of theory that explains basic patterns common in social life. Like most forms of qualitative research, grounded theory makes its greatest contribution in areas in which little research has been done (21).

The objective of this research was to identify factors influencing the consumption of calcium-rich foods among adolescents in our country using focus group interview and grounded theory approach methodology.

## SUBJECTS AND METHODS

### Subjects and focus group interviews

Each focus group had 7 to 9 subjects and 12 focus groups totaling 96 adolescents participated in this study. The study was carried out in April to May 2000 in Busan, Korea. The subjects were assigned to each group according to age or gender. The younger group contained 48 6th grade students from three different elementary schools (24 boys and 24 girls), and the older group consisted of 48 10th grade students from six different high schools (24 boys and 24 girls). Therefore, six groups of boys (three of them aged 12, 13 and three of them aged 16, 17) and six groups of girls (three were 12, 13 years old and the rest of them were 16, 17 years old) were in the focus group.

Focus group interviews were performed in a quiet classroom at each school. Before conducting discussions, the investigator explained the purpose of the focus group interviews and got permission for audio-recording. Each session lasted for an hour and a half on the average. Focus group interviews were led by trained investigators, following the method suggested by Krueger (22). The investigators developed an interview guide (Table 1) based on the literature available (7,9,23). The interview guide included questions eliciting what influenced consumption of calcium rich foods, usual eating and drinking habits, amount of milk usually drunk, description of milk and milk products. The investigators made notes during discussions.

### Data collection and analysis

Data was completely transcribed based on notes and tape-recordings after focus group interviewing and the results were summarized by focus group, then by age or gender. A grounded theory approach was used for data analysis (24,25). The first step of data reduction was to identify salient themes, recurring ideas or language, and patterns of beliefs. Within these categories, the use of

**Table 1.** Questions for focus group sessions

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<b>A. Consumption and description of calcium-rich foods</b>
1. How would you describe calcium-rich foods?
2. What influences your intake of the calcium-rich foods?
3. What would get you to eat more of these calcium rich foods?
<b>B. Usual eating and drinking habits</b>
1. What do you usually eat and drink?
2. What influences that choice?
3. What do your friends usually eat and drink?
4. What do members of your family usually eat and drink?
<b>C. About milk and milk products</b>
1. How about milk and milk products?
2. There are different types of milk and milk products, what types are available?
3. What are some reasons why you might choose milk and milk products?
<b>D. Amount of milk usually drunk</b>
1. How much milk do you drink a day?
2. How much milk do you drink now compared to when you were in 6th grade?
3. Why do you think boys drink more milk than girls?

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qualifiers and adjectives, the context of the statements, and the consistency of responses by individuals and agreement by the group was noted. Finally, there was an integration of categories across the focus groups to identify overall themes and relationships. These themes were identified as factors influencing the consumption of calcium-rich foods.

## RESULTS AND DISCUSSION

### General characteristics of subjects

General characteristics of subjects who participated in the focus group interviews are presented in Table 2. Mean ages of subjects were 13 years old for the younger groups and 17 years old for the older groups. Mean height and weight were 151.8 cm, 41.8 kg for the younger girl group, 149.6 cm, 41.5 kg for the younger boy group, 159.7 cm, 51.4 kg for the older girl group and 171.7 cm, 61.3 kg for the older boy group, respectively, which were similar to the Korean standard for adolescents of each age and gender (10,26). Mean body mass index (BMI) of subjects by group were the range of 18.3~20.9 and most of subjects were healthy according to their BMI.

### Motivators influencing the consumption of calcium-rich foods

Table 3 shows motivators influencing the consumption of calcium-rich foods among adolescents. The motivators are taste, food type, body image, health, perception, family, convenience, location and weather. Taste of food was found to be the major factor in determining calcium consumption among adolescents. It turned out to be that

**Table 2.** General characteristics of subjects

Characteristics	Girls		Boys	
	Younger <sup>1)</sup> (n=24)	Older (n=24)	Younger (n=24)	Older (n=24)
Mean age (yr)	12.8±0.6 <sup>2)</sup>	16.9±0.4	12.9±0.3	16.9±0.4
Weight (kg)	41.8±9.9	51.4±3.9	41.5±8.6	61.3±7.4
Height (cm)	151.8±7.4	159.7±3.8	149.6±8.6	171.7±4.9
Body Mass Index (BMI, kg/m <sup>2</sup> )	18.3±3.1	20.3±1.6	18.8±2.4	20.9±1.6

<sup>1)</sup>Younger = Age 12~13 yr; Older = Age 16~17 yr

<sup>2)</sup>Mean ± SD.

**Table 3.** Motivators to consuming calcium-rich foods among adolescents

Major factors	Motivators
Taste	I eat toasted and seasoned laver often because it is tasty.
Food type	I usually don't eat cheese, but I love eating pizza with cheese topping on it.
Body image	I only drink milk because I wish to be taller, though I don't enjoy drinking it at all.
Health	I do drink milk to keep me in good health.
Perception	Anchovy is a little bit gross, but I eat it because I've been hearing it's good for kids.
Family	I couldn't eat soup made with bones at first, but my mom said it was good for health and made me try it once, so I did. Now I like to eat the soup.
Convenience	I drink milk in the morning because I have no time for breakfast.
Location	When I was in elementary school, I spent more time at home and thus had more chance to drink milk.
Weather	I like ice-cream when it gets hot.

adolescents were less likely to consume plain milk than flavored milk such as banana and chocolate milk. "I like milk because of its richness." "It tastes better if you add Nestle to milk." "I do drink plain milk, but I prefer banana milk because it just tastes better." Not only milk but the taste of other calcium-rich foods also played a key role in determining the pattern of calcium intake. "Yogurt is delicious." "I eat toasted and seasoned laver often because it is tasty." "I like soup made with bones. It is savoury." "Tofu tastes neat and I like it." As shown in a quotation, the taste of calcium-rich foods including dried anchovy, fish cake, tofu, and soup made with bones as well as flavored milk was the major determinant factor in calcium intake.

Most adolescents talked to intake the calcium foods in their diet, if they could be given foods which were matched with calcium-rich food like bread and milk, for example. The bread here was the very reason for adolescents to consume calcium-rich food such as milk. This food type was a key factor in motivating young people with increased calcium consumption. "I like eating cereal with milk." "Eating dried anchovy dipped in hot pepper paste is better than any other cuisine." "I usually don't eat cheese, but I love eating pizza with cheese topping on it. That feels really chewy." "I hate tofu, but I like to eat it cooked in bean-paste stew." "I like eating seaweed-wrap with dipping sauce, though I don't eat that seaweed by itself." As appears in these testimonies, most young people didn't favor dried anchovy due to its distinctive fish smell. However, they said that it was better than any

cuisine if prepared with hot pepper paste. This study clearly showed that it was, in fact, to find the right way of presenting calcium enriched food to provide this selection of food to younger population. By doing so, we could encourage them with their calcium consumption, without forcing them to eat more.

Body image and health were also key motivators behind the consumption of calcium-rich foods. Self-body image and consciousness of health turned out to be also a key factor in motivating young people with increased calcium consumption. The adolescent population in Korea was specially concerned with being tall, and this, as they say, was what motivated them to drink more milk than they actually would. "I drink milk because I want to be tall." "As I reach puberty, I have become very conscious of my health especially being tall, so I drink milk a lot these days." "I eat soup made with bones a lot, which helps me grow tall." Also they said milk was an affordable wholesome food and specially good for people on a diet because it didn't make them fat. "I think milk is the most affordable wholesome food to build myself up." "I keep drinking milk while I am on a diet because it's rich in nutrients yet I can stay slim." Besides milk and dairy products, they said they enjoy eating soup made with bones, another calcium rich food, for their bone strength. "I eat the soup made with bones because it's good for bone growth." Such responses revealed that body image and health were the main reasons for people to consume these kinds of foods.

Another important motivator in food choices was the

adolescent's perception of the food. That was how the food would affect their bodies. "I drink milk because I think it's very nutritious." "I would rather not drink milk as often if I think it isn't good for my body." As indicated in these interviews, perception of food such as milk not the taste of it was what encourages adolescents in its consumption. "Anchovy is a little bit gross, but I eat it because I've been hearing it's good for kids." As shown above, a correct understanding of calcium-rich foods was a main motivator toward consumption of such foods as people tended to choose to eat based upon their wholesomeness regardless of tastes. "I eat yogurt because I've been told it's good for your intestines." "I have not been told that yogurt makes you grow tall though it is good in taste." Few adolescents considered yogurt and seaweed as a good source of calcium, which also contributed to their growth, and it was necessary to educate them with a correct understanding of these foods. Therefore, to educate adolescents with information about varieties of calcium-rich foods as well as their health promoting effects will lead to an increase in calcium consumption among them.

Among other motivators, feedback from family was also considered an important influence to take calcium rich foods. Adolescents were better encouraged to consume calcium rich foods when they were constantly reminded by their parents to drink milk. "When I wake up in the morning, my mom makes me drink a glass of milk." "My father said that milk is good to prevent osteoporosis." "My sister, who used to drink milk a lot, is tall. So I try to drink it a lot to become like her." "My mom often cooks seaweed soup because she likes it, and now I like it too." "I couldn't eat soup made with bones at first, but my mom said it was good for health and made me try once, so I did. Now I like to eat the soup very much."

Convenience was one of the other motivators for encouraging adolescents to consume calcium rich foods. They found it convenient that milk or any dairy products could be a substitute for meals when they had little time for breakfast or working mother. Also milk and dairy foods were considered as a good night-snack. "I drink milk

in the morning because I have no time for breakfast." "My mother goes to work, so I simply drink milk with a piece of bread." "If I get hungry a little bit at night, then I drink milk before going to bed." "Unlike other fishes, I like eating anchovies because I don't need to bone the fish and it's easy to eat."

Location could also be a motivator in consumption of calcium rich foods. "I can always drink milk at home." "When I was in elementary school, I spent more time at home, and thus had more chance to drink milk." "We have toasted and seasoned laver always available on the table in the kitchen." "I can find packs of yogurt in the refrigerator all the time." "I eat cooked anchovies and toasted and seasoned laver as often as I want rather at home than at school, where I tend to eat them rarely."

Weather was considered as one of the motivators of food choices by adolescents. They preferred ice cream in hot weather and hot cocoa milk in the cold season. "I like ice cream when it gets hot, it's cool and tasty." "In winter, I like to drink cocoa milk." They also seemed to enjoy fish cakes often in winter. "Skewered fish cakes at a snack bar is really good in winter time." "In winter I often eat stir-cooked rice cakes in hot pepper sauce mixed with fish cakes, which happens to be my favorite." Media, however, had little influence on adolescents selecting calcium-rich foods. "I don't see much difference in TV commercials of different products. I drink milk regardless of its advertising." "I drink milk whatever it is." "I don't remember a particular milk brand." "Sometimes I try milk that I remember from the advertisement, but most of the time I choose for its taste."

#### Barriers influencing the consumption of calcium-rich foods

The barriers for choosing calcium-rich foods were taste, food type, location, friends, price, weather and lactose intolerance (Table 4). Taste, food type, location and weather factors could be both motivators and barriers influencing the consumption of calcium-rich foods (Table 5). Taste of calcium-rich foods was one of the main barriers for the youths to avoid such foods, specially like plain

**Table 4.** Barriers to consuming calcium-rich foods among adolescents

Major factors	Barriers
Taste	I don't like plain milk because it has its own distinctive smell and is too rich.
Food type	Hamburg always goes well with soda. It tastes good as well as you digest better if you eat greasy foods with soda.
Location	I drink soda at fast food restaurants since there are no choices.
Friends	When I buy something to drink, I choose a coke to drink as my friends do.
Price	I like cheeses, but my mom doesn't buy them often because they are expensive.
Weather	I rarely drink milk in summer at school. I keep it warm inside my desk drawer, but then I found it to be spoiled later.
Lactose intolerance	After I drink milk I get a stomachache and need to use the restroom a lot.

**Table 5.** Both motivators and barriers influencing the consumption of calcium-rich foods among adolescents

Major factors	Motivators	Barriers
Taste	I like milk because of its richness.	Anchovies are as bad in taste as they look.
Food type	I hate tofu, but I like to eat it cooked in bean-paste stew.	I drink soda with snacks because it's good that way.
Location	I drink milk very often because it's always available at home.	Soda just comes with a hamburger in fast food restaurant.
Weather	Eating fishcakes in cold weather is the best, its soup is so good.	I don't drink milk in summer, sodas are cool in summer.

milk with no flavors added to it. "I don't like plain milk because it has a milky flavor and is too rich." "Anchovies are as bad in taste as they look. Anchovies are too fishy." "Soup made with bones is too rich." "Beans are thick and tasteless. I feel unpleasant eating them."

It was important for adolescents to have matched foods for consumption of calcium-rich foods, according to the response such as they preferred drinking sodas with fast foods or snacks to milk, "I drink soda with snacks because it's good that way." "Hamburg always goes well with soda. It tastes good as well as you digest better if you eat greasy foods with soda." As mentioned above, adolescents tended to drink sodas as refreshments after eating greasy foods.

Location was also a factor for adolescents to the access of calcium rich foods. Young people preferred drinking sodas at places like fast food chains or school cafeterias. "Soda just comes with a hamburger in fast food restaurant." "There are all kinds of sodas in my school cafeterias. They also carry milk but I don't buy it." "I don't buy milk at school because I drink it at home." Friends could also be an influencing factor on choices of what to drink among adolescents. "Sodas are the most available, and everyone is drinking and so am I." "When I go to a fast food chain with friends, we all would have cokes and we share a bottle of coke." "I drink a 2% since my friend told me that doesn't get me fat."

Price was considered as one of determinants in choosing types of drinks among adolescents by saying that they were intimidated of buying something pricy. "Yogurt is pricy and you don't get much." "I like pizza but they are expensive. So I and my friends chip in our money to order about once a month." "I like soup made with bones but I don't get to eat as often because it's expensive." Weather could limit access to milk consumption as people responded they looked for something cold in summer and warm in winter. "I rarely drink milk in summer at school. I keep it warm inside my desk drawer, but then I found it to be spoiled later." "I drink cold milk in summer but I don't like to drink it warm, it just feels too thick." "I don't drink milk very much in summer. Sodas are cool in summer, but not milk."

Lactose intolerance was a limiting factor for con-

sumption of milk. A few adolescents complained about their physiological discomfort in their gastrointestinal track from drinking milk on some occasions. "I feel uneasy after drinking milk." "I use a restroom a lot for stomach discomfort after I drink milk."

#### Age and gender differences

Younger adolescents tended to be strongly influenced by taste and family. "I prefer banana-flavored milk to plain milk. It simply tastes better." "Yogurt is sweet and good." "My mom makes sure I drink a cup of milk in every morning." "Though I find seaweed rather unpleasant to eat, I eat it because it's good for my health said my dad." "I don't like anchovies, but I have to eat them because my mom pushes me to do so." Like this, younger adolescents showed to have a preference for flavored milk, and they were more likely to be motivated by opinions of their family to eat calcium rich foods than by their own decision upon knowledge.

Older adolescents were strongly influenced by body image, convenience, health, perception and friends. "As I got into puberty and began to be more concerned about my body and being tall, I tried to drink milk a lot more." "While in elementary school, I either gave my milk away to friends or just took that home. But now I try to drink it more often because I want to take good care of my health and be tall as well." "I heard you become stronger when eating anchovies." "I like to eat soup made with bones because it is as healthy as good in taste." As shown above, adolescents played an active role in taking their health as priority over taste when it came to consumption of calcium-rich foods, especially like milk, which was largely consumed for its benefit for health and growing.

Older adolescents preferred foods which were as easy to get and fast to eat. "I just drink milk in the morning because I don't have time to eat breakfast." "I drink milk for a night snack." Milk, therefore, was preferred for it was as easy to get as fast. They also tended to eat small meals for dinner, either ramen or noodle soup. "I usually eat out for dinner with friends, something like noodle or rice rolled in laver, and it's fast." As they spent more time outside of houses with their friends, they were more

likely influenced by their friends. "We do things the same as we spend more time together, such as to decide what to drink. We normally drink sodas." Older adolescents tended to be more effected by decision of their peer group. "It looks cool if I drink a coke, but people would see me as being childish if I drink milk." "I remember drinking milk a lot while in elementary school, now I drink something other than milk." Regardless of its benefit from drinking milk, it was considered to be something childish for drinking of milk. "During elementary school, school had provided us milk so that we were able to drink milk regularly, but now we drink sodas using vending machine at school" As such, older adolescents were less likely to have been exposed to chances in drinking milk.

Unlikely of age, however, it was tended to show little difference by gender in determining consumption of foods that are rich in calcium. Male adolescents partly tended to be more influenced by their body image and health than female adolescents did. "I drink milk because it helps strengthen bone so that I don't get hurt easily and live healthy." For the female adolescents, there had been not a particular factor influencing consumption of calcium-rich foods. Skipping meals by a desire to be thin hinder them for a chance to consume such foods. "I don't feel like eating anything in the morning." "For a healthy diet, I drink low calorie drinks, mostly like 2%." "I was told that you couldn't lose the fat gained from milk drinking, so I abstain from drinking milk for a while." Thus, male adolescents consumed milk in order to be healthier as well as stronger. Unlike male groups, however, female populations idealized thinness, and the negative image of milk that it made them fat caused some females to avoid milk.

As mentioned all above, there were numerous of factors to influence consumption of calcium-rich foods. The factors influencing to consume calcium-rich foods showed similar patterns among adolescents in our country and Asian adolescents in Hawaii except some factors (11). Taste and type of food accompanying the calcium-rich food were key factors influencing common both adolescents at home and Asian adolescents in Hawaii. Media and fattening also were important factors influencing Asian adolescents in Hawaii to consume calcium-rich foods, but the factors exerted little influence on consuming these foods for adolescents in our country.

Recommended Dietary Allowance in calcium intake was about 800~900 mg/day for adolescents in our country. However, they were deficient in actual calcium intake reported as low as about 500~600 mg/day. Especially, consumption of milk, which was one of the best example

of calcium rich foods, was only about 124~189 mL/day (10). Such a fact showed consumption of dairy products was insufficient in comparison to American adolescents whose intake of dairy foods was as high as 44~53% of total calcium consumed (6). Therefore, it is expected to find out factors that might influence consumption of calcium rich foods such as facts shown in results of this study, and help adolescents increase their calcium consumption by promoting them with motivators of foods as well as getting rid of impediments.

That is, adolescents will be more likely to eat calcium rich foods if they have the foods matched with calcium rich foods, and also to drink milk if flavored, and when encouraged by family. It should be reinforced via education programs focusing on the fact that various kinds of calcium-rich foods as well as milk have an effect on health and body image, because health motivation of these adolescents appeared to play a role in encouraging consumption of calcium-rich foods. Towler and Shepherd reported that health was more important than convenience and price (27). Family and peers education programs may be also effective by reason that family and peer could exert an influence on choices of what to eat and drink among adolescents. Larson reported, however, parental forcing of consumption of calcium-rich foods might lead to rebellion and eating disorders (28).

Fast food was an important component of adolescent diets influencing a change in eating habits. Adolescents preferred drinking soda to milk at fast food restaurant. Guenther reported that soft drink use negatively associated with both milk intake and calcium intake in the diets of American teenagers (29). So, menu of calcium-rich food focusing on taste and price will be developed to promote consumption of these foods at fast food restaurants. Consumption of calcium-rich food could be increased if cold and fresh drinks in summer, and hot and warm ones in winter were provided because adolescents responded that they looked for something cold in summer and warm in winter.

Since adolescents were better motivated for consuming calcium-rich foods when they were aware of them, they would increase their consumption if they were properly educated with knowledge of various type of calcium foods and understanding of beneficial effects on their bodies. Especially, for late stage adolescents who assumed to have completed their physical growth and paid less attention to calcium-rich foods, they also need to be educated about the importance of intake of calcium-rich foods continuously in order to maximize bone density, and further for prevention of osteoporosis and other bone-related problems from aging. It was also desirable

to have school provide milk for adolescents, who spent most of their time at school or outside of their home and limited their access to calcium-rich foods such as milk at home. Also it was recommended to publicize more widely the benefits of milk and other dairy products for their wholesomeness and as an excellent healthy diet for those who skip meals regularly or who are on diet.

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(Received September 17, 2001; Accepted January 14, 2002)