

**Unravelling the Relationship between Oral Health Literacy and Oral Health Status among Indian Population**

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**Abstract**

**Background:** In the past few decades literacy has evolved as a relatively new concept. Health literacy is being increasingly described as the currency for improving the quality of health and is recognized as an important determinant of health as well as a causal factor in health disparities among different population groups. So, literacy specifically the oral health literacy is believed to be an important determinant of oral health, one that intersects with other determinants in myriad ways. Thus, present study was conducted to investigate the relationship between oral health literacy and oral health status.

**Methods:** A cross sectional study was conducted among 402 subjects each selected from Bangalore city. A self-administered questionnaire was used to collect information on demographics, oral health literacy and oral health status. The oral health literacy was assessed by using the Health literacy in dentistry-14 scale (HeLD-14). The data obtained was analysed using descriptive and inferential statistical analysis

**Results:** The response rate was 95.7% and the mean age of the participants was  $20.56 \pm 2.63$  years. A statistically significant difference was observed in OHL according to the clinical parameters. Caries prevalence was higher

among subjects with low OHL with a mean DMFT score of  $7.0 \pm 1.53$ , compared with high-OHL students having a mean DMFT of  $1.7 \pm 0.4$ . Similarly, community periodontal index scores were lower ( $1.06 \pm 0.8$ ) in subjects with high OHL than in those with low literacy ( $1.6 \pm 0.6$ ). Participants with low oral health literacy were more likely to have dental diseases.

**Conclusions:** Our findings indicated that oral health literacy is associated with differences in oral health behaviours and clinical oral health status. An understanding of participants' oral health literacy levels is crucial for designing effective health educational materials and creating intervention programs to promote oral health.

**Keywords:** Oral health literacy, HeLD-14, oral health status, dental caries, periodontal disease

**Introduction**

Oral health is an integral part of overall health and well-being. It is more than a healthy mouth, a pleasing smile, freedom from pain and infection but also contributes positively to self-esteem and personal success.<sup>1</sup> Understanding of the causes and treatment of diseases has grown exponentially over past decades. However, profound and consequential health disparities still persist globally.<sup>2</sup> Many reasons could be attributed to

this but low health literacy is one amongst these factors. Researchers hypothesize that an individual's health literacy is represented by a constellation of skills and abilities, including word recognition, reading comprehension, communication proficiency, and conceptual knowledge.<sup>3</sup> Oral health literacy is a new imperative in dentistry and is considered as interplay between culture and society, the health system, education system, and oral health outcomes indicating that it may be a new determinant of oral health and should be considered more intensively in oral health research. Knowledge of oral health is considered to be a prerequisite for health related behaviour.<sup>4</sup> According to the World Health Organization, health literacy is defined as the "cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health."<sup>5</sup> In dentistry, Healthy People 2010 first defined oral health literacy 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."<sup>6</sup> Studies have indicated that health literacy is related to various aspects of health, including knowledge, status, outcomes, and the use of services.<sup>7</sup>

People with low health literacy may struggle to comprehend and use information in written materials that contain new ideas or unfamiliar terminology.<sup>8</sup> Till date many oral health literacy measurement tools have been developed and are of usually 2 types – word recognition tests and comprehension tests. Word recognition tests, test the ability to recognize, or read and pronounce individual words.<sup>9</sup> Various word recognition tools are REALD-30, REALD-99, REALM-D, TS-REALD, REALMD-20, OHLA-S and HKREALD-30.<sup>10</sup> While the comprehension tests assess patient's ability to understand written texts of

varying difficulty. These include TOFHLiD, OHLI, CMOHK and HKOHLAT-P.<sup>9</sup>

These tools were not considering the adequate threshold level of oral health literacy is required to effectively navigate through today's complex oral health care system.<sup>11</sup> Recently, a new tool called Health literacy in dentistry (HeLD-14) was developed which takes into account a broad approach by measuring an individual's ability to seek, understand and utilize oral health information to make appropriate oral health-related decisions.<sup>12</sup> While carrying out an extensive search and it was found that there is scarcity of literature regarding the impact of oral health literacy on oral health status and also till no study has used Held -14 scale for same purpose. Thus, the objective of this cross-sectional study was to investigate how oral health literacy relates to oral health status i.e. clinical dental and periodontal conditions in Bangalore.

### **Methods**

A cross-sectional descriptive epidemiological study was conducted among young adults aged 18-25 years studying in 6 different institutes of Bengaluru South zone. Prior ethical approval for the study was obtained from institutional review board. A simple random sampling technique was used for the present survey. The sample size was calculated based on the prevalence of dental caries among the population and the final sample size arrived at was 384 which was rounded up to 400. The questionnaire was tested for validity and reliability before the start of the survey. Test and retest method was used to check for reliability, and the value of kappa statistic was found to be 0.80 and back translation method was used to check content validity of the questionnaire. A specially designed proforma was used to collect data on socio-demographics, oral health literacy followed by type III clinical examination for recording the oral health status of

participant using WHO modification of DMFT index and CPI index respectively (for assessing dental caries using and periodontal status). Written informed consent was obtained from the participants before the start of an interview.

Oral health literacy was assessed using HELD -14 scale having 14 items based on seven domains: communication, understanding, receptivity, utilization, support, financial and access. Participants were asked questions on a range of oral health literacy related functions or tasks and the responses were assessed on the basis of the level of difficulty experienced while performing these tasks or functions. Each item was ranked on a 5-point scale ranging from 0 through to 4. Possible HeLD-14 scores ranged from 0 to 56, with higher scores indicating minimal difficulty in performing functions (high oral health literacy) and low scores indicating very limited capacity in performing functions or tasks ( low oral health literacy).<sup>12</sup> For analysis purpose, the OHL scores were categorized into low, moderate and high.

The data was analyzed using Statistical Package for Social Sciences, IBM Corporation, SPSS Inc., Chicago, IL, USA version 21 software package (SPSS). Descriptive statistics

with frequency mean and standard deviation was computed. Chi-square test was used to analyze gender and age differences. The association between each questionnaire item with 3 categories of oral health literacy scores was analyzed using chi-square test. Pearson’s correlation coefficient was calculated to correlate oral health literacy scores with oral health status. Statistical significance was set at the 5% level.

**Results**

Among the 420 participants approached for the study, 18 refused to participate thus yielding a response rate of 95.7%. The mean age of participants was 20.56 ± 2.63 years (range: 18-25 years), with male:female ratio of 1:1.29 respectively (Table 1). Among 402 participants, 20 (6%), 67 (16.7%), 315 (78.4%) had low, medium and high OHL (HeLD-14) scores (Figure 1). The mean OHL scores were 47.16 ± 8.57 for the total sample with the females having higher scores (Figure 2).

Table 1: Comparison of demographic characteristics with the level of oral health literacy scores among study participants using Chi square test.

Variables	Categories	Low OHL		Mod. OHL		High OHL		Total		χ <sup>2</sup> value	p-value
		n	%	n	%	n	%	n	%		
Age in Years	18	11	55.0	25	37.3	108	34.3	144	35.8	17.120	0.25
	19	4	20.0	14	20.9	39	12.4	57	14.2		
	20	0	0.0	4	6.0	18	5.7	22	5.5		
	21	0	0.0	7	10.4	20	6.3	27	6.7		
	22	1	5.0	5	7.5	25	7.9	31	7.7		
	23	3	15.0	5	7.5	37	11.7	45	11.2		
	24	1	5.0	3	4.5	35	11.1	39	9.7		
	25	0	0.0	4	6.0	33	10.5	37	9.2		
Gender	Males	12	60.0	32	47.8	131	41.6	175	43.5	3.179	0.20
	Females	08	40.0	35	52.2	184	58.4	227	56.5		

Figure 1: Percentage distribution of HeLD-14 scores among study participants

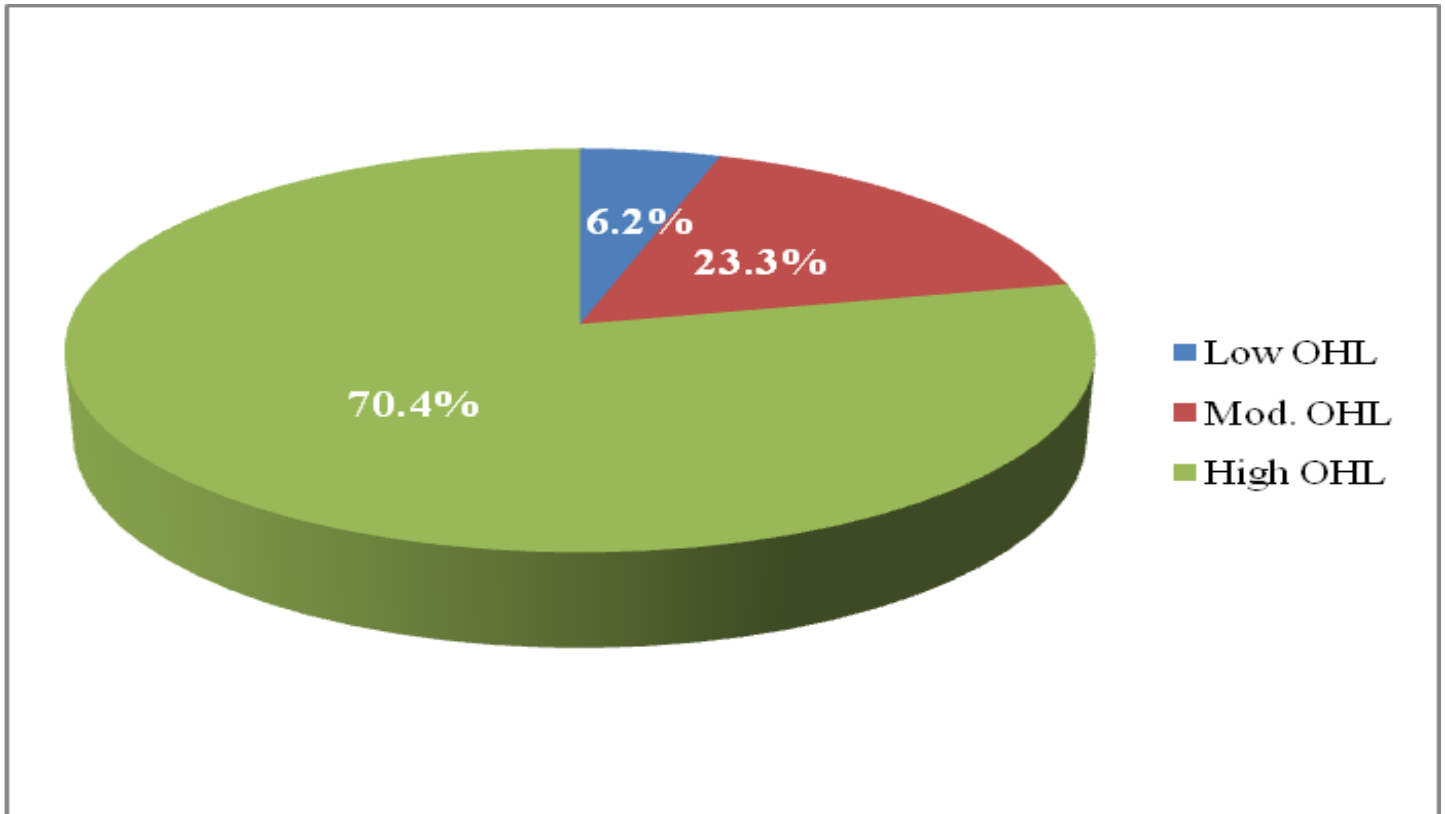
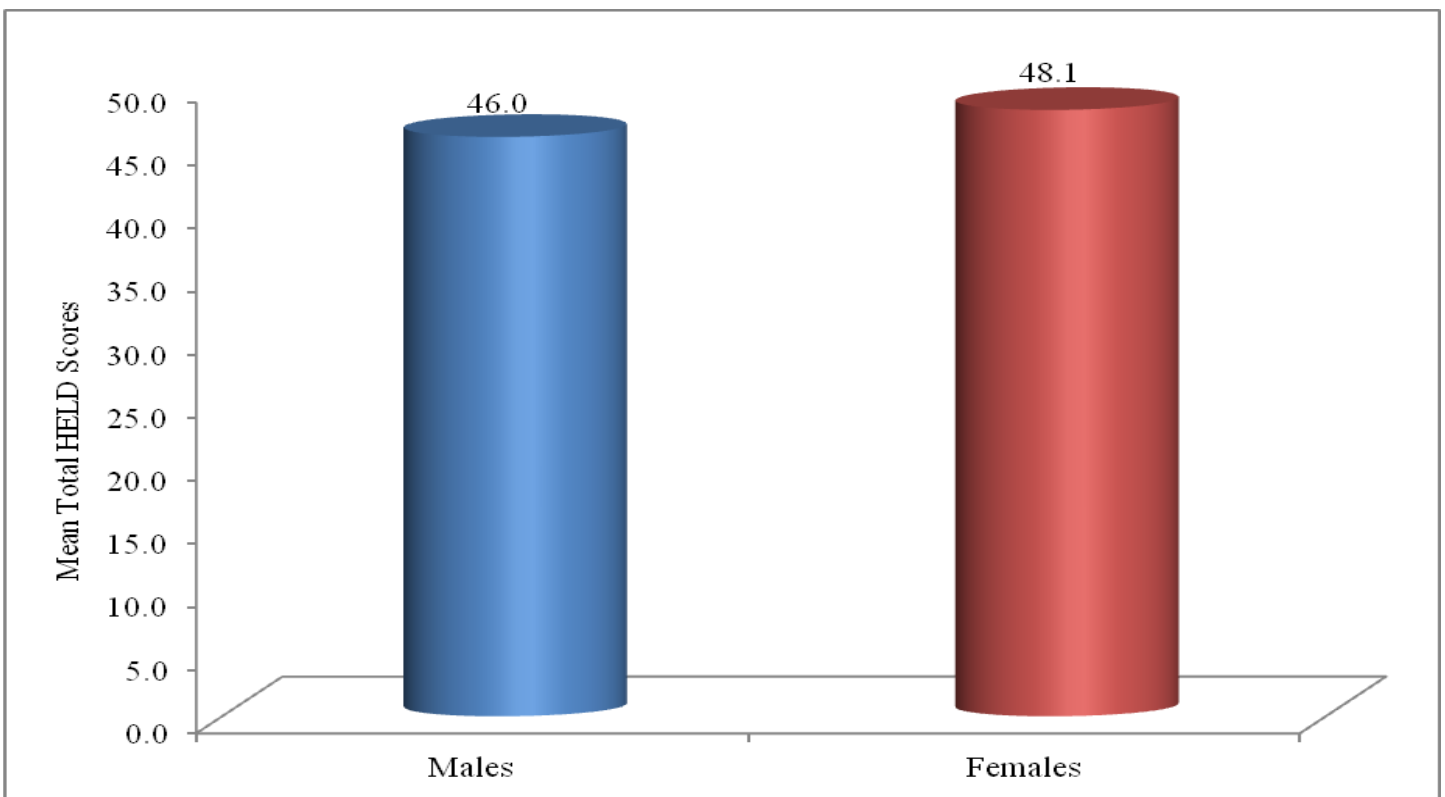


Figure 2: Gender-wise comparison of mean HeLD-14 scores among study participants



**Clinical oral health status**

The mean DMFT scores were  $2.57 \pm 2.36$  with males having higher mean scores as compared to females (Table 2). Caries prevalence was high among subjects with low OHL – their mean DMFT score being  $7.0 \pm 1.53$  whereas those with high OHL had a mean DMFT of  $1.06 \pm 0.8$ . Similarly CPI scores were lower ( $1.06 \pm 0.8$ ) for subjects with high OHL than for those having low OHL literacy ( $2.6 \pm 0.6$ ) and these differences were statistically

significant (Table 3). Among subjects with low OHL, 90% had calculus deposits while those 40% of those having high OHL had healthy periodontium and these associations were statistically significant.

Table 2: Gender-wise comparison of mean DMFT and its component scores using Mann Whitney U Test

Variables	Gender	N	Mean	SD	S.E.M	Mean Diff	Z value	p-value
Decayed(D)	Males	178	2.2	1.9	0.1	0.1	-1.063	0.29
	Females	224	2.0	2.0	0.1			
Missing(M)	Males	178	0.2	0.6	0.0	0.0	-0.150	0.88
	Females	224	0.2	0.4	0.0			
Filled(F)	Males	178	0.2	0.5	0.0	-0.2	-1.202	0.23
	Females	224	0.4	1.0	0.1			
DMFT score	Males	178	2.6	2.4	0.2	0.0	-0.229	0.82
	Females	224	2.6	2.3	0.2			

Table 3: Comparisons of literacy rates in relation to clinical parameters

Variable	Oral health literacy rate	Mean±SD	p-value
Decayed component	Low	5.6±0.8	<0.001*
	High	1.4±0.2	
Filled component	Low	0.6±0.4	0.04
	High	0.1±0.1	
Missing component	Low	0.9±0.2	0.08
	High	0.2±0.1	
DMFT	Low	7.0±1.53	<0.001*
	High	1.7±0.4	
CPI	Low	1.06±0.8	<0.001*
	High	1.6±0.6,	

\* - Statistically significant.

A negative correlation was found between OHL and DMFT and CPI scores ( $p < 0.05$ ) suggesting that higher the oral health literacy, better the oral health status (Table 4).

Table 4: Correlation between HeLD-14 Scores, DMFT and CPI scores

Variables	Correlation between HELD-14 scores with	
	r-value	p-value
DT	-0.72	<0.001*
MT	-0.27	<0.001*
FT	-0.24	<0.001*
DMFT	-0.73	<0.001*
CPI	-0.31	<0.001*

\* - Statistically significant using Pearson correlation (r)

### Discussion

Literacy is counted to be one of the key foundations for social and economic growth of the country. India, being a developing country with estimated population of apparently 1.27 billion has a literacy rate of 74.04%, as per the recent Census of India, 2011.<sup>13</sup> This cross-sectional descriptive epidemiological study was aimed to assess the oral health literacy and to assess the relationship of OHL with oral health status among study participants.

Awareness regarding oro-dental health highly depends on one's literacy level and higher the health literacy, greater is the adoption of potent disease prevention methods, successful adherence to treatment regimens and ultimately improved oral health status. In the present study, it was seen that majority of the participants (78.4%) had high oral health literacy, which could be attributed to the reason that majority of subjects were pursuing their university degrees and education leads to faster adaptation of learning new terms and acquiring skills, thereby

increasing the knowledge and use of preventive care services. About 58.4% of females had higher oral health literacy which could be due to their increased concern about the aesthetic appearance, better understanding about what good oral health entails in it and a more positive dental health attitude. These results were consistent with the findings of Sistani et al, Sabbahi et al<sup>14,15</sup> while inconsistent with the findings of Padmaja et al study.<sup>16</sup>

In order to assess the relationship between the level of oral health literacy and oral health status of study participants, hard and soft tissue changes i.e. dental caries and periodontal status were measured using DMFT index and Community periodontal index. In present study, it was noticed that males had more number of decayed teeth  $2.2 \pm 1.9$  as compared to females. While, the filled teeth were slightly more in females  $0.4 \pm 1.0$ . Although, the mean DMFT scores were almost equal in both the genders  $2.6 \pm 2.4$  and  $2.6 \pm 2.3$  respectively. This indicates that females pay more attention to their oral health care and thus try to resolve dental problems at the earliest. A statistically significant difference in mean DMFT scores was observed among different genders.

In present study, it was noticed that the subjects with low oral health literacy, had higher total mean DMFT as well as components wise scores i.e. 7.0 and 5.6, 0.4, 0.9 respectively as compared to those with high OHL i.e. 1.7 and 1.4, 0.1, 0.2 respectively. This indicated that persons with lower oral health literacy usually neglect their oral health leading to higher prevalence of caries was among them. This could be attributed to the reason that persons with high oral health literacy were practising better oral hygiene behaviours, hence better oral health status. A statistically significant difference was observed between different categories of oral health literacy and clinical parameters. These results were consistent with results of a

study conducted by Haridas et al, in Karnataka using REALD-30 where the mean DMFT scores 4.40.<sup>17</sup> In a study conducted among Japanese adults by Ueno et al, where similar results were observed i.e. those with low OHL had mean scores of  $1.08 \pm 1.09$ , those with high OHL mean scores were  $0.80 \pm 0.91$  suggesting that higher the OHL, fewer the number of decayed teeth.<sup>8</sup> Kanupuru et al study also showed similar results where subjects with higher OHL had mean DMFT scores of  $0.22 \pm 0.41$  and in those with low OHL had higher mean DMFT scores of  $2.6 \pm 1.5$  respectively indicating that as level of OHL increases, the mean DMFT decreases.<sup>18</sup> In present study, it was found that majority of subjects had calculus deposits on their posterior teeth. While on anterior teeth, periodontium was found to be relatively healthier. The reason behind this could be that due to concern for aesthetics as anterior teeth are more visible while smiling and talking, so, people tend to give more attention, time and follow proper brushing technique for anterior teeth as compared to posterior teeth leading to more calculus deposits on them. Subjects with high OHL, majority had healthy periodontium as compared to those with low OHL as they had more calculus deposits. The differences were statistically significant. We felt it was not worth recording CPI in this study since the participants were young in age and no advanced effect could be made or predicted. These results are consistent with the results of Kanupuru et al and Wehmeyer et al where also lower the OHL literacy, higher was the CPI scores.<sup>17,19</sup>

The present study, using the newly adapted instrument, revealed a significant negative correlation between oral health literacy and clinical parameters measured. Correlation scores between total DMFT and CPI and HeLD-14 score were 0.73, 0.30 respectively, that is, higher OHL was associated with better oral health. OHL had a negative correlation with oral hygiene status and

carries prevalence. People with low OHL had poor oral hygiene and higher caries prevalence. Higher the oral health literacy of participants could be attributed to tooth brushing habit, regular dental check-ups, and their better oral hygiene status. These findings were in accordance with studies conducted by Kanupuru et al in Nellore, where also a negative correlation was observed with OHL, CPI, DMFT ( $r=0.45, 0.86$ )<sup>17</sup> and Ueno et al where also a negative correlation is found.<sup>8</sup> Similar results were seen in study conducted by Lee et al, where an association was seen between the oral health literacy (REALD-30) with oral health status indicating that a higher OHL was associated with better OHS.<sup>20</sup> Studies have shown that a health-literate individual has the knowledge, skills, and confidence that will enable him to manage health on a daily basis.

Better navigation skills will result in appropriate utilization of dental services and therefore will improve oral health outcomes. Public health significance of this paper lies in the fact that an understanding of participants' oral health literacy levels is crucial in designing effective health educational materials for individuals, as well as designing intervention programs to successfully achieve oral health promotion at a community level. Low level of oral health literacy possibly interferes with ability to process and understand oral health information and may act as barrier in adoption of preventive oral care measures. The often substantial differences concerning expertise on and practice of oral hygiene allow deriving that there is great need of educational efforts in the general population. Further research is needed to improve the level of oral health literacy on larger population and assess its impact on oral health.

The present study acknowledges certain limitations. Firstly, our sample size was too small hence; we recommend that future studies be carried out on larger

populations so that the results can be generalized. In this study the male and female participants were slightly unequal in number which hindered comparison between genders. Furthermore, with the small number of marginal and inadequate scores, the small sample may not have contained enough variation to detect differences or to allow the investigation of a larger number of explanatory variables.

### Conclusion

Oral health literacy may be part of causal mechanisms that lead to worse oral health. Low oral health literacy levels directly affected the oral health status. Improving health literacy is a critical goal in improving health outcomes and requires intensive collaborative efforts among healthcare. Higher the oral health literacy of participants could be attributed to tooth brushing habit, regular dental check-ups, and their better oral hygiene status.

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