

Studies on Health Administration for Obese Students (9) —Paper Questionnaire Concerning Daily Life—

Tetsuo OHKUWA*¹, Yuzo SATO*², Sayoko HAYAMIZU*³,
Chikashi YAMAMOTO*⁵, Eiko SAKAI*⁴,
Akiko KUMAZAWA*⁴, Yasushi TODA*² and Akira ITO*²

To establish useful methods of teaching students being treated for obesity, a paper questionnaire concerning daily life were administered among 346 obese and 590 control students.

The following results were obtained:

- 1) Obese students are used to going to the university by trains or buses instead of walking or using a bicycle and don't like to perform physical exercise.
- 2) Obese students tend not to take breakfast and report fewer food dislikes.
- 3) Energy intake of obese students is almost equal to that of control students.

From these results, it may be inferred that physical inactivity is a major factor in human obesity and that it is wise to spread out energy intake over three or more meals per day.

Previously, obesity was a symbol of wealth and health, but nowadays, it is recognized that obesity is a trigger for diabetes, hypertension, fatty liver and various other diseases^{1), 2)}. Accordingly, obese students should be treated as soon as possible.

Body weight reduction in obese students was attempted through group behavior therapy including meal control and physical exercise³⁾, and treatment in hospitals⁴⁾. Applying this group treatment we found that the mean body weight of obese students decreased 5 kg per year, while that of the control group decreased by only 1.5 kg³⁾.

On the other hand it is very difficult for these subjects to maintain their weight loss after the termination of these treatments⁵⁾. For example, results from an obesity clinic in one university hospital showed that five years after the end of the treatment 70% of the patients had regained their former weight⁶⁾. This suggests that it is most important to change the patients' daily living

conditions, eating habits and physical exercise in order to reduce their body weight.

The purpose of this survey was consequently designed to establish useful methods guiding students in reducing and eliminating obesity.

Subjects and methods

At Nagoya University, during the three-year period 1978 to 1980, 346 obese students and 590 students of normal weight were selected at random during annual health check-ups. A student was considered obese if his weight exceeded the normal body weight limits set forth in Broca's Index by more than 20%. In this study the questionnaire factors concerned living conditions, transportation to the university, sleeping hours, physical exercise and eating habits (including breakfast, food preference and energy intake).

The comparison between the two groups was

*¹Nagoya Institute of Technology *²Research Center of Health, Physical Fitness and Sports, Nagoya University *³Aichi Prefectural University *⁴Nagoya Women's University *⁵Nagoya Gakuin University

made on the basis of the squaring method (X^2).

Results

Table I indicates the number of obese students at Nagoya University during the eight years between 1973 and 1980. 1149 students (2.3%) were diagnosed as obese. Although each year the number of obese students has been slightly decreasing, the percentage remains high.

Now, it is said that diets and physical exercise are the dominant factors in treatments of obesity¹⁾. This study was focused especially on the eating habits, daily living conditions and physical exercise of obese and normal students.

Fig. 1 shows transportation methods to the university used by both groups. 26% of the obese students walk or ride bicycles, while 74% of them use buses or trains. On the other hand, 33% of the students with normal weight walk or ride bicycles, while 67% of them use buses or trains. But there were no statistically significant differences between two groups.

The habits of physical exercise are depicted in Fig. 2. 28% of the controls performed physical exercise at sports facilities, while 22% of obese students engaged in this kind of activity. Control students

who little or no exercise constituted 17% of their group while 25% of the obese students were included in this category. After examining the results of the studies of transportation methods to the university and physical exercise habits in obese students we may infer that a lack of physical exercise may produce obesity or might be a main precipitating factor in obesity.

Fig. 3, 4, 5, 6 illustrate eating habits. 69% of the obese students did not have any special foods they disliked, while 47% of control students disliked some foods. Thus we found a high incidence of fastidious eaters in the normal weight group (Fig. 3)

Fig. 4 shows whether the students ate breakfast or not. 58% of the obese students ate breakfast every day while 68% of the controls had breakfast regularly.

Fig. 5 illustrates whether the students like sweet foods or not. Similar results were obtained in both groups.

Fig. 6 illustrates total energy intake and the intake of carbohydrates, lipids and proteins. There were no statistically significant differences in these factors.

The relationship between obesity and living conditions is illustrated in Fig. 7. A higher percentage of the obese students live with their parents than live alone. Both groups have an almost

Table 1. The number of obese students at Nagoya University

Year		1973	1974	1975	1976	1977	1978	1979	1980	Total (%)
All the number of students		8375	8313	8539	8564	8645	8655	8753	8876	68720
The number of health check-ups		6180	5990	5707	5661	5997	6229	6697	6591	49052 (71.4)
The number of obese students	A	93	74	52	40	108	91	44	144	646 (1.3)
	B	56	26	16	9	66	30	20	53	276 (0.6)
	C	12	11	5	5	83	5	7	7	135 (0.3)
Total (%)		161 (2.6)	111 (1.9)	122 (2.1)	109 (1.9)	162 (2.7)	145 (2.3)	132 (2.0)	207 (3.1)	1149 (2.3)

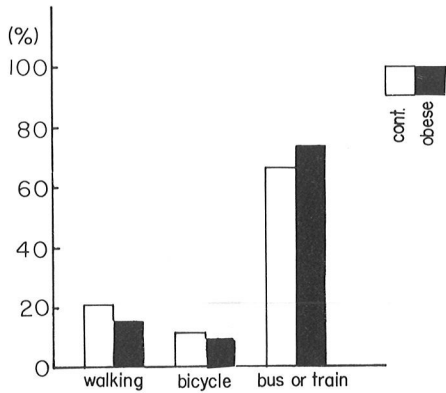


Figure 1. The transportation means to the university in both groups.

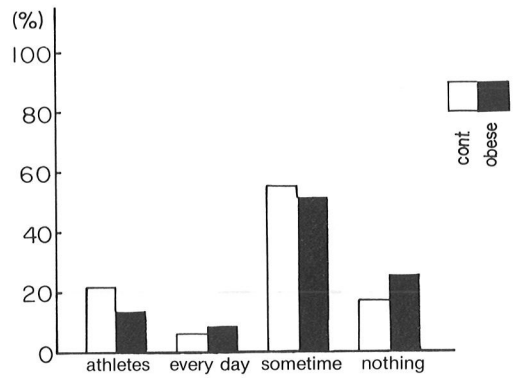


Figure 2. Physical exercise.

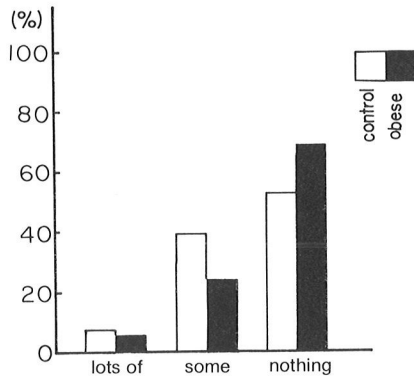


Figure 3. The eating habits (special dislike foods)

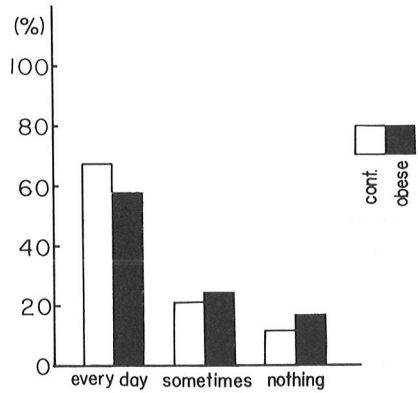


Figure 4. The eating habits (breakfast)

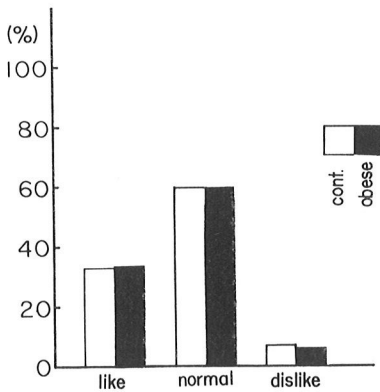


Figure 5. The eating habits (sweet foods)

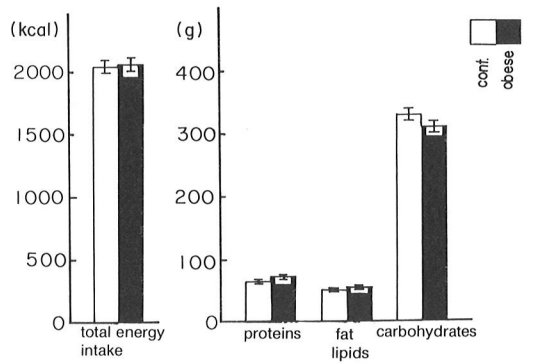


Figure 6. The eating habits (energy intake, nutritive substances)

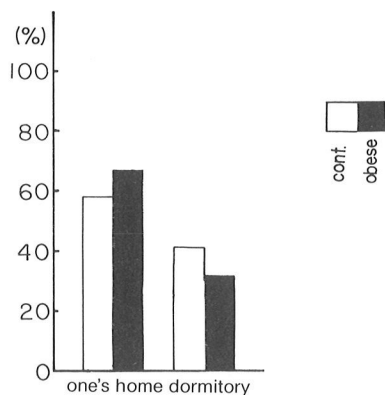


Figure 7. Living conditions

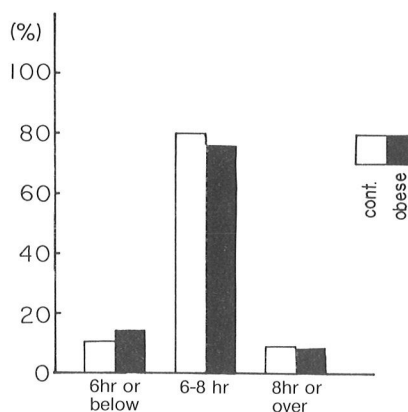


Figure 8. Sleeping habits

identical number of sleeping hours (Fig. 8).

Discussion

Obesity, like high blood pressure, is not a disease; it is a symptom⁷⁾. It occurs when the energy intake exceeds the energy requirements of the body both for physical activity and for growth. As a result there is an accumulation of fat, which is stored in the adipose tissue. Obesity is a serious and common disease in those countries in which a combination of generous food supplies and sedentary occupations readily permits the assimilation of more food than is necessary. The excessive deposition of fat is associated with an increased incidence of degenerative diseases such as atherosclerosis, diabetes, and arthritis; indeed, the only common cause of death that does not strike earlier in the obese than in the lean population is suicide. The ill effects of obesity can be prevented and, to some extent, repaired by weight reduction^{1), 8), 9)}.

According to Bray⁷⁾, etiologic mechanisms for human obesity can be divided into several categories: (1) hypothalamic obesity, (2) endocrine obesity, (3) physical inactivity, (4) dietary obesity, (5) genetic obesity and (6) drug-induced obesity

(Table 1).

In the present study, obese students are used to going to the university by trains or buses instead of walking or using a bicycle (Fig. 1) and don't like to perform physical exercise (Fig. 2)

These observations thus suggest that inactivity is a major factor in human obesity. There is clear evidence that physical activity is decreasing as our society becomes more mechanized¹⁰⁾. There is evidence also from epidemiologic studies to suggest that, as economic status improves, inactivity frequently increases and obesity results¹¹⁾.

Similarly people particularly athletes who have been accustomed to high levels of activity during their university student period, frequently undergo substantial weight gain when their life pattern changes from the activity of an athletic career to the inactivity of most sedentary occupations^{12), 13)}

Of particular interest is the fact that energy intake of obese students is almost equal to that of control students. There are two possible situations that produce this equality. Firstly, the obese students already have made efforts to reduce their food intake, after they were informed by our staff that they were overweight. Secondly, it is not necessary for obese persons to take more food to maintain

their body weight during static obesity while dynamic obese patients must take more food in order to gain weight¹⁴⁾.

The current findings indicate that obese students tend not to take breakfast. Fabry¹⁵⁾ has already produced obesity by converting animals which normally eat frequent meals (nibbling) into animals which eat meals only one or two times a day (gorging). Another animal experiment showed that the content of body fat in tube-fed rats will be significantly greater than in the animals fed ad libitum, if rats in one group are allowed to eat ad libitum and rats in the second group are fed an identical quantity of food by stomach tube twice a day¹⁶⁾. This evidence suggests that animals which eat food rapidly, and have few meals (many energy at one time) tend to convert a larger fraction of the energy to fat. The rapid ingestion of energy and the ingestion of many energy at once enhance the output of insulin (hyperinsulinism), which is in turn lipogenic. Further, if starvation continues for a fairly long time, insulin-dependent enzyme activities in the liver (such as key glycolytic enzymes) become reduced. Therefore, the liver can not utilize the intaken nutrients and they go into peripheral tissues¹⁷⁾. Then adipose tissue become hypertrophic and hyperinsulinism also stimulates this phenomenon. In animals that eat many small meals, the quantity of energy stored as fat is reduced. Gwinup et al.¹⁸⁾ and Young et al.¹⁹⁾ have shown that in college males, the frequency of feedings did have a pronounced influence on carbohydrate tolerance and on the level of cholesterol. When normal college students were fed a weight-maintenance or a weight-reduction diet in one meal, they showed impairment of their glucose tolerance curves and higher levels of plasma cholesterol compared to those for the same diet fed in three or six equal feedings. This data would suggest that it is wise to eat three or more meals per day²⁰⁾.

Acknowledgements

This work was supported, in parts, by a Grant in aid for Fundamental Scientific Research from the Education Ministry of Japan (No. 548351).

References

- 1) Thorn, G. W. *et al.*: Obesity. In Principles of Internal Medicine, 5th ed., *McGraw-Hill New York*, 1966, p.394.
- 2) Cahill, G. F.: Obesity and diabetes. In Recent Advances in Obesity Research II. *Newman Pub.*, 1978, p.101.
- 3) Sato, Y. *et al.*: Follow-up results of group behaviour therapy for Japanese obese students. *Alim. Nutr. Metab.*, **1**: 351, 1980.
- 4) Sato, Y. *et al.*: Studies on health administration for obese students. (3), *Japanese J. School Health*, **20**: 10, 1978.
- 5) Stunkard, A. J.: Behavioral treatment of obesity: the first the years. In Recent Advances in Obesity Research II. *Newman Pub.*, 1978, p.295.
- 6) Ishikawa, K. *et al.*: Treatment of simple obesity. *Clinical Science (Osaka)*, **11**:832, 1975.
- 7) Bray, G. A.: The varieties of obesity. In Treatment and Management of Obesity. *Harper & Row. New York.*, 1974, p.61.
- 8) Felig, P. *et al.*: Splanchnic glucose and amino acid metabolism in obesity. *J. Clin. Invest.*, **53**: 582, 1974.
- 10) Walter, L. B. *et al.*: Inactivity as a major factor in adult obesity. *Metabolism*, **16**: 679, 1967.
- 11) Chirico, A. M. *et al.*: Physical activity and human obesity. *New. Eng. J. Med.*, **263**: 935, 1960.
- 12) Bray, G. A. *et al.*: To treat or not treat—that is the question? In Recent Advances in Obesity Research II. *Newman Pub.*, 1978, p.248
- 13) Bullen, B. A. *et at.*: Physical activity of obese and non-obese adolescent girls appraised by motion picture sampling. *Am. J. Clin. Nutr.*, **14**:211, 1964.
- 14) Sims, E. A. *et al.*: Experimental obesity in man. A progress report. *Israel J. Med. Sci.*, **8**: 813, 1972.
- 15) Fabry, P. *et al.*: Meal frequency—a possible factor in human pathology. *Am. J. Clin. Nutr.*, **23**: 1059, 1970.
- 16) Cohn, C. *et al.*: Studies on the effects of feeding frequency and dietary composition on fat de-

- position. *Ann. N.Y. Acad. Sci.*, **131**: 507, 1965.
- 17) Sakamoto, N.: Metabolism in Diabetics. *J. Japan. Diabetic Society*, **23**: 991, 1980.
- 18) Gwinup, G. *et al.*: Effect of nibbling versus gorging on serum lipids in man. *Am. J. Clin. Nutr.*, **13**: 209, 1963.
- 19) Young, C. M. *et al.*: Effect on body composition and other parameters in obese young men of carbohydrate level of reduction diet. *Am. J. Clin. Nutr.*, **24**: 290, 1971.
- 20) Sato, Y. *et al.*: Studies on health administration for obese students. (4)—paper questionnaire concerning eating habits—. *Japanese J. School Health*, **21**: 134, 1979.

(Received January 28, 1981)