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Longitudinal Study Tracking the Body Mass Index of Children in Clark County, Arkansas

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Alex Morrison, Hunter Heird and Detri Brech, Ph.D

Abstract

According to the Centers for Disease Control and Prevention (CDC), National Health and Nutrition Examination Survey data obtained in 2011-2012, 17% (12.5 million) of children and adolescents aged 2-19 years are obese. Racial and age disparities exist with higher levels among Hispanic children (22.4%) and non-Hispanic black children (20.2%). As a child ages, the rates of obesity increase: 8.4% of 2-to-5-year-olds, 17.7% of 6-to-11-year-olds, and 20.5% of 12-to 19-year-olds. The CDC has set a body mass index (BMI) percentile for underweight as less than the 5th percentile, a healthy weight as a BMI percentile ranging from the 5th percentile to less than the 85th percentile, overweight as a BMI percentile ranging from the 85th to less than the 95th percentile and obese as a BMI percentile equal to or greater than the 95th percentile. A longitudinal study originating in 2007 tracks the BMI percentiles of children aged 3-to-14-years in Clark County, Arkansas. Each summer children in the treatment and control groups are weighed and have height measured. A BMI and BMI percentile are calculated for each child. The treatment group receives two months of weekly nutrition and physical activity classes as well as parents receive nutrition and physical activity information to implement at home. At the end of the data period, the treatment and control groups are re-assessed. Comparisons are made within and between the groups. Five hundred and forty-five children (262 males and 283 females; 292 Caucasian, 243 African American, 9 Hispanic, 1 Asian) have been followed in the study with an average of 2% of children in the underweight percentile, 49% of children in the healthy weight percentiles and 49% of children in the overweight/obese percentiles. The 2014 summer research resulted in three children in the treatment group moving from the obese to the overweight category, three children moving from the overweight to the healthy weight category, and one child moving from the obese to the healthy weight category.

Purpose

The purpose of this research was to assess BMI of children before and after nutrition/physical activity education occurred to determine the effects of education and knowledge of nutrition/physical activity on the BMI of children.

Introduction

According to the Centers for Disease Control and Prevention childhood obesity has more than doubled in children and quadrupled in adolescents throughout the past thirty years. Since 1980 obese rates of children between the ages of six and twelve years in the United States increased from 7% to 18% in 2012. Overweight is defined as having excess body weight for a particular height from fat, muscle, bone, water, or a combination of factors, and obesity is defined as having excess body fat. Children and adolescents who are obese are more at risk for adult obesity, heart disease, type 2 diabetes, cancer of the breast, colon, endometrium, esophagus, kidney, pancreas, gall bladder, thyroid, ovary, cervix, and prostate. Education is the most important factor in prevention of childhood obesity; therefore, the research project conducted with the children of Arkadelphia, Arkansas located in Clark County.[1]

Reference

Childhood Obesity Facts at Centers for Disease Control and Prevention Web site. http://www.cdc.gov/healthyyouth/obesity/facts.htm Updated February 27, 2014. Accessed July 10, 2014.

Methods

The research project was approved by the Institutional Review Board at Ouachita Baptist University. Five sites (summer childcare facilities) in Arkadelphia, Arkansas agreed to participate in the study. Three sites were designated the treatment groups and two sites were designated the control groups. Parents/guardians signed and dated an informed consent form to allow the child to participate in the program. All children in both groups were measured and weighed before and after the treatment. Weights were used to calculate body mass index and body mass index for age percentile. In addition age, gender, ethnicity and grade completed were collected. An age appropriate nutrition/physical activity education program developed by two undergraduate dietetic majors was presented each week for six weeks during the 2014 summer. The education lessons were as follows:

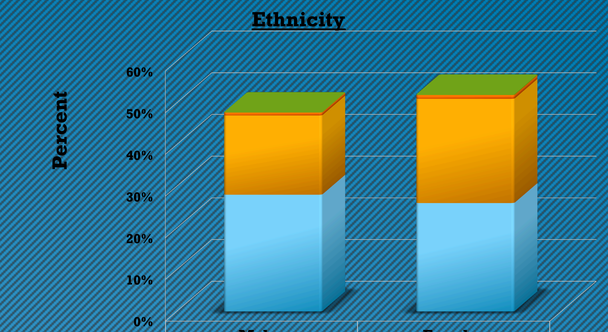
Week 1: Pre-assessment of height and weight. Sugar: How it can affect the body.
Week 2: MyPlate: Creating a healthy plate.
Week 3: Physical activity: The importance of staying fit.
Week 4: Protein: What protein is and the effects it has on the body.
Week 5: Portion Distortion: How to size up your plate.
Week 6: Physical activity: The importance of staying fit. Post-assessment of height and weight.

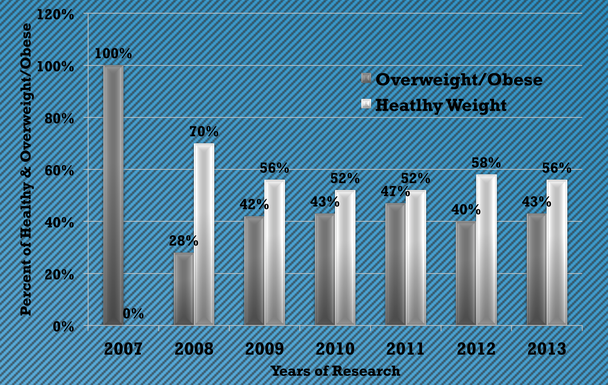
Data was entered into an Excel spreadsheet. Comparisons were made between the pre-assessment data and the post-assessment data within groups and between groups. The 2014 summer data was added to the longitudinal data for years 2007-2014.

Longitudinal Data

Longitudinal results from the 2007-2014 data were collated. A cohort of 545 children included 262 boys (48%) and 283 girls (52%) aged 3-14 years. Two hundred and ninety-two (53.6%) were Caucasian, 243 (44.6%) were African American, 9 (1.6%) were Hispanic, and 1 (0.2%) was Asian. Based upon the CDC BMI percentiles for age, in 2007, 70% of participants (n=23) were overweight/obese. After the first year, the numbers in the study grew to over 100 participants each summer. The percent of children with a BMI percentile for age in the healthy weight category for 2007-2014 was as follows: 2007-30%; 2008-70%; 2009-56%; 2010-52%; 2011-52%; 2012-58%; 2013-58%; and 2014 %. The percent of children with a BMI percentile for age in the overweight/ obese category for 2007-2014 was as follows: 2007-70%; 2008-28%; 2009-42%; 2010-43%; 2011-47%; 2012-40%; 2013-43%; and 2014- %. Less than 5% of children were in the underweight category for any one year

Longitudinal Data Results





Summer 2014 Results

The 2014 summer research project conducted at three treatment sites and two control sites consisted of 72 children in the treatment group for pre-BMI and post-BMI assessments and 36 children in the control group for pre-BMI and post-BMI assessments. One hundred and fourteen children were present on the pre-BMI assessment day, but only 72 children were in attendance on the post-BMI assessment day for the treatment group. Attendance varied from week to week. Within the treatment group, there were 33 females (12 Caucasian and 21 African American) and 39 males (20 Caucasian, 18 African American and 1 Hispanic). Within the control group, there were 17 females (11 Caucasian and 6 African American) and 19 males (12 Caucasian and 7 African American). The mean treatment group BMI was 19.5 pre-treatment and 19.4 post-treatment ($p>0.05$). The mean control group BMI was 16.4 pre-treatment and 16.5 post-treatment ($p>0.05$). Rates of obesity (BMI percentile for age >95th) for the treatment group were 12% of 2-to-5-year-olds; 34% of 6-to-11-year-olds; and 50% of 12-to-19-year-olds. The only age group with obesity in the control group were the 2-to-5-year-olds with 9%. The national rates reported by the CDC for childhood obesity are: 8.4% of 2-to-5-year-olds; 17.7% of 6-to-11-year-olds; and 20.5% of 12-to-19-year-olds. See the tables and graphs for data

Summer 2014 Data Results

2014 Pre and Post Assessment Data

CDC Category	Treatment Group		Control Group	
	Pre- Assessment	Post -Assessment	Pre-Assessment	Post-Assessment
Underweight	3	1	0	0
Healthy	54	37	30	27
Overweight	19	14	4	6
Obese	38	20	2	3

Percent of Underweight, Healthy Weight, and Overweight/Obese Children for Control Group (n=36)

	African American (n=13)		Caucasian (n=23)	
Gender	Healthy	Overweight/ Obese	Healthy	Overweight/Obese
Male	100%	-	75%	25%
Female	50%	50%	73%	27%

Percent of Underweight, Healthy Weight, and Overweight/Obese Children for Treatment Group (n=72)

	African American (n=39)		Caucasian (n=32)			Hispanic (n=1)
Gender	Healthy	Overweight/ Obese	Underweight	Healthy	Overweight/ Obese	Overweight/ Obese
Male	50%	50%	-	60%	40%	100%
Female	38%	62%	8%	50%	42%	-

2014 Pre and Post BMI Frequencies

Statistics	Treatment Group		Control Group	
(n=72)	Pre-BMI	Post-BMI	Pre-BMI	Post-BMI
Mean	19.5	19.4	16.3	16.4
Std. Deviation	4.8	5.2	2.3	2.1
Minimum	12.5	13.2	13	13.5
Maximum	37.5	38	26.5	25.5
Percentiles 25	16	15.8	15.3	15.3
50	18	17.3	16	16
75	21.6	21.8	16.7	16.9

Conclusion

After the post assessment it was found that a total of seven children in the treatment group lost enough weight to move down into different BMI categories. Three moved from the obese to overweight category, three moved from overweight to healthy, and one child moved from the obese category to a healthy weight. Also in the treatment group, one child moved from underweight to healthy, and three children moved from healthy to overweight. In the control group there was one child who lost weight moving them from overweight to a healthy weight. Four children gained weight and moved from the healthy to the overweight while one child moved from overweight to obese.

Acknowledgment

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