CLINICAL RESEARCH STUDY

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Targeting Preschool Children to Promote Cardiovascular Health: Cluster Randomized Trial

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ABSTRACT

BACKGROUND: School programs can be effective in modifying knowledge, attitudes, and habits relevant to long-term risk of chronic diseases associated with sedentary lifestyles. As part of a long-term research strategy, we conducted an educational intervention in preschool facilities to assess changes in preschoolers' knowledge, attitudes, and habits toward healthy eating and living an active lifestyle.

METHODS: Using a cluster design, we randomly assigned 14 preschool facilities in Bogotá, Colombia to a 5-month educational and playful intervention (7 preschool facilities) or to usual curriculum (7 preschool facilities). A total of 1216 children aged 3-5 years, 928 parents, and 120 teachers participated. A structured survey was used at baseline, at the end of the study, and 12 months later to evaluate changes in knowledge, attitudes, and habits.

RESULTS: Children in the intervention group showed a 10.9% increase in weighted score, compared with 5.3% in controls. The absolute adjusted difference was 3.90 units (95% confidence interval [CI], 1.64-6.16; $P < .001$). Among parents, the equivalent statistics were 8.9% and 3.1%, respectively (absolute difference 4.08 units; 95% CI, 2.03 to 6.12; $P < .001$), and among teachers, 9.4% and 2.5%, respectively (absolute difference 5.36 units; 95% CI, −0.29-11.01; $P = .06$). In the intervened cohort 1 year after the intervention, children still showed a significant increase in weighted score (absolute difference of 6.38 units; $P < .001$).

CONCLUSIONS: A preschool-based intervention aimed at improving knowledge, attitudes, and habits related to healthy diet and active lifestyle is feasible, efficacious, and sustainable in very young children.
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KEYWORDS: Cardiovascular disease (CVD); Global health; Health education; Noncommunicable disease (NCD); Preschool children

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Noncommunicable diseases are responsible for the majority of deaths throughout the world.[1] According to the World Bank, 56% of all deaths in low- and middle-income countries may be attributed to noncommunicable diseases, mainly cardiovascular diseases,[2] and by 2020, 80% of all deaths may be attributed to these diseases.[3] The growing burden of these diseases stresses the need for population-based studies on effective strategies for their primary prevention in both developed and developing nations.

There is growing evidence that negative health behaviors initiated in childhood may persist through adulthood, leading to risk factors of cardiovascular disease and other chronic diseases.[4,5] This represents an opportunity for primary prevention, particularly in low- and middle-income countries, where rapid changes are occurring in chronic

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disease-relevant behaviors.[6] School and community programs that promote regular physical activity are recommended toward reducing the burden of chronic diseases associated with sedentary lifestyle and obesity.[7-10]

We therefore decided to design and implement a long-term pedagogic and communication research program aimed at developing and evaluating effective strategies for modifying knowledge, attitudes, and habits of preschool children and other stakeholders in Colombia.

Over a 5-month period, we assessed the impact on children's knowledge, attitudes, and habits towards healthy eating and living an active lifestyle following a preschool-based intervention. As secondary objectives, we evaluated parents' and teachers' knowledge, attitudes, and habits, changes in children's nutritional status, and body mass index (BMI), the association between children's BMI and knowledge, attitudes, and habits, and changes in knowledge, attitudes, and habits 12 months after the intervention ended.

CLINICAL SIGNIFICANCE

- Preschool-aged children undergoing this Healthy Habits intervention had a significant improvement in their cardiac well-being.
- The study also saw a positive outcome of knowledge, attitudes, and habits on parents and teachers.
- The intervention appears to have durability when evaluated 1 year later.

METHODS

Study Design

We conducted a cluster, randomized controlled trial in 14 preschool facilities in Usaquén (Bogotá, Colombia) between May and November, 2009. Usaquén represents the different socioeconomic status levels seen in Colombia, and includes an underprivileged community with a high migration rate. Randomization occurred at the preschool facility level. We used a blinded randomization assignment schedule, concealed until treatments had been allocated. All children 3-5 years of age at baseline, and their parents and teachers, were eligible. We excluded children, parents, or teachers who had received formal training in healthy habits, nutrition, or physical activity in the 6 months before the study and children whose parents did not consent.

It was assumed that the improvement rate in knowledge, attitudes, and habits in the control group would be 5%. A total sample size of 1043 children was calculated based on being able to detect a doubling of the improvement rate under the intervention, with 80% power, a 2-sided 5% significance test, and 1:1 allocation. We estimated 10% losses to follow-up. Institutional review board approval was obtained from both the Mount Sinai School of Medicine and Fundación Cardioinfantil in Bogotá.

Study Intervention

Based on the knowledge that negative health behaviors initiated in childhood that persist through adulthood can be risk factors that predict chronic diseases,[4,5] we designed an intervention based on social cognitive theory and the transtheoretical model in health promotion,[11] which was incorporated in a ludic and pedagogical strategy teaching preschool children key messages on the importance of healthy eating and living an active lifestyle in 3 integrated areas: body and heart, nutrition, and physical activity.

The intervened children were provided classroom educational and playful activities during 5 months, which included Sesame Workshop Healthy Habits storybooks, posters, videos, games, and songs (1 hour daily); a "Healthy family day" workshop (1 hour); and weekly health notes. Parents participated in 3 workshops and weekly notes containing positive health messages about nutrition and active lifestyles to share with their children. Teachers also participated in 3 centralized training sessions, plus personalized working sessions with a research supervisor (2 hours every 15 days), and received a teacher's guide (Appendix 1, online only). Meanwhile, the control preschool facilities continued with their usual preschool curriculum. As part of a requirement of a local institutional review board, these preschool facilities were provided with a similar intervention of 8 months, after the initial 5-month study ended.

Study Measurements

We developed questionnaires to measure knowledge, attitudes, and habits on healthy eating and living an active lifestyle in children, parents, and teachers. A panel composed of experts in psychology, qualitative research, pediatrics, nutrition, child development, and education was convened to ensure face and content validity of the instruments, based on item identification and extraction from published and unpublished questionnaires.[12,13]

The surveys were pilot tested in groups of children 3-5 years old (n = 20), parents, and teachers (n = 20). The final children questionnaire contained 21 simple items (10 for knowledge, 6 for attitudes, and 5 for habits) and used age- and sex-appropriate photographs to frame each question. The parent and teacher questionnaire had 28 and 30 items, respectively (Appendix 2, online only).

Children's, parents', and teachers' knowledge, attitudes, and habits were measured by a group of trained psychologists using a standardized protocol, blinded to intervention status. Study population was initially measured in May 2009, immediately before randomization and intervention allocation. The intervention was administered between June and October, 2009, and the second measurement was performed in November 2009 in all 14 preschool facilities. To assess long-term changes, the study population was again evaluated 12 months after the intervention ended.