



# Digital Health Literacy and Oral Health Prevention Behaviors Among Generation Z Dental Technicians: A Cross-Sectional Study

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## ABSTRACT

*Background: Digital transformation has increased public access to health information through various online platforms. Purpose: This study aimed to identify the level of digital health literacy, assess preventive oral health behaviour, and analyse the relationship between digital health literacy and preventive oral health behaviour among Generation Z dental technicians. Methods: A quantitative cross-sectional study was conducted among 120 Generation Z dental technicians and dental technology students in West Jakarta using purposive sampling. Data were collected from January to March 2026 through an online survey. Digital health literacy was measured using the eHealth Literacy Scale (eHEALS), while preventive oral health behaviour was assessed using a structured questionnaire. Data were analysed using descriptive statistics and Spearman's rank correlation test with a significance level of 0.05. Results: Most respondents had moderate digital health literacy (53.3%) and adequate preventive oral health behaviour (55.0%). A significant positive correlation was found between digital health literacy and preventive oral health behaviour ( $r = 0.462$ ;  $p < 0.001$ ). Conclusion: Digital health literacy is significantly associated with preventive oral health behaviour among Generation Z dental technicians. Integrating digital health literacy into dental vocational education may support evidence-based decision-making and promote sustainable preventive oral health practices.*

**Keywords:** Digital Health Literacy, eHEALS, Oral Health Preventive Behavior, Dental Technician



## INTRODUCTION

Developments in information and communication technology have driven a significant transformation in the healthcare sector, known as digital health transformation. This transformation is characterized by the increasing use of digital technologies, such as the internet, health apps, and social media, in disseminating health information. The World Health Organization emphasizes that health digitalization plays a crucial role in improving access to healthcare services and empowering communities in health decision-making (World Health Organization, 2021). In this context, individuals are no longer passive recipients but rather active participants in seeking and using health information.

However, easy access to digital information also presents serious challenges, such as misinformation, disinformation, and information overload. Invalid health information can negatively influence individual perceptions and decisions. Studies show that social media has great potential for disseminating health information, but it also carries a high risk of becoming a source of unverified information (Ghalavand et al., 2025). Therefore, the ability to filter and evaluate information is crucial in the digital age.

In response to this phenomenon, the concept of digital health literacy emerged, which refers to an individual's ability to search for, understand, evaluate, and use digital-based health information effectively (Wiener & Abuhalimeh, 2025). This literacy integrates health literacy and digital literacy, emphasizing not only information access but also critical skills in assessing the quality of that information.

Conceptually, digital health literacy encompasses several key components: the ability to search for health information online, evaluate the credibility of sources, and apply that information to health decision-making. This distinguishes it from traditional health literacy, which focuses more on directly understanding medical information (Alzahrani et al., 2024). Thus, digital health literacy is an essential competency in navigating the complexities of modern health information.

Generation Z is a group born and raised in the digital era, thus known as digital natives. This group has high levels of access to technology and the internet, and uses digital platforms as their primary source of health information. However, this high level of access is not always accompanied by adequate evaluation skills. This creates a paradox: ease of access to information does not always equate to quality of understanding (Wiener & Abuhalimeh, 2025).

These conditions increase the risk of errors in health decision-making, such as inaccurate self-diagnosis and the use of non-evidence-based information. In the context of oral health, misinterpretation of information can lead to inappropriate care practices and worsen an individual's health condition. Oral health is an integral part of general health and is closely linked to an individual's quality of life. The World Health Organization reports that oral diseases, such as caries and periodontal disease, affect nearly 3.5 billion people worldwide (World Health Organization, 2022). This indicates that oral health remains a significant global public health issue.

In Indonesia, according to the Ministry of Health of the Republic of Indonesia's Riskedas report, the prevalence of oral health problems stands at around 57.6% of the population, yet only around 10.2% receive treatment from healthcare professionals (Kemenkes, 2025). These figures



highlight a gap between the need for and the uptake of dental care services, which is partly due to low public awareness and a lack of preventive behaviour

Preventive oral health behaviors include actions such as proper tooth brushing, regular dental checkups, and dietary management. These behaviors are influenced by various factors, including knowledge, attitudes, and access to health information. Research shows that health literacy is significantly associated with individual health behaviors, with individuals with higher levels of literacy tending to engage in better preventive behaviors (Altas et al., 2025).

In the context of oral health, health literacy has also been shown to contribute to dental hygiene behaviors and healthcare utilization. However, most research still focuses on general health literacy, rather than specifically on digital health literacy, which has different dynamics. (Macek et al., 2025).

Dental technicians, as part of the vocational health workforce, play a crucial role in the dental and oral health care system. Despite their technical competence, this group doesn't necessarily have a strong promotive and preventive orientation. Furthermore, as members of Generation Z, dental technicians have high levels of exposure to diverse digital information (Kemenkes, 2021).

This creates a potential gap between digital health literacy and health behaviors. Studies show that increased access to digital information is not always accompanied by consistent changes in health behaviors (Saini et al., 2025). Therefore, a more in-depth study of the relationship between digital health literacy and health behaviors is needed.

To date, research specifically examining the relationship between digital health literacy and oral health prevention behaviors among Generation Z dental technicians is limited. Most studies focus on the general population or healthcare students and have not comprehensively integrated digital literacy aspects into the context of oral health.

Based on the description, there is a significant research gap, namely the lack of cross-sectional quantitative studies that examine the relationship between digital health literacy and oral health prevention behaviors in the Generation Z dental technician group. Therefore, this study is important to conduct.

Theoretically, this research is expected to enrich the conceptual development of the relationship between digital health literacy and health behaviors. Practically, the results can serve as a basis for developing digital-based educational interventions. Therefore, this study aims to identify the level of digital health literacy, the level of oral health prevention behaviors, and the relationship between the two among Generation Z dental technicians.

## **METHODS**

This study employed a quantitative analytical observational design with a cross-sectional approach to examine the relationship between digital health literacy and oral health prevention behaviours among Generation Z dental technicians. The cross-sectional design was chosen as it allows for the simultaneous measurement of independent and dependent variables within a single data collection period, thereby facilitating an efficient assessment of the association between variables.



The study was conducted in West Jakarta, an urban area characterised by high population density and good access to digital technology. This location was selected on the basis that the Generation Z population in urban areas has a high level of exposure to digital information, making it relevant to examine the relationship between digital health literacy and health behaviours. Data collection took place over a three-month period, from January to March 2026, covering the preparation phase, respondent recruitment, data collection and preliminary analysis.

The study population consisted of Generation Z dental technicians and dental technology students who were actively engaged in educational or professional activities during the study period. Based on institutional records, the accessible population comprised approximately 175 individuals who met the criteria. The minimum sample size was determined using a sample size formula for a correlation study with a 5% significance level, 80% statistical power, and an expected correlation coefficient of 0.30. Calculations indicated a minimum requirement of 84 participants. To increase statistical power and account for incomplete responses, a total of 120 respondents were included in the final analysis.

Participants were recruited using a non-probability purposive sampling technique. This method was chosen to ensure that respondents possessed characteristics relevant to the research objectives. Inclusion criteria comprised: (1) dental technicians or dental technology students classified as Generation Z (born between 1997 and 2012); (2) actively engaged in academic or professional activities during the study period; (3) having regular access to digital devices and internet-based health information; and (4) providing consent to participate in the study. Respondents who submitted an incomplete questionnaire or withdrew their participation before completing the survey were excluded from the analysis.

The independent variable in this study is digital health literacy, defined as an individual's ability to search for, understand, evaluate and utilise health information obtained via digital platforms. The dependent variable is oral health prevention behaviour, which includes activities such as correct toothbrushing, routine dental check-ups, dietary control and other oral health prevention practices. Digital health literacy was measured using the eHealth Literacy Scale (eHEALS) developed by Norman and Skinner, comprising eight items rated on a five-point Likert scale. Oral health prevention behaviours were measured using a structured questionnaire developed based on established indicators of oral health behaviour.

Prior to data collection, the validity and reliability of the research instruments were tested through a pilot study involving 30 respondents with characteristics similar to the study population. Validity testing was conducted using Pearson's product-moment correlation, and all items of the instruments were deemed valid with correlation coefficients  $> 0.361$  (table-r,  $n=30$ ;  $\alpha=0.05$ ). The reliability test using Cronbach's Alpha yielded a value of 0.827 for the eHEALS questionnaire and 0.853 for the preventive behaviour questionnaire; both exceeded the threshold of 0.70, indicating satisfactory internal consistency.

Data collection was carried out via an online survey using Google Forms. Before completing the questionnaire, all respondents received detailed information regarding the research objectives, procedures, potential benefits and their rights as participants. Participation was voluntary, and



respondents were required to provide electronic informed consent before submitting their data. To ensure geographical representation, respondents residing outside the West Jakarta area were excluded from the study.

The collected data were analysed using statistical software. Descriptive (univariate) analysis was carried out to summarise the characteristics of the respondents and the study variables using frequency, percentage, mean, and standard deviation. Data normality was tested using the Kolmogorov–Smirnov test. As the distributions of both research variables were non-normal, the relationship between digital health literacy and oral health prevention behaviour was tested using Spearman’s rank correlation test. Statistical significance was set at a p-value of less than 0.05.

This study received ethical approval from the Health Research Ethics Committee of the Jakarta II Ministry of Health Polytechnic of Health, under number 123/KEP-JKTII/XXVI/2026. All research procedures complied with the ethical principles set out in the Declaration of Helsinki. The anonymity and confidentiality of participants were strictly maintained throughout the study, and all data were used solely for research purposes.

## RESULTS

### 1. Respondent Characteristics

**Table 1. Distribution of Respondent Characteristics (n = 120)**

Variables	Category	n	%
Gender	Man	38	31.7
	Woman	82	68.3
Status	Student	74	61.7
	Active technician	46	38.3
Age (years)	18–21	52	43.3
	22–25	68	56.7
Intensity of internet usage/day	< 3 hours	27	22.5
	3–6 hours	63	52.5
	> 6 hours	30	25.0

The majority of respondents were female (68.3%) and students (61.7%). Most were aged 22–25 (56.7%), indicating a late Generation Z dominance. Internet usage intensity was relatively high, with 77.5% of respondents using the internet for more than 3 hours per day, indicating high exposure to digital information.

### 2. Univariate Analysis

**Table 2. Descriptive Statistics of Research Variables**

Variables	Mean	Elementary School	Min	Max
Digital Health Literacy (eHEALS)	29.84	4.12	18	40
Oral Health Prevention Behavior	32.15	5.03	20	45

The average digital health literacy score was 29.84 (SD = 4.12), indicating that respondents generally had a moderate to high literacy level. Meanwhile, oral health prevention behaviors



averaged 32.15 (SD = 5.03), indicating a relatively good trend toward preventive behavior, although there was still variation between individuals.

### 3. Variable Categorization

**Table 3. Distribution of Digital Health Literacy Categories**

Category	n	%
Low	18	15.0
Currently	64	53.3
Tall	38	31.7

Most respondents were in the moderate digital health literacy category (53.3%), but there were still 15% of respondents with low literacy who potentially experienced difficulties in evaluating digital health information.

**Table 4. Distribution of Oral Health Prevention Behavior**

Category	n	%
Bad	20	16.7
Enough	66	55.0
Good	34	28.3

The majority of respondents demonstrated adequate preventive behavior (55.0%), but only 28.3% demonstrated optimal behavior. This indicates room for improvement in oral health preventive practices.

### 4. Normality Test

**Table 5. Results of Normality Test (Kolmogorov-Smirnov)**

Variables	p-value
Digital Health Literacy	0.021
Oral Health Prevention Behavior	0.034

A p-value < 0.05 for both variables indicates that the data is not normally distributed, so bivariate analysis uses the Spearman Rank correlation test.

### 5. Bivariate Analysis

**Table 6. Spearman Rank Correlation Test Results**

Variables	r (Spearman)	p-value
Digital Health Literacy↔Preventive Behavior	0.462	0,000

The results of the correlation test show:

- Correlation coefficient value (r = 0.462)→moderate correlation
- P value = 0.000 (< 0.05)→statistically significant



This means there is a significant positive relationship between digital health literacy and oral health prevention behaviors. The higher the level of digital health literacy, the better the oral health prevention behaviors among Generation Z dental technicians.

## **DISCUSSION**

### **1. Digital Health Literacy Level of Generation Z Dental Technicians**

The results of this study indicate that the majority of Generation Z dental technicians fall into the moderate digital health literacy category (53.3%), followed by high (31.7%), and low (15.0%). These findings indicate that although this group has grown and developed within the digital ecosystem, their ability to search for, evaluate, and critically apply health information is not yet fully developed.

These findings are conceptually aligned with the eHealth Literacy framework developed by Norman and Skinner, which explains that digital health literacy encompasses more than just technical internet access skills, but also the cognitive capacity to assess the credibility, relevance, and quality of health information obtained online. This framework emphasizes that accessibility to technology does not automatically equate to a person's literacy capacity. In their analysis of the concept of digital health literacy, clarified that the most important dimension of this literacy lies in the ability to evaluate reliability and determine relevance—two dimensions most vulnerable to gaps in young populations exposed to high volumes of information. The high exposure to digital information among Generation Z has the potential to create information overload, which hinders critical evaluation skills—a paradox consistently reported in the literature.

Several previous studies provide empirical support for the distribution of categories found. Jiao et al. (2023) in a cross-sectional study of Generation Z using the eHEALS instrument found that although this generation is the most active internet users, their ability to manage and critically evaluate health information is not commensurate with the intensity of their access. The study emphasized that digital nativeness is not synonymous with competent digital health literacy. Arias Lopez et al. (2023) through a scoping review of 53 articles also confirmed that eHEALS is the most widely used measurement tool to assess this literacy, and consistently showed a pattern of dominance of the moderate category in young populations with high levels of education. Meanwhile, Yuen et al. (2024) in a rapid review of 36 studies found that although younger age and higher education tend to predict better digital health literacy, the relationship is nonlinear and varies greatly depending on the population context. Cetin & Gumus, (2023) strengthened this finding through a cross-generational (X, Y, Z) comparative study conducted in Turkey, where Generation Z did not consistently outperform other generations in digital health literacy scores despite having much higher digital exposure.

Researchers assume that the dominance of the moderate category among Generation Z dental technicians is due to the structure of the vocational health education curriculum, which has not explicitly integrated digital health literacy competencies as part of the graduate competency standards. Although this group possesses basic clinical knowledge of dental and oral health, their ability to access and filter health information from diverse digital sources has not been systematically



trained in the formal learning process. This condition is a significant concern, given that the role of dental technicians in supporting evidence-based dental health services requires strong digital literacy skills, not just high access.

## 2. Oral Health Prevention Behavior

The distribution of oral health prevention behaviors in this study showed that the majority of respondents were in the fair category (55.0%), followed by the good category (28.3%), and the poor category (16.7%). These data indicate that oral health prevention practices among Generation Z dental technicians have not yet reached optimal levels, with only about one in four respondents demonstrating overall good preventive behaviors.

These findings can be theoretically explained through the Health Belief Model (HBM) developed by Rosenstock, Strecher, and Becker, which states that preventive health behavior is influenced by an individual's perception of their own vulnerability, the severity of the condition they are facing, the benefits of preventive measures, and perceived barriers. When someone does not perceive themselves as being at risk for oral health problems, for example because they have clinical knowledge that makes them feel more protected, the internal drive to consistently carry out preventive behavior tends to weaken. Fini et al. (2023) in a cross-sectional study based on the HBM on 550 college students aged 18–25 years firmly found that perceived barriers and self-efficacy were the most significant predictors of dental preventive behavior, not simply knowledge. This finding confirms that the ability to recognize barriers and self-confidence in carrying out preventive actions are far more decisive in determining actual behavior than theoretical knowledge alone.

On the other hand, the Theory of Planned Behavior (TPB) proposed by Ajzen emphasizes that attitudes, subjective norms, and perceived behavioral control jointly determine a person's health intentions and behaviors. In this context, the clinical knowledge possessed by dental technicians should shape positive attitudes, but these attitudes may not necessarily translate into consistent preventive actions without the support of adequate social norms and perceived control. Chan et al. (2023) in a systematic review of theory-based behavior change interventions for periodontal health confirmed that interventions that combine elements of health beliefs, motivation, and self-regulation produce more meaningful improvements in oral health outcomes, but their impact tends to decline over time without ongoing reinforcement strategies (booster sessions).

Researchers assume that the dominance of the "sufficient" category in this group's preventive behavior is influenced by a cognitive paradox: as health professionals working in the dental field, they implicitly feel they already understand the importance of prevention and therefore do not feel the need for more systematic, active efforts in implementing it. This paradox, known in the literature as a professional blind spot, can explain why technical knowledge does not always translate into optimal preventive behavior in everyday life. Basic behaviors such as brushing teeth are carried out, but more comprehensive preventive measures such as regular routine checkups and controlling diet have not yet formed as permanent habits.



### 3. Normality Test as a Basis for Selecting Statistical Tests

The results of the Kolmogorov-Smirnov test indicate that the two research variables are not normally distributed, namely digital health literacy ( $p = 0.021$ ) and oral health prevention behavior ( $p = 0.034$ ), both with  $p$  values  $< 0.05$ . This condition provides a scientific basis for researchers to use the Spearman Rank correlation test as an appropriate non-parametric alternative, considering that the assumption of data normality as a requirement for using the Pearson test is not met.

This method selection is consistent with similar research practices. Hakeem et al. (2023) in a cross-sectional study examining the relationship between eHealth literacy and oral health outcomes in dental patients in Saudi Arabia also used Spearman's correlation coefficient as the primary bivariate analysis instrument due to similar data distributions.

### 4. The Relationship between Digital Health Literacy and Oral Health Prevention Behavior

The results of the Spearman Rank correlation test showed a correlation coefficient value of  $r = 0.462$  with  $p = 0.000$  ( $p < 0.05$ ), which indicates a statistically significant positive relationship with moderate correlation strength between digital health literacy and oral health prevention behavior in Generation Z dental technicians. This means that the higher a person's level of digital health literacy, the better their oral health prevention behavior.

These findings align with the Health Literacy and Health Behavior Framework, which states that health literacy plays a role as a determinant of health behavior and a mediator between information exposure and individual health actions. In the digital dimension, the ability to identify, sort, and evaluate valid health information online improves the capacity for evidence-based health decision-making, including the decision to consistently implement preventive actions. This relationship can also be understood through Bandura's Social Cognitive Theory, which emphasizes the central role of self-efficacy in shaping health behavior: individuals with higher digital health literacy tend to have stronger self-confidence in their ability to find and apply relevant health information, thus encouraging more consistent preventive behavior.

Specifically in the context of oral health, conducted a cross-sectional study of 478 dental patients in Saudi Arabia using eHEALS, finding that individuals with sufficient eHealth literacy had a significantly lower chance of exhibiting irregular toothbrushing frequency (OR = 0.24; 95% CI: 0.10–0.62;  $p = 0.003$ ) compared to the group with inadequate literacy. This finding provides the most topically relevant direct empirical support for this study (Hakeem et al., 2023).

The researchers assume that the positive relationship with a moderate correlation found in this study indicates that digital health literacy is an important factor in shaping oral health prevention behaviours, but not the only factor at play. Respondents' ability to access and understand digital health information enables them to acquire a broader knowledge of preventive practices for dental and oral diseases. This knowledge subsequently contributes to the development of awareness and a tendency to adopt preventive behaviours in daily life.

Nevertheless, the moderate correlation coefficient indicates that changes in health behaviour are not solely influenced by digital literacy skills. Other factors, such as previous health experiences, family and social support, personal motivation, habits formed from an early age, and ease of access



to dental care, are thought to also influence oral health prevention behaviour. Therefore, improving digital health literacy needs to be accompanied by other supporting strategies to bring about more optimal and sustainable behavioural change.

Researchers also assume that Generation Z's close affinity with digital technology makes digital media a promising channel for oral health promotion and prevention initiatives. If the health information received is of high quality, easy to understand and comes from credible sources, the likelihood of adopting better preventive behaviours will increase.

## CONCLUSIONS

This study aims to identify the level of digital health literacy, the level of oral health prevention behavior, and analyze the relationship between the two in Generation Z dental technicians. Based on the results of the data analysis and the discussion that has been described, three main conclusions can be drawn as follows.

First, the digital health literacy level of Generation Z dental technicians is predominantly in the moderate category (53.3%), with a small proportion in the high (31.7%) and low (15.0%) categories. This indicates that this group's high exposure to digital technology has not been matched by the ability to critically and optimally evaluate and utilize health information. While they possess the ability to search for health information online, the capacity to assess the credibility and relevance of information sources still requires systematic strengthening, particularly through the integration of digital health literacy competencies into the dental health vocational education curriculum.

Second, the oral health prevention behaviors of Generation Z dental technicians were predominantly in the adequate category (55.0%), with only 28.3% achieving good behavior. This finding illustrates a gap between clinical knowledge and the consistent application of preventive behaviors in daily life, a phenomenon known as the knowledge-behavior gap. Basic preventive measures are generally implemented, but more comprehensive practices such as regular checkups and dietary control have not yet become established habits for most respondents.

Third, there is a statistically significant positive relationship between digital health literacy and oral health prevention behavior in Generation Z dental technicians ( $r = 0.462$ ;  $p = 0.000$ ), with a moderate correlation strength. The positive direction of the relationship indicates that the higher a person's digital health literacy level, the better their oral health prevention behavior. The moderate correlation strength indicates that digital health literacy is a significant determinant but not a stand-alone, and needs to be considered alongside other factors such as self-efficacy, social support, service accessibility, and intrinsic motivation in efforts to improve preventive behavior holistically.

Overall, the results of this study emphasize the importance of strengthening digital health literacy as a relevant and prospective promotive-preventive strategy in improving the quality of oral health prevention behavior in Generation Z vocational health workers. Structured, contextual, and sustainable digital-based educational interventions are needed to bridge the gap between high access to information and optimal quality of health literacy and behavior.



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