DEVELOPMENT AND EVALUATION OF AN ORAL HEALTH LITERCY INSTRUMENT FOR ADULTS

by

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Abstract

Objectives: To develop and validate an instrument to measure oral health literacy of adults. **Methods:** The Oral Health Literacy Instrument (OHLI) was developed based on the Test of Functional Health Literacy of Adults (TOFHLA). The OHLI was validated on a convenience sample of 100 dental patients. Predictive validity was assessed by determining the association between the OHLI and dental knowledge, education level and frequency of dental visits. Concurrent and construct validity were assessed by correlating OHLI and TOFHLA scores. Test-retest reliability and internal consistency reliability were assessed using the intra-class correlation coefficient (ICC) and Cronbach's alpha, respectively. Results: The OHLI showed a significant correlation with the TOFHLA ($r_s=$ 0.613, $P<0.001$). Also, OHLI overall scores were significantly correlated to dental knowledge ($r_s=0.573$, $P<0.001$) and frequency of dental visits ($P<0.05$). The Cronbach's alpha and ICC values were high. **Conclusion:** The OHLI is a reliable and valid test to assess oral health literacy.

Dedication

This thesis is dedicated to my beloved Father and Mother who have supported me all the way since the beginning of my studies and without whom none of this would have been possible

Also, this thesis is dedicated to my Husband who has been a great source of motivation and inspiration

Finally, this thesis is dedicated to my Sons for bringing so much happiness into my life and for making my day everyday

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List of abbreviations, symbols, and nomenclature

ADD	Attention deficit disorder
AMA	American Medical Association
CIHR	Canadian Institute of Health Research
IALS	International Adult Literacy Survey
ICC	Intra-class correlation coefficient
IOM	Institute of Medicine
NALS	National Adult Literacy Survey
NIDCR	National Institute of Dental and Craniofacial Research
OHLI	Oral Health Literacy Instrument
REALD-30	Short version of Rapid Estimate of Adult Literacy in Dentistry
REALD-99	Long version of Rapid Estimate of Adult Literacy in Dentistry
REALM	Rapid Estimate of Adult Literacy in Medicine
REALM-R	Revised version of Rapid Estimate of Adult Literacy in Medicine
SPSS	Statistical Package for the Social Sciences
TOFHLA	Test of Functional Health Literacy of Adult
TOFHLiD	Test of Functional Health Literacy in Dentistry

CHAPTER 1:

INTRODUCTION AND OVERVIEW

1.1. Historical background and definition

The term "health literacy" was first used by Simonds (1974) in his paper *"Health Education as Social Policy"*. The paper described how health information is shaped by the educational system, health care system, and mass communications (1). This early use of "health literacy" suggests a link between health literacy and health education, which implies that any failure in health education can contribute to poor health literacy; in other words, health literacy is an outcome of health education. Today, demands for health literacy have increased due to the advancements in medical science, changes in the availability and quality, as well as delivery of health information, and patients' responsibility for self-care in a complex health care system. This culture of high health literacy demands has led to an increase in health literacy problems (2), for example where over-the-counter drugs are concerned, parents are required to read and calculate a child's weight in relation to his/her age to determine the proper dosage given.

Because health literacy is still an emerging concept, different definitions of health literacy have evolved. Each of these definitions has its own scope. One of these definitions was developed by *The American Medical Association (AMA)* which defined health literacy as "the constellation of skills, including the ability to perform basic reading and numerical tasks required to function in the health care environment" (3). The *Joint Committee on National Health Education Standards* defined it as "the capacity of individuals to obtain, interpret and understand basic health information and services and the competence to use such information and services in ways which enhance health". Another definition for health literacy was developed by *Ratzan and Parker* and was adopted for use in *Healthy People 2010*. It 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" (2;4).

In their definition of health literacy, the *AMA* confines the scope of health literacy to the health care sector. On the other hand, the *Joint Committee on National Health Education Standards* extended the concept of health literacy beyond the health care sector to the education sector to maintain a focus on the level of the individual's knowledge and skills. However, they failed to take into consideration the complexity of various health contexts. Finally, the *Healthy People 2010* definition for health literacy is based on the concept that health literacy should encompass a variety of health contexts with which an individual may interact for health information (4). These "health contexts" include individuals, media, the marketplace, and governmental agencies which provide basic health information.

1.2. A conceptual framework for health literacy

A conceptual framework for health literacy was designed by the Institute of Medicine (IOM) (Figure 1), which places *literacy* as the foundation for health literacy (4). "*Literacy*" is defined as "the ability to read, write, communicate and comprehend" (5). From this definition, it is obvious that a person's level of literacy is determined by the size of his or her vocabulary and how well he or she clearly understands definitions of words (6). In 1991, *the U.S. National Literacy Act* defined literacy as "an individual's ability to read, write, and speak English, and compute and solve problems at levels of proficiency necessary to function on the job and in society, to achieve one's goals, and develop one's knowledge and potential" (7).
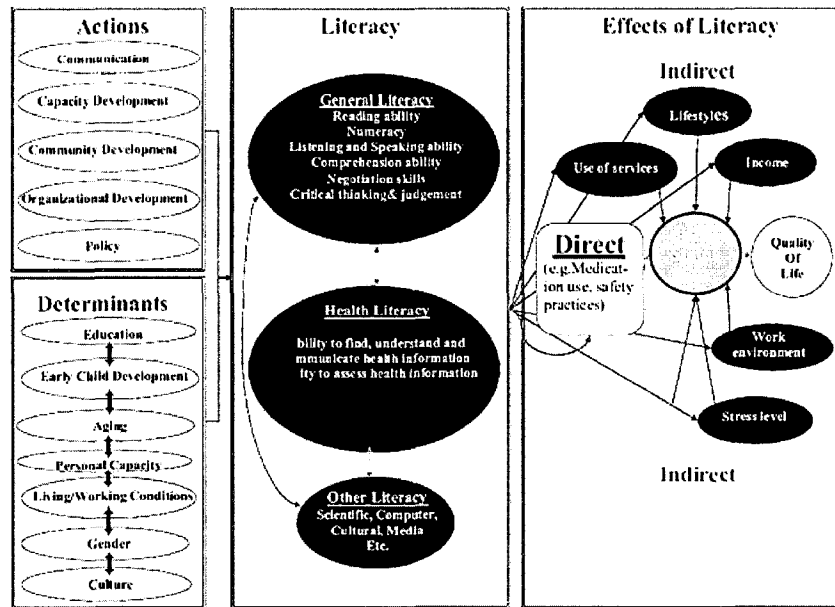
Figure 1. Conceptual framework for literacy and health research (8)

In the National Adult Literacy Survey (NALS) and International Adult Literacy Survey (IALS), literacy was measured along three dimensions:

1. **Prose literacy** was defined as "the ability to locate requested information within written text documents such as editorials, news stories, poems and fiction, to integrate disparate information presented in the texts, and to write new information based on the texts".

2. **Document literacy** was defined as "the ability to locate selected information on a short form or graphical display of everyday information such as job applications, transportation schedules, and maps, to apply selected information presented in documents and to use writing to complete documents and survey forms that required filling in information".

3. **Quantitative literacy (numeracy)** was defined as "the ability to locate numbers within graphs, charts, prose texts and documents; to integrate the quantitative

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information from texts; and to perform appropriate arithmetic operations on text-based quantitative data such as banks automated machines, and to understand bar graphs and to complete an income tax form" (9;10).

1.3. Factors affecting literacy or "Determinants of Literacy"

There are many factors affecting literacy, some of which are considered as determinants of health. A Canadian Institute of Health Research (CIHR) report on literacy and health in Canada, produced by Irving Rootman and Barbra Ronson in 2003, provides an excellent overview of factors affecting literacy (8). These factors are described below (Figure 2):
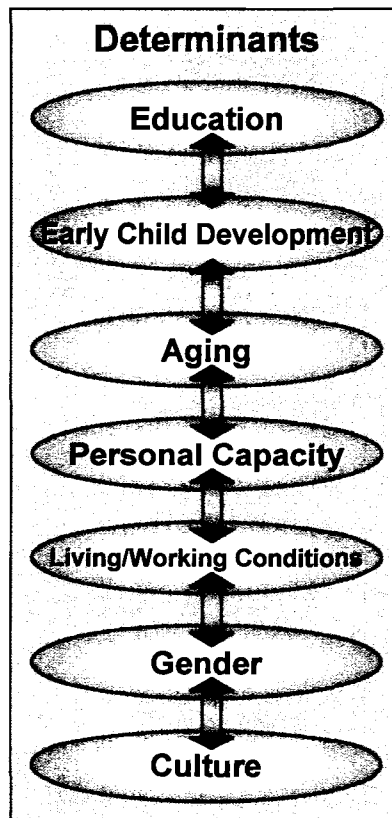
Figure 2. Determinants of literacy (8)

1. Education:

In general, schools differ in literacy level of their students. There is a strong relation between education and literacy. However, they are not perfectly correlated.

2. Personal Ability:

Some conditions can affect learning ability, for example:

- Sight and hearing problems.

- Genetic conditions that might affect learning ability (e.g. Downs Syndrome).

- Attention Deficit Disorder (ADD).

- Learning disabilities.

Subjects with these conditions should receive special attention, especially during their childhood.

3. Early Childhood Development:

It is easier to learn during early childhood, for example, it is easier to acquire a language from birth till three years. This task becomes difficult as the child gets older.

4. Aging:

Several factors might be attributed to limited health literacy in the elderly:

- Elderly people have more reading difficulties compared to younger people. This difficulty can be attributed to less time at school compared to children today and to the fact that an individual might lose reading skills over time if he or she does not read a lot.

- Loss of hearing or sight might worsen the understanding and learning abilities of elderly persons.

- It is common for elderly people to have mental or physical disabilities which might affect their understanding and learning abilities.

Some researchers have linked the lower reading ability among the elderly with more and longer hospitalization and susceptibility to more mental problems compared to persons with adequate reading ability.

5. Living and working conditions:

- Lower health literacy was found to be associated with low incomes.

- Parents' attitude toward their children's learning tends to affect their learning.

- Violence and abuse tends to decrease the learning abilities for both adults and children.

- Work environments might affect learning abilities of workers.

6. Gender:

- In developing countries, women have fewer chances to read compared to men.

- World wide, girls tend to score better than boys.

- In Canada, literacy skills are better in young girls compared to young boys. Nonetheless, this gender difference disappears as young people become adults.

7. Culture and language:

In Canada, lower literacy has been reported among Francophones, Aboriginal peoples and immigrants. This lower literacy is related to language and cultural barriers (8).

1.4. Factors contributing to limited health literacy

Several other factors may affect a patient's health literacy (11). These include:

1. Factors related to the health care system:

- Complexity of new medications and treatments.

- Health providers have less time to spend with patients.

- Increasing demands for self-care procedures increases the need for better health literacy, since most of the self-care home procedures need more understanding by patients.

- Fragmentation of services between different specialties and lack of proper communication between them which makes the patient act as an "inter-physician messenger", a difficult role for patients with limited literacy skills and poor understanding of medical concepts.

- Complexity of insurance and health-related paperwork increases the difficulty of understanding them.

2. Factors related to the providers:

Health care providers tend to use terms that patients may not understand. Furthermore, they spend little time ensuring that the patient understands the information.

3. Factors related to the patient:

Patients with limited health literacy tend to have low self-empowerment and are ashamed of their limitations, which might affect their ability to interact with the health care system and health care providers (11).

1.5. Functional health literacy

The term health literacy, as mentioned above, is used for describing situations and settings in which individuals or groups receive health-related information and messages. If these people successfully function in the complex and multidimensional health care environment and use health information, they are considered to have *functional health literacy*, which includes the ability to successfully complete tasks such as reading and comprehending prescriptions and appointment slips, and completing forms on financial eligibility (1;12). Furthermore, functional health literacy involves accessing, understanding

and applying health information received from other non-clinical sources such as newspapers, magazines, television programs and websites (10).

In order to have functional health literacy, many skills are needed, including:

- Skills and ability of traditional literacy.

- Abilities in prose, document, and quantitative literacy.

- Ability to engage in two-way communications.

- Skills in media literacy and computer literacy.

- Motivation to receive health information.

- Freedom from impairments and/or communicative assistance from others.

Traditional, prose, document, and quantitative literacy are all necessary in order to have functional health literacy but they are still not sufficient for overall functional health literacy. The National Adult Literacy Survey assessed five domains necessary for functional health literacy including reading, writing, numeracy, speaking and listening. When a person is able to engage in a conversation by speaking and listening, known as "two-way communication ability", he/she will be able to clearly and accurately express his/her physical, mental and emotional status to health care providers, and to understand and process health information expressed by the health care provider (13).

Currently, new abilities and skills are needed for overall functional health literacy because health information comes from so many different sources. One of these abilities or skills is *media literacy* which is defined as "the ability to develop an informal and critical understanding of the nature of mass media, the techniques used by them and the impact of those techniques" (14). Another new skill is *computer literacy* which is defined as "an

understanding of the concept and terminology and operations related to general computer use and the essential knowledge needed to function independently with a computer. This functionality includes being able to solve and avoid problems, adapt to new situations, keep information organized, and communicate effectively with other computer literate people" (15). These skills are needed for accessing, understanding, and applying health information since so much of the health information available today comes via television, radio and the internet. In other words; the ability to seek, find, understand and use health information provided through electronic sources such as the internet, is known as *eHealth literacy*. This eHealth literacy needs six different literacies. Norman and Skinner (2006) developed a model for eHealth literacy dividing those six literacies into two central parts: analytical (traditional, media, and information literacies) and context-specific (computer, scientific, and health literacies) and called it "The Lily Model"(16). People who lack media, computer and/or eHealth literacy may be more likely to misunderstand essential health information available through these channels of communication (15;17).

Another attribute necessary for overall functional health literacy is what people believe about health information they have received and how they react to it. Lack of motivation to receive or act on health information can be a barrier to functional health literacy (18).

Physical and/or mental impairment also can affect functional literacy and influence overall literacy related skills and abilities (10).

1.6. Measuring health literacy

Traditionally, researchers and clinicians used patient's education level as an indicator for their literacy skills (19-23). Although education is highly correlated with reading level and the level of functional literacy, educational level alone cannot predict literacy

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(21;23;24). A person who completed high school or even a higher level of education could still have poor literacy skills and vice versa (21;23-25).

Subsequently, researchers and clinicians have realized the need for an alternative approach to assess individuals' literacy.

Hence, informal and formal methods were developed for this purpose. One of the informal methods is described as observing the patient's behavior when handling literacy tasks in the clinical setting, such as filling out forms incompletely, misspelling many words, asking for help, becoming angry and uncomfortable with having to fill out the forms or leaving the clinic before completing the forms (24). Another informal way to test health literacy is asking the patient to bring his/her medication to the clinical visit; those who identify the medications by opening the bottle and looking at the pills rather than reading the label may lack the skills to read and understand prescription labels. Also, those patients who do not know why they are taking the medication probably have low health literacy (26).

On the other hand, formal and more accurate way of assessing health literacy can be achieved by using a validated instrument. Two types of standardized reading tests, *"Reading Recognition Tests"* and *"Reading Comprehension Tests"*, are used in health literacy testing.

Reading recognition tests are useful predictors for general reading ability. In fact, reading recognition tests are the most commonly used tests to identify low-level readers in the health care setting, because they are the easiest and quickest type of instrument to administer and score (19).

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Reading comprehension tests assess the patient's ability to read and understand text written at different levels of difficulty (19;20). These types of tests need more time and skills to administer than word recognition tests.

The most commonly used reading recognition test in the health care setting is the *Rapid Estimate of Adult Literacy in Medicine (REALM)* (27), which was first developed in 1991 and revised in 1993. This test was specifically designed to screen for low literacy in the health care setting (19;20;28). It is composed of common medical words and terms for body parts and illnesses. The words were chosen from written material commonly given to patients in primary care settings. The test is for adults only and needs minimal training to administer and takes only about 2-3 minutes to complete (28). The primary limitation of this test is that it does not give a point estimate grade rather it only assigns a grade-range estimate (29) (Appendix I).

In 2002, a shortened version of the REALM (*REALM-R)* was designed as a rapid screening instrument to identify patients at risk for poor literacy in health care settings (30). It is composed of 10 words derived from the original REALM, which contains three lists, each with 22 words. The time required for the REALM-R including explanation and delivery is less than 2 minutes (30;31).

On the other hand, the *Test Of Functional Health Literacy in Adults (TOFHLA)* (32) is an example of a reading comprehension test. This test has been used for health literacy research in medical and community settings (19;25;32;33). The TOFHLA consists of reading comprehension of "Cloze-style" health care material in which 50 items are distributed through three selected passages, and 17 items are included in the numeracy section. Both sections are composed of actual material that patients may receive in any health care setting (Appendix II). The TOFHLA is used only for adults, but unlike the

REALM, the original TOFHLA takes longer, usually between 18 and 22 minutes. Because of its length, a shorter version of the TOFHLA was created with a 36-item reading comprehension and a 4-item numeracy test (Appendix III). This shorter version of the test takes about 12 minutes or less to administer and has been shown to have good internal reliability. Both English and Spanish versions of this test are available (4;34).

1.7. Limitations of health literacy testing

One of the limitations in health literacy is the lack of health literacy tests for listening and speaking skills, which are also important for people seeking health information and instructions (8). Also, health literacy tests cannot determine the cause or type of reading or learning problems, and are used only to detect low literacy (35).

1.8. Oral Health Literacy

While the body of health literacy research has grown in recent years, little is known about oral health literacy at present (36). Because oral health is an integral part of overall health and well-being, it is important that individuals have a greater degree of oral health literacy. *Oral Health Literacy* has been defined as "the degree to which individuals have the capacity to obtain, process and understand basic oral health information and services needed to make appropriate health decisions" (37). This definition leads to *Functional Oral Health Literacy*, which encompasses knowledge as well as the ability to use that knowledge in making appropriate decisions related to oral health (36) (Figure 3). Individuals can receive oral health information in a variety of ways such as texts, tables and graphs, as well as presentations by experts. This indicates that oral health literacy encompasses far more than reading; it also involves writing, numeracy, speaking and listening just like health literacy (36).
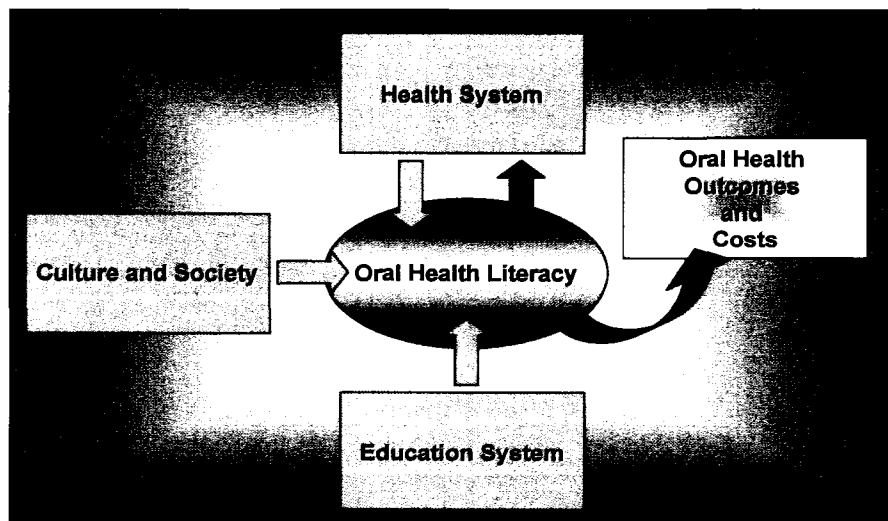
Figure 3. Oral Health Literacy Framework derived from the 2004 IOM Report on Health Literacy (4)

1.9. Oral health literacy framework

In order to create a comprehensive oral health care agenda, oral health literacy must be taken into account. A workgroup sponsored by the National Institute of Dental and Craniofacial Research (NIDCR) called upon researchers to explore three types of research needed to set up this agenda, including:

- *Descriptive studies* that provide the information needed to develop intervention.

- *Correlational studies* that identify the relationship between oral health literacy and oral health outcome.

- *Interventional studies* that test the efficacy of improved oral health literacy practice (36).

Although there are several instruments to assess health literacy, only few published instruments are available to measure oral health literacy.

Lee *et al.* (2007) developed a word recognition instrument to test the health literacy in dentistry based on the Rapid Estimate of Adult Literacy in Medicine (REALM) (38). This oral health literacy instrument is called the Rapid Estimate of Adult Literacy in Dentistry (REALD-30) and consists of 30 common dental words listed from the easiest to the most difficult. The REALD-30 was found to have a good internal reliability (Cronbach $\alpha = 0.87$) and its scores were significantly related to the REALM and the TOFHLA scores which indicate that the REALD-30 has good convergent validity (38). The REALD-30 predictive validity was partially established since the instrument's scores were positively associated with oral health-related quality of life ($p < 0.5$) but not significantly associated with self-perceived oral health status in a multivariate analysis (38).

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Richman *et al.* (2007) added 69 new words to the REALD-30 to develop a longer version of word recognition dental health literacy instrument (REALD-99) (39). Similarly, the REALD-99 had a good internal reliability (Cronbach α = 0.86) and its scores were significantly related to the REALM which indicates that the REALD-99 also has a good convergent validity (39). The REALD-99 predictive validity was partially established since the instrument's scores were positively associated with oral health-related quality of life (p < 0.5) but not significantly associated with self-perceived oral health status of the parents and their children in a multivariate analysis (39). Although, it was reasoned that a longer list of words would represent more components of oral health and might provide a better chance of measuring oral health literacy more accurately, both the REALD-30 and the REALD-99 performed similarly when tested. It should be mentioned that the REALD-99 needed more administration time of about 5 minutes compared to 3 minutes for the REALD-30 (39).

The second oral health literacy instrument is the Test Of Functional Health Literacy in Dentistry (TOFHLiD) that was developed by Gong *et al.* (2007) based on the TOFHLA to test functional oral health literacy (40). The TOFHLiD consists of a 68-item reading comprehension test and a 12-item numeracy test. The reading comprehension section of the TOFHLiD consists of 3 passages about instruction for a caregiver after fluoride varnish application to their child's teeth, a consent form for dental treatment and a Medicaid rights and responsibilities. The numeracy section has questions related to four topics: instructions for fluoridated toothpaste use, a paediatric dental clinic appointment, and prescription labels for fluoride drops and fluoride tablets. The TOFHLiD had a low internal reliability (Cronbach α = 0.63) and a strong convergent validity since the TOFHLiD scores were highly correlated to the REALD-99 scores (40). In addition, The TOFHLiD showed a

moderate ability to discriminate between dental and medical literacy (moderate discriminant validity). The TOFHLiD predictive validity was partially established since the instrument's scores were positively associated with oral health-related quality of life ($p <$ 0.5) but not significantly associated with self-perceived oral health status of the parents and their children in a multivariate analysis (40).

It should be noted that the TOFHLiD was developed to test parents' oral health literacy skills using items that are mostly encountered in the field of paediatric dentistry and that both the REALD and the TOFHLiD testing did not include an assessment of the test-retest reliability.

In a recent publication, the oral health literacy level for 101 adult patients attending two private offices in North Carolina, USA was measured using a word recognition test (REALD-30) (41). The results of this study revealed that about 29% of the participants had a low oral health literacy level (scored below 22 out of 30). Also, this study showed that patients who answered dental knowledge questions incorrectly, who had not visited the dentist in the past year, who reported fair to poor oral health, had low income, or who had a high school education or less, scored low in the REALD-30 compared to their reference groups (41).

1.10. Objective:

To develop an Oral Health Literacy instrument for adults and test its validity and reliability.

CHAPTER 2:

MANUSCRIPT

A submission to

Community Dentistry and Oral Epidemiology

Abstract - Although several instruments are available for measuring general health literacy, at present only two exist to measure oral health literacy. ***Objectives***: The purpose of this study was to develop and validate an instrument to measure the oral health literacy of adults. ***Methods***: A thorough literature review was conducted to evaluate available data about medical and oral health literacy. Based on the Test of Functional Health Literacy of Adults (TOFHLA), the Oral Health Literacy Instrument (OHLI) was developed and evaluated by experts in the fields of community dentistry, preventive dentistry and health literacy. The instrument has two parts. The first part (reading comprehension section) consists of 38 items distributed through two passages about dental caries and periodontal disease. The second part consists of 19 items to test the participant's ability to comprehend directions for taking some of the common prescriptions associated with dental treatment, post-extraction instructions and clinical appointments. The OHLI, the TOFHLA and a knowledge test were administrated to a convenience sample of 100 dental patients attending the Faculty of Dentistry clinics at the University of Toronto. Predictive validity was assessed by determining the correlation between the OHLI score and patient dental knowledge, education level and frequency of dental visits, while concurrent and construct validity were assessed by comparing the results of the OHLI and the TOFHLA. Test-retest reliability and internal consistency reliability were assessed using the intra-class correlation coefficient (ICC) and Cronbach's alpha, respectively. ***Results***: The means of the OHLI and the TOFHLA scores were 87.2 and 91.7, respectively. The mean scores for the OHLI and the TOFHLA reading part were 43.3 and 46.3, respectively. The mean scores for the OHLI and the TOFHLA numeracy part were 44.0 and 45.5, respectively. The overall scores for both tests were correlated ($r_s = 0.613$, $P < 0.001$). Also, The OHLI overall scores and the dental knowledge test scores were positively correlated ($r_s = 0.573$, $P < 0.001$). A

significant association was found between the OHLI overall score and the frequency of dental visit ($P < 0.05$). In contrast, the association between the OHLI overall score and education level was not significant. The Cronbach's alpha values were high (more than 0.7) for the knowledge test, the OHLI and its components. The ICC values indicated good agreement between the test and retest results for the OHLI and its components.

Conclusion: The OHLI is a reliable and valid test to evaluate oral health literacy.

Introduction

The term "health literacy" was first used by Simonds in 1974 in his paper *"Health Education as Social Policy"*. The paper described how health information is shaped by the educational and health care systems and by mass communications (1). This early use of "health literacy" suggests a link between health literacy and health education, which implies that any failure in health education can contribute to poor health literacy. Today, demands for health literacy have increased due to the advancements in medical science, changes in the delivery of health information and patients' responsibility for self-care in a complex health care system. A contemporary definition of health literacy which was adopted for use in Healthy People 2010 is "the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions" (2;3). This definition addresses the concept of functional health literacy, which refers to the ability to apply the received knowledge to utilize the health services and make the appropriate health decisions.

In 2003, Human Resources Development Canada and other agencies funded the International Adult Literacy and Skills Survey (IALSS). The results of this survey show that 4 out of 10 adult Canadians, age 16 to 65 - representing 9 million Canadians - struggle with low literacy (4-6). Furthermore, 15% of Canadian adults have serious problems in reading; an additional 27% can only deal with simple reading tasks. Previous evidence indicates that basic reading, writing and numeracy skills are important in the health care setting (4). Patients with low literacy skills, who struggle with reading, understanding and processing health information, do not fully benefit from different health services. Today's culture of high health literacy demands has led to an increase in health literacy problems (3), for example where over-the-counter drugs are concerned parents are required to read

and calculate a child's weight in relation to his/her age to determine the proper dosage given.

Traditionally, researchers and clinicians used patient's education as an indicator for their literacy skills (7-11). Although education is highly correlated with reading level and the level of functional literacy, educational level alone cannot predict literacy (9;11;12). Subsequently, researchers and clinicians have realized the need for an alternative approach to assess individuals' literacy. Two tests have been commonly used in medical research to assess health literacy. The first test is the *Rapid Estimate of Adult Literacy in Medicine (REALM)* (13), which is a reading recognition test specifically designed to screen for low literacy in the health care setting (7;8;14). The second test is the *Test Of Functional Health Literacy in Adults (TOFHLA)* (15) which is used to assess the patient's reading comprehension and numerical abilities. The TOFHLA consists of reading comprehension of "Cloze-style" health care material in which 50 items are distributed through three selected passages, and 17 items are included in the numeracy section. Both sections are composed of actual material that patients may receive in any health care setting.

In the last several years, the awareness of the importance of literacy in dentistry has grown and many efforts have been directed to adapt the concept of oral health literacy to clinical practice. Although many studies linked low level of health literacy to poor health outcomes, evidence that links low oral health literacy to poor oral health outcomes cannot be examined due to insufficient means of measuring oral health literacy. In order to be able to evaluate the impact of limited literacy skills on oral health outcomes, an instrument is needed to assess oral health-related literacy skills. Given the obvious differences between the dental and medical health systems, the instrument should be specifically designed to measure oral/dental health literacy.

Recently, two oral health literacy instruments have been developed. Lee *et al.* (2007) developed a word recognition instrument to test health literacy in dentistry based on the Rapid Estimate of Adult Literacy in Medicine (REALM) (16). This oral health literacy instrument is called the Rapid Estimate of Adult Literacy in Dentistry (REALD-30) and consists of 30 common dental words listed from the easiest to the most difficult. The REALD-30 was found to have a good internal reliability (Cronbach α = 0.87) and its scores were significantly related to the REALM and the TOFHLA scores which indicate that the REALD-30 has a good convergent validity (16). The REALD-30 predictive validity was partially established since the instrument's scores were positively associated with oral health-related quality of life ($p < 0.5$) but not significantly associated with self-perceived oral health status in a multivariate analysis (16).

Richman *et al.* (2007) added 69 new words to the REALD-30 to develop a longer version of word recognition dental health literacy instrument (REALD-99) (17). Similarly, the REALD-99 had good internal reliability (Cronbach α = 0.86) and its scores were significantly related to the REALM which indicates that the REALD-99 also has good convergent validity (17). The predictive validity of the REALD-99 was partially established since the instrument's scores were positively associated with oral health-related quality of life ($p < 0.5$) but not significantly associated with self-perceived oral health status of the parents and their children in a multivariate analysis (17). Although, it was reasoned that a longer list of words would represent more components of oral health and might provide a better chance of measuring the oral health literacy more accurately, both the REALD-30 and the REALD-99 performed similarly when tested. It should be

mentioned that the REALD-99 needed more administration time of about 5 minutes compared to 3 minutes for the REALD-30 (17).

The second oral health literacy instrument is the Test Of Functional Health Literacy in Dentistry (TOFHLiD) that was developed by Gong *et al.* (2007) based on the TOFHLA to test functional oral health literacy (18). The TOFHLiD consists of a 68-item reading comprehension test and a 12-item numeracy test. The reading comprehension section of the TOFHLiD consists of 3 passages about instructions for a caregiver after fluoride varnish application to their child's teeth, a consent form for dental treatment and a Medicaid rights and responsibilities. The numeracy section has questions related to four topics: instructions for fluoridated toothpaste use, a paediatric dental clinic appointment, and prescription labels for fluoride drops and fluoride tablets. The TOFHLiD had a low internal reliability (Cronbach α = 0.63) and a strong convergent validity since the TOFHLiD scores were highly correlated to the REALD-99 scores (18). In addition, The TOFHLiD showed a moderate ability to discriminate between dental and medical literacy (moderate discriminant validity). TOFHLiD's scores were positively associated with oral health-related quality of life ($p < 0.5$) but not significantly associated with self-perceived oral health status of parents and their children in a multivariate analysis (18).

Since the currently available oral health literacy instrument for adults is a word recognition test, this study was undertaken to develop and test a new, more comprehensive instrument to measure functional oral health literacy of adults.

Materials and Methods

- ### Instrument Development

A thorough literature review was conducted to evaluate available data on medical and oral health literacy instruments. The search included dental patient educational materials, such as pamphlets, brochures and on-line materials, pre-operative and post-operative instructions for different dental procedures, labels and instructions for commonly prescribed drugs in dentistry, and patient registration and appointment forms. Based on the Test of Functional Health Literacy of Adults (TOFHLA), the Oral Health Literacy Instrument (OHLI) was developed from a sample of these materials that were found to be widely used and of varying literacy levels.

The OHLI consists of two parts: reading comprehension and numeracy. The reading comprehension section is composed of two passages; one on dental caries and the other on periodontal disease. The dental caries passage contains thirteen sentences with 264 words, while the periodontal disease passage consists of fourteen sentences with 228 words. Using a modified cloze procedure (2;15;19), a 38-item test was developed by selectively omitting certain words from the two passages. The participant selects from four possible choices, one of which is correct; the remaining choices are similar but grammatically or contextually incorrect. The readability levels of the passages, according to the Flesch-Kincaid Grade Level (20) scale, are 7.6 and 8.1, respectively, and on the Flesch Reading Ease (20) scale are 73.6 and 65.1, respectively. The numeracy section consists of 19 items to test the participant's ability to comprehend directions for taking some of the common prescriptions associated with dental treatment, post-extraction instructions and clinical appointments. In the first section each participant was asked to write his/her answers in a test booklet, while in the second section, he/she was provided with labeled medication

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bottles, an appointment card, and an instruction pamphlet. Then he/she was asked questions by the investigator who recorded the answers on the answer sheet.

A dental knowledge test was developed specifically to evaluate the participant's general dental knowledge. This knowledge test consists of seven pictures showing some perioral and intraoral structures, oral conditions and diseases, dental fillings, dental prosthesis, and oral hygiene aids. Certain parts (17 items) of these pictures are labeled. To the left of each picture is a list of numbered words. Each participant was asked to choose the word from the word list that describes the labeled part.

To calculate the score of the OHLI and the knowledge test, each item was scored with one (1) if answered correctly or zero (0) if answered incorrectly. Later, the raw scores of the reading comprehension and numeracy sections were multiplied by (50/38) 1.316 and (50/19) 2.632, respectively, to create a weighted score from 0 to 50. The OHLI score, which ranged from 0 to 100, was equal to the sum of both sections. Also, the knowledge raw score was multiplied by (100/17) 5.88 to create a weighted score from 0 to 100.

Because both the TOFHLA and the OHLI overall scores ranged between 0 and 100, the TOFHLA's cut-off points for assessing the health literacy level were chosen to divide the participants into 3 levels based on their OHLI overall scores: inadequate (0-59), marginal (60-74), and adequate (75-100).

- *Participants*

The instrument was field-tested on a convenience sample of patients attending the Faculty of Dentistry Clinics of the University of Toronto between February and March 2007. Pre-established exclusion criteria were used in this study, which excluded those persons younger than 19 and older than 69 years of age, those with psychiatric disorders

and illnesses, and those with any physical or mental disabilities. One hundred and thirty (130) patients were approached by the primary investigator and asked to participate in the instrument testing. First, the participants were asked if they could read, speak and understand English (well, little, or none). Only those who reported that they could read, speak and understand English well were chosen to participate in the study. Thirty patients were excluded due to fulfilling one or more of the exclusion criteria, refusal to participate in the study either because they were not interested or due to time limitations, failure to complete the test materials or inability to read, speak and understand English. All the eligible patients who agreed to participate in the study gave signed informed consent (Appendix V).

- *Procedures*

Prior to instrument testing, the research protocol received University of Toronto Research Ethics Committee's Approval (Appendix IV).

First, the participants were asked to fill out a questionnaire about their age, sex, education level and frequency of dental visits (Appendix VI). They were then asked to complete a dental knowledge test followed by the OHLI (Appendix VI) and TOFHLA (Appendix II). All the tests were administrated by the primary investigator. Most of the participants completed all the tests at the same visit, while 37 participants completed them in 2 visits due to time constraints. One to two weeks after their first set of tests, 20 participants were retested using the knowledge test and OHLI.

- *Validity Testing*

Validity, defined as the degree to which a scale measures what it purports to measure (21), was assessed as follows:

1. **Face validity,** which indicates that the instrument appears to measure what it is designed to measure, was established by three experts in the fields of community dentistry, preventive dentistry and health literacy. The first version of the OHLI was given to the experts and they were asked to assess the test for face validity, and the wording of some of the items was slightly modified following their comments.

2. **Content validity,** which is the extent to which the measurement incorporates the domain of phenomenon under study, was enhanced by incorporating the actual materials and texts, listed above, which are encountered by dental patients.

3. **Construct validity,** which is the extent to which the measurement corresponds to theoretical concepts (construct) concerning the phenomenon under study, was assessed by comparing the results of the newly developed OHLI with a health literacy test (the TOFHLA) that has established reliability and validity.

4. **Criterion validity,** the extent to which the measurement correlates with the external criterion of the phenomenon under study, has two aspects:

   - **Predictive validity,** the measurement's validity is expressed in terms of its ability to predict the criterion, was assessed by determining the correlation between the OHLI score and patient dental knowledge, education level and frequency of dental visits.

   - **Concurrent validity,** which is when the measurement correlates with an external criterion of the phenomenon under study taken at the same point in time, was assessed by comparing the result of the

newly developed OHLI with a health literacy test (the TOFHLA) that has established reliability and validity.

- *Reliability Testing*

Reliability, defined as the degree of stability exhibited when the measurement is repeated under identical conditions (21), was assessed using the test-retest method and by calculating of the intra-class correlation coefficient (ICC), computed for the OHLI for the 20 patients who completed the questionnaire twice, two weeks apart. Internal consistency reliability of the OHLI's items for the overall sample was calculated using the Cronbach's alpha formula, which is used to assess the consistency of results across items within a test.

- *Data Analysis*

The data were analyzed using the SPSS software for Windows (version 14.0, SPSS Inc., Chicago, IL, USA). All statistical tests were two-tailed and performed at an alpha level of 0.05. Because the data (Table 1) were found not to be normally distributed, nonparametric methods were used to analyze the data.

Descriptive statistics (proportions, mean and standard deviation) were used to summarize the recorded demographic data, frequency of dental visits and the various tests' results.

As noted above, internal consistency of the items in the OHLI and knowledge tests was determined by using Cronbach's alpha coefficient. The intraclass correlation coefficient (ICC) was used to assess the reliability of the test-retest results.

Spearman's rank correlation was used to measure the association between the weighted scores for the reading comprehension and numeracy sections, and the total score for the

OHLI with their corresponding scores for the TOFHLA, and to correlate the knowledge test score with the total OHLI and TOFHLA scores.

The Kruskal-Wallis test was used to assess the differences in the OHLI overall score, the TOFHLA overall score and knowledge score for the subgroups divided by educational level and frequency of dental visits. The Mann-Whitney U test was used to compare the tests' scores for both sexes.

The Chi-square test (or the Fisher's exact test) was used to evaluate the association between the levels of oral health literacy (adequate, marginal and inadequate) with the sex, education level, frequency of dental visits and the level of the health literacy, as recorded by the TOFHLA.

Multiple linear regression was used to evaluate the association between total OHLI score as the dependent variable and the patient's age, gender, educational level, frequency of dental visits as predictors.

Results

The age of the participants in this study ranged between 19 and 69 years, with a mean of 39 years plus or minus 12 (Table 2). The majority of the participants were female (73%) and had college or university education (64%). Forty percent of the sample reported that they visit their dentist every 3-6 months.

Both graphical and statistical evaluation of the OHLI, the TOFHLA and knowledge test scores revealed a skewness of the distributions or departure from normality (Figure 4). Accordingly, non-parametric statistics were used to analyze the continuous variables in this study.

The means of the OHLI and the TOFHLA scores were both high and somewhat comparable 87.2 and 91.7, respectively (Table 3 and Fig. 5). Similarly, the mean scores for both reading and numeracy components were also high and comparable for both OHLI and TOFHLA: 43.3 and 46.3, respectively for the reading part and 44.0 and 45.5 for the numeracy part (Fig. 6). The mean knowledge score was 57.5, indicating a low-moderate level of dental knowledge among the sample.

The OHLI and the TOFHLA scores were correlated to assess the concurrent validity of the OHLI. The Spearman's rank correlation between the OHLI and the TOFHLA overall scores indicated a moderate to strong and statistically significant positive association between the OHLI and the TOFHLA (r_s = 0.613, P < 0.001) (Table 4). However, the association was stronger for the reading part than for the numeracy part, which showed a "positive weak correlation" (r_s = 0.651, P < 0.001 and r_s = 0.307, P = 0.002, respectively).

Female participants had a significantly higher knowledge and TOFHLA overall scores, on average, than male participants (Table 5 and Fig. 7). The difference between the sexes was not statistically significant for the OHLI overall score.

The Kruskal-Wallis test revealed a significant association between the OHLI, the TOFHLA and knowledge test scores and the frequency of dental visits (Table 6). Participants who visited the dentist every 3-6 months had significantly higher mean scores than those who visited the dentist when they had pain. In contrast, the associations between the participants' educational level and their scores for the OHLI and the TOFHLA were not significant, except for knowledge.

The Spearman's rank test revealed a moderate positive correlation between the dental knowledge test score and the OHLI overall score (r_s = 0.573) and a weak positive correlation with the TOFHLA overall score (r_s = 0.381) (Table 7).

The Cronbach's alpha values were high (more than 0.7) for the knowledge test, the OHLI and its components (Table 8). These high values, which reflect a high internal reliability of the items in the OHLI, did not increase significantly with the sequential deletion of the test items.

The intra-class correlation coefficient (ICC) was 0.88 for the knowledge test, reflecting an excellent agreement between test and retest results (Table 9). The ICC for the overall OHLI, reading comprehension and numeracy sections were 0.70, 0.76 and 0.64, respectively. These ICC values reflect a good agreement between the test and retest results for the OHLI and its components. However, it should be noted that for numeracy, ICC was the lowest.

Multiple regression analysis confirmed the participants' education level and frequency of dental visits to be associated with the OHLI scores (Table 10). The coefficient of determination was 13.3%, indicating that only 13% of the variation in the OHLI scores was explained by this model. However, after including knowledge in the model, it eliminated the effects of both participants' education level and frequency of dental visits

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and raised the coefficient of determination from 13.3% to 43.8%. Dental knowledge was the most powerful factor associated with OHLI scores in this study.

The majority of the participants reported "adequate" health (97%) and oral health literacy (89%) (Table 11 and Fig. 8). Significant associations were found between oral health literacy levels (dichotomized) and the participants' education level dichotomized at more/less than high school education (borderline significance) and their health literacy level (p <.001) (Fig. 9). In contrast, there were no significant associations between the oral health literacy levels (adequate *versus* marginal or inadequate) and the sex or the participants' frequency of dental visits (every year or more often *versus* every 2-3 years or when there is pain only).

Discussion

The purpose of this study was to develop a new and improved test to evaluate the functional oral health literacy of adults and to test its validity and reliability. The OHLI measures the patient's ability to perform oral health-related tasks that require reading comprehension and numeracy skills. This is the first reading comprehension test developed to assess oral health literacy in adult dental patients. The only other adult oral health literacy instrument (REALD-30) is a word recognition test, while the TOFHLiD is also a reading comprehension test but was developed to assess the literacy of the parents of pediatric dental patients.

As stated previously, the OHLI was developed to test the patient's ability to read and understand texts related to dentistry. These texts contain some specific dental terms, which are crucial for an understanding of common dental procedures and practices. For this reason, a dental knowledge test was also developed to assess participant's ability to recognize basic terms that the patients might encounter in the dental clinic and/or dental educational materials.

The OHLI's content and face validity are apparent since the instrument was developed using actual materials and texts which dental patients might encounter in the clinics, unlike the TOFHLiD, which, due to its design, uses items that are mostly encountered in the field of paediatric dentistry. Prior to applying the OHLI, these materials and texts were evaluated by a panel of experts in the fields of community dentistry, preventive dentistry and health literacy.

Concurrent validity was established by demonstrating a strong to moderate statistically significant association between the OHLI and the TOFHLA overall scores. The association was stronger for the reading parts compared to the numeracy parts; this could be due to the

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fact that dealing with numbers and mathematical equations would be more difficult and complicated than dealing with letters and words. Although the TOFHLA was developed to test functional health literacy in medicine, it was chosen to evaluate the concurrent validity because there was no available published test for the evaluation of functional oral health literacy at the time the instrument was tested.

Predictive validity was determined by assessing the association between oral health literacy and education level, frequency of dental visits and dental knowledge. It was expected that participants who had lower oral health literacy scores, would be more likely to be less educated, visit the dentist less frequently and have lower dental knowledge scores. These findings were true for the frequency of dental visits (as ordinal variable) and dental knowledge score but not for the education level.

The associations between frequency of dental visits and both dental knowledge test and the OHLI scores were anticipated since participants who visit the dentist more frequently are expected to be exposed to the environment in the dental clinic more often; hence, more familiar with dental terms, information and procedures. This exposure was expected to be reflected in their oral health literacy score and their dental knowledge score. A similar association was found between the frequency of dental visits and TOFHLA score, and can be explained by the similarity between the dental and medical settings and procedures.

The results of this study revealed a moderate positive correlation between dental knowledge and oral health literacy levels. Similarly, several studies reported an association between health literacy levels and knowledge about different diseases (22-25). On the other hand, the weak positive correlation between dental knowledge and TOFHLA scores suggests that the OHLI contains items related specifically to oral health as compared with the TOFHLA, which offers a broader spectrum of medical terms. The OHLI has a similar

design as the TOFHLiD which also shows a moderate ability to discriminate between dental and medical literacy.

In this study, there was no significant difference in the oral health literacy score among participants with different levels of education (Table 6). It is not clear if these findings were the result of a lack of an association between education and oral health literacy or because the distribution of the education level variable was skewed toward college or university level (64%), which in turn could affect the possibility of finding a significant difference between the different education levels. In contrast, several studies reported a significant association between health literacy and education (26-28). It should be mentioned here that patients' education level was associated with oral health literacy level when oral health literacy was dichotomized into adequate versus marginal and inadequate (borderline significance; Table 11). Similar association was reported in a recent publication (29).

While the multiple regression analyses confirmed that the participant's education level and frequency of dental visits were associated with the OHLI scores. This association was eliminated when the dental knowledge test scores were included in the model, which indicates that dental knowledge is a stronger predictor for oral health literacy in comparison with education level and frequency of dental visits.

Similar to our results, Jones *et al.* (29) reported that incorrect dental knowledge, which was assessed using 2 questions about dental caries and periodontal disease, and no dental visit during the last 12 months were associated with low oral health literacy scores. This association remained significant for the dental knowledge but not for the dental visits after adjusting for important covariates.

The OHLI has a high internal consistency, as Cronbach's alpha values were higher than 0.7. Furthermore, these values did not increase significantly after sequential deletion of the test items. On the other hand, Cronbach's alpha value was less than 0.7 (0.63) for the TOFHLiD which revealed low internal reliability (18). Our instrument test-retest reliability was established using the ICC, which showed good agreement between the test and retest results for the OHLI and its components. This was not done for the TOFHLiD. One of the problems associated with this method is that the participant might learn or recall some of the test items between the test and the retest. Another problem with this method of assessing reliability is that a participant's responses may change over time.

Limitations and Future Research

The results of this study cannot be generalized for the entire population because the instrument testing was conducted on a relatively small convenience sample. Future research should be conducted on a probability sample that represents a larger and more diverse population, preferably not regular users of the dental care system.

The OHLI requires about 20 minutes to administer, making it more appropriate as a research tool than a clinical tool. Nevertheless, future research should be directed to develop an even shorter format of the test to make it more practical to be used in clinics.

In addition, modifications could be done to the current OHLI by including other literacy skills encountered by the patient in different settings (e.g. at home or at the drug store).

In this study, the construct (convergent and discriminant) validity of the instrument was assessed against certain variables (education, frequency of dental visits and dental knowledge). Future research should include oral health outcomes (e.g. participant's oral health status objectively and subjectively determined, using clinical indices and oral-health-related quality of life instruments, respectively).

Since two new oral health literacy tests (REALD and TOFHLiD) have been published (16;18) they can be used in future research to assess the convergent validity of OHLI.

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CHAPTER 3:

SUMMARY AND CONCLUSION

In summary, the OHLI is a reliable and valid test to evaluate the oral health literacy of adult patients where it can be used to assess oral health literacy on an individual level. This will allow dentists to identify patients with inadequate oral health literacy in order to provide such patients with special attention.

At the community level, the OHLI can be used to assess the oral health literacy of the whole community to help in estimating the prevalence of inadequate oral health literacy. The latter application is an important measure to appropriately design educational materials and community intervention programs. The OHLI can also be used to conduct outcome-based research in the field of dentistry. Such studies are necessary to improve our understanding of oral health literacy, its determinants, and its association with different oral health outcomes.

Limitations and Future Research

The results of this study should be considered in light of the following limitations:

- The results of this study cannot be generalized for the entire population because the instrument testing was conducted on a relatively small convenience sample. Future research should be conducted on a probability sample that represents a larger and more diverse population, preferably not regular users of the dental care system.

- The limited sample size might affect the distribution of each variable and, subsequently, might have led to insufficient variability to detect a significant difference.

- The OHLI requires about 20 minutes to administer, making it more appropriate as a research tool rather than a clinical tool. Nevertheless, future research should be directed to develop an even shorter format of the test to make it more practical for clinical settings.

- In this study, demographic data were limited to age, gender and educational level of each participant. Future research should include other variables such as income, marital status, race and native language of the participant.

- In this study, the construct (convergent and discriminant) validity of the instrument was assessed against certain variables (education, frequency of dental visits and dental knowledge). Future research should include oral health outcomes (e.g. participant's oral health status objectively and subjectively determined, using clinician-based indices and oral-health-related quality of life measures, respectively).

- OHLI consists of items that test literacy skills needed in the dental clinic settings only. Future research should include other literacy skills encountered by the patient in different settings (e.g. at home or at the drug store).

- In this study, a test of functional health literacy in medicine (TOFHLA) was used to assess the concurrent validity of OHLI. Recently, two new oral health literacy tests (REALD and TOFHLiD) have been published (38;40). These new oral health literacy tests can be used in future research to assess the concurrent validity of OHLI.

Applications of the Oral Health Literacy Instrument for adults

In dental research:

In some areas of dental research, it is important to measure the oral health literacy of individuals, such as in dental health education research, particularly if an oral health education program is found to be ineffective. In such instances, it is essential to find out whether the program's failure is a result of the low level of oral health literacy of the individuals targeted, or if it is due to the dental health professionals, who may be providing dental information at an inappropriate level of oral health literacy for the target population.

On another note, this instrument will allow investigators to measure the oral health literacy level of adults in research dealing with the development and/or evaluation of dental health educational programs. A crucial part in the development of any dental educational program is to know the literacy level of the population targeted so as to design programs that suit that level, whereas in the case of an evaluation of an existing program, assessment of the literacy level of the participants allows us to identify the source of any defects in the program.

Finally, another potential application of OHLI would be for the investigation of the relationship between some oral conditions or diseases and the oral health literacy level of the patients. An example and a topic for future research could be how low oral health literacy impacts on dental treatment outcomes among adults.

In dental clinics:

The oral health literacy instrument developed could also be used by dentists in the clinic to determine the level of oral health literacy of each patient they are dealing with, thereby improving their level of communication with those same patients.

In community dentistry:

This oral health literacy instrument will help oral health care providers measure the oral health literacy of individuals and their communities, which will, in turn, help in choosing and designing appropriate programs to coincide with the literacy level of the target population, so as to ensure the effectiveness of community-based dental health education, prevention and oral health promotion programs.

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TABLES

Table 1: Variables used in the statistical analysis and their coding

Variable	Type	Variable levels/Range
Age	Continuous	19-69 years
Sex	Categorical (Nominal)	Female=0 Male=1
Education level	Categorical (Ordinal)	College/University = 0 Some college/Some University = 1 High school or less = 2
Frequency of dental visits	Categorical (Ordinal)	Every 3-6 months = 0 Every year = 1 Every 2-3 years = 2 When there is pain = 3
TOFHLA reading weighted score	Continuous	0-50
TOFHLA numeracy weighted score	Continuous	0-50
TOFHLA overall score	Continuous	0-100
OHLI reading weighted score	Continuous	0-50
OHLI numeracy weighted score	Continuous	0-50
OHLI overall score	Continuous	0-100
Knowledge test score	Continuous	0-100
OHLI level (oral health literacy level)	Categorical (Ordinal)	Adequate = 0 Marginal = 1 Inadequate = 2
TOFHLA level (health literacy level)	Categorical (Ordinal)	Adequate = 0 Marginal = 1 Inadequate = 2

TOFHLA = Test of Functional Health Literacy of Adults (32)
OHLI = Oral Health Literacy Instrument

Table 2: Sample characteristics (*n*=100)

	Overall # or %
Age	
Mean age (± SD)	39.0 years (± 12.4)
Median	39 years
Interquartile range	20 years
Min.	19 years
Max.	69 years
Missing	5
Sex (%)	
Males	27
Females	73
Education level (%)	
High school or less	22
Some college/Some university	13
College/University	64
Missing	1
Frequency of dental visits (%)	
Every 3-6 months	40
Every year	30
Every 2-3 years	7
When there is pain only	19
Missing	4

Table 3: Mean OHLI & TOFHLA overall scores and their components (*n*=100)

	OHLI	Knowledge test	TOFHLA
Mean (± SD)	87.20 (± 10.23)	57.53 (± 26.01)	91.73 (± 7.83)
Min.	47	0	56
Max.	100	100	100
95% CI	85.17 – 89.23	52.37 – 62.69	90.18 – 93.28
Mean reading (± SD)	43.25 (± 5.70)	NA	46.28 (± 4.13)
Mean numeracy (± SD)	43.95 (± 6.10)	NA	45.45 (± 5.54)

Table 4: Correlations between OHLI & TOFHLA overall scores and components (Concurrent validity)

Score	Coefficient *	P-value
Overall	.613	< .001
Weighted Reading	.651	< .001
Weighted Numeracy	.307	.002

* Non-Parametric "Spearman's rank" (r_s)

Table 5: Mean scores for OHLI, TOFHLA and knowledge by sex

	OHLI	Knowledge	TOFHLA
Male (± SD)	86.21 (± 11.67)	48.58 (± 25.83)	89.19 (± 8.46)
Female (± SD)	87.56 (± 9.71)	60.84 (± 25.46)	92.67 (± 7.42)
P-value[*]	.660	.039	.034

[*] *P*-value obtained from **Mann-Whitney *U* test**

Table 6: Mean scores for OHLI, TOFHLA and knowledge by education level and frequency of dental visits

	OHLI	Knowledge	TOFHLA
Education level			
High school or less (± SD)	82.89 (± 13.93)	**43.32 (± 20.01)** [**]	90.18 (± 8.63)
Some college/ Some university (± SD)	88.06 (± 10.38)	60.63 (± 23.33)	90.31 (± 8.37)
College/University (± SD)	88.67 (± 8.29)	**62.41 (± 26.53)** [**]	92.56 (± 7.49)
Total (± SD)	87.31 (± 10.23)	57.93 (± 25.82)	91.74 (± 7.87)
P-value [*]	.244	.010	.332
Frequency of dental visits			
Every 3-6 months (± SD)	**89.31 (± 7.84)** [**]	**65.00 (± 25.55)** [**]	**93.75 (± 5.81)** [**]
Every year (± SD)	86.62 (± 11.74)	59.02 (± 26.60)	90.90 (± 8.88)
Every 2-3 years (± SD)	91.35 (± 5.42)	51.26 (± 20.01)	95.43 (± 3.91)
When there is pain only (± SD)	**81.16 (± 11.97)** [**]	**42.41 (± 24.54)** [**]	**87.21 (± 9.05)** [**]
Total (± SD)	87.01 (± 10.34)	57.66 (± 26.38)	91.96 (± 7.84)
P-value [*]	.031	.032	.009

[*] *P*-value obtained from **Kruskal-Wallis test**
[**] Significantly different using the Tukey HSD and Scheffe multiple comparison tests (*P* <0.05)

Table 7: Correlations of the knowledge test scores with the OHLI and TOFHLA overall scores

	Coefficient *	P-value
knowledge and OHLI	.573	< .001
knowledge and TOFHLA	.381	< .001

* Non-Parametric "Spearman's rank" (r_s)

Table 8: Internal reliability of the OHLI, with or without the oral health knowledge test

	Number of items	Cronbach's alpha
Knowledge	17	.871
Reading	38	.819
Numeracy	19	.715
Knowledge and Reading	55	.890
Knowledge and Numeracy	36	.864
Reading and Numeracy	57	.854
Knowledge, Reading and Numeracy (all OHLI components)	74	.898

Table 9: Intraclass Correlation Coefficient (ICC) for OHLI and its components

	ICC
OHLI	0.704
Knowledge	0.883
Reading	0.756
Numeracy	0.641

Table 10: Results of multiple linear regression for OHLI scores

Model without knowledge:

Predictor	β	Standard Error	Sig.
Age	.090	.083	.280
Gender	-.342	2.285	.881
Education Level	**-2.680**	**1.278**	**.039**
Frequency of dental visits	**-2.110**	**.915**	**.024**
Constant	**87.574**		

$R^2 = 13.3\%$

Model with knowledge:

Predictor	β	Standard Error	Sig.
Age	.087	.067	.198
Gender	2.399	1.895	.209
Education Level	-.942	1.067	.380
Frequency of dental visits	-.649	.772	.403
Knowledge	**.241**	**.035**	**< .001**
Constant	**70.305**		

$R^2 = 43.8\%$

Table 11: Literacy level categorized and comparisons by sex, education level, frequency of dental visits and health literacy level

Literacy level	OHLI (%)	TOFHLA (%)
Adequate	89	97
Marginal/Inadequate	11	3

	Adequate (%)	Marginal or Inadequate (%)
Gender		
Male	24	3
Female	65	8
p-value*	.983 / (Fisher's exact test .616)	
Education level		
High school or less	17.2	5.1
More than high school	71.7	6.1
p-value*	.049 / (Fisher's exact test .063)	
Frequency of dental visits		
Every year or more often	65.6	7.3
Every 2-3 years or when there is pain only	22.9	4.2
p-value*	.462	
TOFHLA level		
Adequate	89	8
Marginal/Inadequate	0	3
p-value*	< 0.001/ (Fisher's exact test .001)	

*Obtained from Chi-square test or Fisher's exact test, where indicated.

FIGURES
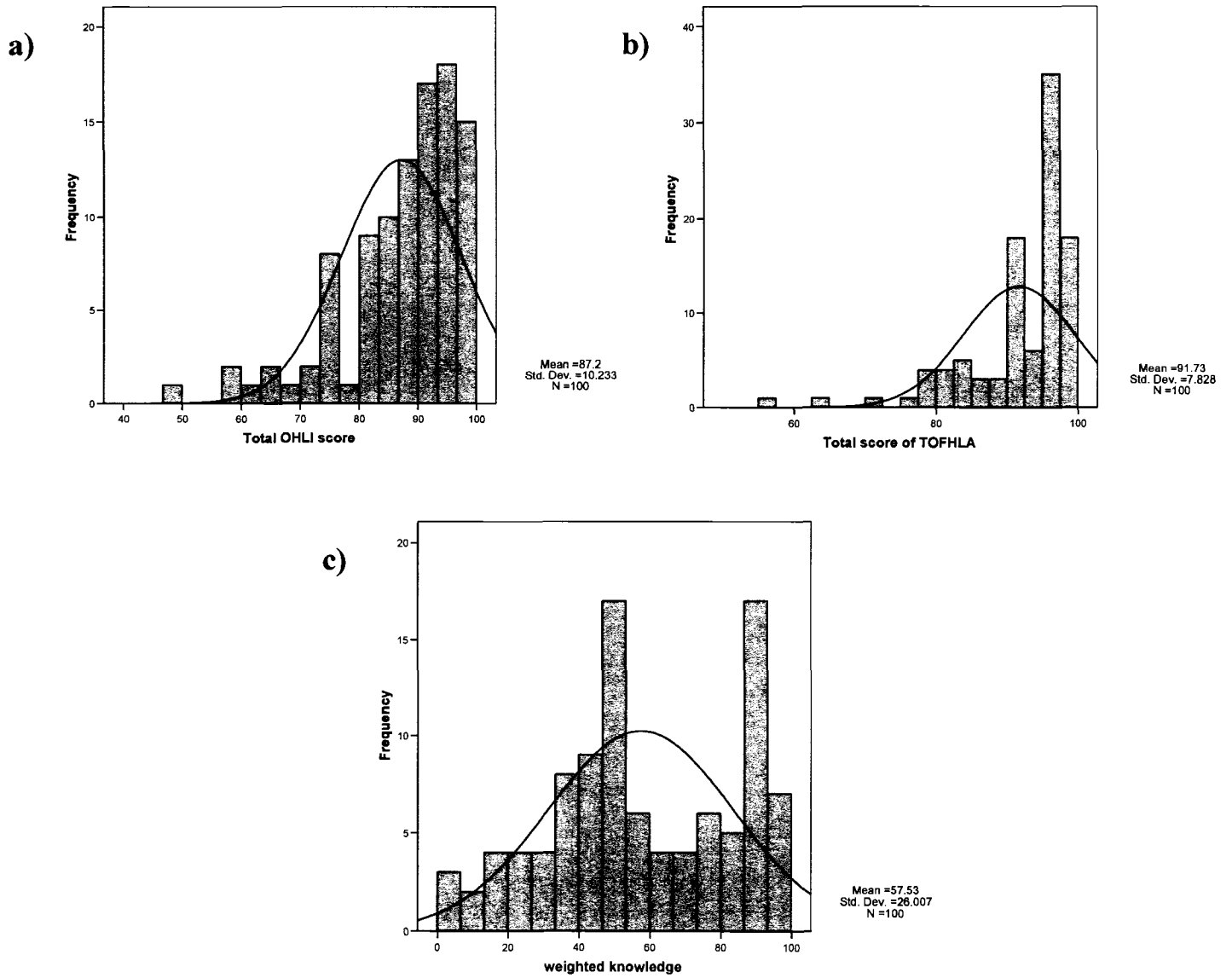
Figure 4: a: Histogram showing the distribution of the OHLI test scores (negative skewed)
 b: Histogram showing the distribution of the TOFHLA test scores (negative skewed)
 c: Histogram showing the distribution of the knowledge test scores (bimodal)
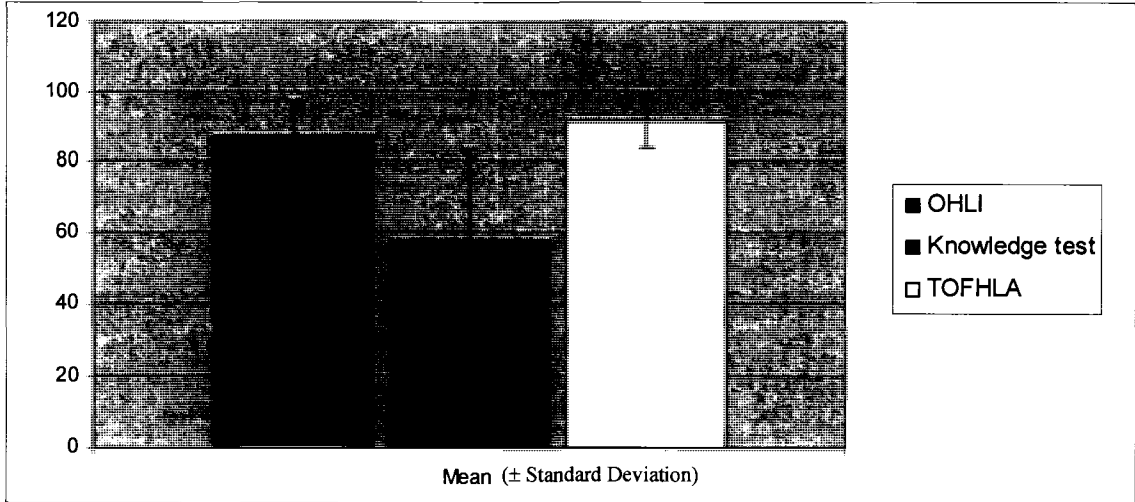
Figure 5: Mean (± Standard Deviation) OHLI & TOFHLA overall scores
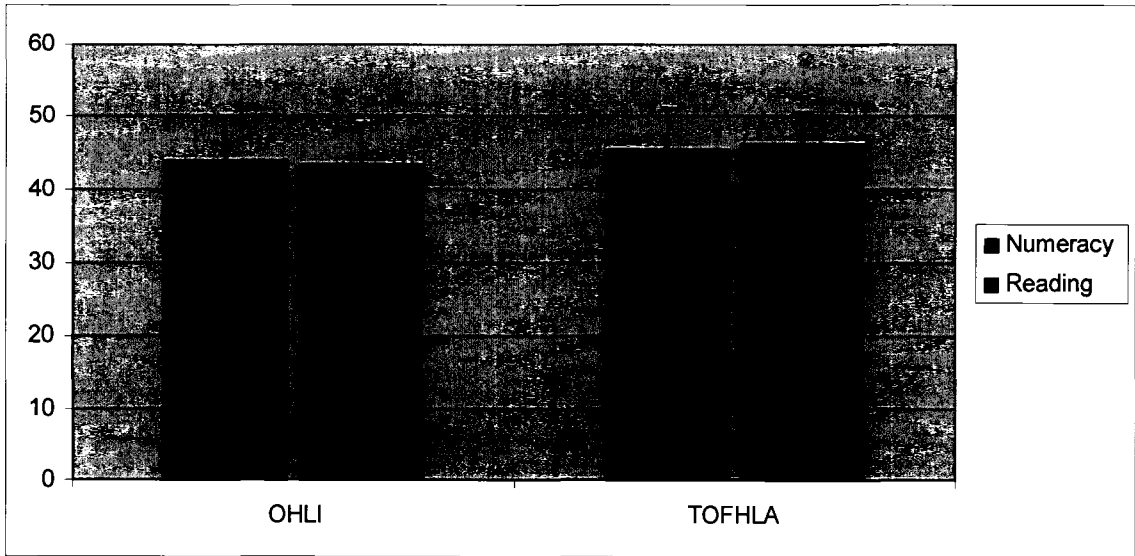
Figure 6: Mean (± Standard Deviation) OHLI & TOFHLA component scores (Numeracy and Reading parts)
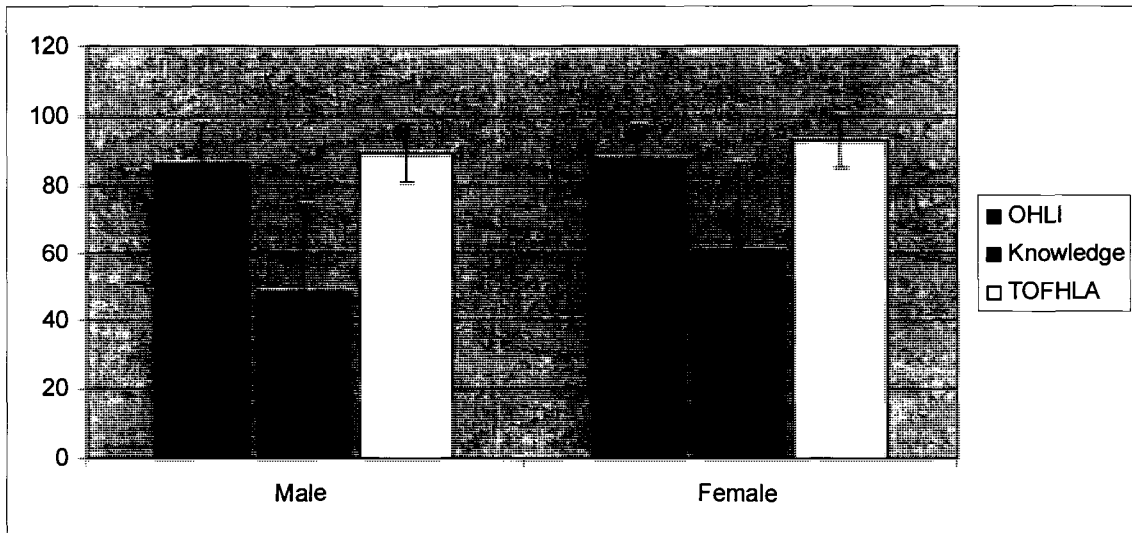
Figure 7: Mean (± Standard Deviation) scores for OHLI, TOFHLA and knowledge by sex
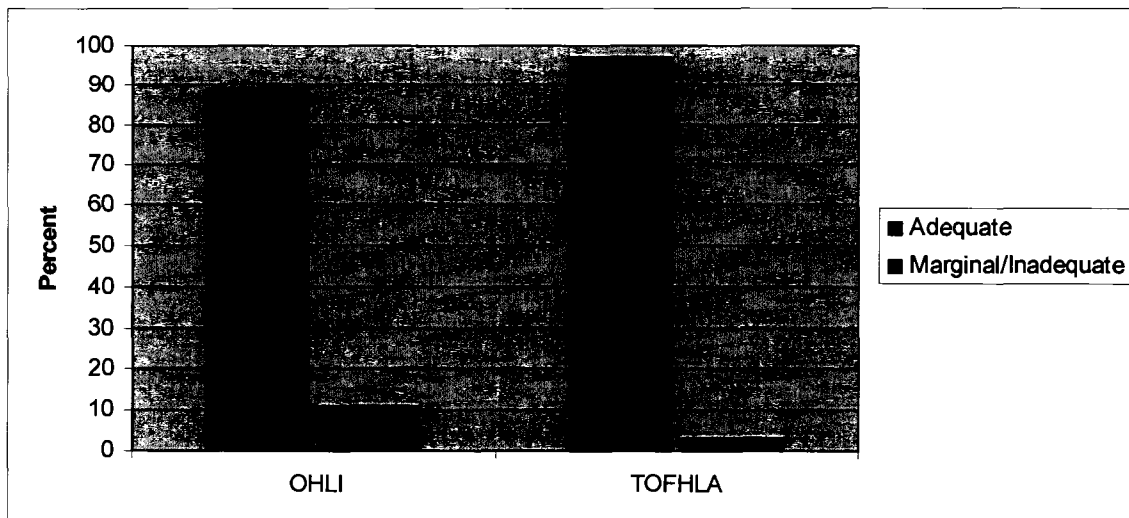
Figure 8: Literacy levels in both OHLI and TOFHLA
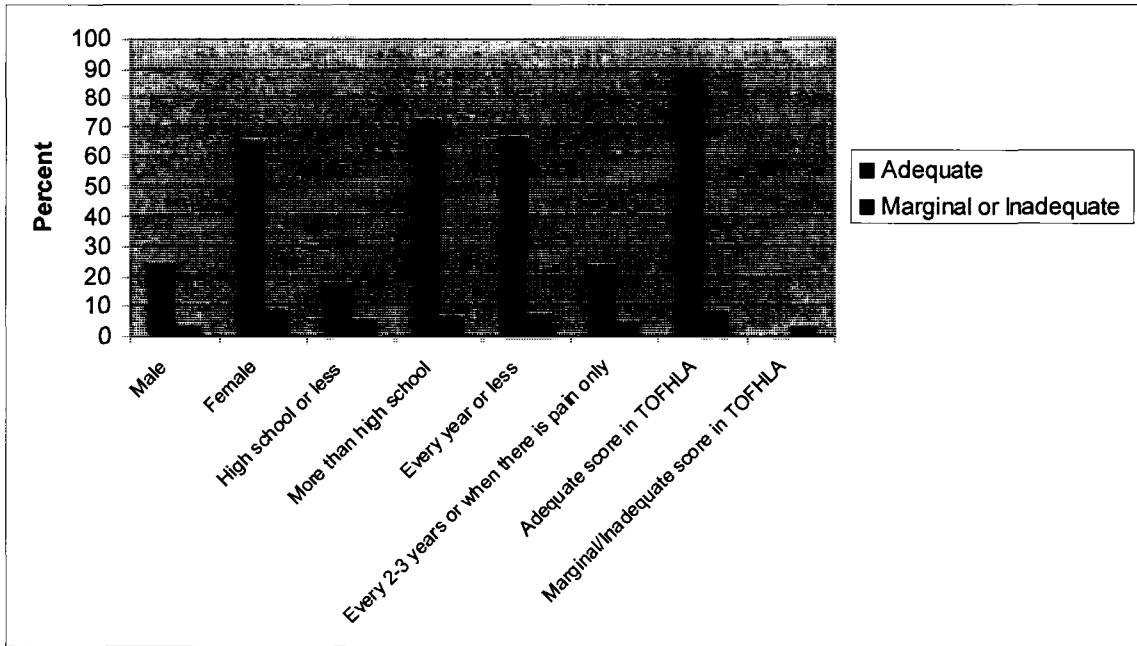
Figure 9: Literacy levels in both OHLI and TOFHLA and comparisons by sex, education level, frequency of dental visits and health literacy level

APPENDICES

APPENDIX

I

RAPID ESTIMATE OF ADULT LITERACY IN MEDICINE (REALM)©

TABLE C-1 REALM

Patient Name/ Subject # _____	Date of Birth _____	Reading Level _____
Date _____ Clinic _____ Examiner _____		Grade Completed _____

| List 1	List 2	List 3
Fat	Fatigue	Allergic
Flu	Pelvic	Menstrual
Pill	Jaundice	Testicle
Dose	Infection	Colitis
Eye	Exercise	Emergency
Stress	Behavior	Medication
Smear	Prescription	Occupation
Nerves	Notify	Sexually
Germs	Gallbladder	Alcoholism
Meals	Calories	Irritation
Disease	Depression	Constipation
Cancer	Miscarriage	Gonorrhea
Caffeine	Pregnancy	Inflammatory
Attack	Arthritis	Diabetes
Kidney	Nutrition	Hepatitis
Hormones	Menopause	Antibiotics
Herpes	Appendix	Diagnosis
Seizure	Abnormal	Potassium
Bowel	Syphilis	Anemia
Asthma	Hemorrhoids	Obesity
Rectal	Nausea	Osteoporosis
Incest	Directed	Impetigo

SCORE
List 1 _____
List 2 _____
List 3 _____

Raw Score _____

74

Directions:

1. Give the patient a laminated copy of the REALM and score answers on an unlaminated copy that is attached to a clipboard. Hold the clipboard at an angle so that the patient is not distracted by your scoring procedure. Say:

   > "I want to hear you read as many words as you can from this list. Begin with the first word on List 1 and read aloud. When you come to a word you cannot read, do the best you can or say "blank" and go on to the next word."

2. If the patient takes more than five seconds on a word, say "blank" and point to the next word, if necessary, to move the patient along. If the patient begins to miss every word, have him or her pronounce only known words.

3. Count as an error any word not attempted or mispronounced. Score by marking a plus (+) after each correct word, a check (✓) after each mispronounced word, and a minus (−) after words not attempted. Count as correct any self-corrected word.

4. Count the number of correct words for each list and record the numbers in the "SCORE" box. Total the numbers and match the total score with its grade equivalent in the table below (Table C-2).

TABLE C-2 Scores and Grade Equivalents for the REALM

GRADE EQUIVALENT

Raw Score	Grade Range
0–18	3rd Grade and below

- Will not be able to read most low literacy materials; will need repeated oral instructions, materials composed primarily of illustrations, or audio or videotapes

19–44	4th to 6th Grade

- Will need low literacy materials; may not be able to read prescription labels

45–60	7th to 8th Grade

- Will struggle with most patient education materials; will not be offended by low literacy materials

61–66	High School

- Will be able to read most patient education materials

APPENDIX

II

.

EXCERPTS FROM THE TEST OF FUNCTIONAL HEALTH LITERACY IN ADULTS

Numeracy

The numeracy section of the TOFHLA measures the patient's ability to understand and act on numerical directions given by a health-care provider or pharmacist. The test items reproduce real-life situations in receiving, following, and paying for medication plans. The numeracy section uses a series of prompts to which the patient responds. These prompts consist of prescription vials, an appointment slip, a chart describing eligibility for financial aid, and an example of results from a medical test. The patient is handed the prompt for each question, the administrator reads each question, and the responses are recorded.

Sample Items

At the beginning of this section, the following introduction is read: "These are directions you or someone else might be given at the hospital. Please read each direction to yourself. Then I will ask you some questions about what it means." For the first few questions in this section the patient is given Prompt 1, a prescription bottle that has the label shown in Figure C-1 below taped to it.

GARFIELD IM   16 Apr 93
FF941858 Dr. Lubin, Michael

PENICILLIN VK
250MG 40/0
Take one tablet by mouth four
times a day 02 (4 of 40)

FIGURE C-1 Prompt 1 for TOFHLA. Prescription label that should taped onto an actual prescription bottle that can be handed to the patient to read.

Questions for Prompt 1:
If you take your first tablet at 7:00 am, when should you take the next one?
And the next one after that?
What about the last one for the day, when should you take that one?

At the end of the numeracy section, the patient is given Prompt 10, a laminated card with information shown in Figure C-2 below.

> You can get care at no cost if after deductions your monthly income and other resources are less than:
>
> $581 for a family of one $1,196 for a family of four
> $786 for a family of two $1,401 for a family of five
> $991 for a family of three $1,606 for a family of six.

FIGURE C-2 Prompt 10 for TOFHLA. Laminated card with financial information about clinic services.

Question for Prompt 10:
Let's say that after deductions, your monthly income and other resources are $1,129. And, let's say you have 3 children. Would you have to pay for your care at that clinic?

Reading Comprehension

The reading comprehension section of the TOFHLA measures a patient's ability to read passages using real materials from the health-care setting using a modified Cloze procedure. Passages included come from instructions for preparation for an upper GI series, the patient rights and responsibilities section of a Medicaid application form, and standard hospital informed consent language.

Sample Items

At the beginning of the reading comprehension section of the TOFHLA, the following instructions are read:

> Here are some other medical instructions that you or anybody might see around the hospital. These instructions are in sentences that have some of the words missing. Where a word is missing, a blank line is drawn, and 4 possible words that could go in the blank appear just below it. I want you to figure out which of those 4 words should go in the blank, which word makes the sentence make sense. When you think you know which one it is, circle the letter in front of that word, and go on to the next one. When you finish the page, turn the page, and keep going until you finish all the pages.

The reading comprehension section consists of three passages; one of these passages is shown on the next page.

PASSAGE B: Medicaid Rights and Responsibilities

I agree to give correct information to _____ if I can receive Medicaid.

    a. hair
    b. salt
    c. see
    d. ache

I _____ to provide the county information to _____ any

a. agree
b. probe
c. send
d. gain

a. hide
b. risk
c. discharge
d. prove

statements given in this _____ and hereby give permission to

    a. emphysema
    b. application
    c. gallbladder
    d. relationship

the _____ to get such proof. I _____ that for

a. inflammation
b. religion
c. iron
d. county

a. investigate
b. entertain
c. understand
d. establish

Medicaid I must report any _____ in my circumstances

    a. changes
    b. hormones
    c. antacids
    d. charges

within _____ (10) days of becoming _____ of the change.

a. three
b. one
c. five
d. ten

a. award
b. aware
c. away
d. await

I understand _____ if I DO NOT like the _____ made on my

a. thus
b. this
c. that
d. than

a. marital
b. occupation
c. adult
d. decision

case, I have the _____ to a fair hearing. I can _____ a

a. bright
b. left
c. wrong
d. right

a. request
b. refuse
c. fail
d. mend

hearing by writing or _____ the county where I applied.
a. counting
b. reading
c. calling
d. smelling

If you _____ AFDC for any family _____, you will have to
a. wash   a. member,
b. want   b. history,
c. cover   c. weight,
d. tape   d. seatbelt,

_____ a different application form. _____, we will use
a. relax   a. Since,
b. break   b. Whether,
c. inhale   c. However,
d. sign   d. Because,

the _____ on this form to determine your _____.
a. lung   a. hypoglycemia.
b. date   b. eligibility.
c. meal   c. osteoporosis.
d. pelvic   d. schizophrenia.

Excerpts taken from: Nurss JR, Parker RM, Williams MV, Baker DW. 2001. *Test of Functional Health Literacy in Adults*. Available from Peppercorn Books and Press, Inc. Reprinted with permission.

APPENDIX

III

The Questions below correspond to instructions on a prescription bottle, blood glucose results, and information on an appointment slip that are provided to the subject.

1. Have a look at this one…if you take your tablet at 7:00 am, when should you take the next one?

2. Here is another direction you might be given… If this were your score, would your blood sugar be normal today?

3. Now, take a look at this one… When is your appointment?

Here is another instruction you might be given… If you eat lunch at 12:00 noon, and you want to take this medicine before lunch, what time should you take it?

APPENDIX

IV

APPENDIX

V

FACULTY OF DENTISTRY, UNIVERSITY OF TORONTO

124 Edward Street, Toronto, Ontario M5G 1G6
CANADA

CONSENT FORM

Title of the Project: **Development and Evaluation of an Oral Health Literacy Instrument**

I have been asked to participate in the study titled above, which is being conducted by Dr. Dania Sabbahi, as a part of her Masters' project at the Faculty of Dentistry, University of Toronto. Dr. Sabbahi is working under the supervision of Dr. Herenia P. Lawrence, Associate Professor in the Discipline of Community Dentistry at the University of Toronto. The following information has been provided to me so I can make an informed decision to participate in this study. At least 50 adult patients attending the University of Toronto Faculty of Dentistry clinics are expected to participate in this study.

Purpose of the Study

The purpose of this study is to develop an instrument (test) to measure the oral health literacy of individuals and to test the instrument's validity and reliability. I understand that this instrument will help to evaluate the degree to which individuals obtain, process and understand basic oral health information and how they make use of health services to improve their oral health.

Study Procedures

This study requires that participants attend two (2) study visits with the investigators:

1. The first visit:

In this visit, I will be asked to complete the oral health literacy instrument (test) which consists of four (4) parts:
- In the first part, I will be asked questions about my name, age, gender, education level and how often I visit the dentist.
- In the second part, I will be given some pictures of the mouth and asked to match the numbers on each picture with a list of words.
- In the third part, I will be asked to read two (2) passages about oral health topics. In these passages, some words will be missing. I will be asked to choose the appropriate word to fill each blank from a list of words.
- In the fourth part, I will be shown some cards with drug labels and instructions that are given after the dental procedure. I will be asked some questions about these labels and instructions.

In the first three parts, I will be asked to write my answers in a test booklet, while in the fourth part I will be asked questions by the principal investigator who will record my answers on the answer sheet.

In the same visit, my health literacy will be tested using the *Test Of Functional Health Literacy in Adults (TOFHLA)*.

2. The second visit (approximately two weeks after the first visit):

In this visit, I will be asked again to complete the same oral health literacy instrument (test).

I understand that the results of my test will be available to me after completing the study and that the study investigators might need access to my dental and medical records at the Faculty of Dentistry, University of Toronto.

Length of the Study

This study will last about two (2) weeks, and involves two (2) visits of about one (1) hour each.

Confidentiality of Study Records

The information regarding my participation in this study will be kept confidential. All information collected in the study will be used only for research purposes. Forms used in this study will be stored in a locked filing cabinet at the Faculty of Dentistry, University of Toronto. All electronic data will be saved on the personal laptop computer of the principal investigator. Only the principal investigator, Dr. Dania Sabbahi, and her supervisor, Dr. Herenia P. Lawrence, will have access to these forms and electronic data. All the study records will be maintained by the principal investigator for a period of three (3) years and will be destroyed thereafter.

The results of this study may be presented at professional and scientific conferences and/or published in scientific journals. However, the results will contain no names or specific information about individual participants or communities.

Risks

There are no risks involved in this study.

Benefits

There are no direct benefits from my participation in this study. However, the development of this oral health instrument (test) will help oral health care providers to measure the oral health literacy of individuals and their communities. These measurements will help in

APPENDIX

VI

ORAL

Health

LITERACY

Instrument

Date: -----/-----/-----

       (dd/mm/yyyy)

Name: _____

Date of Birth: -----/-----/-----

       (dd/mm/yyyy)

Age: _____(yrs)

Gender:

☐ Male

☐ Female

Education level:

☐ Less than high school

☐ High school

☐ Some college/university

☐ College/university graduate

How often do you visit the dentist?

☐ Every 3-6 months

☐ Every year

☐ Every 2-3 years

☐ When there is pain only

In this part, you will be shown some pictures on the right side of the pages, and on each picture there are labels pointing to certain parts of the picture.

On the left of the pages, there are lists of numbered words. Each picture has its own word list. Choose the word from the word list that describes the part that is labeled. Put the word number in the label (at the end of each line).

The number of words in each list might be more than the number of labels.

Please choose only one word for each label.

1. Caries

2. Molars

3. Uvula

4. Composite

5. Incisors

6. Frenum

7. Dorsal side of the tongue

8. Gingiva

9. Amalgam

10. Denture

11. Palate

12. Lips
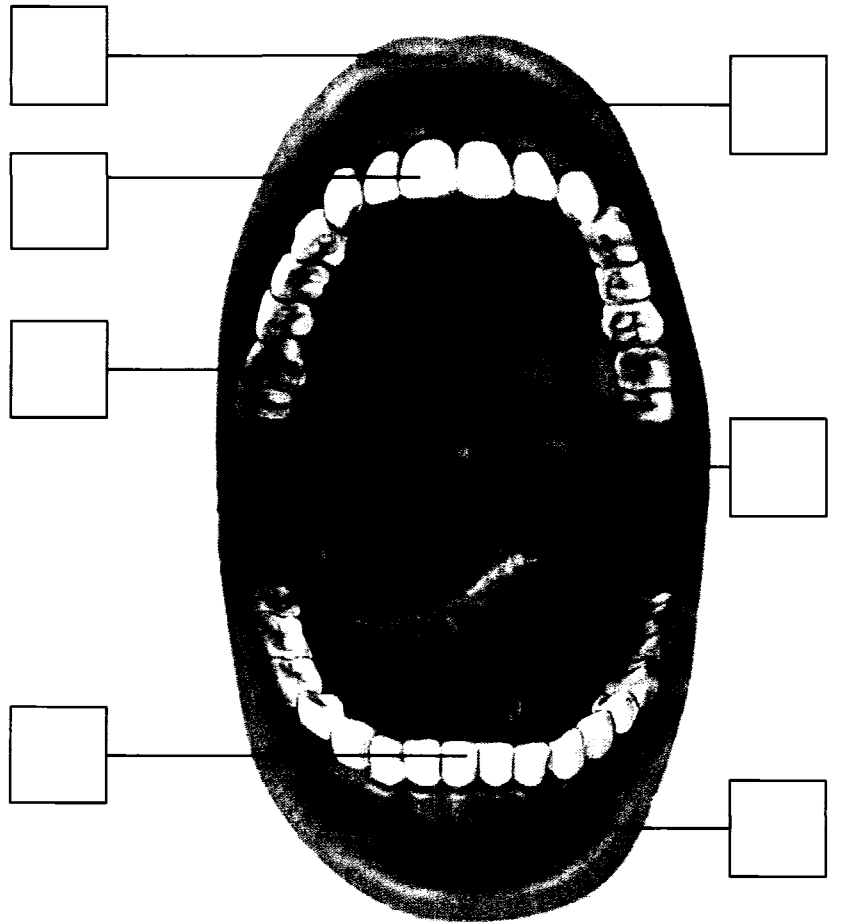
1. Caries

2. Physiologic pigmentation

3. Molars

4. Pre-molars

5. Internal bleeding

6. Composite

7. Calculus

8. Brushing

9. Floor of the mouth

10. Amalgam

11. Gingival bleeding
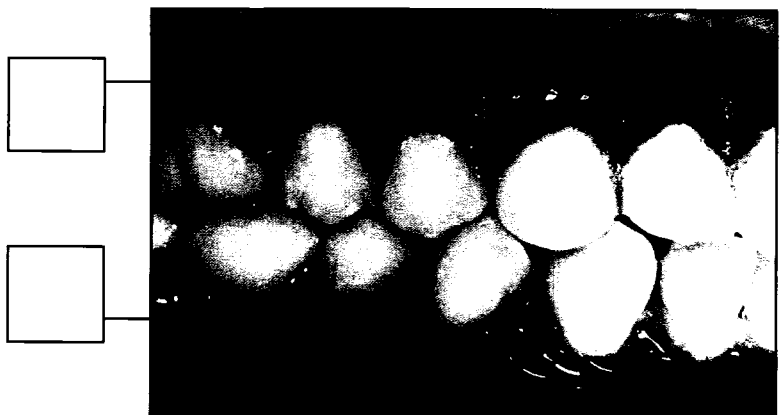
1. Caries

2. Molars

3. Uvula

4. Composite

5. Incisors

6. Amalgam

7. Denture

8. Palate
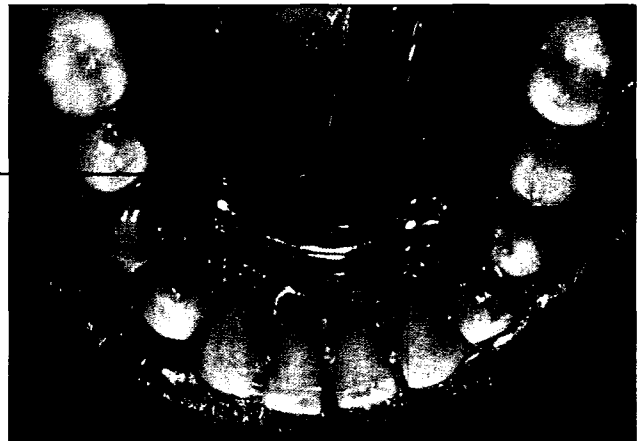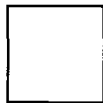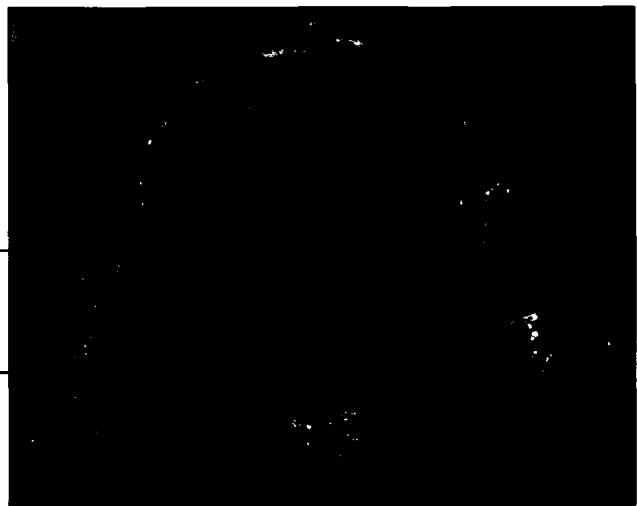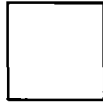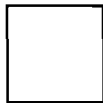
1. Brush

2. Interdental brush

3. Dental floss

4. Mouthwash

5. Fluoride application

6. Brackets
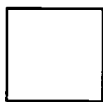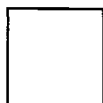
Part 2

In this part, you will be given two passages talking about some dental problems and their solutions that you or anybody might see in the dental clinics or in dental pamphlets.

In each passage, there is a missing word (indicated by a blank line). There are four (4) possible words listed and one fits well in the blank.

From these four (4) words, choose the word that you think will make sense and circle the letter in front of the word. Repeat this for all the blanks and for all the passages until you are finished.

Passage 1:

When you go for a check-up, your dentist checks your fillings (if you have any), he/she

may _____ you replace any loose or broken ones. Your dentist also looks for signs

      a. suggest
      b. send
      c. see
      d. since

of decay and may want to use an/a _____ to take a closer look at the problem.

      a. lab coat
      b. X-ray
      c. drill
      d. binuclear

Cavities are caused when _____ in the food we eat and bacteria in our _____ mix

      a. color   a. clothes
      b. fibers   b. coffee
      c. sugar   c. muffins
      d. fat   d. mouth

together to produce a mild acid that _____ the outer layer of the tooth causing a

      a. deposits
      b. dissolves
      c. drops
      d. deletes

hole.

When you have a cavity in your tooth, it needs to _____.There are different

      a. grow
      b. eat
      c. be filled
      d. be measured

kinds of fillings to do the job, but the final _____on which type is placed in your

      a. material
      b. decision
      c. occupation
      d. destination

mouth _____.

    a. is the dentist's
    b. depends on the material
    c. depends on your pain
    d. is yours

There are two main types of fillings, metal and tooth-coloured fillings. Dental amalgam

fillings are examples of metal fillings and _____ they are silver in colour they are

    a. because
    b. However
    c. whether
    d. then

used to fill _____ teeth. The other types of dental fillings are tooth-coloured fillings;

    a. turn
    b. forward
    c. around
    d. back

_____composite fillings and are also called _____fillings.

a. therefore	a. white
b. such as	b. colored
c. moreover	c. yellow
d. walk in	d. silver

Both metal and tooth-coloured fillings can usually be done in _____ (1) visit.

    a. seven
    b. five
    c. one
    d. ten

There are other kinds of dental fillings which you can _____.

    a. ask your dentist about
    b. ignore
    c. tell your dentist to use
    d. not use

If the cavity is _____ and your tooth is damaged but not lost, a crown may have

    a. very small
    b. not seen
    c. large
    d. sealed

to be used to cover _____ of your tooth and it will _____ your

    a. only a small part   a. protect
    b. the damaged part   b. prepare
    c. the majority   c. predict
    d. the infected part   d. provide

tooth from further damage.

However, if a tooth is badly damaged or lost, crowns can not be used. Bridges and dentures

are two ways to _____ badly damaged teeth or lost teeth.

    a. damage
    b. break
    c. extract
    d. replace

Passage 2:

Research shows that there maybe a link between oral diseases and other health problems

such as _____, heart disease and stroke as well as pre-term and low-birth

        a. excessive drinking
        b. diabetes
        c. mental illness
        d. muscular dystrophy

weight babies.

Gum disease is one of the _____ common dental problems. _____ is also called

        a. most   a. Is
        b. more   b. The
        c. far   c. It
        d. big   d. At

_____ and it often develops slowly and without causing _____ pain.

a. periodontal disease   a. on
b. preventive disease   b. an
c. plantation disease   c. any
d. retention disease   d. many

You may not notice any _____ until the disease is serious and you are in danger of

        a. science
        b. symptoms
        c. stimulation
        d. syphilis

losing teeth. Fortunately, gum disease can be nearly _____ prevented.

        a. away
        b. any
        c. some
        d. always

If it starts it can be _____ and even can be turned around or _____ in its

a. sped up
b. treated
c. left alone
d. no problem

a. reversed
b. revised
c. released
d. resounded

early stages.

Gum disease _____ the attachment that is located _____ the teeth and gums.

a. assesses
b. affects
c. efforts
d. offers

a. during
b. left
c. right
d. between

It begins with _____, which is clear and sticky and contains bacteria. If it is not

a. saliva
b. toothpaste
c. plaque
d. rinse

removed every day by _____with tooth brush and paste and floss, it

a. licking
b. tooth brushing
c. scraping with a finger
d. swishing

hardens into _____, which can't be removed by brushing and flossing.

a. stone
b. calculus
c. more tooth
d. tongue deposits

Calculus can only be removed by _____by a dentist or dental hygienist.

a. a polishing
b. instructions
c. a scaling
d. rinsing

The early stages of gum disease are called _____. It is characterized by mild

    a. gingivitis
    b. diabetes
    c. asthma
    d. angina

_____ (colour) and a bit of _____ when you brush. Over time, the infection

a. swelling   a. asthma
b. redness   b. diabetes
c. pain   c. anemia
d. etching   d. bleeding

breaks down the _____ between the gum and teeth. This is called attachment loss

    a. ice
    b. nerves
    c. attachment
    d. glass

and if it is not treated, the teeth become loose and may _____.

    a. become less of a problem
    b. abscess and fall out
    c. move to better position
    d. shorten

Part 3

In this part, you will be shown some drug labels and instructions after a dental procedure. I will ask you some questions about them and you will be asked to answer these questions orally.

Dania Sabbahi   Refill: 00   1 Sept. 2006

Amoxicillin Capsules
500 MG   21/0

Take one tablet by mouth three (3) times a
day for 7 days

Q1: If you take the first tablet at Friday 10 a.m., when should you take the   (1)   (0)

next one?

Q2: When should you take the last one?   (1)   (0)

Q3: If your symptoms are gone by the 4th day of taking the medication,   (1)   (0)

should you stop taking the medication?

Q4: When should you stop the medication?   (1)   (0)

Q5: How many times you can refill this medication?   (1)   (0)

Total

Dania Sabbahi	Refill: 00	1 Sept. 2006

Penicillin V Capsules
500 MG   28/0

Take one tablet by mouth every 6 hours for 7 days.

Q1: How many capsules should you take per day?   (1)   (0)

Total

```
┌─────────────────────────────────────────────┐
│ Dania Sabbahi     Refill: 00     1 Sept. 2006 │
│                                               │
│ **Chlorhexidine Mouthwash 0.12 %**            │
│                                               │
│ Swish and spit 15cc for 30 seconds 3 times a  │
│ day then nothing per mouth for 30 minutes     │
│                                               │
│                                               │
└─────────────────────────────────────────────┘
```

Q1: What do you understand from this prescription? Can you swallow it?   (1)   (0)

Q2: If you use it at 5 p.m., when can you eat or drink?   (1)   (0)

Total

Dania Sabbahi   Refill: 00   1 Sept. 2006

Ibuprofen
400 MG   20/0

Take one tablet by mouth every 4 hours when needed.

Expiration date: May 2007

Q1: If you are not feeling any pain, should you take the medication?   (1)   (0)

Q2: If you are feeling a pain, how many capsules can you take per day?   (1)   (0)

Q3: Can you take this medicine on June 2008?   (1)   (0)

Total

```
┌─────────────────────────────────────────────┐
│  Dania Sabbahi     Refill: 00     1 Sept. 2006 │
│                                                 │
│  Amoxicillin Capsules                           │
│  500 MG     4/0                                 │
│                                                 │
│  Take 4 tablets by mouth one hour before the    │
│  dental appointment.                            │
│                                                 │
└─────────────────────────────────────────────┘
```

Q1: How many times do you have to take this medication?   (1)   (0)

Q2: If your dental appointment is scheduled at 10 a.m., when should you take   (1)   (0)

the medication?

                                                        Total

```
┌──────────────────────────────────────────────┐
│              Appointment card                  │
│                                                │
│  Clinic: Dental                                │
│                                                │
│  Location: 1st floor                           │
│                                                │
│  Date: February 27                             │
│                                                │
│  Day: Tuesday                                  │
│                                                │
│  Time: 9:45 a.m.                               │
│                                                │
└──────────────────────────────────────────────┘
```

Q1: When is your next appointment?   (1)   (0)

Q2: Does this means that you leave home quarter to 10? "9:45 a.m."   (1)   (0)

Q3: Where should you go?   (1)   (0)

Total

POST - OPERATIVE INSTRUCTIONS

Some discomfort, / bleeding / bruising / swelling / stiffness of your jaw / sensitivity of adjacent teeth and numbness for a period of time are expected after having a tooth removed.

SWELLING – This may occur after the removal of a tooth and is quite common if the operation has been difficult and most commonly if the gum tissue has been pushed back in order to remove the tooth. The swelling is often accompanied by stiffness of the jaws and you may be unable to open normally. The swelling is at its maximum at about the second or third day and then slowly goes down. If you have access to ice, then the swelling may be made less by placing ice in a plastic bag on the face and applying it for 20 minutes. The ice is then removed for 20 minutes and then may be replaced. This is done for 6 hours, after which it has no effect. If ice is not available, a bag of frozen vegetables is equally effective.

Q1: If your tooth was extracted on Monday, when do you expect the swelling   (1)   (0)

to reach its maximum?

Q2: If you start placing the ice bag at 10:00 a.m., when should you remove it?   (1)   (0)

Q3: When will you place the bag of ice for the second time?   (1)   (0)

Total