

Effect of Lectures by Medical Students on the Awareness of Lifestyle for Elementary School Students

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Abstract

Recently, the number of elementary school students with obesity is increasing in the later elementary grades in Japan. In order to examine medical students provided lecture for improving lifestyle and inspiring interest in health including standard body weight, body mass index (BMI), and obesity for students and their parents, a cross-sectional questionnaire study on fifth grade of elementary students in response to 45 minutes lecture was conducted. The number of students who knew their height and weight were increased by 6 to 10% three months after the lecture. It was found that one lecture from medical students generated positive effect about the percentages of students who knew the information about their height and weight three months after lectures. The results of this study would be helpful as basic data of lifestyle guidance and health education not only for elementary school students but also for their parents and further research work of health education including weight control.

Keywords: Elementary school students; Health Education; Obesity; Weight; Questionnaires

Introduction

In these years, child health issues such as unbalanced nutrition, poor eating habits such as skipping breakfast, or tendency towards obesity have led to some grave questions. In particular, the number of students with obesity has increased in the later elementary grades in Japan. The percentage of the sixth grade students with obesity and slim figure has increased from 7.1% in 1982 to 10.2% in 2005 and 1.4% to 3.5%, respectively [1]. The incidence of type 2 diabetes mellitus in children, to which lifestyle predominantly contributes to onset, as is the case in the adult variety, has also been escalated from 1.36/100,000 children between 1982 and 1986 to 3.85 between 1992 and 1996 [2]. The same escalation in childhood incidence has also been indicated overseas for the past 30 years [3]. To improve the situation, Basic Act on Food Education was established in 2005, and many initiatives have been established, including the Nutrition Teacher System, to protect children's health.

Several studies have been conducted which provide occasions for medical students to contribute to societal healthcare and preventive medicine [4-6]. These have generally focused on teaching general health in elementary schools, or smoking cessation from elementary schools to high schools. The latter in particular is approved as credit in some universities [4,5]. These studies maintain the quality of intervention through review by experts.

In Japan, there are interviews held with the families of obese children [7] and an investigation to clarify parents' perception of health status of school-age children [8]. However, no research has been performed regarding student lifestyle education, or regarding the changes in student awareness as a result of such intervention.

We designed a study where medical students provided lecture for improving lifestyle and inspiring interest in health in students and their parents. The intervention was designed based on guidelines prepared by endocrinologists (the sub-specialty in diabetes). Additionally, we performed questionnaire to reveal the presence of changes in awareness regarding lifestyle and the degree of obesity in these students.

Materials and Methods

We conducted our study on fifth grade students from six elementary schools who were participate in the study and subsequently accepted

the request. The elementary schools were as follows: Mino Jiyu Gakuen (Toyonaka city, Osaka, Japan), Shijonawate Gakuen Primary School (Daito city, Osaka, Japan), Kyoto Municipal Muromachi elementary school (Kyoto city, Kyoto, Japan), Kyoto Municipal Shinmachi elementary school (Kyoto city, Kyoto, Japan), Kyoto Municipal Kenryu elementary school (Kyoto city, Kyoto, Japan), and Kyoto Municipal Seishin elementary school (Kyoto city, Kyoto, Japan).

Intervention

Fourth year medical students from Kyoto University (Kyoto, Japan) provided 45 minutes of teaching during the time allocated for health education under the supervision of the school health education teacher after measuring student's height and weight. These lectures were based on the original curriculum. Lecture content was based on guidelines from endocrinologists, as well as on advice given by the homeroom or health education teachers present in each school (Table 1). Summarized notes were distributed during the session for the review of both the students and their parents.

Questionnaire

The elementary school students were asked to complete a questionnaire before, immediately after, and approximately three months after lecture (Supplementary Table S1-3). Parents were asked to complete a questionnaire immediately after, and three months after lecture to their children (Supplementary Table S4). The questionnaire, though original, was prepared for the study under expert's guidance with reference to "2005 Report of Actual Dietary Life of Students" by National Agency for the Advancement of Sports and Health (NAASH).

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Self-introduction by a lecturer
Summary of the lesson (a. healthy life, b. disease, and c. body and health condition of their own)
Ask students about healthy life and draw their opinions
Explain about healthy life with materials
Ask students whether they spend healthy life and what would happen if unhealthy life is continued
Introduce lifestyle-related diseases and symptoms may be induced by these diseases by using materials
Let several pupils wear sleep shades to experience blind/near blind situation and draw their opinions, based on an assumption that they would be blind because of unhealthy lifestyle
After concluding that unhealthy life may cause lifestyle-related diseases, inform students that they can know their body status
Teach how to calculate the degree of obesity by BMI using worksheet
Explain about how to evaluate degree of obesity and emphasize that although current degree of obesity is important, change in the degree in the future more fundamental. Elucidate the characteristics of degree of obesity (advantage, disadvantage, and limitation) by using materials
Tell points pupils should know and pay attention to by using materials
Summarize the lesson by using materials

Table 1: Lecture provided as an intervention.

Degree of obesity

For the elementary student degree of obesity, we used the Rohrer index (Website of Japan Medical Association) [9] for classification. Weight (kg) was divided by the height cubed (m) and then multiplied by 10. Values obtained were designated as: “Very Underweight” for <100, “Underweight” for ≥ 100 to <115, “Ideal weight” for ≥ 115 to <145, “Overweight” for ≥145 to <160, and “Very Overweight” for ≥ 160.

Analyses

In questionnaires for students, the number of responses and percentages of each option were calculated. The differences between before, immediately after and three months after lecture were tested as primary endpoint in the following items; “Can you calculate degree of obesity?” and questions related to awareness of health. In questionnaires for parents, the differences between immediately after and three months after lecture in questions related to awareness of degree of obesity and health were tested. In addition, ad-hoc analyses were performed whether children’s degree of obesity to cause differences in each item of questionnaire for students and parents. Chi-square test was adopted for percentages, with significant level of 0.05. All analyses were conducted using JMP 9.0 (SAS Japan).

Anonymity and protection of personal data

Height/weight and questionnaire were linked by school, class and number. When questionnaires were collected, names were removed from questionnaire and left in each school, the researchers had questionnaires without name, by which data became linkable and anonymized.

Informed consent

The study was accepted by Board of Education and consented by school heads, class teachers and nursing teachers of all schools. As requested by schools, explanation to students and parents were provided by class or nursing teachers with explanatory documents. When they replied to the questionnaire, it was considered as their consent.

Ethical considerations

The study was conducted after approval by Kyoto University

Graduate School and Faculty of Medicine, Ethics Committee (Approval Number E632).

Results

In June 2009, medical students of Kyoto University conducted 45-minutes lectures for each elementary school class. Total number of students who replied to questionnaire was 353 (private school 169, public school 184). The number of students, their heights and weights, and the degree of obesity distribution, as per the Rohrer index classification, are shown in table 2.

The results of the questionnaire for elementary school students are summarized in table 3. Although changes were predicted for the health-related question “Would you like a healthy lifestyle?,” no significant changes were observed, as 95.4% replied “Yes” before the lectures, 95.0% immediately after, and 96.7% three months later. There were, however, dramatic changes observed in response to the question “Can you calculate the degree of obesity?” Immediately after the lectures, 89.2% of respondents replied “Yes” to this question, and the number fell as low as 22.9% three months later (p=0.01). The post-hoc analysis were performed responses to this question by dividing the students into three groups based on their initial classification – an “underweight” group, including the underweight and very underweight; a “ideal weight” group, and; an “overweight” group, including the overweight and the very overweight. When compared thus, the percentage of “Yes” responses fell from 91.1% immediately after lectures to 23.8% three months later in the underweight group. Similar declines were observed for the ideal weight group, falling from 88.4% to 22.1%, and in the overweight group, where figures fell from 87.5% to 25.0%. For the question “Do you think the degree of obesity is useful in facilitating living a healthy lifestyle?” 76.9% replied “Yes” immediately after lectures. This value dropped to 65.9% three months later. In response to the question “Do you do anything to ensure your health?” 53.1% and 57.6% answered “Yes” immediately and three months after lecture, respectively, which showed almost no change. Awareness regarding personal height and weight showed a significant increase in the number of respondents who answered “Yes” three months after lecture. Other questions in which changes were observed included “Do you drink soft-

School	Total	Boy	Girl
School A (private)	70	43	27
School B (private)	99	50	49
School C (public)	38		
School D (public)	81	43	38
School E (public)	26	12	14
School F (public)	39		

Height and weight

	Average	Standard deviation
Height (cm)	139.3	6.7
Weight (kg)	33.8	7.3

Degree of obesity of pupils (by Rohrer index)

	The Number of students	%
Very Underweight	10	2.8
Underweight	97	27.6
Ideal weight	203	57.7
Overweight	28	8.0
Very Overweight	14	4.0

Table 2: The number of students by school and their height, weight, and degree of obesity

drinks (carbonated drinks)?” Prior to lectures, 10.9% of respondents reported consuming them almost every day, and three months later, this had dropped to 7.4%.

Results of questionnaire for parents are shown in table 4. According to the results, 76% of parents knew about the degree of obesity before the study. We then performed post-hoc analysis of the responses by dividing the parents into 5 groups according to the degree of obesity of their children. When thus divided, 74% of parents with children who were “Very Underweight,” “Underweight,” and “Ideal weight” responded affirmatively to this question both pre- and post-lectures, which showed no change. There was, however a significant change in parents of children in the “Overweight” and “Very Overweight” groups, in which the percentages who responded yes were 86.4% and 100% respectively. This indicated a tendency of parents with children who are overweight to have been aware of the degree of obesity prior to the lectures. Approximately 80% of parents replied that degree of obesity was useful, and the percentage did not change immediately or three months after lectures. On the other hand, 24.7% of parents responded that they knew the degree of obesity of their own children immediately after lectures, and 22.8% responded thus three months later, demonstrating low values in both cases. More than 80% of parents did, however, know their children’s height and weight. The number of parents who conducted activities aimed at maintaining health remained mostly unchanged, with responses of “Yes” from 67.1% immediately after and 61.3% and three months after the lectures respectively (p =0.15).

Discussion

This research was conducted to clarify changes in awareness regarding health following 45 minutes lectures to elementary school students from medical students. The research was conducted in collaboration with six elementary schools. No statistically significant changes were found in terms of health awareness, which was the primary endpoint. This was due to the ability to conduct the lecture only once, as there were various limitations regarding scheduling. A significant change was observed in positive responses to “I can calculate the degree of obesity,” with 89.2% of students responding affirmatively immediately after the lectures. This value dropped to 22.9% three months after the lecture. When students were divided into three subgroups according to their degree of obesity, the percentages of those responding affirmatively to “I can calculate the degree of obesity” did not vary widely between subgroups. The range of variation in affirmative responses three months after the lecture was between 22% and 25%. The most important finding in this research is that several elementary students were unable to calculate the degree of obesity three months after attending the lecture. During the lecture, students were instructed on how to calculate the BMI. This reference index was selected because it is easier to calculate manually than the Rohrer index, which requires cubing, as debated by endocrinology experts. The formula used involves multiplying the square of the student’s height (m) by 22, and then multiplying the square of the student’s height by their own body weight, followed by calculating the percentage by which the two values differ. The final result of this calculation yields the degree of obesity. This formula was not easy for the 5th grade students to remember three months later. In contrast to degree of obesity, children who knew their height and weight increased significantly three months later. Those who knew their height increased from 55.9% before lectures to 65.6% three months later (p<0.0001). Those who knew their body weight similarly increased from 66.7% to 72.9% (p<0.001). The outcome suggests that awareness of their own height and weight was improved due to having

	N (%)	N (%)	N (%)	
	Yes	No	No opinion	
Do you want to have a healthy life?				
Before lectures	335(95.4)	16(4.6)	0	
Immediately after lecture	320(95.0)	5(1.5)	12(3.6)	
Three months after lecture	326(96.7)	11(3.3)	0	
p=0.08				
Can you calculate the degree of obesity?				
	Yes	No		
Immediately after lecture	288(89.2)	35(10.8)		
Three months after lecture	74(22.9)	249(77.1)		
P=0.01				
Underweight				
Immediately after lecture	92(91.1)	9(8.9)		
Three months after lecture	24(23.8)	77(76.2)		
Ideal weight				
Immediately after lecture	160(88.4)	21(11.6)		
Three months after lecture	40(22.1)	141(77.9)		
Overweight				
Immediately after lecture	35(87.5)	5(12.5)		
Three months after lecture	10(25.0)	30(75.0)		
Do you think degree of obesity is useful to evaluating a healthy life?				
	Yes	No	No opinion	
Immediately after lecture	259(76.9)	12(3.6)	66(19.6)	
Three months after lecture	222(65.9)	8(2.4)	107(31.8)	
p=0.001				
Do you do anything to maintain your health?				
	Yes	No		
Before lecture	186(53.1)	164(46.9)		
Three months after lecture	194(57.6)	143(42.4)		
p=0.24				
Do you know your height?				
Before lecture	187(55.9)	147(44.1)		
Three months after lecture	219(65.6)	115(34.4)		
P<0.0001				
Before lecture	224(66.7)	112(33.3)		
Three months after lecture	245(72.9)	91(27.1)		
P<0.0001				
Do you consume soft-drinks (especially carbonated drink)?				
	Almost every day	4-5d/w	2-3d/w	Almost never
Before lectures	38(10.9)	43(12.3)	117(33.4)	152(43.4)
Three months after lecture	25(7.4)	30(8.9)	95(28.2)	187(55.5)
Do you eat breakfast?				
	Every day	Not eat 2-3 d/w	Not eat 4-5 d/w	Almost never
Before lecture	308(88.3)	26(7.4)	7(2.0)	8(2.3)
Three months after lecture	298(88.4)	18(5.3)	9(2.7)	12(3.6)
Do you have a snack after School before dinner?				
	Almost every day	4-5 d/w	2-3 d/w	Almost never
Before lecture	98(28.2)	78(22.5)	83(23.9)	88(25.4)
Three months after lecture	104(31.0)	56(16.7)	103(30.7)	73(21.7)
Do you eat late-evening snack?				
	Almost every day	4-5d/w	2-3 d/w	Almost never
Before lecture	65(18.6)	35(10.0)	93(26.6)	156(44.7)
Three months after lecture	62(18.7)	21(6.3)	82(24.7)	167(50.3)

Table 3: Results of questionnaire for students.

Do you have knowledge about degree of obesity before?	N (%)	N (%)	N (%)
		Yes	No
Whole population	Immediately after lecture	218(76.0)	69(24.0)
Very Underweight		6(75.0)	2(25.0)
Underweight		62(74.7)	21(25.3)
Ideal weight		119(73.9)	42(26.1)
Overweight		19(86.4)	3(13.6)
Very Overweight		12(100.0)	0(0.0)
p=0.23			
Do you think the degree of obesity is useful for evaluating a healthy life?			
	Yes	No	No opinion
Immediately after lecture	227(79.1)	15(5.2)	45(15.7)
Three months after lecture	217(80.7)	19(7.1)	33(12.3)
Do you know degree of obesity of your child within the previous 3 months?			
	Yes	No	
Before immediately after lecture	71(24.7)	216(75.3)	
Three months after lecture	61(22.8)	207(77.2)	
p=0.58			
Do you know height of your child?			
	Yes	No	
Immediately after lecture	249(86.8)	38(13.2)	
Three months after lecture	223(82.9)	46(17.1)	
Do you know weight of your child?			
	Yes	No	
Immediately after lecture	255(88.9)	32(11.1)	
Three months after lecture	234(87.0)	35(13.0)	
Do you do something for your child's health?			
	Yes	No	
Immediately after lecture	192(67.1)	94(32.9)	
Three months after lecture	165(61.3)	104(38.7)	
p=0.15			

Table 4: Results of questionnaire for parents

learnt during the lecture that the degree of obesity can be calculated by using height and weight. If a tool were developed for these students to enable them to calculate their degree of obesity by entering their height and weight, will be enable to further increase their awareness of this parameter. The multiple lectures throughout the year would also facilitate improved memory, although the current research was only able to conduct one 45 minutes lecture in June. Manios et al. [10] reported that health education interventions targeting students and their parents, which take place over a three years, influence physical activity and fitness indices. In addition, several studies reported that when interventions were performed for entire schools, changes in lifestyle or weight reduction were observed [11-13]. The method of intervention thus requires further investigation. Furthermore, studies describe nutrition education to students improving BMI and overweight status at follow-up 10 years later [14], which suggests that optimal study periods and long-term follow-up periods should be considered.

In questionnaire for parents, 76% of them responded prior

knowledge about the degree of obesity. When stratified by the degree of obesity in their children, the percentage of parents who had prior knowledge about the degree of obesity increased in accordance to the degree of obesity in their children. The incidence of prior knowledge regarding degree of obesity was particularly notable in those with children classified from "Overweight" to "Very Overweight." This may be a natural response by parents as they tend to become more aware when their child is obese. By contrast, however, only 23–25% responded to the question "Do you know the degree of your child's obesity?" Thus, remaining three quarters did not know. He and Evans [15] described that 63% of parents were not aware that their children were overweight or obese in a study conducted in Ontario. The results from our study were consistent in this regard. Also, there were no changes in parents resulting from the intervention for any of the questions. The percentage of parents who gave positive responses to questions of "Do you think the degree of obesity is useful to a healthy lifestyle?" or "Do you do anything to maintain your health?" did not fluctuate. In addition, the percentages of "Yes" responses to the questions about the height and weight of their own children were as high as $\geq 80\%$, which did not change three months later. These results were different to responses obtained from students. This may be because parents did not receive a 45 minutes lecture, but simply received the relevant material from their children. Some parents may therefore not have read the material, and the parental intervention was not enough to change the response. On the other hand, Klohe-Lehman et al. [16] and Muran et al. [17] reported that intervention targeting parents reduced weight in their children. It is thus important to consider how to provide information to the family, including the parents, and this point should be carefully considered in the future study.

Almost all responses immediately after lecture were positive, including responses such as "enjoyable," "useful," or "I can obtain knowledge about diseases" (data are not shown). Thus an intervention by medical students did not seem to have unpleasant or adverse effects on students, which was facilitated in part by our preparation for the intervention. This preparation included careful advance deliberation regarding what and how to teach, preparation of mandatory entries and anticipated questions, and taking every effort to ensure teaching in as pleasant and enthusiastic an atmosphere as possible.

In our study, following limitations are considered. (i) Since the percentages of children who were "Very Underweight" or "Very Overweight" were small, it was difficult to discover obvious tendency between subgroups stratified by degree of obesity. (ii) Because we were unable to obtain information regarding gender in all schools, we could not compare between the sexes. (iii) Height and weight of students 1 year later were unavailable, so the relationship between awareness of obesity or the degree of obesity and the change in degree of obesity in students themselves could not be established. (iv) Since we did not get measures of height and weight after the lecture in an objective manner, we could not clarify whether students actually have knowledge about the exact values of height and weight, and we could not offer a system of quality control of the measures. (v) The perform of only a single lecture may have limited the power of the intervention in this study.

Conclusion

Although we were unable to detect obvious change in awareness regarding health through this intervention, and the data collected in this study after the lecture are only declarative including objective measures, it was demonstrated that one lecture from medical students

generated positive effect about the percentages of students who knew the information about their height and weight three months after lectures. Thus, these findings of this study will become valuable basic data when designing the lecture for health awareness or when establishing the goal of understanding for the upper (4-6th) grade student of elementary school in Japan, and it would be also helpful as basic data of lifestyle guidance not only for elementary school students but also for their parents and further research work of health education including weight control.

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