Effect Analysis of Family-Based Intervention on Child Obesity

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Abstract: In the past 20 years, the increasing incidence of overweight and obesity in children has become a global public health problem. In this paper, children in the junior class of 5 kindergartens in Nanjing were randomly selected as the research subjects, aged 3 years old. Among them, children from 2 kindergartens were included in the intervention group, and those from 3 kindergartens were included in the control group. In the intervention group, child overweight and obesity intervention training was performed on the patents. The body weight was measured once a month, the height was measured once every semester, the dietary behavior and frequency of meals were investigated once every three months. The results showed that both the overweight and obesity rates in the intervention group were lower than those in the control group after the intervention, and the differences were statistically significant (P < 0.05). The end-line overweight rates of boys and girls in the intervention group and the control group were both lower than the baseline, and the differences were statistically significant (P < 0.05). There was no significant difference in the end-line overweight rates of girls in the control group compared with the baseline. (P > 0.05). After the intervention, both the overweight and obesity rates of girls in the intervention group were lower than those in the control group, and the differences were statistically significant (P < 0.05). The end-line obesity rate of girls in the intervention group was decreased compared with the baseline, and the difference was statistically significant (P < 0.05). Family-based interventions are effective in child overweight and obesity, and the effect on girls is more significant.

1. Introduction

In the past 20 years, the increasing incidence of overweight and obesity in children has become a global public health problem [1]. In 2006, a survey by the Chinese Childhood Simple Obesity Research Collaboration Group showed that the overall detection rates of obesity and overweight in children aged 0 ~ 6 were 7.2% ~ 19.8%, respectively. Overweight or obese children aged 3 ~ 5 years are five times more likely to be overweight or obese in the period of adolescence than healthy children, and the risks of chronic diseases increase significantly in adulthood [2]. Previous intervention studies of overweight or obesity in preschool children focused on how to improve children's diet and exercise in childcare institutions [3]. Growth monitoring is an integral part of family child health work. Through monitoring children's health index, their growth and development deviations can be identified in time, and intervention measures can be taken in time to correct them [4-6]. Few studies have analyzed the effects of family interventions. The purpose of this study was to explore the effect of family-based interventions on child overweight or obesity through training and monitoring.

In this study, the body weight and height of children in the intervention group were monitored more frequently than the control group. The family could adjust the intervention strategy in time according to the child's height, body weight, and BMI. It could strengthen parents' awareness of children's overweight and obesity and change their parenting behaviors. It has a positive meaning. In the case of only routine health care, the end-line overweight rate of the control group children was lower than the baseline overweight rate, and there was no difference in obesity rate, suggesting that overweight children may become normal-weight even without special intervention measures as they grow older. However, it is difficult for obese children to drop to healthy weight without intervention. This suggests that it is crucial to screen overweight children early and prevent them from developing into obesity.

2. Subjects and Methods

(1) Research subjects

Children from a total of 5 kindergartens in Nanjing, aged 3, were selected as the study subjects. Among them, children from 2 kindergartens were included in the intervention group, and those from 3 kindergartens were included in the control group. The baseline number of children in the intervention group was 543, the end-line number of children was 400, the number of children lost to follow-up was 143, and the rate of lost to follow-up was 26.34%; the baseline number of control group was 662, the number of end-line was 397, the number of children lost to follow-up was 265, and the rate of lost to follow-up was 40.03%. The χ^2 test was performed on the subjects lost to follow-up, and there was no statistically significant difference in gender distribution ($\chi^2 = 1.037$, P = 0.308). The χ^2 test was performed on the distribution of height, body mass, and body mass index (BMI), and the differences were not statistically significant. (P > 0.05). Subjects were tested for equilibrium. There was no significant difference in gender distribution ($\chi^2 = 2.802$, P = 0.094) and BMI values (t = -0.340, P = 0.734) between the two groups.

(2) Baseline survey

The height and carcass weight of the study subjects were measured by trained professionals in accordance with a unified method, and the BMI value was calculated. The "WHO 0 ~ 6-year-old children's overweight and obese height standard weight values" (prepared by the China Center for Disease Control and Prevention Maternal and Child Health Center Table) for child overweight and obesity standards. The medical history and physical examination of suspicious pathological obese children were inquired. The corresponding laboratory tests were performed to eliminate pathological obese children if necessary.

(3) Intervention methods

Training: The kindergarten in the control group conducted routine child health care content.

The intervention group nursery adopted the following intervention methods:

① Parent training. Educate all parents on healthy eating habits and lifestyles, introduce the health damage caused by obesity, prevent obesity, and determine the criteria for obesity. Introduce parents of overweight and obese children how to treat obese children properly, how to correct dietary behavior, how to cultivate exercise habits, how to reduce meditation time, and how to determine obesity.

② Chef training. Limit salt intake and reduce the consumption of pickles. Improve children's acceptance of vegetables, such as increasing the colors and flavors of vegetables, and cutting long fiber vegetables into appropriate volumes. Reduce the amount of deep-fried cooking, try to use less thickening, and reduce oil and salt intake.

Monitoring: Intervention group: For obese and overweight children, their body weight was measured once a month, body height was measured once every semester, and their dietary behavior and frequency of meals were investigated once every 3 months. For normal-weight children, their body weight was measured once every 3 months, body height was measured once every semester, and their dietary behavior and frequency were investigated once every semester. Control group: For all children in the group, their height, body mass, dietary behavior and frequency of meals were measured once every semester.

(4) Final investigation

Two years after the start of the study, a final survey with the same content as the baseline survey was conducted in both intervention and control kindergartens.

(5) Statistical analysis

After all the data was verified, the data were analyzed statistically using the SPSS 10.0 software package. The comparison between groups was performed by χ^2 test, and that between before and after the intervention was performed by the McNemar test. Differences at P < 0.05 were considered statistically significant.

3. Result Analysis

(1) Comparison of overweight and obesity rates between two groups of children before and after the intervention

In this study, there were 400 children in the intervention group and 397 children in the control group. At baseline, there were no statistically significant differences in the overweight and obesity rates between the intervention group and the control group (P > 0.05). In the end-line survey, the difference between overweight and obesity rates in the two groups was statistically significant (P < 0.05), as shown in Table 1.

Table 1 Comparison between Two Groups of Children Before and after Overweight, Obesity Intervention [Cases (%)]

Body mass	Group	Baseline	Terminal line
Overweight	Intervention group	77(19.3)	30(7.5)
	Control group	86(21.7)	47(11.8)
	χ^2 value	0.713	4.298
	P value	0.399	0.038
Obesity	Intervention group	46(11.5)	33(8.2)
	Control group	39(9.8)	52(13.1)
	χ^2 value	0.588	4.916
	P value	0.443	0.027

(2) Self-control comparison of overweight and obesity rates between two groups of children before and after the intervention

Compared with baseline, the overweight and obesity rates at the end of the intervention group were statistically significant (P < 0.05). Compared with baseline, the end-line overweight rate in the control group was statistically significant (P < 0.05), and the difference in obesity rate was not statistically significant (P > 0.05), as shown in Table 2.

Table 2 Comparison of Self-Control Before and after Intervention for Overweight and Obesity in Two Groups of Children [Case (%)]

Body mass	Group	Number of surveys	Baseline	Terminal line	Decline (%)	Decline rate (%)	χ^2 value	P value
Overweight	Intervention group	400	77(19.3)	30(7.5)	11.7	60.9	29.210	0.000
	Control group	397	86(21.7)	47(11.8)	9.9	45.6	19.865	0.000
Obesity	Intervention group	400	46(11.5)	33(8.2)	3.3	28.7	90.559	0.047
	Control group	397	39(9.8)	52(13.1)	3.3	33.7	48.207	0.098

(3) Prevalence of overweight and obesity in different genders before and after the intervention

The end-line overweight rates of the boys and girls in the intervention group and the control group were both lower than the baseline, and the difference was statistically significant (P < 0.05); the end-line overweight rates of the girls in the control group were not significantly different from the baseline. (P > 0.05). There was no significant difference in the overweight rate between the two groups of boys before and after the intervention and the overweight rate of the girls between the two groups before the intervention (P > 0.05). The overweight rate of the girls in the intervention group was lower than that in the control group after the intervention, and the differences were statistically significant (χ^2 = 6.017, P = 0.014). The end-line obesity rate of the girls in the intervention group was decreased compared with the baseline, and the differences were statistically significant (P < 0.05). The end-line obesity rate of the boys in the intervention group and the control group was lower than the baseline, and there was no statistically significant difference (P > 0.05). There was no statistically significant difference in the obesity rate of the boys between the two groups before and after the intervention and that of the girls between the two groups before the intervention (P > 0.05). The obesity rate of the girls in the intervention group was lower than that in the control group after the intervention, and the difference was statistically significant (χ^2 = 5.175, P = 0.017), as shown in Tables 3 ~ 4

Table 3 Comparison of The Decline in Overweight Rates between Different Genders Before and after the Intervention [Case (%)]

Group	gender	Number of surveys	Baseline	Terminal line	Decline (%)	Decline rate (%)	χ^2 value	P value
Intervention group	male	200	52(26.0)	21(10.5)	15.5	59.6	20.447	0.000
Control group	male	222	67(30.2)	30(13.5)	16.7	55.2	20.433	0.000
Intervention group	Female	200	25(12.5)	9(4.5)	8.0	64.0	8.653	0.002
Intervention group	Female	175	19(10.9)	17(9.7)	1.1	10.5	0.045	0.832

Table 4 Comparison of The Decline in Obesity Rates between Different Genders Before and after the Intervention [Case (%)]

Group	gender	Number of surveys	Baseline	Terminal line	Decline (%)	Decline rate (%)	χ^2 value	P value
Intervention group	male	200	29(14.5)	25(12.5)	2.0	13.8	0.450	0.503
Control group	male	222	23(10.4)	34(15.3)	-5.0	-47.8	3.030	0.080
Intervention group	Female	200	17(8.5)	8(4.0)	4.5	52.9	3.764	0.049
Intervention group	Female	175	16(9.1)	18(10.3)	-1.1	-12.5	0.050	0.824

4. Conclusions

Child obesity is an early sign or high-risk factor for many adult diseases, which not only damages the physical and mental health of children but also dramatically increases the risk and burden of chronic diseases such as cardiovascular disease in adults. The older the child, the longer it is, and the higher the risk of adult cardiovascular disease. Hence, early obesity intervention is of great significance to reduce the harm of obesity to children's health.

Long-term classification studies on children's obesity, healthy behaviors, and blood pressure have verified that family behavior interventions have a wide range of effects on children at high risk for behavior problems, and are consistent with the results of the theoretical model of fostering healthy behavior development. Obesity interventions, especially for high-risk children, are not sufficient to target children's diet and exercise without changing the fundamentals of their living environment. In this study, health education of obesity prevention knowledge was performed on the teachers, chefs, and parents in the intervention group, aiming to change their child-rearing style and behavior. The study showed that in the end-line survey, the overweight and obesity rates in the intervention group were lower than those in the control group, and the end-line overweight and obesity rates in the intervention group were also lower than the baseline overweight and obesity rates. This suggests that health education on teachers, chefs, and parents is useful for obesity intervention. This study indicated that the overweight and obesity rates of girls in the intervention group were lower than those in the control group after the intervention, while there was no difference in the boys compared with the control group, suggesting that the obesity detection rate of boys was higher than that of girls.

References

[1] Min Jeong Kim, Eunju Sung, Eun Young Choi. Delphi Survey for Designing a Intervention Research Study on Child obesity Prevention[J]. Korean Journal of Family Medicine, 2017, 38(5):284-290.

[2] Colson, Natalie, Naug. The impact of MTHFR 677 C/T genotypes on folate status markers: a meta-analysis of folic acid intervention studies[J]. European Journal of Nutrition, 2017, 56(1):247-260.

[3] Gori D , Guaraldi F , Cinocca S , et al. Effectiveness of educational and lifestyle interventions to prevent paediatric obesity: systematic review and meta‐analyses of randomized and non‐randomized controlled trials[J]. Obes Sci Pract, 2017, 3(3):235-248.

[4] Johnston C A , Moreno J P , Hernandez D C , et al. Dissemination of a School-based Obesity

Intervention for Mexican Americans: A Randomized Controlled Trial[J]. Health Behavior & Policy Review, 2017, 4(5):454-465.

[5] Azizpour Y , Delpisheh A , Montazeri Z , et al. Effect of childhood BMI on asthma: A systematic review and meta-analysis of case-control studies[J]. BMC Pediatrics, 2018, 18(1):143-156.

[6] B. Sevilla-Villanueva, K. Gibert, M. Sànchez-Marrè,et al. Evaluation of Adherence to Nutritional Intervention Through Trajectory Analysis[J]. IEEE J Biomed Health Inform, 2017, 21(3):628-634.