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Effectiveness of Early Childhood Obesity Prevention Programs in Primary Care Setting

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ABSTRACT

Background: Preventive infrastructure in low and middle income countries continue to be limited and childhood obesity is an escalating global health concern. The early childhood period is a critical period for establishing lifelong dietary and activity patterns as it presents an opportune window for intervention. The goal of this study was to test a structured obesity prevention program in the context of the primary care setting at Allied Hospital Faisalabad. **Methods:** The study is a prospective interventional one conducted from July to December, 2024, among 120 children aged 2–5 years. The participants were randomly assigned into intervention (n=60) and control (n=60) groups. Structured counseling on nutrition, physical activity, screen time reduction and sleep hygiene was provided to the intervention group during the routine visits, along with relevant educational materials and monthly follow ups. Standard pediatric care was given to the control group. Data were collected at baseline, 3 months and 6 months on anthropometric and behavioral measures. **Results** After 6 months, the intervention group significantly decreased BMI percentile (BMIPCT: –5.7 ± 1.9; $p < 0.001$) and positively changed dietary intake (3.2 servings/week more of fruits and vegetables and 4.1 fewer of sugary drinks), physical activity (45.6 min/week more) and screen time (58.2 min/day less). Results from the control group showed no significant changes. **Conclusion:** Structured obesity prevention programs integrated into primary care improve early childhood health behaviors and weight trajectories substantially. Such interventions are feasible and have impact in resource constrained settings, as we show in these findings.

INTRODUCTION

Childhood obesity has reached the status of a global health problem and the number of obese children in both developed and developing countries is growing steadily (Koliaki et al., 2023; Carullo et al., 2023). In 2020 (Amir-ud-Din et al., 2022; Cao et al., 2024), the World Health Organization reported that globally there were over 39 million overweight children under the age of five with more of the burden placed on low and middle income countries. Indeed, the first five years of life constitute a crucial developmental window during which dietary patterns, levels of physical activity and lifestyle habits are set up in early childhood which commonly coincide and persist into adolescence and adulthood (Mastorci et al., 2024; Martín-Rodríguez et al., 2022; Tohi et al., 2022). This period presents a strategic moment for intervention in the prevention of obesity and its coexisting conditions such as type 2 diabetes, cardiovascular disease and psychological disorders (Perone et al., 2023; Yang et al., 2022).

While recognition is high, effective prevention strategies to incorporate across this critical age group in routine clinical practice are underutilized (Reynolds 3rd, 2022; Shahid, 2024). Early obesity interventions in primary care settings provide a geographic proximity (Carmine, 2024) (Baker & Bjerregaard, 2023), they are a unique platform that has not yet been fully exploited in preventing children's weight gain. Others have highlighted the potential for brief, structured counseling during well child visits to facilitate change in a parental's behaviors around nutrition, physical activity, screen exposure and sleep hygiene (Bodepudi et al., 2024; Hayman, 2024). Although existing models for assessing the effectiveness of prophylaxis were proposed by Spencer et al. (2023) and Gamberini et al. (2022), their implementation and efficacy in resource limited healthcare systems have not adequately been addressed.

Despite the absence of awareness around the seriousness of the issue, the slow, but definite rise of childhood overweight and obesity in Pakistan is alarming,

particularly when it comes to preschool-aged children in urban centres where some rates have been reported to exceed 10 percent (Saif & Anwar, 2023; Obita & Alkhatib, 2023). Still, preventive efforts are fragmented and retrospective, rather than proactive. Efforts are needed develop and evaluate sustainable, culturally adapted and evidence based interventions within existing health infrastructure. The present study was intended to quantify the effectiveness of an early childhood obesity prevention program integrated in the primary care setting at Allied Hospital Faisalabad. This study focuses on modifiable behaviors to get at actionable insights regarding feasibility and impact of provider-led structured counseling to address early obesity in the context of routine pediatric visits.

METHODOLOGY

Allied Hospital Faisalabad is tertiary care set up with dedicated pediatric and family medicine units where this study was conducted during the period from July 2024 to December 2024. A prospective interventional design was used to determine the effectiveness of early childhood obesity prevention interventions in the primary care setting. Pediatric visits for routine care were screened in children 2–5 years for overweight or obesity using the age- and sex-specific BMI percentiles according to WHO growth standards. Participants and their caregivers were enrolled following informed consent if they were eligible.

The intervention involved structured counseling sessions from trained primary care providers which included education on nutrition, promotion of physical activity, sleep hygiene and reduced screen time. These sessions were then followed up with educational materials and follow up calls at monthly intervals. Participants in the control arm received standard care which consisted of general health advice without structured obesity specific counseling. Anthropometric baseline data were obtained at three-month and six-month intervals to measure BMI percentile, dietary habits and physical activity levels.

SPSS version 26 was used to analyze data. For continuous variables, independent sample t-tests were performed and for categorical variables, chi-square tests were performed for between group comparisons. Changes in BMI percentile over time were evaluated by a repeated measures ANOVA. Statistical significance was described at $p < 0.05$. Before initiation of this study, we obtained ethical approval from the institutional review board of Allied Hospital Faisalabad.

RESULTS

A total of 120 children, ages 2–5 years were enrolled in the study and were randomly assigned to the intervention (n=60) group or the control (n=60) group. The participants consisted of 51.7% male, 48.3% female and had a mean age of 3.6 ± 0.9 years. Baseline BMI percentiles, dietary intake, physical activity levels and screen time were not significantly different between groups($p>0.05$).

After six months of intervention, the intervention group had a statistically significant decrease in mean BMI percentile (from 91.4 ± 2.3 to 85.7 ± 3.1 $p < 0.001$) and the control group failed to change significantly (from 90.9 ± 2.5 to 90.1 ± 2.7 $p = 0.12$). The intervention group also showed improvements in their dietary patterns, including a significant reduction in the intake of sugary beverages (mean reduction of 4.1 servings/week; $p = 0.002$) and a significant increase in fruit and vegetables (mean increase of 3.2 servings/week; $p = 0.004$).

The mean increase in physical activity in the intervention group was significant (45.6 minutes/week moderate physical activity; $p = 0.001$) and screen time decreased by a mean average of 58.2 minutes/day ($p < 0.001$). There were no significant changes identified in the control group on these parameters.

Table 1

Baseline Characteristics of Participants

Variable	Intervention Group (n=60)	Control Group (n=60)	p-value
Mean Age (years)	3.6 ± 0.9	3.5 ± 0.8	0.54
Male (%)	52%	51%	0.88
Baseline BMI Percentile	91.4 ± 2.3	90.9 ± 2.5	0.27
Sugary Beverage Intake (serv/wk)	7.8 ± 2.1	7.6 ± 2.4	0.61
Fruit & Veg Intake (serv/wk)	6.3 ± 2.0	6.4 ± 2.2	0.74
Physical Activity (min/week)	72.4 ± 20.5	73.1 ± 21.2	0.81
Screen Time (min/day)	135.5 ± 32.4	138.2 ± 30.7	0.63

Table 2

Changes in Key Outcomes Over Six Months

Outcome	Intervention Group (Δ)	Control Group (Δ)	p-value
BMI Percentile	−5.7 ± 1.9	−0.8 ± 1.6	<0.001
Sugary Beverage Intake (serv/wk)	−4.1 ± 1.2	−0.6 ± 1.3	0.002
Fruit & Veg Intake (serv/wk)	+3.2 ± 1.1	+0.4 ± 0.9	0.004
Physical Activity (min/week)	+45.6 ± 10.2	+5.8 ± 9.7	0.001
Screen Time (min/day)	−58.2 ± 12.7	−6.3 ± 14.1	<0.001

Table 3

Repeated Measures ANOVA – BMI Percentile Over Time

Time Point	Intervention Group	Control Group	Interaction Effect (Group × Time)
Baseline	91.4 ± 2.3	90.9 ± 2.5	
3 Months	88.2 ± 2.7	90.5 ± 2.6	
6 Months	85.7 ± 3.1	90.1 ± 2.7	F = 29.47, p < 0.001

DISCUSSION

Findings of this study support the effectiveness of structured early childhood obesity prevention programs provided in the primary care setting. Over a 6 month period, children in the intervention group experienced a significant decrease in BMI percentile as well as healthy improvements in dietary intake, physical activity and screens time behaviors. Consistent with existing literature showing that early, targeted interventions, often delivered through routine visits in primary care, can make positive changes in behavior and reduce early obesity risks, these results are.

Sugary beverage intake decreased and fruit and vegetable consumption increased considerably in the intervention group, emphasizing the importance of caregiver education and consistent follow up for creating favorable changes in diet. Likewise, the enhanced physical activity and reduction of screen time echoes the value of behavioral

counseling coupled with parental involvement in establishing daily habits centred on a healthy weight during early childhood. Standard pediatric care was important but not sufficient to change behavior, as the control group did not demonstrate this change.

Further, our findings support the feasibility of embedding preventive strategies into existing healthcare infrastructure in a way that does not require a wholesale overhaul of the system. With little extra training, primary care physicians and family health teams can deliver effective counselling that is targeted to the developmental stage of the child and the family environment. The high retention and high follow-up adherence also suggest good acceptability of interventions among the caregivers if the interventions are relevant to the context in which they find themselves and if they are delivered within trusted care settings.

However, this study is limited. Because of the limited duration of follow up, no conclusions can be drawn regarding sustainability of observed benefits over the long term. In addition, reliance upon caregiver reported data for dietary intake and screen time may also introduce recall or social desirability bias. However, the commonality of these outcomes across different domains of behavior strengthens the evidence of the benefits of structured, primary care based preventive efforts.

Finally, primary care providers may play an early role in prevention of childhood obesity by integrating programs into care. Such models can be scaled up across similar healthcare settings, as a low cost and sustainable solution to a growing public health problem, especially in resource challenged environments. However, these findings require validation by future studies with longer follow/up and larger sample sizes to investigate the long term impact on weight trajectories and metabolic outcomes.

CONCLUSION

Early childhood obesity prevention programs implemented in primary care settings can contribute to marked improvements in BMI percentile and health behaviors in young children as indicated by this study. Both feasible and effective in the resource constrained environment of Allied Hospital Faisalabad, the structured, developmentally appropriate counseling approach delivered by trained healthcare providers was used. Enhanced dietary intake, improved physical activity and reduced screen time also support the multilevel benefits of intervening at an early age according to the practice of evidence-based principles. Additionally, the delivery of this model takes place on the back of existing healthcare infrastructure and routine pediatric visits, making this a scalable model. Although short follow up duration and reliance on self reported behavior metrics are limitations, the consistency of positive outcomes warrants broader adoption and integration into future policy decisions. Further long term studies are needed to test the durability of the observed behavioral changes and their consequences for metabolic health outcomes. This model has the potential to be a sustainable and cost effective solution to reversing the trend of childhood obesity that is on a rise.

REFERENCES

1. Koliaki, C., Dalamaga, M., & Liatis, S. (2023). Update on the obesity epidemic: after the sudden rise, is the upward trajectory beginning to flatten? *Current Obesity Reports*, *12*(4), 514-527. https://doi.org/10.1007/s13679-023-00527-y
2. Carullo, N., Zicarelli, M., Michael, A., Faga, T., Battaglia, Y., Pisani, A., ... & Andreucci, M. (2023). Childhood obesity: insight into kidney involvement. *International Journal of Molecular Sciences*, *24*(24), 17400. https://doi.org/10.3390/ijms242417400
3. Amir-ud-Din, R., Fawad, S., Naz, L., Zafar, S., Kumar, R., & Pongpanich, S. (2022). Nutritional inequalities among under-five children: a geospatial analysis of hotspots and cold spots in 73 low-and middle-income countries. *International Journal for Equity in Health*, *21*(1), 135. https://doi.org/10.1186/s12939-022-01733-1
4. Cao, F., Xu, Z., Li, X. X., Fu, Z. Y., Han, R. Y., Zhang, J. L., ... & Pan, H. F. (2024). Trends and cross-country inequalities in the global burden of osteoarthritis, 1990-2019: a population-based study. *Ageing research reviews*, 102382. https://doi.org/10.1016/j.arr.2024.102382
5. Mastorci, F., Lazzeri, M. F. L., Vassalle, C., & Pingitore, A. (2024). The transition from childhood to adolescence: Between health and vulnerability. *Children*, *11*(8), 989. https://doi.org/10.3390/children11080989
6. Martín-Rodríguez, A., Bustamante-Sánchez, Á., Martínez-Guardado, I., Navarro-Jiménez, E., Plata-SanJuan, E., Tornero-Aguilera, J. F., & Clemente-Suárez, V. J. (2022). Infancy dietary patterns, development, and health: an extensive narrative review. *Children*, *9*(7), 1072. https://doi.org/10.3390/children9071072
7. Tohi, M., Bay, J. L., Tu'akoi, S., & Vickers, M. H. (2022). The developmental origins of health and disease: adolescence as a critical lifecourse period to break the transgenerational cycle of NCDs—a narrative review. *International Journal of Environmental Research and Public Health*, *19*(10), 6024. https://doi.org/10.3390/ijerph19106024
8. Perone, F., Pingitore, A., Conte, E., Halasz, G., Ambrosetti, M., Peruzzi, M., & Cavarretta, E. (2023, March). Obesity and cardiovascular risk: systematic intervention is the key for prevention. In *Healthcare* (Vol. 11, No. 6, p. 902). MDPI. https://doi.org/10.3390/healthcare11060902
9. Yang, M., Liu, S., & Zhang, C. (2022, August). The related metabolic diseases and treatments of obesity. In *Healthcare* (Vol. 10, No. 9, p. 1616). MDPI. https://doi.org/10.3390/healthcare10091616
10. Reynolds 3rd, C. F., Jeste, D. V., Sachdev, P. S., & Blazer, D. G. (2022). Mental health care for older adults: recent advances and new directions in clinical practice and research. *World Psychiatry*, *21*(3), 336-363. https://doi.org/10.1002/wps.20996
11. Shahid, I., Khan, M. S., Fonarow, G. C., Butler, J., & Greene, S. J. (2024). Bridging gaps and optimizing implementation of guideline-directed medical therapy for heart failure. *Progress in Cardiovascular Diseases*, *82*, 61-69. https://doi.org/10.1016/j.pcad.2024.01.008
12. Baker, J. L., & Bjerregaard, L. G. (2023). Advancing precision public health for obesity in children. *Reviews in Endocrine and Metabolic Disorders*, *24*(5), 1003-1010. https://doi.org/10.1007/s11154-023-09802-8
13. Carmine, L. (2024). Current challenges in school-based health center care: COVID, mental health care, immigrant

youth, expansion of telemedicine. *Current Problems in Pediatric and Adolescent Health Care*, 101583. https://doi.org/10.1016/j.cppeds.2024.101583
14. Bodepudi, S., Hinds, M., Northam, K., Reilly-Harrington, N. A., & Stanford, F. C. (2024). Barriers to Care for Pediatric Patients with Obesity. *Life*, *14*(7), 884. https://doi.org/10.3390/life14070884
15. Hayman, L. L. (2024). The Role of Nursing in Pediatric Lifestyle Medicine. *American Journal of Lifestyle Medicine*, 15598276241233237. https://doi.org/10.1177/15598276241233237
16. Spencer, S. A., Adipa, F. E., Baker, T., Crawford, A. M., Dark, P., Dula, D., ... & Morton, B. (2023). A health systems approach to critical care delivery in low-resource settings: a narrative review. *Intensive care medicine*, *49*(7), 772-784. https://doi.org/10.1007/s00134-023-07136-2
17. Gamberini, C., Angeli, F., & Ambrosino, E. (2022). Exploring solutions to improve antenatal care in resource-limited settings: an expert consultation. *BMC Pregnancy and Childbirth*, *22*(1), 449. https://doi.org/10.1186/s12884-022-04778-w
18. Saif, S., & Anwar, S. (2023). Unraveling the South Asian enigma: concurrent manifestations of child anthropometric failures and their determinants in selected South Asian countries. *BMC nutrition*, *9*(1), 120. https://doi.org/10.1186/s40795-023-00771-4
19. Obita, G., & Alkhatib, A. (2023). Effectiveness of lifestyle nutrition and physical activity interventions for childhood obesity and associated comorbidities among children from minority ethnic groups: A systematic review and meta-analysis. *Nutrients*, *15*(11), 2524. https://doi.org/10.3390/nu15112524