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Randomized controlled trial of a clinic based intervention to promote healthy beverage consumption among Latino children

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Abstract

The objective of this study was to evaluate an educational module for Latino parents about the health effects of sweet beverages. Latino parents were randomized to receive the beverage module or a control module. Child beverage consumption was assessed at baseline, 2-weeks, 2-months and 3-months via a beverage recall survey. At 2-week follow-up, children of intervention participants had a mean reduction in 7-day total sugar-sweetened beverage and 100% fruit juice consumption of 16 ounces while controls had a mean increase of 4 ounces (p=0.01). At 2-month and 3-month follow-up, there was a reduction in mean total SSB and 100% fruit juice consumption among both intervention and control children. An educational module on beverages for Latino parents reduced child consumption of sweet beverages at 2-week follow-up. However, study participation appears to have also reduced controls' beverage consumption suggesting that frequent intensive surveys of beverage intake may be an intervention unto itself.

Keywords

beverages; Latinos; primary care; health education; obesity prevention; oral health

Introduction

Latino children in the United States are 50% more likely to be obese than their non-Hispanic white counterparts.[1] This disparity is much larger among pre-school age children. In the National Health and Nutrition Examination Survey (NHANES) from 2013–2014, Latino 2–5 year olds were three times more likely to be obese than non-Hispanic white preschoolers.[1] In addition, Latino children suffer from dental caries at higher rates than non-Hispanic white

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children.[2] The consumption of sugar-sweetened beverages (SSBs) is a major risk factor for childhood obesity[3–6] and dental caries,[7,8] and there is also evidence that 100% fruit juice contributes to both of these conditions.[9,10] Consequently, the American Academy of Pediatrics recommends that children avoid SSBs and that 100% fruit juice consumption be limited to no more than 4–6 ounces per day in children under age 7.[11,12] Despite these recommendations, numerous studies show that Latino children consume more SSBs and 100% fruit juice than non-Hispanic white children,[13–16] a behavior that is likely a major driver in differential rates of obesity and caries. Furthermore, SSB consumption has been linked to numerous other adverse health outcomes including Type 2 Diabetes,[17] non-alcoholic steatohepatitis,[18] and hypertension.[19] Thus, it is important to develop effective, easily deliverable and sustainable interventions to improve beverage consumption patterns among Latino children.

Incorporating education on SSBs and fruit juice consumption into primary care visits is a potentially high yield strategy. Children have numerous well-child visits in the first years of life (at least 9 by age 2); therefore, clinic based interventions for parents of young children may be able to improve child beverage intake patterns before they become firmly established and less amenable to change. In addition, embedding nutrition education within primary care visits may be more convenient for parents than interventions which occur at a separate time or location, making them more acceptable and easier to disseminate. Three prior studies have demonstrated that brief targeted counseling on beverage consumption during primary care visits can reduce children's consumption of SSBs[20] and 100% fruit juice[21,22] respectively. Limitations of these studies as applied to Latino children are that two out of three did not report the ethnicity of participants and none of the studies used materials which were culturally tailored to Latino families. In addition, in all of these studies, the intervention was delivered by the primary care providers themselves which may be a difficult model to sustain given the numerous topics that need to be addressed during well-child visits.

For this pilot study, we sought to design and test a brief, lay-person delivered educational intervention on beverage consumption for Latino parents of young children. We used a pilot randomized controlled trial design to test the effects of the intervention on child consumption of SSBs and 100% fruit juice at 2-weeks, 2-months and 3-months post-intervention. We hypothesized that there would be a significant effect of the intervention at 2-weeks with a decrease in intervention impact at the 2- and 3-month follow-up intervals.

Methods

Intervention development

We first developed the intervention that was tested in this study as an educational module for parents of overweight and obese children seen in the pediatric obesity clinic at Zuckerberg San Francisco General Hospital (ZSFG). In implementing this intervention with parents of overweight and obese children, we found that it was highly acceptable to parents. In addition, several parents expressed that they would have liked to receive this education when their child was younger as a means of preventing the onset of obesity. This feedback prompted us to consider testing the effects of the intervention on parents of young children

attending regular pediatric visits in our clinic at ZSFG. The intervention content was based on the results of a qualitative study that we conducted with Latino immigrant parents in Northern California to understand their practices, beliefs and knowledge regarding child beverage intake.[23] Some key findings from the qualitative study were that parents served children a very wide range of different SSBs and fruit juice including many homemade and culturally specific beverages (such as “agua fresca” which is made from blended fruit, water, and sugar and “horchata” which is made with rice, milk and sugar). While parents were generally aware that store-bought SSBs such as soda were unhealthy, many perceived homemade beverages to be healthy despite high sugar content. In addition, many parents thought that store-bought beverages labeled as “all natural” were healthy even when they contained large amounts of sugar. Furthermore, there was significant confusion regarding the sugar content and health effects of 100% fruit juice with many parents reporting that 100% fruit juice must be healthy because it is distributed by the WIC program. In addition parents in our study reported a great interest in receiving nutritional information in a health care setting. We used the Information-Motivation-Behavioral Skills (IMB) Model of health behavior promotion to inform intervention structure and approach.[24] See Table 1 for a detailed description of the intervention components and the relevant IMB constructs. Highlights of the intervention include an interactive approach with tailored information provision, a teach to goal approach, setting an action plan, and delivery by a lay person.

Study procedures

Parents with a child ages 6 months to five years who self-identified as Latino and were attending a well or sick visit in the ZSFG outpatient pediatric clinic were eligible to participate in the trial. Parents were excluded if their child had a health condition that precluded oral consumption (such as feeding tube dependent children) or if they had been referred to the ZSFG pediatric weight management clinic at that visit or during previous visits (as there would likely be significant overlap in educational content between the weight management visits and the study intervention).

The study was approved by the Institutional Review Board of the University of California San Francisco. The study was registered at ClinicalTrials.gov with study number NCT02257203. Participants were recruited directly by providers during visits and through flyers available in the clinic. Interested parents were screened for eligibility and provided informed consent. Parents first completed a demographic survey (all questions for this and all subsequent surveys were read out loud to parents). The youngest child in the family between the ages of 6 months and 5 years was designated as the index child and all subsequent questions were asked about that child. Then parents completed two beverage intake surveys. The first survey asked about their child’s consumption of different beverages on the previous day. Parents were asked separately about each of the following beverage categories: unflavored milk, flavored milk, soda, fruit flavored drinks with sugar, lemonade, “agua fresca,” sports drinks, freshly squeezed juice, store bought 100% fruit juice, and plain water. For each beverage, parents were asked if they served their child the beverage on the previous day, how many times they served their child the beverage, how many total ounces they served their child, and how many ounces the child drank. Parents were then asked if (to the best of their knowledge) anyone else had served the child the beverage, how many

ounces other people had served their child, and how many ounces their child had actually drunk. For the second beverage survey, parents were asked about their child's consumption over the previous 7 days. For each of the 10 beverage categories, parents were asked if their child had consumed the beverage in the previous 7 days, on which days the child had consumed the beverage, and how many ounces the child had consumed. For beverages that are frequently made at home such as lemonade, "agua fresca," and fresh squeezed juices, the research assistant specified to parents to include homemade beverages. To assist parents in quantifying their child's consumption of different beverages, the research assistant showed them beverage containers and glasses of different sizes and specified the volume of each. Parents then completed a brief survey about reading to children. They were asked on how many days they had read to their child in the previous seven days, whether they had a library card, whether they had taken their child to the library in the previous month and how many children's books were in their home. After completing the survey, parents were randomized to either participate in the beverage intervention (see Table 1 for a complete description of the beverage intervention) or a control intervention on interactive reading. We used a computer generated block randomization scheme with blocks of ten. Both the beverage and reading interventions were provided by the research assistant and lasted for approximately 20 minutes. Parents were called by another member of the research team, 2-weeks, 2-months and 3-months after study entry and were administered both the beverage surveys and the reading survey. The team member conducting the follow-up surveys was blinded as to whether participants were in the intervention or control group. At least three attempts were made to reach each participant at each follow-up point (even those who had not been successfully contacted for earlier follow-up points).

Statistical analysis

Our primary outcome measures were the proportion of parents in the intervention and control arms reporting that their child had consumed any SSB on the day prior to the survey and the proportion who reported that their child had consumed greater than 4 ounces of 100% fruit juice on the day prior to the survey from the 24-hour recall survey at 2-week follow-up. We assessed significance with a chi-squared test. The secondary outcome measure was total 7-day child consumption of SSBs and 100% fruit juice in ounces from the 7-day recalls survey at two-week follow-up. Beverage intake at 2-months and 3-months post-intervention was also collected to assess the durability of any intervention effect. For the 7-day consumption analysis, we compared mean reported consumption between intervention and control participants at baseline and each of the three follow-up points using t-tests. We also conducted a difference in differences analysis. We determined the difference in total SSB and 100% fruit juice consumption from baseline to each of the three follow-up time points for each study participant. We then used a t-test to compare the mean difference in total SSB and 100% fruit juice consumption from baseline to each follow-up time point for intervention control participants. We used Stata version 12.1 (Stata Corp, College Station, Texas) for all analyses.

3. Results

A total of 82 participants consented to the study and were randomized to intervention or control. Of these, 68 participants completed 2-week follow-up, 60 participants completed 2-month follow-up and 56 participants completed 3-month follow-up. See Table 2 for demographic characteristics of study participants. There were no significant differences in demographic characteristics between intervention and control participants. At baseline 38% of intervention and 40% of control participants had consumed an SSB on the day prior to the study. At 2-week follow-up, fewer intervention participants reported child consumption of an SSB on the day prior (23%) versus control participants (39%), but this difference was not statistically significant. The percentage of intervention participants who had consumed an SSB remained lower than control participants at 2-month and 3-month follow-up, but again these differences were not significant (Figure 1). At baseline, 13% of intervention and 19% of control participants had consumed more than 4 ounces of 100% fruit juice on the day prior (p=0.42). At 2-week follow-up, 0% of intervention and 12% of controls had consumed more than 4 ounces of 100% fruit juice (p=0.03). The percentage of intervention participants who consumed more than 4 ounces of 100% fruit juice remained lower than that for control at 2-month and 3-month follow-up, but these differences were not statistically significant (Figure 1).

With respect to the secondary outcome of total SSB and 100% fruit juice consumption in ounces in the 7 days, prior to the survey, at baseline there was no significant difference between intervention participants with a mean total consumption of 31 ounces and control participants with a mean total consumption of 40 ounces (p=0.41). At 2-week and 2-month follow-up, mean total SSB and 100% fruit juice consumption for intervention participants was significantly lower than for controls (Table 3). At 3-month follow-up, intake remained lower for intervention compared to control, but this difference was no longer statistically significant (Table 3). The difference in differences analysis revealed that at 2-weeks, intervention participants had a mean decrease in total SSB and 100% fruit juice consumption of 16 ounces vs. a mean increase of 4 ounces among controls (p=0.01). However, at 2-month and 3-month follow-up the difference in differences analysis was no longer significant as both cases and controls had decreased total consumption of SSBs and 100% fruit juice (Table 3).

We compared baseline characteristics of participants who completed 2-week follow-up to those who did not and found no significant differences in child age, child gender, maternal education, maternal country of origin or beverage consumption. We found that those who completed 2-week follow-up were more likely to speak Spanish at home rather than English (p=0.014) and had a lived in the United States for fewer years on average (9.1 vs 12.2 years p=0.05).

Discussion

In this pilot RCT, we found that a single 20-minute culturally tailored educational intervention on healthy beverage consumption provided to Latino parents by a lay research assistant led to fewer intervention children consuming more than 4 ounces of 100% fruit

juice at 2-week follow-up. In addition, the intervention resulted in lower 7-day child consumption of SSBs and 100% fruit juice among intervention participants at 2-week follow-up compared to controls (12.4 ounces 38.8 ounces). Furthermore, our difference in differences analysis revealed that intervention participants reduced total 7-day consumption of SSBs and 100% fruit juice at two weeks by 16 ounces on average while controls increased consumption by four ounces. These results indicate that, as hypothesized, the intervention had an immediate impact on child consumption of unhealthy beverages. The 7-day reduction in total sweet beverage consumption is not merely statistically significant, but also clinically significant. It has been estimated that reducing SSB consumption by two servings per week can prevent 2 pounds per year of weight gain.[25] Furthermore, interventional studies in children have demonstrated metabolic improvement with reductions in SSB consumption of 12 ounces per week.[26]

As we were testing a low intensity, one-time intervention, we anticipated that any decrease in consumption seen at 2-weeks might wane over time. We found that mean total 7-day SSB and 100% fruit juice consumption actually remained significantly lower for intervention compared to control participants at 2-month follow-up (6.9 ounces vs. 23.1 ounces). At 3-month follow-up, 7-day SSB and 100% fruit juice consumption was still lower for intervention vs. control, but this difference was no longer statistically significant, likely due in part to inadequate power from loss to follow-up. While we expected that intervention effects would fade over time, the lack of difference between intervention and control at 3 months also appears to be due in part to an unexpected decrease in intake of SSBs and 100% fruit juice among controls rather than a reversion of intervention participants back to previous intake levels. This is highlighted in the difference in differences analysis (Table 3) which revealed that at 2-months and 3-months, both intervention and control participants decreased their 7-day SSB and 100% fruit juice consumption compared to baseline.

The decrease in SSB and 100% fruit juice consumption among controls at 2-months and 3-months was an unexpected and yet important finding. One possible explanation is that participating in an intensive and detailed survey of their child's beverage consumption was an intervention unto itself for the parents in the control group. By participating in the surveys, which asked detailed questions about numerous beverage categories and included culturally specific and homemade beverages, parents may have developed a greater awareness of their child's total consumption of SSBs' and 100% fruit juice over a 7-day period. This increased awareness, coupled with messages that parents may have heard about the health effects of sweet beverages in other settings, may have been enough to decrease consumption. Two qualitative studies with Latino parents on the health effects of beverages revealed that parents were generally aware of the health effects of store bought SSBs, and had particular concerns about soda, but did not consider homemade beverages with added sugar (such as agua fresca and homemade lemonade) to be unhealthy.[23,27] Thus, the mere fact that the survey asked about beverages which are often homemade may have signaled to parents that there were health concerns associated with these beverage categories that they had not previously considered.

Three previous RCTs have demonstrated that primary-care based interventions to reduce SSB and/or 100% fruit juice consumption in young children can be effective. Doymaz et al.

reported that a brief educational intervention provided by pediatric residents to parents of children ages 2–10 on the health effects of soda and juice reduced consumption of soda but did not significantly impact 100% fruit juice consumption at 2-week follow-up.[20] French et al. studied two interventions (one focused on maternal and one on child behaviors) which provided brief anticipatory guidance on nutrition to mothers at each well child visit in the first year of life accompanied by supportive educational materials.[21] The messages included recommendations not to serve infants sugary beverages or juice in a bottle and to limit juice in a cup to 2–4 ounces per day. At 12 months, infants in both intervention groups consumed less juice per day compared to control participants who received usual care. Cloutier et al. reported the results of a primary care based obesity prevention intervention for low-income minority preschool children that coupled brief counseling and parent goal setting on obesogenic behaviors with a follow-up phone call. Intervention participants in this study reduced consumption of 100% fruit juice at 12 month follow-up with no change in SSB consumption.[22] Our study adds to the literature due to its focus on Latino children, the culturally tailored content and messaging, an active control group, and the repeated assessments of intervention effect over time. In addition, as opposed to the three previous studies outlined above, our intervention was delivered by a lay person rather than a health care provider which may be a more economical and sustainable approach to primary care based health education.

Our study does have a number of important limitations. Participants were recruited at a single clinic site and nearly all parents were Spanish speaking and born outside of the United States, mostly in Mexico and Central America. Thus, our results might not be applicable to more acculturated Latino families or to immigrants from other parts of Latin America. Despite our best efforts, we did have fairly high loss to follow-up resulting in loss of power to detect intervention effects, particularly for the dichotomized outcomes. Furthermore, while there were no differences in the baseline behaviors of those who completed follow-up versus those who were lost, there were some minor demographic differences. It is possible that the intervention had less of an impact on the more acculturated parents who were lost to follow-up. Finally, all of the data from this study came from parental report which may be driven by social desirability bias.

Conclusions

Notwithstanding the limitations noted above, our study does have important implications. We found that a brief intervention in primary care by a lay research assistant focused on reducing SSBs and 100% fruit juice did have a short-term positive impact on unhealthy beverage consumption in young Latino children. Such interventions are a promising means for intervening to reduce disparities in obesity and caries in Latino populations. Future studies should test the durability of intervention effects over a longer time period and also assess outcomes such as body mass index and the incidence of caries. We also found reductions in the consumption of SSBs and 100% fruit juice by control participants at 2- and 3-month follow-up, suggesting that repeated detailed surveys on child beverage consumption may be an effective means of intervention on its own that is worthy of future study.

The results of our study suggest that incorporating brief lay-led health education interventions into pediatric primary care is feasible and may impact parent feeding behavior in the short term. In addition, our finding of improvement in consumption among controls suggests that asking parents about a health behavior using a detailed survey can serve as a prompt to behavior change. Given the tremendous disparities in beverage consumption between Latinos and non-Hispanic whites, health care providers treating Latino populations should prioritize education on the health effects of beverages and consider inquiring about a wide array of culturally specific beverage categories, some of which parents might not perceive as unhealthy.

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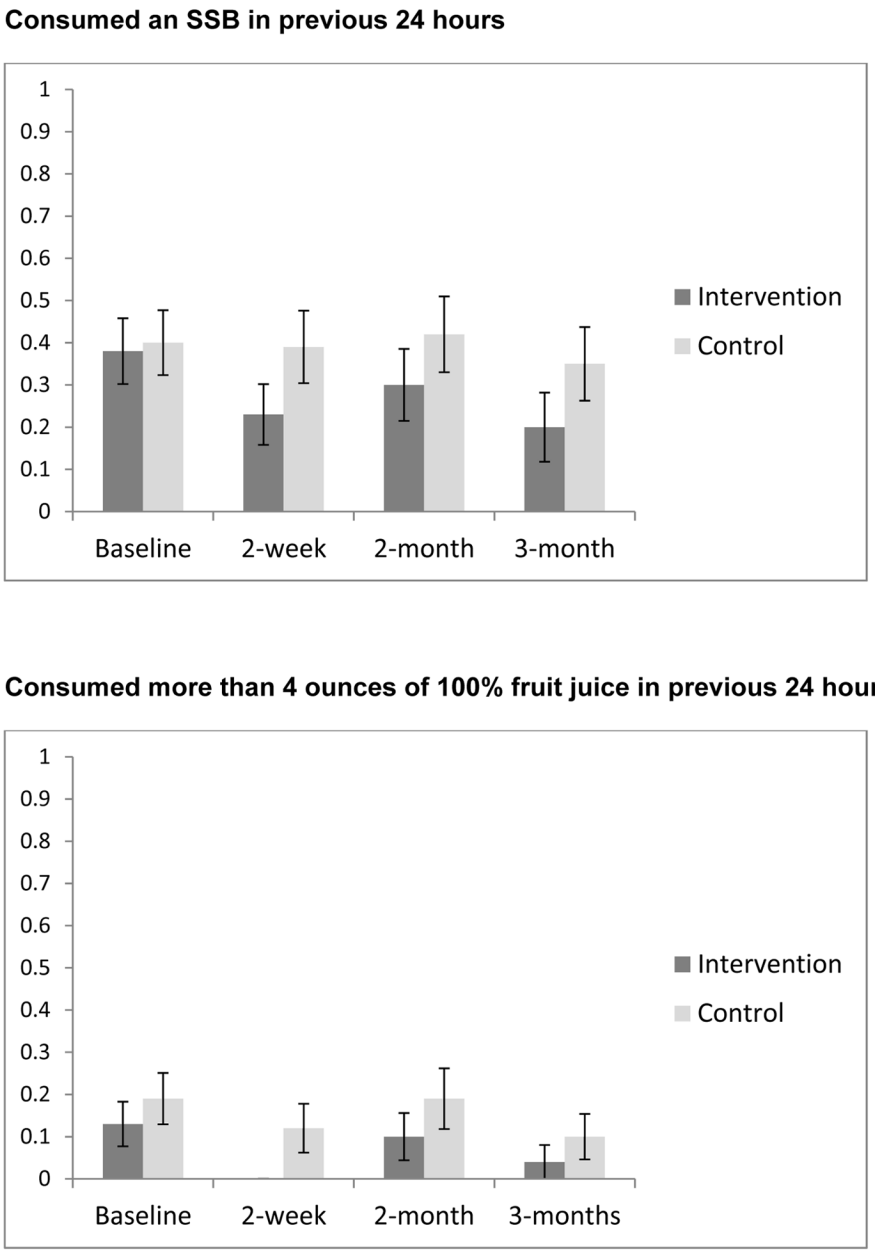

Figure 1.

Proportion of intervention and control participants who reported that their child had consumed any SSB on the day prior and the proportion who reported that their child consumed greater than 4 ounces of 100% fruit juice with standard error bars.

Table 1

Description of the beverage education intervention with relevant constructs from the Information-Motivation-Behavioral Skills (IMB) Model of Health Behavior

Module Activity/Content	**IMB constructs**
1) Facilitator asks parent which beverages they and their children typically consume and assesses parents' knowledge of the health effects of SSBs and 100% fruit juice and their attitudes towards consumption. Facilitator fills in health effects of SSBs' and 100% fruit juice not mentioned and clarifies that these effects are a concern with both homemade and store-bought beverages.	Information Motivation
2) Facilitator explains recommendations for beverage consumption (no SSBs and max 4–6 ounces of 100% fruit juice per day) and uses a measuring cup to demonstrate 4–6 ounces.	Information Motivation
3) Facilitator demonstrates to parents how to determine sugar content from a beverage label on a soda can in grams and show parents equivalent amount of sugar using sugar cubes. Facilitator explains benefits of dietary fiber and shows parents how to find information on fiber and vitamin content from a food label.	Information Behavioral Skills
4) Parents are given bottles of SSBs and 100% fruit juice and a sheet with nutritional information for a typical homemade *agua fresca* and are assisted in finding grams of sugar and fiber, and vitamin content. Parents are then given pictures of different fruits with nutritional information and are assisted in finding grams of sugar and fiber and vitamin content. As parents determine nutritional information, facilitator fills values into a chart to compare the sugar, fiber and vitamin content of the various SSBs, 100% fruit juice and whole fruits.	Information Behavioral Skills
5) Role playing exercise in which parents practice explaining to a family member the effects of SSBs and 100% fruit juice compared to the benefits of whole fruit	Behavioral Skills
6) Parents set a goal for reducing child's SSBs and 100% fruit juice consumption which they document on an educational handout to be taken home	Motivation

Table 2

Child and parent demographic characteristics

	Intervention		Control		
	Mean	**%**	**Mean**	**%**	**P**
Index Child characteristics					
Age in months	24		28		0.3
Female		50		45	0.67
Publicly insured		100		100	1.0
Receive WIC		85		86	0.89
Parent characteristics					
Foreign born		93		93	0.95
Spanish speaking at home		100		93	0.09
Years in the United States	9		10		0.42
Educational level					
≤6th grade		23		21	0.91
Some high school		33		33	0.92
High school graduate		40		40	0.97
College graduate		3		5	0.59
Country of origin					
Mexico		45		33	0.28
Guatemala		15		24	0.31
El Salvador		13		21	0.28
Honduras		18		12	0.47
Other		10		10	0.92

Table 3

Mean 7-day total consumption of SSBs and 100% fruit juice at baseline and follow-up among intervention and control (upper half of table) and mean of the individual differences in 7-day total consumption of SSBs and 100% fruit juice from baseline to each follow-up time point for intervention and control participants (lower half of table).

	Baseline (n=82)	**2-weeks (n=68)**	**2-months (n=60)**	**3-months (n=56)**
	Mean consumption (ounces)			
Intervention	31	12.4	6.9	11.4
Control	40	38.8	23.1	21.3
p-value *	0.41	0.02	0.001	0.1
	Mean difference in consumption from baseline (ounces)			
Intervention		−16	−17	−13
Control		+4	−18	−21
p-value *		0.01	0.96	0.51

* All p-values are for differences between intervention and control at each time point