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Health Literacy

Association between health literacy and child and adolescent obesity

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ABSTRACT

Objective: We tested the association between child and parental health literacy (HL) and odds of child and adolescent obesity.
Methods: We conducted an anonymous cross-sectional survey of a convenience sample of English-speaking child-parent dyads. Newest Vital Sign (NVS) measured HL. We used multivariable logistic regression to test adjusted association between child and parental NVS and obesity. Analyses were stratified for school-aged children (aged 7–11) vs. adolescents (aged 12–19).
Results: We surveyed 239 child-parent dyads. Median child age was 11 [inter-quartile range 9–13]; 123 (51%) were male; 84% Medicaid recipients; 27% obese. For children, the odds of obesity [adjusted odds ratio (95% confidence interval)] decreased with higher parent NVS [0.75 (0.56,1.00)] and increased with parent obesity [2.53 (1.08,5.94)]. For adolescents, odds of obesity were higher for adolescents with the lowest category of NVS [5.00 (1.26, 19.8)] and older parental age [1.07 (1.01,1.14)] and lower for Medicaid recipients [0.21 (0.06,0.78)] and higher parental education [0.38 (0.22,0.63)].
Conclusion: Obesity in school-aged children is associated with parental factors (obesity, parental HL); obesity in adolescents is strongly associated with the adolescent's HL.
Practice implications: Strategies to prevent and treat obesity should consider limited HL of parents for child obesity and of adolescents for adolescent obesity.

1. Introduction

Health literacy is defined as "the degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions" [1]. The concept of health literacy encompasses a variety of factors, including but not limited to individual cognitive capacities, communication skill, decision-making capacity, cultural/social/policy influences, and the context in which interactions with a health system occur [2–4]. However, most attempts to measure health literacy have been limited to capturing "functional health literacy" including specific skills such as reading comprehension and numeracy or the capability to perform mathematical computations required to manage one's health [5].

Numerous studies have demonstrated the association between better functional health literacy (FHL) and better health outcomes in adults [6–11]. Fewer studies are available in pediatrics, but those that do exist demonstrate an association between low FHL amongst parents and more medication dosing errors [12], worse asthma care [13], and worse glycemic control in children with type 1 diabetes [14].

While the decisions of parents affect child health outcomes, children can also be in a position to influence their own health, particularly within the context of chronic diseases such as asthma and diabetes. Children as young as 4 years have been reported to be involved in their own self-care [15–26]. In one study, 4- to 6-year-old children understood that they required low sugar diets, and that insulin was needed to convert sugar into energy [17]; in another, children aged 9–12 years read carbohydrate details on food labels and regulated insulin doses to match their energy needs [18]. Within the context of child obesity, children regularly have the opportunity to make independent decisions about their food consumption; we know that school-aged children eat almost half their meals in school [27] and are targeted by advertising via vending machines and snack bars [28].

In a previously published study amongst overweight children, we reported a relationship between a child's own FHL and his or her body mass index [BMI). Using the Short Test of Functional Health Literacy in Adults (STOFHLA) and regression analysis adjusting for parental literacy and BMI, we found that

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child FHL was independently and inversely associated with child BMI Z score [29]. To our knowledge, no other investigators have reported on the relationship between a child's own FHL and obesity; hence, we sought to test this relationship again in a more general population. Because parent vs. child's influence on health-related decision-making likely varies as children advance through the cognitive stages from childhood through adolescence, we hypothesized that parental FHL would be a driver for obesity in school-aged children, while adolescent FHL would drive obesity amongst adolescents.

2. Methods

We conducted an anonymous cross-sectional survey of a convenience sample of parent-child dyads in the outpatient waiting rooms of urban pediatric primary and subspecialty care clinics of an academic children's hospital. Clinics were either hospital-based or at one of two primary care sites (Wilmington, DE, and Philadelphia, PA). Children meeting the following inclusion criteria were enrolled: aged 7–19, accompanied by a legal guardian who is also a biological parent, and parent and child speak English. No compensation was provided for participation in this 5- to 10-min survey. Surveys were conducted by trained research assistants during 2- to 6-week blocks in the spring/summer of 2010, summer of 2011, and spring of 2012. This study was approved by the Institutional Review Board of Nemours/Alfred I. duPont Hospital for Children, and informed consent and child assent were obtained from all participants.

2.1. Measures

2.1.1. Dependent variable: presence of obesity

The trained research assistant weighed and measured each child using a standard clinic scale and stadiometer. Children were weighed in light clothing, with shoes/jackets removed and pockets emptied. The BMI was calculated according the formula kg/m^2, and BMI percentile was obtained using CDC growth charts [30]. We categorized child BMI percentile into the following groups: underweight (<5th percentile), normal weight (5th–85th percentile), overweight (85th–95th percentile), and obese (>95th percentile).

2.1.2. Main independent variable: functional health literacy

We administered the Newest Vital Sign (NVS), a screen for FHL, separately to both the parent and the child [31]. The test, which takes an average of 2.9 min to administer [32], consists of a nutrition label from an ice cream container, with six verbally administered questions that test both reading comprehension and numeracy. All questions are scored equally, for a total score ranging from 0 to 6. Amongst adults, the NVS has been shown to have high internal consistency (Cronbach alpha = 0.76) and good criterion validity ($r = 0.59$, $p < 0.001$) with the Test of Functional Health Literacy (TOFHLA) [33]. While the NVS has not been validated for use with children/adolescents, no validated tests exist that measure both reading comprehension and numeracy amongst child or adolescent populations. Because the NVS uses a food label as the prompt to measure health literacy, we believed it presented the most theoretically relevant test for measuring FHL in the context of child obesity. The TOFHLA has also not been validated in children but includes questions related to specific adult procedures (bowel preparation for radiograph) and adult medications (blood pressures pills). We chose not to use the Rapid Estimate of Adult Literacy in Medicine (REALM-Teen), which has been validated in adolescents [34], because it is a word list only and does not measure either reading comprehension or numeracy.

2.1.3. Measured covariates

Parental height and weight were measured in the same manner as described above for children, and BMI was calculated. A structured parent interview gathered data on child age, sex, race/ethnicity, child's insurance, parent's level of education (ordinal scale 1–7; 4 = completed high school or GED), and zip code, which we matched to national census data to retrieve median household income.

2.2. Analysis

First, because their values were extreme, we excluded three children with BMI below the 5th percentile and categorized the remainder of the sample between obese and non-obese. Demographics and NVS score data were characterized for obese and non-obese children. We used the NVS score both as an ordinal variable (0–6) and categorized it according to the author's criteria: "high likelihood of limited FHL" (0–1), "possibility of limited FHL" [2,3], and "adequate FHL" [4–6]. Because the sample was largely made up of Medicaid recipients, child insurance was categorized as Medicaid vs. other (private insurance, Children's Health Insurance Program, uninsured). Quantitative variables were summarized by mean and standard deviation or median and inter-quartile range (IQR) if non-normally distributed. Categorical variables were summarized using frequency and percentage.

To identify the variables to be entered in regression analysis, we used univariable logistic regression to examine the unadjusted association of the odds of child obesity with child NVS, parent NVS, child demographic characteristics (age, sex, grade in school, race, Medicaid status), and parent characteristics (median household income, educational level, age, BMI, obesity status). The procedure was performed separately for school-aged children (aged 7–11.9 years) and for adolescents (aged 12–19 years). We used bivariate analyses to test the associations of theoretically relevant demographic variables with the main independent variables (child and parent NVS). Non-parametric and parametric statistics were used as appropriate.

We used multivariable logistic regression to test the association between child and parent NVS and obesity, stratified by age group (children vs. adolescents). Variables associated with child obesity were entered in the regression if the p value in the unadjusted analysis was less than 0.50. Variables associated with the child and parental NVS on bivariate analyses with a p value of less than 0.20 were added to the regression equations. Variables were retained in the final equations if their p value was less than 0.20.

3. Results

3.1. Demographic characteristics

We surveyed 239 child-parent dyads. Median (IQR) child BMI percentile was 82 (55–95); 65 (27%) were obese. Median (IQR) parent BMI was 27.5 [23–32]; 85 (35%) were obese. As expected for a sample recruited in a health care setting, the prevalence of obesity in this sample is higher than national averages and slightly higher than average for the Philadelphia, PA, and Wilmington, DE, where subjects were recruited. The median age of children was 11 yrs (IQR 9–13), 123 (51%) were male, 173 (72%) were African American, 66 (28%) were white, and all were non-Hispanic. Seventy percent of parents were mothers; median parent age (IQR) was 37 [32–43], 84% had a high school degree/GED, and median (IQR) household income based on zip code was $53,110 ($44,576–$60,189) (Table 1). Children were primarily Medicaid recipients [$n = 202$ (84%)]; compared with children with other types of insurance, median household income (IQR) was lower for Medicaid