

Knowledge of Oral Health Issues Among Low-Income Baltimore Adults: A Pilot Study

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Introduction

Parker and Ratzan defined health literacy 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 Researchers believe that health literacy encompasses a constellation of health-related abilities, including word recognition, reading comprehension, communication skills and conceptual knowledge.² National data show that limited health literacy is widespread within the population. According to the 2003 National Adult Assessment of Literacy, 22% of adults had only basic literacy skills, and 14% of adults had below-basic abilities.³ Among those most likely to have been affected were seniors, individuals for whom English was a second language and low-income and minority adults.

There have been numerous investigations regarding the links between health literacy and general health in the literature. These studies have shown that limited health literacy is associated with lower knowledge of disease management and health-promoting behaviors, poorer health status and lower utilization of health care services.⁴ These studies have also shown that limited health literacy is associated with higher rates of hospitalization, greater use of emergency services and higher medical costs.^{5,6} By comparison, there have been relatively few investigations concerning the links between health literacy and oral health. These

Abstract

Purpose: This pilot study documents conceptual knowledge of oral health among low-income adults in Baltimore.

Methods: Selected questions from the Baltimore Health Literacy and Oral Health Knowledge Project, a cross-sectional, population-based investigation of oral health literacy, were used for this analysis. Participants were asked questions during face-to-face interviews about basic oral health and the prevention and management of dental caries and periodontal diseases. Descriptive analyses included tests of association with selected socio-demographic variables (age, sex, education level, annual household income).

Results: The majority of respondents were African American women, 45 to 64 years of age, with 12 years of education and an income less than or equal to \$25,000. Ninety-one percent of respondents knew that sugar caused dental caries, while 82% understood that the best way to prevent tooth decay was to brush and floss every day. Knowledge of oral hygiene practices and the prevention and management of gingivitis and periodontitis was mixed. Seventy-six percent understood that the best way to remove tartar was by a dental cleaning. However, only 15% knew how often to floss their teeth and only 21% knew that plaque was composed of germs.

Conclusion: Conceptual oral health knowledge is one component of oral health literacy. In turn, oral health literacy impacts communication. Practitioners should account for limited conceptual knowledge when they discuss oral health issues with their low-income and minority patients. If this is not accounted for, they will probably find that their oral hygiene education messages are being ignored and health promotion is being adversely affected.

Keywords: adults, knowledge, oral health, oral hygiene, periodontal diseases, questionnaires

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studies primarily showed that limited oral health literacy is associated with poor oral health quality of life.⁷⁻⁹ Despite the dearth of studies linking health literacy and oral health, there is wide agreement that they are related. In 2008, the American Dental Association (ADA) stated that "limited oral health literacy is a potential barrier to effective prevention, diagnosis and treatment of oral disease."¹⁰ Horowitz and Kleinman added that "being able to understand health information and how to obtain services is critical to oral health management."¹¹ Several investigations of oral health literacy are ongoing and should provide support for additional associations between health literacy and oral health in the future.

The purpose of this pilot investigation is to document conceptual knowledge of oral health issues among a population of low-income adults. Findings will be useful to practitioners who wish to emphasize particular health education topics when they communicate with their low-income adult patients. Results will also be useful to policymakers who wish to tailor health education messages to underprivileged communities. Dental hygiene faculty will find the results valuable for designing health education curricula.

Review of the Literature

Health literacy is the bridge between having knowledge and applying that knowledge to one's health care. Accurate and timely knowledge enables an individual to control a variety of challenging health-related situations and scenarios.¹² Acquisition of knowledge from print and broadcast media stems from familiarity with the vocabulary that is being used. Unfortunately, most patient brochures and other educational materials require a reading level far above that of the average person.¹³⁻¹⁵ The majority of health educational materials are written at the tenth and eleventh grade level, whereas a more appropriate level would be fifth or sixth grade level.¹² For those with limited health literacy, gaining knowledge from these educational sources of information is especially challenging. Acquisition of knowledge from encounters with other persons also relates to familiarity with vocabulary, however, it is also associated with a variety of interpersonal factors, including culture and social position.^{16,17}

According to a National Institute of Dental and Craniofacial Research work group on health literacy, improving understanding of oral health issues by the public will follow from increased sensitivity to the social and cultural factors that affect oral health, comprehensive health educational programs offered to students in the K-12 and adult education systems and greater attention to communication between

patient and provider.¹⁸ Horowitz and Kleinman stated that effective communication is the key to quality and success in oral health care.¹¹ The ADA's House of Delegates echoed this sentiment when it stated "clear, accurate and effective communication is an essential skill for effective dental practice."¹⁰ Good communication is an integral part of dental hygiene practice, particularly as it relates to the prevention and management of oral conditions such as dental caries, periodontal disease and oral cancer.

When communicating with their patients, health care providers may believe they are using layman's terms when, in fact, they are using technical terms and jargon that are unclear to the patient. Consequently, the messages imparted become irrelevant.¹⁹ Manner of communication is also important. Culturally appropriate content that focuses on actions and behaviors is preferred over detailed facts.¹² Patients also appreciate practical information that motivates action.

For the provider, communicating so the patient is involved may lead to increased understanding and better decision-making.¹⁹ One such type of communication is motivational interviewing (MI). Using MI, the health care provider establishes rapport with the patient which, in turn, leads to the patient feeling more comfortable with decision-making.²⁰ This pattern of communication is likely to work especially well for those with limited health literacy, as it establishes interactive dialogue and offers the patient some level of control. One additional technique to improve communication involves using a teach back method. The patient is asked to summarize discussions and demonstrate skills to the practitioner, providing evidence that knowledge has been imparted or not imparted.¹¹

Methods and Materials

Data for the present study was derived from the Baltimore Health Literacy and Oral Health Knowledge Project (BHLOHKP), a cross-sectional investigation of oral health literacy conducted by selected authors on the present article. The BHLOHKP utilized a comprehensive questionnaire to assess knowledge in 4 broad topic areas:

1. Basic oral health
2. Prevention and management of dental caries
3. Prevention and management of periodontal disease
4. Prevention and management of oral cancer

The BHLOHKP was designed to assess whether conceptual knowledge in these 4 broad topic areas was associated with word recognition and reading comprehension – 2 accepted measures of health literacy.²¹ The present article used selected data from the BHLOHKP to describe conceptual knowledge results of particular interest to dental hygienists. Additional analysis describing the conceptual knowledge findings thought to be of interest to general and pediatric dentists are planned for the future.

The BHLOHKP questionnaire was developed in 2 phases. During the first phase, a panel of dental content experts developed a list of open-ended questions related to each of the 4 broad topic areas. The open-ended questions were then administered to a sample of 16 low-income adults from Baltimore during a pilot-testing session. Participants were also asked to comment on the wording and formatting of each survey item. During the second phase of questionnaire development, responses generated during the pilot-testing session were used to create multiple-choice versions of each open-ended question. Comments regarding wording and formatting were also used to guide decisions about the appropriate number of questionnaire items. The resulting multiple-choice questionnaire contained a total of 44 items. A convenience sample of 15 practicing dentists from Maryland was asked to review the draft questionnaire, and minor changes to the wording and ordering of survey items were subsequently made.

Sampling Method

Researchers at the University of Baltimore's Schaefer Center for Public Policy randomly selected study participants for the present study from a list of Baltimore residents who had documented land-line telephones. Telephone numbers were matched against mailing addresses to maximize the number of residences in the sample. In order to facilitate the objectives of the research project, participants were drawn mainly from areas in Baltimore where the U.S. Bureau of the Census indicated lower levels of educational achievement in comparison to the general population of Baltimore.

Those who agreed to participate during initial telephone contact were sent a follow-up letter confirming participation. Reminder telephone calls were made both the day before and the day of the scheduled interview appointment. Among residences contacted, 231 adults said they were willing to participate in the study and were given an appointment. Of these, 100 adults presented to their appointed time. Interviewed participants

received a \$25 payment and a packet containing a toothbrush, floss, toothpaste and a selection of oral health-related brochures. They also received information about safety-net dental clinics in Baltimore.

Data Collection

Surveys were conducted during face-to-face interviews in small conference rooms at the University of Baltimore. Interviewers were trained to conduct the face-to-face sessions in a standardized fashion. Instructions were scripted to minimize variation across interviews. Data collection occurred on weekdays between 9:00 a.m. and 8:00 p.m.

Questionnaire items were printed in large font and placed in a bi-fold binder so the participant could view the questions and response categories while the interviewer read the questions aloud. Before interviews began, participants were reminded that if they were not sure of their answer or if they did not know the correct response to a question it was acceptable to answer "I don't know."

Study Variables

The present study limited its focus to the questionnaire items from the BHLOHKP that were most relevant to dental hygiene practice. Among the items highlighted in this report, 4 questions came from the Basic Knowledge section of the survey, 2 from the Knowledge of Dental Caries Prevention and Management section and 8 from the Knowledge of Periodontal Disease Prevention and Management section.

In addition to these oral health knowledge questions, participants were also asked questions about several demographic factors, including age (coded as 18 to 44 years, 45 to 64 years and 65 years or more), sex, race (African American, other), education level (less than 12 years, 12 years and 12 or more years) and annual household income (\$0 to \$25,000, more than \$25,001 or unknown).

Data Management and Analysis

Responses to questionnaire items were recorded on data entry sheets by the interviewers and later transferred into a Microsoft Excel spreadsheet. Descriptive data analysis was conducted using SAS Statistical Software for Windows (Version 9.1).²² Chi-square statistical tests were used to test associations. Statistical significance was defined by an alpha value of 5%.

Research methods were approved by institution-

al ethics review boards at the University of Maryland, Baltimore and the University of Baltimore. Informed consent was obtained from each participant and documented.

Results

Table I lists characteristics of the study sample. The majority of respondents were African American women, 45 to 64 years of age, with 12 years of education and an annual household income that was less than \$25,000.

Only 63% of respondents knew that the ADA recommended adults brush their teeth at least 2 times per day. By comparison, 35% percent incorrectly thought they were supposed to brush every time they ate or drank. Regarding dental visits, only 57% knew that the ADA recommended dental visits twice per year – 31% incorrectly thought that only 1 visit per year was recommended. Only 27% of respondents knew that the ADA recommended the use of soft-bristled toothbrushes – 55% mistakenly thought that the bristles should be medium. Only 15% knew they should floss their teeth at least 1 time per day – 35% incorrectly thought that they were supposed to floss every time they ate or drank. Of these basic knowledge questions, only 1 was significantly associated with demographics – adults with 12 years or more of education were significantly more likely to know what type of bristles a toothbrush should have than were those with fewer years of education.

In general, knowledge of dental caries prevention and management was notably higher than it was for basic knowledge. Ninety-one percent of respondents knew that sugar caused dental caries, while 82% understood that the best way to prevent tooth decay at home was to brush and floss every day. Realizing that sugar caused dental caries was significantly associated with age – adults aged 45 to 64 years had better knowledge than did those aged 65 years or more. Knowing that regular brushing and flossing was the best way to prevent tooth decay at home was significantly associated with sex – women had better knowledge than men.

Knowledge of gingivitis and periodontitis was mixed. Of the 8 questions asked, 3 reflected relatively high levels of understanding. Seventy percent correctly identified “gums that are puffy and red” as gingivitis, 76% knew that the best way to remove tartar from one’s teeth was by a dental cleaning and 75% knew that failing to brush and floss was the main cause of gingivitis. The remaining questions, however, reflected much poorer

Table I: Sample characteristics, Baltimore, Maryland, 2008 (N=100)

Characteristics	N	Percentage
All	100	100.0
Age (years)*		
18–44	30	30.3
45–64	43	43.4
>65	26	26.3
Sex		
Male	45	45.0
Female	55	55.0
Race*		
African American	92	93.9
Other	6	6.1
Education level*		
<12 years	20	20.2
12 years	50	50.5
>12 years	29	29.3
Household income		
Unknown	15	15.0
\$0–\$25,000	51	51.0
>\$25,001	34	34.0

*Total does not sum to 100 due to missing values

knowledge. Only 21% knew that dental plaque was composed of germs – the majority of respondents (62%) incorrectly thought that plaque was made up primarily of food. In addition, only 29% of respondents knew that diabetes was associated with periodontitis, 34% knew that smoking cigarettes was a risk factor for periodontitis and 36% equated gingival recession with periodontitis. Finally, only 39% knew that dentists and dental hygienists usually treat gingivitis with a dental cleaning – 35% mistakenly believed that prescribing antibiotics was the treatment of choice.

Several of the periodontal disease knowledge questions were significantly associated with education level. Years of education was significantly associated with knowing the etiology of gingivitis – adults with less than 12 years of education were less likely to know that it was related to brushing and flossing than were those with 12 or more years of education. Education was also significantly associated with knowing that recession equated with periodontitis – those with less than 12 years of education were less likely to make the connection between recession and disease than were those with 12 or more years of education. Knowing that smoking cigarettes was a risk factor for periodonti-

tis was also significantly associated with education level. Those with less than 12 years of education were less likely to know the connection between smoking and periodontitis than were those with 12 years of education.

Discussion

The present study revealed that oral health knowledge in Baltimore is mixed. On the positive side, knowledge of dental caries prevention and management was very good. A majority of respondents knew that sugar caused dental caries and that brushing and flossing were good ways to prevent tooth decay at home. These findings likely reflected the frequency and consistency by which some oral health messages are being delivered to the public. However, less than half of respondents knew that a toothbrush should contain soft bristles, knew how often they should floss their teeth, knew how to identify periodontal disease, understood the behaviors and conditions that were associated with periodontitis, knew the composition of dental plaque and understood how gingivitis was usually treated. These poor results were rather troubling, especially considering that knowledge of some of these issues related to the topics of better understanding listed previously. For example, whereas most knew that brushing and flossing prevented tooth decay, relatively few knew how frequently to engage in the activity. Additional attention to these areas of poor understanding follows.

Almost three-quarters of study participants mistakenly thought that toothbrushes should contain "medium" or "hard" bristles. Adults with 12 or less years of education were even more likely to have incorrect knowledge of this topic. Although the survey did not ascertain why respondents thought stiffer bristles were better than soft bristles, one possible explanation was that respondents believed harder bristles cleaned more effectively or lasted longer. Given that using stiffer bristles may be associated with root surface abrasion, gingival recession and sensitivity, incorrect knowledge in this area could be causing undue harm to periodontal tissues.²³

Although 15% of respondents knew that they should floss at least 1 time per day, a total of 65% thought they should floss more frequently (35% answered "every time they ate or drank" and 30% answered "at least 2 times per day"). On the surface, this lack of knowledge might not seem to be a problem – there may be nothing wrong with flossing more often than what is recommended. The problem, however, is that those who believe they should floss at least 2 times per day may believe that this frequency is too burdensome. As a result,

they may refrain from the behavior all together. The relatively low prevalence of flossing in the U.S. supports this possibility.²⁴⁻²⁶

When shown a photograph of gingival recession, approximately one-third of study participants correctly identified the "receding gums" as a sign of periodontal disease. For those with less than 12 years of education, only 10% recognized the condition. Given that periodontitis is more prevalent in groups with low socioeconomic status (SES),²⁷ poor adults and those with less than a high school level of education are likely to see gingival recession frequently among family and friends. As such, the respondents might not have equated what they commonly saw within their social circles as a sign of disease. In other words, these findings might have reflected expectations (i.e., the public viewed "becoming long in the tooth" as normal).

In addition to not recognizing the signs of periodontitis, less than half of respondents knew that smoking cigarettes and having diabetes were risk factors for the disease. For smoking, this lack of knowledge is problematic because low SES adults are more likely to use tobacco than are their higher SES peers.²⁸ Diabetes is also more common among those with low SES, particularly among women,²⁹ so lack of knowledge of the connection between diabetes and periodontitis is also a problem for low-income adults. However, lacking knowledge of the diabetes and periodontitis connection is also problematic because periodontitis may negatively impact one's glycemic control.³⁰ As national studies have shown, dentate adults with diabetes are significantly less likely to visit a dentist than those without diabetes.³¹⁻³³ A lack of knowledge of the diabetes and periodontitis connection may also be adversely affecting dental visit behaviors.

Only 21% of respondents knew that plaque was made of germs. The vast majority (62%) mistakenly believed that it was composed of food. This lack of knowledge could have potentially impacted whether gingivitis and periodontitis were considered diseases and, by extension, whether brushing and flossing were taken seriously. In other words, study participants might have been less concerned about food buildup on their teeth than they would have been about a buildup of bacteria. Building on this argument, we discovered that 35% of respondents thought that prescribing an antibiotic was the usual way that dental professionals treated gingivitis. On the one hand, this incorrect answer suggested that some respondents thought gingivitis was, indeed, a disease. On the other hand, believing that antibiotics were necessary also suggested that respondents had little understanding of

the roles that plaque, calculus and regular prophylaxis played in the disease process.

Limitations

This study had 2 notable limitations. The first was that the study sample might not have been representative of all adults in Baltimore. In the city, African Americans comprise approximately 60% of all adults and in the study sample they comprised about 94%. In addition, about 18% of Baltimore's adults are 65 years of age or older, whereas 25% of the study sample was in this age range. It is possible that the study sample was more representative of low-income adults in the city than it was of the general population. However, demographic data was not available to make this comparison directly. Given these differences between the study sample and target population, generalizations of our study findings to the larger population of Baltimore adults should be made with some caution.

The second limitation was the relatively small sample size. Some of the statistical tests that assessed differences in knowledge across socio-demographic variables might not have attained significance because of insufficient power. For example, associations between demographic variables and 3 of the survey items yielded chi-square p-values between 0.05 and 0.10. These associations might have reached statistical significance had the sample size been larger. Despite these shortcomings, the present pilot study and the larger BHLOHKP were the first to comprehensively measure oral health knowledge among Baltimore adults, and the breadth of findings provided compelling evidence that oral health knowledge among low-income Baltimore adults needs to improve.

Conclusion

Dental hygienists are in a unique position to improve oral health knowledge through their encounters with low-income and minority patients with limited health literacy. Communication between the patient and provider should begin with simple terminology and vocabulary that is consistent with the patient's reading level.^{12,34} Dental hygienists are also urged to reinforce conceptual knowledge whenever possible, explaining to their patients the fundamentals of disease prevention and management. Furthermore, in order to ensure that messages are transmitted effectively, practitioners should follow Streets' 5 principles of communication:³⁵

1. Do not make assumptions about the patient's level of knowledge

2. Show empathy
3. Recognize the supportive role of family caregivers
4. Exhibit encouragement and support
5. Follow up, as needed

Having patients involved in decision-making may also increase understanding.¹⁹ Once a trusting relationship is established, the patient will likely feel more comfortable asking questions, requesting additional information and sharing in treatment decisions.²⁰

Effective communication between patient and provider is complex and challenging, especially for those with limited health literacy.³⁶ Persons with poor conceptual knowledge of oral health issues may not understand why certain behaviors are important and why some other behaviors should be avoided. Practitioners who take knowledge for granted will probably find that their messages are being ignored. Strategies to address these challenges need to be imparted during provider training and reinforced by periodic updates and reviews over a practitioner's professional career. Only then will dental health education have the desired effect – prevention of oral diseases and promotion of oral health.

The results of this pilot study should serve as the basis for larger studies of the links between health literacy and oral health. These studies will explore the relationship between conceptual oral health knowledge, appropriate health decisions and a variety of oral health outcomes. Until these new data are available, the present study provides a tantalizing glimpse into how common poor understanding is and the role it likely plays in determining oral health disparities within the population.

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