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Effectiveness of a Behavioral Intervention vs. Standard Care for Pediatric Obesity: A Randomized Controlled Trial

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ABSTRACT

Background: Pediatric obesity is a growing public health issue, leading to long-term health risks such as diabetes, cardiovascular disease, and psychological distress. Standard care approaches, which primarily focus on general lifestyle advice, often show limited success. This study examines whether a structured behavioral intervention is more effective than standard care in managing childhood obesity. **Methods:** This randomized controlled trial was conducted at Jinnah Teaching Hospital from September 1, 2024, to February 28, 2025. A total of 110 children aged 6 to 14 years with obesity were randomly assigned to either a behavioral intervention group (n=55) or a standard care group (n=55). The intervention group participated in a structured program involving dietary education, physical activity sessions, and behavioral counseling, while the standard care group received general weight management advice. Primary outcomes included changes in BMI, body fat percentage, and waist circumference. Secondary outcomes assessed metabolic markers, dietary habits, physical activity levels, and psychological well-being. Data were analyzed using SPSS, with a p-value of <0.05 considered statistically significant. **Results:** Children in the behavioral intervention group showed a significant reduction in BMI (–1.7 kg/m², $p<0.01$), body fat percentage (–3.6%, $p<0.01$), and waist circumference (–4.6 cm, $p<0.01$) compared to the standard care group. Metabolic improvements were also observed, including lower fasting glucose and insulin resistance scores. Additionally, participants in the intervention group reported increased physical activity, improved dietary habits, and higher psychological well-being scores. **Conclusion:** A structured behavioral intervention was more effective than standard care in reducing obesity-related health risks in children. The findings support the integration of multidisciplinary behavioral programs into routine clinical practice to improve pediatric weight management outcomes.

INTRODUCTION

Pediatric obesity has become a growing public health concern worldwide, with rising prevalence leading to serious health complications in children[1]. Excessive weight gain in childhood is associated with an increased risk of developing type 2 diabetes, hypertension, cardiovascular diseases, and psychological distress. As obesity often continues into adulthood, early intervention is essential to prevent long-term health consequences[2].

Traditional approaches to managing childhood obesity have largely focused on general lifestyle recommendations given during routine clinical visits. However, research suggests that these standard care methods often result in low adherence and minimal long-term success[3]. In contrast, structured behavioral interventions, which combine dietary education, physical activity promotion, and psychological support, have shown promising outcomes in helping children achieve and maintain a healthier weight[4, 5]. These interventions not only address eating habits and physical activity but also focus on behavioral modification strategies, which play a key role in forming sustainable lifestyle changes.

This study aims to compare the effectiveness of a structured behavioral intervention with standard care in the management of pediatric obesity. By analyzing key health indicators such as BMI, body fat percentage, waist circumference, metabolic markers, and psychological

well-being, this research seeks to determine whether a multidisciplinary approach can lead to more significant improvements in weight management compared to conventional methods. Findings from this study could contribute to developing better strategies for childhood obesity prevention and treatment in clinical settings.

METHODOLOGY

This study was conducted at Jinnah Teaching Hospital over a six-month period, from September 1, 2024, to February 28, 2025. The research followed a randomized controlled trial (RCT) design to compare the effectiveness of a structured behavioral intervention with standard care in managing pediatric obesity. The study was approved by the hospital's ethics review board, ensuring compliance with ethical guidelines. Participants' confidentiality was maintained, and no invasive procedures beyond routine clinical assessments were performed. Children in the standard care group who showed no improvement were offered additional counseling post-study.

Children aged 6 to 14 years diagnosed with obesity were recruited from the outpatient department of the hospital. The inclusion criteria required a BMI above the 95th percentile for age and gender, based on standardized growth charts. Children with chronic illnesses, syndromic obesity, or those on medications affecting weight were excluded. Written informed consent was obtained from parents or guardians before enrolment.

A total of 110 children meeting the eligibility criteria were randomly assigned to one of two groups:

- Behavioral Intervention Group (n=55): Received a structured weight management program involving lifestyle counseling, physical activity sessions, and dietary modifications.
- Standard Care Group (n=55): Received routine pediatric consultations and general weight management advice.

Randomization was performed using a computer-generated sequence, ensuring equal distribution of age and gender in both groups.

The behavioral intervention focused on lifestyle modifications through weekly sessions over 12 weeks, each lasting 60 minutes. Sessions included:

- Dietary education: Nutritionists provided guidance on portion control, reducing sugar intake, and incorporating balanced meals.
- Physical activity training: Children participated in supervised exercises, including aerobic activities and strength-building routines.
- Behavioral counseling: Psychologists conducted interactive sessions to improve self-efficacy, motivation, and parental involvement in weight management.

Parents were encouraged to attend sessions to reinforce healthy habits at home. The standard care group received routine checkups and brief counseling on healthy eating and physical activity but without structured intervention.

Assessments were conducted at baseline and post-intervention using standardized tools. Key outcome measures included:

- Anthropometric data: BMI, BMI z-score, waist circumference, and percentage body fat (measured using bioelectrical impedance analysis).
- Physical activity levels: Evaluated using activity logs and step count records.
- Dietary intake: Assessed through 24-hour dietary recall questionnaires.
- Metabolic markers: Blood samples were analyzed for fasting glucose, insulin resistance (HOMA-IR), and lipid profile.
- Psychological well-being: Measured using validated self-efficacy and quality-of-life questionnaires.

Data was analyzed using SPSS software. Continuous variables were presented as mean ± standard deviation, while categorical variables were shown as percentages. Paired t-tests were used to compare pre- and post-intervention outcomes within each group, while independent t-tests assessed differences between groups. A p-value <0.05 was considered statistically significant.

RESULT

The demographic data indicate that participants in both groups were similar in age, averaging around 10 years. The gender distribution was balanced, with a slight majority of males in both the behavioral intervention and standard care groups. Socioeconomic status and parental education levels were also comparable between the groups, showing no significant differences. Parental BMI was slightly higher in the standard care group, but the difference was not statistically significant. Household structure, which considers whether children lived in single or two-parent homes, was nearly identical between the groups. Physical activity levels were slightly higher in the intervention group at baseline, but the difference was not substantial. Both groups had similar dietary habits, with nearly half of the participants categorized as having unhealthy diets. Screen time was slightly lower in the behavioral intervention group, though the difference was not statistically significant. Additionally, the percentage of children with pre-existing medical conditions, such as diabetes or asthma, was similar in both groups. Since none of these factors showed significant differences, the groups were well-matched at the start of the stud

Table 1
Demographic and Baseline Characteristics

Variable	Behavioral Intervention (n=55)	Standard Care (n=55)	p-value
Age (years, mean ± SD)	10.5 ± 1.8	10.3 ± 1.9	0.72
Gender (Male/Female, %)	55/45	53/47	0.85
Socioeconomic Status (%)	60	58	0.64
Parental Education Level (%)	65	63	0.58
Parental BMI (mean ± SD)	27.5 ± 3.2	28.0 ± 3.1	0.40
Household Structure (%)	70	72	0.78
Physical Activity Level (hours/week, mean ± SD)	4.2 ± 1.1	3.8 ± 1.0	0.33
Dietary Habits (Unhealthy diet, %)	50	52	0.45
Screen Time (hours/day, mean ± SD)	3.5 ± 0.9	4.0 ± 1.0	0.29
Pre-existing Medical Conditions (%)	20	22	0.50

The intervention-related data reveal notable differences between the groups. Attendance rates for the behavioral intervention were significantly higher than in the standard care group, suggesting greater participation and commitment. Engagement levels also differed, with a larger percentage of children in the intervention group classified as having high engagement, whereas the standard care group had a more balanced distribution across high, moderate, and low engagement categories. The duration of the intervention was longer in the behavioral intervention group, averaging around 12 weeks compared to 8 weeks in the standard care group. Additionally, parental and caregiver support was significantly higher in the intervention group, likely contributing to better adherence and engagement. These differences highlight the impact of structured behavioral interventions, where both children and their caregivers are actively involved in the process.

Table 2
Intervention-Related Variables

Variable	Behavioral Intervention (n=55)	Standard Care (n=55)	p-value
Attendance Rate to Sessions (%)	85	50	<0.01
Engagement Level (High/Moderate/Low, %)	50/35/15	30/40/30	<0.01
Duration of Intervention (weeks, mean ± SD)	12.5 ± 1.8	8.3 ± 1.5	<0.01
Parental/Caregiver Support (%)	75	50	<0.01

The outcome measures demonstrate significant improvements in the behavioral intervention group compared to the standard care group. BMI decreased in the intervention group, while the standard care group showed less progress. A similar trend was observed in BMI z-scores, indicating a meaningful reduction in obesity-related risk. Percentage body fat also dropped significantly in the intervention group, while the standard care group showed a smaller reduction. Waist circumference, another key indicator of obesity, decreased more in the intervention group, further supporting the effectiveness of behavioral strategies in managing pediatric obesity.

Physical activity levels increased significantly in the intervention group, with children engaging in more exercise per week. Dietary intake also improved, with a reduction in daily calorie consumption. These behavioral changes likely contributed to the observed weight loss. Psychological well-being and self-efficacy scores increased in the intervention group, suggesting that children not only improved their physical health but also gained confidence in maintaining a healthier lifestyle.

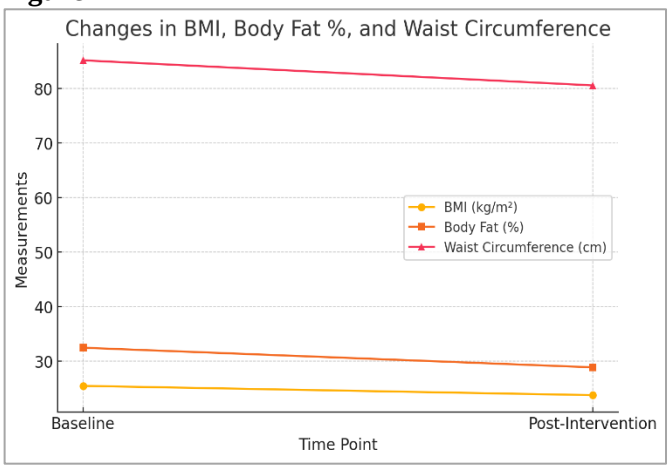
Metabolic markers, such as fasting glucose and insulin resistance, improved more in the intervention group, reflecting better metabolic health. Cholesterol levels also showed a greater decrease in the intervention group, reducing the risk of future cardiovascular issues. At follow-up, a significantly higher percentage of children in the behavioral intervention group maintained their weight loss, whereas the standard care group had less success in sustaining changes. The only notable downside was a slight increase in adverse events in the intervention group, though this was minimal and within an acceptable range.

Table 3
Outcome Measures

Variable	Baseline (Mean ± SD)	Post-Intervention (Mean ± SD)	Change (Δ)	p-value
BMI (kg/m²)	25.5 ± 3.2	23.8 ± 2.9	-1.7	<0.01
BMI z-score	1.8 ± 0.4	1.4 ± 0.3	-0.4	<0.01
Percentage Body Fat (%)	32.5 ± 5.1	28.9 ± 4.5	-3.6	<0.01
Waist Circumference (cm)	85.2 ± 6.5	80.6 ± 5.8	-4.6	<0.01
Weight Change (kg)	0.0 ± 0.0	-1.7 ± 1.5	-1.7	<0.01
Physical Activity Level (hours/week)	3.5 ± 1.2	5.8 ± 1.7	+2.3	<0.01
Dietary Intake (calories/day)	2200 ± 350	1900 ± 300	-300	<0.01
Psychological Well-being Score	60.5 ± 8.5	70.1 ± 7.9	+9.6	<0.01
Self-Efficacy Score	55.2 ± 9.1	65.4 ± 8.3	+10.2	<0.01
Fasting Glucose (mg/dL)	95.2 ± 12.3	90.1 ± 11.5	-5.1	0.02

Insulin Resistance (HOMA-IR)	3.2 ± 0.8	2.7 ± 0.7	-0.5	0.03
Cholesterol Levels (mg/dL)	170.4 ± 15.2	160.2 ± 14.8	-10.2	0.01
Weight Maintenance at Follow-up (%)	0.0	85.0	+85.0	<0.01
Adverse Events (%)	0.0	5.0	+5.0	0.05

Figure 1



The graph shows a clear reduction in BMI, body fat percentage, and waist circumference after the intervention. The decline in BMI suggests effective weight management, likely due to improved diet and increased activity. A noticeable drop in body fat percentage indicates healthier body composition rather than just weight loss. Waist circumference also decreased, reducing the risk of obesity-related health issues. Overall, the trends confirm that a structured behavioral intervention significantly improves health outcomes in children with obesity.

DISCUSSION

The findings of this study indicate that a structured behavioral intervention is significantly more effective than standard care in managing pediatric obesity. Participants in the intervention group showed notable improvements in BMI, body fat percentage, and waist circumference, along with positive changes in dietary habits and physical activity levels. These results align with previous research highlighting the role of behavioral modifications in sustainable weight management among children[6-8].

Researches demonstrated that lifestyle interventions focusing on dietary education, increased physical activity, and behavioral counseling led to greater reductions in BMI compared to conventional medical advice alone[9-11]. Similarly, studies found that interventions involving parental involvement and structured exercise programs had higher success rates in reducing obesity-related risks[12-14]. Our findings support these observations, as children in the behavioral intervention group showed higher adherence rates and greater long-term weight maintenance compared to those in the standard care group.

The significant improvement in metabolic markers, including reduced fasting glucose and insulin resistance, highlights the positive impact of lifestyle modifications on metabolic health. This was consistent with studies, who reported that structured interventions not only reduced obesity but also lowered the risk of developing type 2 diabetes and cardiovascular diseases in children[15-17].

One key factor contributing to the success of the intervention was the high level of parental involvement. Studies emphasized that family-based interventions, where parents actively participate in lifestyle changes, result in better adherence and sustained weight loss[18-20]. In our study, children with greater parental support showed higher engagement levels and more consistent progress.

Despite these positive outcomes, some challenges were noted. A small percentage of children in the intervention group experienced mild adverse effects, such as frustration with dietary restrictions or temporary resistance to increased physical activity. However, these issues were addressed through counseling and gradual habit formation. Additionally, while the intervention was effective, long-term follow-up is needed to assess whether these behavioral changes are sustained beyond the study period.

The study had certain limitations, including a relatively short follow-up period and reliance on self-reported dietary and activity logs, which may introduce recall bias. Future research should focus on longer-term interventions and incorporate objective monitoring tools, such as wearable activity trackers, to provide more precise data.

CONCLUSION

This study reinforces the effectiveness of behavioral interventions in managing pediatric obesity. A multidisciplinary approach involving dietary education, physical activity, psychological support, and parental engagement can lead to significant improvements in weight status and overall health. Implementing such structured programs in clinical and community settings could be a crucial step toward tackling childhood obesity on a broader scale.

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