

Original Article

Survey on Perceptions Regarding the Need for Changes in Dental Hygienists' Competencies and Future Job Redesign due to AI Adoption

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ABSTRACT

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Objectives: This study compared and analyzed the perceptions of the general public and dental hygiene students regarding the perceived need for competency changes among dental hygienists due to AI adoption and the necessity for future job redesign. **Methods:** Survey data were collected over one month in November 2025, with a total of 341 participants. Additionally, open-ended response analysis was used to explore the differences in perceptions between the two groups in depth. **Results:** Both groups highly recognized the need for competency changes among dental hygienists, while perceptions regarding job redesign were at least moderate. AI understanding and AI treatment acceptance significantly influenced both competency change needs and job redesign perceptions across both groups. Open-ended responses indicated that both groups viewed AI as an auxiliary tool; however, the general public expressed abstract concerns, while students pointed to specific application issues and a lack of digital education in the curriculum. **Conclusions:** To enhance dental hygienists' professionalism, it is deemed necessary to strengthen education on AI and digital technology utilization, expand education on ethical and legal responsibilities, and establish a clinical and data-linked practical training system.

Keywords: Artificial intelligence, Competencies, Dental hygienist, Digital healthcare, Job redesign

1. Introduction

The modern dental care environment is rapidly undergoing digital transformation, with artificial intelligence (AI) playing a pivotal role across various domains including diagnostic assistance, image analysis, patient data management, and treatment planning [1,2]. Recently, innovative technologies such as AI-based radiographic image interpretation systems, oral structure prediction models using 3D scanners, and patient-specific treatment simulations have been introduced into clinical practice, demonstrating

tangible outcomes in early disease detection, periodontal risk prediction, and patient monitoring [3-5]. Han [6] reviewed overall trends in AI applications for oral and maxillofacial imaging, emphasizing the potential of automated image interpretation and decision-support algorithms. Similarly, Hwang and Heo [7] highlighted that AI-based dental imaging systems may improve diagnostic accuracy, workflow efficiency, and patient safety.

These technological advances extend beyond technical enhancement and increasingly influence the organization of dental workflows and professional roles, including those

of dentists and dental hygienists [8]. The introduction of AI is expected to improve efficiency in dental care delivery while simultaneously reshaping job structures within the healthcare workforce [9]. Dental hygienists have traditionally fulfilled patient-centered roles such as preventive care, oral health education, and clinical assistance [10]. However, as AI systems increasingly support or automate diagnostic and data-driven tasks, the role of dental hygienists is anticipated to evolve from that of machine-centered assistants toward AI-human collaboration managers [2,9]. While tasks such as record management and image analysis may be partially automated, competencies related to patient communication, ethical judgment, data interpretation, and human-centered care are expected to become increasingly important. This shift implies not a simple redistribution of tasks, but a fundamental redesign of dental hygienists' job structure.

Despite these changes, existing studies have predominantly focused on dentist-centered applications of AI, technological performance, or acceptance of AI systems [1-6]. Research addressing dental hygienists has largely remained limited to general technology acceptance or device usability, with insufficient attention to how AI adoption may reshape their job structure and required competencies. Moreover, prior studies have rarely integrated a competency-based framework with the concept of job redesign, nor have they examined how societal perceptions align—or diverge—from those of future dental professionals.

In addition, the stable integration of AI into dental care requires consideration not only of technological feasibility but also of perception gaps between key stakeholder groups. The general public, who often have limited understanding of the specific scope of dental hygienists' work, may form abstract or exaggerated expectations regarding AI adoption. In contrast, dental hygiene students, as pre-professionals with clinical training and educational experience, are more likely to develop realistic and task-specific perceptions of AI's impact. However, empirical studies simultaneously examining these two groups to identify social perception gaps related to AI-driven job redesign in dental hygiene are extremely scarce.

Therefore, unlike previous studies that primarily focused on dentists or technology acceptance alone, this study adopts an integrative approach by simultaneously examining the perceived need for competency changes among dental hygienists, perceptions of future job redesign, and differences in social perceptions between the general public and dental hygiene students. By comparing these perspectives, this study aims to identify gaps between societal expectations and pre-professional perceptions regarding the future role of dental hygienists in the AI era.

2. Methods

2.1. Research design

This study is a descriptive comparative and correlational research aimed at identifying differences in the perceived need for competency changes among dental hygienists due to AI implementation, perceptions of future job redesign, and influencing factors among the general public and dental hygiene students.

2.2. Research participants and data collection methods

This study surveyed members of the general public and dental hygiene students to examine perceptions of competency changes and job redesign associated with AI adoption in dental hygiene. Participants were recruited via convenience sampling, and data were collected through an anonymous online survey using Naver Form. General public participants were adults aged 20 years or older residing in the metropolitan area, while student participants were enrolled in the Department of Dental Hygiene at University A.

Although this study involved human subjects, Institutional Review Board (IRB) approval was not obtained due to scheduling constraints at the time of study initiation. Nevertheless, strict ethical safeguards were implemented. The survey consisted solely of non-invasive questions concerning general perceptions and attitudes, and no personally identifiable or sensitive information was collected. Participation was entirely voluntary, and all participants were fully informed of the study purpose, anonymity, non-commercial use of data, and their right to withdraw at any time without penalty.

To minimize potential coercion, particularly among student participants, it was explicitly stated that participation or non-participation would have no impact on academic standing, grades, or evaluations. The survey was conducted anonymously, preventing identification of individual respondents. All data were securely stored, accessible only to the research team, and used exclusively for research purposes. Following completion of the study, data will be retained for a limited period and then permanently deleted in accordance with ethical research standards.

Based on these safeguards, the study is considered to involve minimal risk under the Act on Bioethics and Safety. Future studies will strictly adhere to research ethics guidelines and obtain prior IRB approval.

2.3. Research tools

2.3.1. General characteristics

The general characteristics section included 10 items for the general public: gender, age, educational level, dental treatment experience within the past two years, level of understanding of AI (artificial intelligence), perceived usefulness of AI in dental treatment, willingness to receive AI-based dental care, expected effects of AI implementation, concerns regarding AI adoption, and areas requiring reinforcement in dental hygienist education for the AI era. For dental hygiene students, 8 items were included: gender, academic year, level of understanding of AI, perceived usefulness of AI in dental care, willingness to receive AI-based dental care, expected benefits of AI implementation, concerns regarding AI adoption, and areas requiring reinforcement in dental hygienist education.

2.3.2. Demand for changes in dental hygienists' competencies

A research instrument was developed to assess demand for changes in dental hygienists' competencies. The initial tool consisted of 10 items rated on a 5-point Likert scale (1 = Not at all important, 5 = Very important), with higher scores indicating greater demand. Content validity was confirmed through expert review by one nursing professor and one dental hygiene professor. Construct validity was examined using exploratory factor analysis (EFA). The KMO value was .89, and Bartlett's test of sphericity was significant (χ^2 , $p < .001$). Four factors were identified: Digital Technology Utilization (3 items), Communication and Human-Centered Competency (3 items), Ethics, Safety, and Responsibility (2 items), and Self-Development and Adaptation (2 items). All factor loadings exceeded .60, and internal consistency was high (Cronbach's $\alpha = 0.920$).

2.3.3. Dental hygienists' perceptions of job redesign

A separate instrument was developed to measure perceptions of job redesign among dental hygienists. The questionnaire consisted of five items rated on a 5-point Likert scale (1 = Strongly disagree, 5 = Strongly agree), with higher scores indicating stronger perceptions of job redesign. Content validity was established through expert consultation, and construct validity was assessed using EFA. The KMO value was .86, and Bartlett's test was significant (χ^2 , $p < .001$). Four factors emerged: Perceived job redesign (4 items), Need for Job Redesign (4 items), Job Enrichment and Job redesign (3 items), and Organizational and Institutional

Aspects (3 items). All factor loadings were above .60, and reliability was high (Cronbach's $\alpha = 0.893$).

2.3.4. Exploration of perceptions regarding AI and changes in dental hygiene work and education (Open-ended questions)

The survey included two open-ended questions administered to both the general public and dental hygiene students to explore perceptions of the role of AI in relation to dental hygienists and anticipated changes in work tasks following the adoption of AI. In addition, one extra open-ended question was included for dental hygiene students to examine their perceptions of AI- and digital technology-related education within the dental hygiene curriculum. Responses were collected in a free-text format.

2.4. Analysis methods

Collected data were analyzed using SPSS version 22.0 (IBM Corp., Armonk, NY, USA) with a significance level of 0.05. Participants' general characteristics were summarized using frequencies and percentages, while perceived demand for competency changes and perceptions of future job redesign were analyzed using means and standard deviations. Differences between the general public and dental hygiene students were examined using independent samples t-tests or one-way ANOVA, with Scheffé's post-hoc tests applied when appropriate. Hierarchical multiple regression analysis was conducted to identify factors influencing perceptions of future job redesign among dental hygienists.

Open-ended responses were analyzed using text mining techniques. Text preprocessing and analysis were conducted using Textom software (version 6.0, The IMC Co., Ltd., Korea), including data cleaning, morphological analysis, synonym integration, and group tagging. Frequency analysis and co-occurrence network analysis were performed to identify key keywords and structural relationships. In addition, qualitative content analysis was conducted, with two researchers independently coding themes related to AI roles, work changes, and educational perceptions. Discrepancies were resolved through discussion, and group comparisons were made based on keyword frequency and thematic patterns.

3. Results

3.1. General characteristics of research participants

The general characteristics of the participants are summarized in Table 1. Among the general public, most re-

spondents were female (62.1%), in their 20s (33.9%), and had a high school education or lower (61.0%). Most had received dental treatment within the past two years (76.8%) and reported being somewhat familiar with AI (58.8%). Perceptions of AI-assisted dental care were generally positive, with 47.5% agreeing, and 40.1% expressing willingness to receive AI-based treatment. The most expected

benefits were improved diagnostic accuracy (50.3%) and personalized treatment (46.9%), while the main concern was AI use in diagnostic and preventive care (33.3%). The most frequently cited educational need was dental medical data analysis and utilization (53.7%).

Among dental hygiene students, most were female (95.1%) and fourth-year students (31.7%). The majority

Table 1. General characteristics of research participants

Characteristics	Division	General		DH	
		N	%	N	%
Gender	Male	67	37.9	8	4.9
	Female	110	62.1	156	95.1
Age (Grade)	20s / 1st year	60	33.9	38	23.2
	30s / 2nd year	31	17.5	39	23.8
	40s / 3rd year	48	27.1	35	21.3
	50s and above / 4th year	38	21.5	52	31.7
Education	≤High school graduate	108	61.0		
	≥University graduate	69	39.0		
Dental treatment experience within the past two years	Yes	136	76.8		
	No	41	23.2		
Understanding of AI	Not familiar	19	10.7	5	3.0
	Heard of it	40	22.6	15	9.1
	Somewhat familiar	104	58.8	141	86.0
	Very familiar	14	7.9	3	1.8
Regarding perceptions of AI technology assisting dental treatment	Not at all	2	1.1	2	1.2
	Not really	9	5.1	3	1.8
	Average	57	32.2	22	13.4
	Agree	84	47.5	99	60.4
	Very much so	25	14.1	38	23.2
Willingness to receive dental treatment incorporating AI	Not at all	6	3.4	2	1.2
	Hardly any	18	10.2	11	6.7
	Average	62	35.0	35	21.3
	Somewhat willing	71	40.1	91	55.5
	Very much	20	11.3	25	15.2
Total		177	100.0	164	100.0
Expected benefits of AI adoption in dental care*	Improved diagnostic accuracy	89	50.3	72	43.9
	Reduced waiting times	76	42.9	91	55.5
	Lower medical costs	49	27.7	34	20.7
	Personalized treatment options	83	46.9	93	56.7
	Enhanced service quality	39	22.1	50	30.5
Total		336	189.8	340	207.3
The common concern about AI adoption*	Oral examination and diagnostic data analysis	59	33.3	40	24.4
	Preventive procedures (e.g., scaling, fluoride application)	59	33.3	68	41.5
	Patient education and personalized health information provision	50	28.2	38	23.2
	Infection control and instrument sterilization	58	32.8	58	35.4
	Administrative and insurance tasks	39	22.0	35	21.3
	Other duties	10	5.6	10	6.1
Total		275	155.4	249	151.8
Regarding areas needing reinforcement in dental hygienist education for the AI era*	Dental medical data analysis and utilization training	95	53.7	102	62.2
	AI ethics, privacy protection, and regulatory compliance training	66	37.3	65	39.6
	Digital healthcare device and software operation practice	61	34.5	75	45.7
	Training to enhance patient counseling and empathy skills in AI-based clinical environments	79	44.6	62	37.8
Total		301	170.1	304	185.4

*Multiple-response

*General = General public, *DH = Dental hygiene students

were somewhat familiar with AI (86.0%), somewhat agreed that AI assists dental care (60.4%), and were somewhat willing to receive AI-based dental care (55.5%). Expected benefits included customized treatment (56.7%) and reduced waiting times (55.5%), while major concerns were preventive procedures (41.5%) and infection control and sterilization (35.4%). As with the general public, dental medical data analysis and utilization was the most frequently identified educational area requiring reinforcement (62.2%).

3.2. Perceived need for changes in dental hygienists' competencies and future job redesign

The perceived need for changes in dental hygienists' competencies and perceptions of future job redesign are presented in Table 2. The overall demand for competency changes was identical for the general public and dental hygiene students (both mean = 4.21), with no significant between-group differences. Across subdomains, the general public rated ethics, safety, and responsibility highest, whereas dental hygiene students rated communication and human-centered competency highest; both groups rated digital technology utilization lowest, with no significant differences observed.

Perceptions of future job redesign did not differ significantly between the general public (mean = 3.86) and dental hygiene students (mean = 3.77). Among the subdomains, the general public rated organizational and institutional aspects highest, whereas dental hygiene stu-

dents rated job enlargement highest. In both groups, the perceived need for job redesign was rated lowest.

3.3. Demand for changes in dental hygienists' competencies based on general characteristics

Differences in the demand for changes in dental hygienists' competencies according to general characteristics are presented in Table 3. Among the general public, the demand for competency changes differed significantly by level of AI understanding, with the highest demand reported by those who were "very familiar" with AI (mean = 4.32±0.342) and the lowest by those "not familiar" (mean=3.86±0.896) ($p<.05$). Post-hoc analysis confirmed a significant difference between these two groups.

Perceptions of AI-assisted dental care also showed significant differences. Respondents who answered "very much so" reported the highest demand for competency changes (mean = 4.50±0.470), whereas those who answered "not at all" reported the lowest demand (mean = 2.20±0.424) ($p<.05$). Post-hoc results indicated significant differences between the "not at all" group and all other response groups. Among dental hygiene students, the highest demand was observed in the "not at all" group (mean = 5.00±0.000), and the lowest in the "neutral" group (mean = 3.80±0.616), with a significant difference confirmed by post-hoc analysis ($p<.05$).

Regarding willingness to receive AI-based dental treatment, the general public showed the highest demand among those "very willing" (mean = 4.52±0.517) and the

Table 2. Perceived need for changes in dental hygienists' competencies and future job redesign

Division		N	Mn±SD	t	p
Requirement for competency change	General	177	4.21±.587	.049	.961
	DH	164	4.21±.509		
Digital technology utilization	General	177	4.05±.676	-.875	.382
	DH	164	4.11±.593		
Communication and human-centered competencies	General	177	4.27±.646	-.392	.695
	DH	164	4.29±.542		
Ethics, safety, and responsibility competencies	General	177	4.35±.659	.890	.374
	DH	164	4.29±.599		
Self-development and adaptability competencies	General	177	4.23±.672	1.150	.251
	DH	164	4.14±.655		
Perceptions of job redesign	General	177	3.86±.549	1.539	.125
	DH	164	3.77±.490		
Perceptions of job changes	General	177	3.82±.646	1.553	.121
	DH	164	3.71±.593		
Need for job redesign	General	177	3.77±.622	1.537	.125
	DH	164	3.67±.602		
Job expansion and job redesign	General	177	3.92±.623	.376	.707
	DH	164	3.89±.586		
Organizational and institutional aspects	General	177	3.94±.666	1.757	.080
	DH	164	3.82±.664		

by t-test; General = General public, *DH = Dental hygiene students

Table 3. Demand for changes in dental hygienists' competencies by general characteristics

Characteristics	Division	General		DH	
		Mn±SD	t or F(p)	Mn±SD	t or F(p)
Gender	Male	4.26±.550	0.869	4.35±.431	0.820
	Female	4.18±.610	(0.386)	4.20±.512	(0.414)
Age (Grade)	20s / 1st year	4.25±.532	0.143	4.18±.534	1.859
	30s / 2nd year	4.18±.506	(0.934)	4.06±.591	(0.139)
	40s / 3rd year	4.21±.685		4.32±.361	
	50s and above / 4th year	4.17±.618		4.25±.494	
Education	≤High school graduate	4.20±.614	-0.368		
	≥University graduate	4.23±.547	(0.700)		
Dental treatment experience within the past two years	Yes	4.22±.606	0.263		
	No	4.19±.529	(0.793)		
Understanding of AI	Not familiar	3.86±.896 ^a	2.708	4.32±.327	1.169
	Heard of it	4.27±.637 ^{ab}	(0.047)	4.07±.434	(0.323)
	Somewhat familiar	4.24±.504 ^{ab}	a<b	4.21±.517	
	Very familiar	4.32±.342 ^b		4.63±.635	
Regarding perceptions of AI technology assisting dental treatment	Not at all	2.20±.424 ^a	8.914	5.00±.000 ^a	9.064
	Not really	4.29±.914 ^b	<0.001	4.00±.693 ^b	<0.001
	Average	4.17±.611 ^b	a<b	3.80±.616 ^b	a>b
	Agree	4.19±.456 ^b		4.18±.443 ^{ab}	
	Very much so	4.50±.470 ^b		4.48±.409 ^{ab}	
Willingness to receive dental treatment incorporating AI	Not at all willing	3.25±1.041 ^a	6.580	5.00±.000 ^a	7.100
	Hardly any	4.24±0.711 ^b	<0.001	3.81±.886 ^b	<0.001
	Average	4.13±0.534 ^b	a<b	3.97±.433 ^b	a>b
	Somewhat willing	4.26±0.481 ^b		4.27±.391 ^{ab}	
	Very much	4.52±0.517 ^b		4.42±.570 ^{ab}	

by t-test and one-way ANOVA (post-test Scheffé) for three or more groups

^{a,b}The same character indication shows that there is no statistical significance.

*General = General public, *DH = Dental hygiene students

lowest among those “not at all willing” (mean = 3.25±1.041), with significant between-group differences ($p < .05$). Post-hoc analysis revealed significant differences between the “not at all willing” group and all other groups. Similarly, among dental hygiene students, the highest demand was observed in the “not at all” group (mean = 5.00±0.000), and the lowest in the “hardly willing” group (mean = 3.81±0.886), with significant differences confirmed by post-hoc analysis ($p < .05$).

3.4. Perceptions of future job redesign for dental hygienists based on general characteristics

Differences in perceptions of future job redesign for dental hygienists according to general characteristics are presented in Table 4. Among the general public, perceptions of job redesign differed significantly by perceptions of AI-assisted dental care, with the highest scores among those responding “very much so” (mean = 4.20±0.546) and the lowest among those responding “not at all” (mean = 2.53±0.660); post-hoc analysis confirmed significant differences between the “not at all” group and all other groups. Dental

hygiene students showed a similar pattern, with the highest perception in the “very much so” group (mean = 4.11±0.450) and the lowest in the “not at all” group (mean = 3.13±0.000), with significant post-hoc differences.

Regarding willingness to receive AI-based dental treatment, the general public reported the highest perception of future job redesign in the “very much so” group (mean = 4.27±0.573) and the lowest in the “not at all” group (mean = 3.28±0.891), showing significant differences; post-hoc analysis indicated stepwise increases across response levels. Similarly, dental hygiene students reported the highest perception in the “very much” group (mean = 4.08±0.556) and the lowest in the “not at all” group (mean = 3.13±0.000), with significant post-hoc differences.

3.5. Factors influencing dental hygienists' perceptions of job redesign

Table 5 presents the results of the hierarchical multiple regression analysis examining factors influencing perceptions of job redesign among dental hygienists. Multicollinearity was initially detected, with high VIF values (>10) for some

Table 4. Perception of future job redesign among dental hygienists by general characteristics

Characteristics	Division	General		DH	
		Mn±SD	t or F(p)	Mn±SD	t or F(p)
Gender	Male	3.93±.554	1.431	3.77±.369	-0.019
	Female	3.81±.544	(0.154)	3.77±.496	(0.985)
Age (Grade)	20s / 1st year	3.90±.555	0.177	3.61±.421	1.752
	30s / 2nd year	3.83±.525	(0.912)	3.81±.552	(0.158)
	40s / 3rd year	3.84±.605		3.81±.495	
	50s and above / 4th year	3.84±.501		3.83±.472	
Education	≤High school graduate	3.84±.591	-0.413		
	≥University graduate	3.88±.480	(0.680)		
Dental treatment experience within the past two years	Yes	3.86±.568	0.194		
	No	3.84±.488	(0.847)		
Understanding of AI	Not familiar	3.65±.683	2.061	3.87±.440	0.422
	Heard of it	3.85±.575	(0.107)	3.70±.325	(0.737)
	Somewhat familiar	3.86±.507		3.77±.510	
	Very familiar	4.13±.521		4.02±.214	
Regarding perceptions of AI technology assisting dental treatment	Not at all	2.53±.660 ^a	6.850	3.13±.000 ^a	9.389
	Not really	4.07±.668 ^b	<0.001	3.82±.269 ^{ab}	<0.001
	Average	3.77±.581 ^b	a<b	3.46±.448 ^{ab}	a<b
	Agree	3.82±.436 ^b		3.72±.449 ^{ab}	
	Very much so	4.20±.546 ^b		4.11±.450 ^b	
Willingness to receive dental treatment incorporating AI	Not at all willing	3.28±.891 ^a	5.447	3.13±.000 ^a	8.950
	Hardly any	3.70±.684 ^{ab}	<0.001	3.50±.687 ^{ab}	<0.001
	Average	3.83±.446 ^{abc}	a<b<c	3.49±.375 ^{ab}	a<b
	Somewhat willing	3.85±.490 ^{bc}		3.84±.408 ^{ab}	
	Very much	4.27±.573 ^c		4.08±.556 ^b	

by t-test and one-way ANOVA (post-test Scheffé) for three or more groups
^{a,b,c}The same character indication shows that there is no statistical significance.
 *General = General public, *DH = Dental hygiene students

Table 5. Factors influencing dental hygienists' perceptions of job redesign

Variables	Model 1				Model 2			
	B	SE	β	t	B	SE	β	t
(Constant)	3.763	.041		90.777***	1.371	.170		8.048***
Regarding perceptions of AI technology assisting dental treatment (Not at all)	.405	.158	.143	2.561*	.336	.125	.119	2.693**
Regarding perceptions of AI technology assisting dental treatment (Somewhat)	.017	.072	.013	.231	.036	.057	.029	.640
Regarding perceptions of AI technology assisting dental treatment (Very much)	.287	.083	.214	3.470**	.142	.066	.105	2.146*
Willingness to receive dental treatment incorporating AI (Not at all)	-.254	.111	-.136	-2.295*	-.171	.087	-.092	-1.961
Willingness to receive dental treatment incorporating AI (Somewhat)	-.083	.067	-.072	-1.245	-.013	.053	-.011	-.238
Willingness to receive dental treatment incorporating AI (Very much)	.199	.094	.129	2.107*	.151	.074	.098	2.027*
Need for competency change					.569	.040	.600	14.310***
F(p)				8.323***				40.740***
adj.R				0.130(0.114)				0.461(0.450)
△R ²				0.130				0.331
Durbin-Watson				2.012				1.918

by hierarchical multiple regression analysis
 ※ reference variables: Regarding perceptions of AI technology assisting dental treatment (Not at all=0), Willingness to receive dental treatment incorporating AI (Not at all =0)

AI-related variables; therefore, redundant “agree” variables were removed. The revised model showed acceptable VIF values (1.195–1.456) and no autocorrelation (Durbin-Watson = 2.012), confirming model adequacy.

In Model 1, which included only control variables, the explanatory power was 13.0% (adj $R^2 = 0.114$, $p < .001$). Perceptions of AI assistance in treatment (“not at all,” $\beta = 0.143$; “strongly agree,” $\beta = 0.214$) and intention to receive AI-based dental treatment (“not at all,” $\beta = -0.136$; “strongly agree,” $\beta = 0.129$) showed significant effects on job redesign perceptions.

In Model 2, after adding perceived need for competency change, explanatory power increased to 46.1% (adj $R^2 = 0.450$, $p < .001$). Significant predictors included perceptions of AI assistance (“not at all,” $\beta = 0.119$; “very much so,” $\beta = 0.105$), intention to receive AI-based treatment (“very much so,” $\beta = 0.098$), and perceived need for competency change ($\beta = 0.600$). Greater perceived need for competency change was the strongest predictor of increased job redesign perception.

3.6. Exploring perceptions of AI and changes in dental hygiene work and education (Open-ended questions)

3.6.1. Perceptions of AI's role

“Is AI an auxiliary tool or a replacement technology?”

Both groups primarily viewed AI as an auxiliary tool rather than a replacement for dental hygienists. The general public tended to express broad expectations of future technological replacement, whereas dental hygiene students identified specific AI-applicable tasks (e.g., image analysis, record management) and emphasized that human-centered functions such as patient communication, manual skills, and ethical responsibility remain difficult to replace. This indicates that students perceive AI from a collaborative and task-differentiation perspective.

3.6.2. Perceived changes in work due to AI adoption

“Which tasks of dental hygienists are likely to change when AI is introduced?”

Both groups expected AI to reshape work structure rather than eliminate dental hygienists' roles, particularly in data processing, administrative tasks, and repetitive procedures. The general public focused on observable tasks such as scheduling and basic administration, while students identified more specialized and practical areas for automation (e.g., image interpretation, charting, insurance billing) and anticipated role restructuring toward greater specialization and

patient counseling.

3.6.3. Perceptions of AI and digital education

“Is the AI and digital technology education in the dental hygiene curriculum sufficient?”

Dental hygiene students largely perceived current AI and digital education as insufficient, citing a lack of AI-related courses, outdated training environments, and theory-centered instruction. Despite some conditional positive views, there was a strong demand for practice-oriented education, including hands-on training with clinical AI systems and education on AI ethics and legal responsibility.

4. Discussion

This study compared perceptions of competency change demands and future job redesign for dental hygienists in the context of AI implementation among the general public and dental hygiene students. Both groups rated the need for competency changes highly (≥ 4 on a 5-point scale) and perceived at least moderate necessity for job redesign, indicating a shared recognition that dental hygienists' roles must evolve with increasing AI and digital technology adoption.

Both groups identified ethics, safety, and responsibility as the most critical competencies, while digital technology utilization was rated relatively lower. This supports prior findings that, despite advances in AI-based diagnosis and prediction, final judgment, responsibility, and patient safety remain human-centered roles [8,9]. Dental hygiene students particularly emphasized communication and human-centered competencies, consistent with studies identifying patient-centered communication as a core, non-replaceable professional competency [4,11].

Regarding job redesign, the general public focused more on organizational and institutional changes, whereas students emphasized job expansion and role transformation. This difference reflects students' practical understanding of clinical workflows and aligns with prior research demonstrating the multidimensional evolution of dental hygienists beyond assistant roles [10,12-15].

Differences by general characteristics showed that AI understanding, perceptions of AI-assisted practice, and willingness to receive AI-based dental care significantly influenced both competency change demands and job redesign recognition. These findings align with evidence that acceptance of AI varies by familiarity and that collaborative, expert-supervised AI models are preferred [3,5-7,16-19]. Importantly, the hierarchical multiple regression analysis clarifies the determinants of job redesign perceptions.

While Model 1 indicated that individual attitudes toward AI—such as perceptions of AI-assisted treatment and willingness to receive AI-based dental care—had limited influence, the marked increase in explanatory power in Model 2 demonstrates that the perceived need for competency change is the most influential factor. This suggests that job redesign perceptions are shaped less by general attitudes or anxiety toward AI and more by a realistic recognition that professional competencies must evolve. In this sense, dental hygienists appear more willing to accept organizational and job restructuring when they perceive opportunities for professional growth and skill development rather than threats of replacement.

Open-ended analyses revealed that while both groups viewed AI as an auxiliary tool rather than a replacement, the general public expressed abstract expectations of technological advancement, whereas students identified concrete AI-applicable tasks such as image analysis, data and record management, and insurance claims, and emphasized irreplaceable human roles including communication, manual skills, and ethical judgment [20,21].

Taken together, these findings suggest that in the AI era, dental hygienists' roles will expand toward managing and interpreting AI-assisted image and data-based tasks, while the importance of human-centered responsibilities such as patient counseling, education, and ethical judgment will be further reinforced. Accordingly, dental hygiene curricula should be restructured to include practice-oriented education encompassing basic AI literacy, hands-on training with clinical AI systems, data interpretation skills, AI ethics and legal responsibility, and patient communication competencies.

Recent studies in dental public health have emphasized that AI enhances diagnostic accuracy and preventive care while simultaneously reinforcing the importance of human-centered roles [22]. In addition, national policy analyses have underscored the need for public governance frameworks and government-led support for workforce training, curriculum reform, and job redesign to ensure the responsible and equitable use of medical AI [23].

Finally, this study has limitations related to regional convenience sampling, cross-sectional design, self-reported data, and potential interpretive bias. The general public sample was centered on metropolitan residents, which may limit the generalizability of the findings. Moreover, comparisons between the general public and dental hygiene students should be interpreted with caution, as differences in age and educational level may independently influence AI familiarity, professional role awareness, and expectations regarding job redesign. Future research should expand samples, adopt longitudinal designs, and conduct in-depth qualitative studies to further inform educational, clinical,

and policy strategies for dental hygienists in the AI era.

5. Conclusion

This study demonstrates that AI adoption does not merely replace dental hygienists' tasks, but rather necessitates a restructured job framework that integrates human-centered competencies with digital and data-based capabilities. In the AI era, dental hygienists are expected to play expanded roles in managing and interpreting AI-assisted image and data outputs, while maintaining core responsibilities in patient counseling, education, ethical judgment, and professional accountability. Accordingly, enhancing dental hygienists' professionalism requires the systematic integration of AI literacy, hands-on training with clinical AI systems, data interpretation skills, and education on ethical and legal responsibilities within dental hygiene curricula. Furthermore, coordinated national and institutional support is essential to facilitate job redesign and curriculum reform that respond effectively to ongoing changes in the digital dental healthcare environment.

Author Contribution

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Conflicts of Interest

The authors declare that they have no conflicts of interest.

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