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Caregiver health literacy and adherence to a daily multi-vitamin with iron regimen in infants

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ABSTRACT

Objective: To determine whether or not limited caregiver health literacy is associated with adherence to a daily multi-vitamin with iron regimen in infants.
Methods: 110 caregiver/infant dyads were enrolled in a prospective study to assess the relationship between caregiver health literacy and adherence to a daily multi-vitamin with iron regimen for infants. Households were contacted biweekly over a 3-month period. Adherence was based upon caregiver report. High adherence, our primary outcome, was defined as the administration of the multi-vitamin with iron on 5–7 days over the past week.
Results: As measured by the Short Test of Functional Health Literacy in Adults (S-TOFHLA), 18% of caregivers had limited health literacy skills. Caregivers with limited health literacy skills were more likely to have higher adherence than caregivers with adequate health literacy, after adjusting for a number of possible confounding variables (AOR = 2.13; 95% 1.20–3.78).
Conclusion: Caregivers with limited health literacy were twice as likely to report high adherence to a daily multi-vitamin with iron regimen in infants as caregivers with adequate health literacy in adjusted analysis.
Practice implications: Health literacy may exert a differential influence on adherence depending upon the complexity of the desired health behavior.

1. Introduction

Over the past decade, there has been growing interest in the relationship between literacy and health outcomes. 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]. Limited health literacy has been associated with poverty, limited education, minority status, immigration, and older age [2]. In a nationally representative household survey of 19,000 adults, it was estimated that 36% of the U.S. adult population have limited health literacy skills [2].

A 2004 report by the Institute of Medicine (IOM) concluded that adults with limited health literacy have less knowledge of disease self-management and health-promoting behaviors, report poorer health status, are less likely to use preventive services, are more likely to be hospitalized, and have worse health outcomes for certain chronic conditions [1]. It has been hypothesized that the relationship between health literacy and medication adherence may mediate the effect on specific health outcomes. However, several adult studies assessing the relationship between health literacy and adherence have produced varied results [3–9]. Some studies suggest worse adherence among individuals with limited health literacy [9]; others report no association [7] or even better adherence [4].

Few studies have assessed the relationship between caregiver health literacy and child health outcomes. Limited caregiver literacy skills have been associated with poorer pediatric outcomes in asthma and diabetes [10,11]; however, few data are available regarding caregiver health literacy and medication adherence in children. As part of a larger randomized controlled trial, we had the opportunity to assess the impact of caregiver health literacy on adherence to a daily multi-vitamin with iron regimen in infants.

Reducing iron deficiency among vulnerable populations is one of the objectives of Healthy People 2010 [12], with toddlers being one of the sub-populations of particular concern. Based upon

Abbreviations: GEE, generalized estimating equations; IOM, Institute of Medicine; S-TOFHLA, Short Test of Functional Health Literacy in Adults.

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NHANES IV data (1999–2002), the prevalence of iron deficiency among U.S. children aged 1–3 years is estimated to be 8% [13]. Children in lower socioeconomic and minority groups have disproportionately high rates of iron deficiency [14], with some studies reporting rates of almost 20% [15,16]. Iron deficiency anemia has been associated with lower cognitive test scores in numerous studies [17,18] and several studies have demonstrated a persistence of poorer cognitive outcomes at school-age and adolescence [17,19,20].

Both limited health literacy and iron deficiency are associated with many of the same risk factors such as poverty, lower parental education, and minority status [2,17]. Iron deficiency anemia in infants has been found to be negatively associated with both level of maternal knowledge of anemia and adherence to iron supplementation [21]; this provides theoretical support for an association between caregiver health literacy and adherence to iron supplementation in infants. This study sought to determine whether or not limited caregiver health literacy was associated with adherence to a daily multi-vitamin with iron regimen in infants. It was hypothesized that infants of caregivers with limited health literacy skills would demonstrate poorer adherence to a daily multi-vitamin with iron supplement than infants of caregivers with adequate health literacy skills.

2. Methods

This study assessed the association between caregiver health literacy and adherence to a daily multi-vitamin with iron regimen in infants as part of a randomized controlled trial designed to compare levels of adherence among two different multi-vitamin with iron formulations. Adherence was based upon caregiver report and was collected bi-weekly over a 3-month study period. At each follow-up visit, caregivers were asked, "*On how many days in the past week did you give (child's name) the drops/sprinkles*?"

Approval and monitoring for this study was provided through the Boston University Medical Center Institutional Review Board. Caregivers provided written informed consent for themselves and their infant.

2.1. Sample

As part of the larger randomized controlled trial, caregivers of healthy infants, aged 5–7 months, were recruited during their 6-month well child visits at two urban pediatric primary care clinics. Caregiver/infant dyads were randomized to receive one of two formulations of a daily multi-vitamin with iron supplement – either a commonly used liquid formulation or a "sprinkles" formulation which is mixed into a baby's solid food. Interviews were conducted in English or Spanish, depending on caregiver preference. Exclusion criteria included a history of conditions associated with iron deficiency or anemia, use of vitamin or iron supplements within the month prior to enrollment, prematurity, multiple gestations, or low birthweight (<2500 g).

Enrollment for the prospective trial began in June 2005 and continued until March 2006. Of the 150 families who were enrolled in the randomized controlled trial, 40 did not complete the health literacy screen; of these 14 (35%) had completed the study prior to June 2005 when literacy screening was introduced, 20 (50%) were lost to follow-up or withdrew prior to completing the health literacy screen, and six (15%) had missing health literacy data. The cohort for the current analysis included data from the remaining 110 families (Fig. 1).

There were no significant differences between the 110 caregivers who completed the health literacy screen and 40 who did not on the following caregiver variables: age, gender, education level, race/ethnicity, and child's health insurance type. However, compared to caregivers who did not complete the health literacy screen, those who completed the screen were more likely to be born outside of the U.S. (66% vs. 44%; $p = 0.01$).

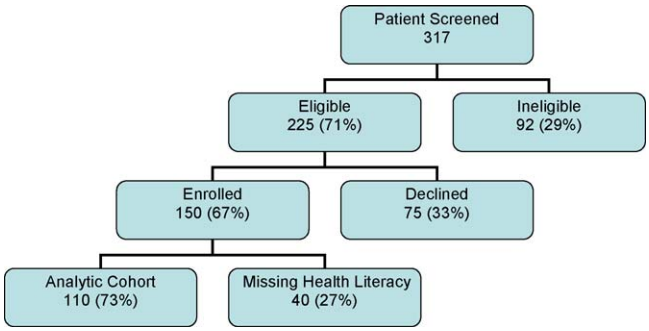

Fig. 1. Flowchart for study enrollment.

2.2. Data collection

Baseline data including demographic information, dietary history, and anthropomorphic measurements were collected via a closed-ended orally administered survey. Bilingual research assistants also provided caregivers with oral and written instructions on how to administer the multi-vitamin with iron supplement. Written instructions were provided in English and Spanish and were written at less than a 5th grade reading level.

Research assistants contacted caregivers on a biweekly basis over a 3-month period between their child's 6-month and 9-month well-child visits, for a total of six possible assessment points. Contact with caregivers alternated between telephone calls and home visits. A closed-ended survey was orally administered to the caregiver at each point of contact and included questions regarding the infant's adherence to the multi-vitamin and iron regimen, ease of administration, and side effects. Attempts were made to collect all survey information from a single caregiver, but this was not always possible. The health literacy screen was administered in-person during one of the home visits or at the 9-month well child check-up, depending on when the research assistants had more time. Families received an additional supply of drops or sprinkles packets during the home visits. A closed-ended survey was administered to caregivers at the end of the study to inquire about any concerns regarding the use of the multi-vitamin with iron supplements.

2.3. Measures

Health literacy, the primary independent variable, was measured using the Short Test of Functional Health Literacy in Adults (S-TOFHLA), a 36-item reading comprehension test [22]. The S-TOFHLA consists of two medically related passages with keywords missing. Utilizing a modified Cloze procedure, subjects select the appropriate word for each omitted word from a list of four choices. The S-TOHFLA has good internal consistency (Cronbach's $\alpha = 0.97$) and is well correlated with the Rapid Estimate of Adult Literacy in Medicine (Spearman correlation 0.81) and the full Test of Functional Health Literacy in Adults (Spearman correlation 0.91), two other measures of health literacy [23]. It is available in English and Spanish. S-TOFHLA scores are categorized as "adequate", "marginal", and "inadequate", based upon standardized cut-off values [22,23]. Prior to analysis, *limited health literacy* was defined as scores in the "marginal" or "inadequate" range; *adequate health literacy* was defined as scores in the "adequate" range.