Dental medicine students' knowledge of lateral cephalometric radiography in orthodontic treatment: a study at Mulawarman University

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ABSTRACT

Objectives: This research aims to evaluate some aspects of the knowledge level in dental medicine students at Mulawarman University regarding the use of lateral cephalometric radiography in orthodontic treatment.

Materials and Methods: This research uses a quantitative methodology with a descriptive cross-sectional approach conducted at the medical faculty of the Mulawarman University dentistry study program located in Samarinda Ulu District. The research sample was taken by a total sampling method and consisted of 90 Mulawarman University dentistry students. Research data were obtained through primary data collection in the form of questionnaires that met the inclusion and exclusion criteria.

Results: The results showed that more respondents had a good level of knowledge, with as many as 41 students (45.56%). The class of 2022 dental students had a more dominant level of good knowledge, with as many as 13 students (68.42%)

of the total class of 2022 students, and the class of 2021 dental students also had a good level of knowledge, with as many as 13 students (59.09%) of the total class of 2021. The results also show that the factor of high interest in learning is owned by the class of 2022, as many as 18 students (94.74%), and high interest also affects knowledge, so that with high interest, you can get a good level of knowledge (97.56%). In addition, the factor of how to study by non-cramming learning method is dominantly owned by the class of 2022, as many as 15 students (78.95%), and the factor of how to study can affect one's knowledge, so that by learning not overnight, the speed system can get a good level of knowledge (78.05%).

Conclusion: In general, dental medicine students are knowledgeable about lateral cephalometric radiography. This level of knowledge is good, and in this study, the results showed that the class of 2022 most dominantly exhibited a non-cramming method and a high level of learning interest.

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INTRODUCTION

Knowledge is the most important part of the formation of a person's actions. Actions that are based on knowledge and awareness will last longer than actions that are not based on knowledge and awareness. Without knowledge, a person cannot make decisions or take appropriate action on a problem. A person's knowledge can be influenced by various factors, including interest and learning. Dentists' own knowledge is obtained from the learning process during lectures. Dental students are a group of people who are pursuing higher education in the field of dentistry. Education in the field of dentistry includes pre-clinical education and clinical education, which is formed in order to produce graduates who have the ability and skills of dentistry, along with professionalism.[1]

Radiography is a supporting examination to establish a diagnosis of disease or abnormalities that are not visible, so as to plan appropriate treatment and therapy for patients. The use of radiography has long been recognized in the fields of general medicine and dentistry. In the field of dentistry, one type of radiography is extraoral radiography, which has its own type and function. The type of radiography that is closely related to the treatment plan, especially in the field of orthodontics, is cephalometry. Cephalometry is a field that studies the measurement of the head and its components, such as the cranial base, maxilla, mandible, maxillary teeth, and mandibular teeth, using radiography.[2,3]

In orthodontics, lateral cephalometry is one type of cephalometric radiography that is often used.[4] Lateral cephalometry is utilized as a very

important radiograph for planning orthodontic treatment for dentists, as it allows for more accurate diagnosis of dentofacial problems and malocclusions in patients.[5] In addition, lateral cephalometry also has benefits such as helping to determine facial shape, predicting orthodontic treatment results, and orthognathy.[6] However, it is not uncommon for projection errors to occur in performing lateral cephalometry. This is due to the rotation of the head in the anteroposterior and transverse axes as well as the vertical axis, which can lead to interpretations that are very different from the actual patient's condition. Therefore, in exposing the movie, projection errors should be reduced as much as possible. With the knowledge of lateral cephalometry, it can help to reduce errors in projection, predict, and analyze changes caused by orthodontic treatment.[7] Studying lateral cephalometry is very important for dental students because it serves as a scientific, diagnostic, and analytical foundation in orthodontics. This understanding enables students to objectively assess craniofacial structures, develop rational treatment plans, and accurately evaluate orthodontic treatment outcomes.[2,7]

MATERIALS AND METHODS

This study is a descriptive study using a cross-sectional approach conducted at the medical faculty of the Mulawarman University dentistry study program located in Samarinda Ulu District. The research sample was taken by a total sampling method and consisted of 90 Mulawarman University dentistry students. The research sample consists of dental students at Mulawarman University from the classes of 2021 to 2023 who have studied lateral cephalometry, and all students from these three classes have received instruction on lateral cephalometry. Research data were obtained through primary data collection in the form of questionnaires that met the inclusion and exclusion criteria. The inclusion criteria for this study include all students from the 2021 to 2023 cohorts of the study program who are willing to participate as respondents and who complete and agree to the informed consent form. The exclusion criteria for this study include students who filled out the questionnaire incompletely and those who are currently on academic leave. The questionnaire in this study contains name, age, gender, faculty, and questions related to lateral cephalometry, interest in learning, and learning method. The criteria for students' interest were determined using a questionnaire consisting of seven questions. Based on the responses to these questions, the results were categorized into three groups: high interest, medium interest, and low interest. The ways of learning criteria were determined using a questionnaire consisting of seven questions about how students study when learning about lateral cephalometry. Based on the responses to these questions, the results were categorized into two groups: the cramming learning method and the non-cramming learning method. Determining students' learning methods is very important to understand the most effective way to study lateral cephalometry and its impact on students' knowledge.

The results of this study are the level of knowledge of Mulawarman University dental students about lateral cephalometric radiography as a support for orthodontic treatment. The correct answer is given a score of 1, and the wrong answer is given a score of 0. The answers are then grouped based on the question criteria and accumulated. The level of knowledge is good if the score is between 76%-100%, fair if the score is 56-75%, and less if the score is <55%.

RESULTS

Based on Table 1, it is known that the class of 2023 semester 3 is more dominant, namely 49 students (54.44%), while 2022 semester 5 students are 19 students (21.11%), and 2021 semester 7 students are 22 students (24.44%).

Table 1. Characteristics of research subjects based on class and semester level

Class and Semester Level	n	%
Class of 2023 3rd Semester	49	54,44
Class of 2022 5th Semester	19	21,11
Class of 2021 7th Semester	22	24,44
Total	**90**	**100,00**

Based on Table 2, in this study, there were students with a good level of knowledge, as many as 41 students (45.56%), had a sufficient level of knowledge, as many as 26 students (28.89%), and had a poor level of knowledge, as many as 23 students (25.56%).

Table 2. Distribution of knowledge level of Mulawarman University dentistry students about lateral cephalometric radiography as a support for orthodontic treatment

Category Knowledge	n	%
Good	41	45,56
Fair	26	28,89
Less	23	25,56
Total	**90**	**100,00**

The data in Table 3 shows that the class of 2023 has a lower level of knowledge (38.78%), the class of 2022 has a good level of knowledge (68.42%), and the class of 2021 also has a good level of knowledge (59.09%).

Table 3. Distribution of knowledge level of Mulawarman University dentistry students about lateral cephalometric radiography as a support for orthodontic treatment based on batch and semester level

Knowledge Level	Class and Semester Level						Quantity	Percentage
	Class of 2023 3rd Semester		Class of 2022 5th Semester		Class of 2021 7th Semester			
	n	%	n	%	n	%		
Good	15	30,61	13	68,42	13	59,09	41	45,56%
Fair	15	30,61	4	21,05	7	31,82	26	28,89%
Less	19	38,78	2	10,53	2	9,09	23	25,56%
Total	**49**	**100,00**	**19**	**100,00**	**22**	**100,00**	**90**	**100,00%**

Based on Table 4, the material that is better understood by students and has the most correct answers is material regarding the type of cephalometry with the number of correct answers 83 (92.22%), lateral cephalometric parameters with the number of correct answers 78 (86.67%), convex facial profiles with the number of correct answers 70 (77.78%) and head analysis in Steiner analysis with the number of correct answers 69 (76.67%).

Table 4. Knowledge distribution of Mulwarman University dentistry students about lateral cephalometric radiography as a support for orthodontic treatment

Question	Answer			
	Correct		Wrong	
	n	%	n	%
Definition of cephalometry	71	78,89	19	21,11
Types of cephalometry	83	92,22	7	7,78
The main purpose of lateral cephalometry	64	71,11	26	28,89
The role of lateral cephalometry as a support for orthodontic treatment	59	65,56	31	34,44
Lateral cephalometry parameters	78	86,67	12	13,33
Angle on steiner analysis	50	55,56	40	44,44
Hard tissue cephalometric points	61	67,78	29	32,22
Convex facial profile	70	77,78	20	22,22
Concave face profile	64	71,11	26	28,89
Face proportion	47	52,22	43	47,78
Steiner's soft tissue analysis method	47	52,55	43	47,78
Head analysis on steiner	69	76,67	21	23,33

The frequency distribution of student interest in learning based on class and semester level can be seen in Table 5. The criteria for students' interest were determined using a questionnaire based on the responses to these questions, and the results were categorized into three groups: high interest, medium interest, and low interest. In this study, all generations had a high learning interest factor in lateral cephalometry, with the highest learning interest owned by the class of 2022 (94.74%).

Table 5. Interest level distribution of Mulwarman University dentistry students about lateral cephalometric radiography as a support for orthodontic treatment

Interest Level	Class and Semester Level						Quantity	Percentage
	Class of 2023 3rd Semester		Class of 2022 5th Semester		Class of 2021 7th Semester			
	n	%	n	%	n	%		
High	41	83,67	18	94,74	20	90,91	79	87,78%
Medium	3	6,12	0	0,00	0	0	3	3,33%
Low	5	10,20	1	5,26	2	9,09	8	8,89%
Total	**49**	**100,00**	**19**	**100,00**	**22**	**100,00**	**90**	**100,00%**

The frequency distribution of student learning methods based on class and semester level can be seen in Table 6. In this study, all generations have a factor of how to study that is a non-cramming learning method, but the class of 2022 is the most dominant in the non-cramming learning method (78,95%).

Table 6. Distribution of learning methods of dentistry students by class and semester level

| Learning Method | Class and Semester Level | | | | | | Quantity | Percentage |
| | Class of 2023 3rd Semester | | Class of 2022 5th Semester | | Class of 2021 7th Semester | | | |
	n	%	n	%	n	%		
Cramming Learning Method	16	32,65	4	21,05	5	22,72	25	27,78%
Non Cramming Learning Method	33	67,35	15	78,95	17	77,28	65	72,22%
Total	**49**	**100,00**	**19**	**100,00**	**22**	**100,00**	**90**	**100,00%**

The frequency distribution of student interest in learning based on the level of knowledge can be seen in Table 7. In this study, respondents with high learning interest factors had a good level of knowledge (97.56%). Respondents with low learning interest factors have a low level of knowledge (17.39%).

Table 7. Distribution of interest of dentistry students based on the knowledge level of Mulawarman University dentistry students about lateral cephalometric radiography

| Interest Level | Knowledge Level | | | | | | Quantity | Percentage |
| | Good | | Fair | | Less | | | |
	n	%	n	%	n	%		
High	40	97,56	22	84,62	17	73,91	79	87,78%
Medium	0	0,00	1	3,85	2	8,70	3	3,33%
Low	1	2,44	3	11,54	4	17,39	8	8,89%
Total	**41**	**100,00**	**26**	**100,00**	**23**	**100,00**	**90**	**100,00%**

The frequency distribution of student learning methods based on the level of knowledge can be seen in Table 8. In this study, respondents with the cramming learning method factor had the highest level of knowledge (38.46%). While respondents with the factor of how to study non-cramming have a good level of knowledge (78.05%).

Table 8. Distribution learning methods of dentistry students based on the knowledge level of Mulawarman University dentistry students about lateral cephalometric radiography

| Learning Method | Knowledge Level | | | | | | Quantity | Percentage |
| | Good | | Fair | | Less | | | |
	n	%	n	%	n	%		
Cramming Learning Method	9	21,95	10	38,46	6	26,09	25	27,78
Non Cramming Learning Method	32	78,05	16	61,54	17	73,91	65	72,22
Total	**41**	**100,00**	**26**	**100,00**	**23**	**100,00**	**90**	**100,00**

DISCUSSION

This study found that most students had a good level of knowledge (45.56%) about lateral cephalometric radiography as a support for orthodontic treatment. The level of good knowledge about lateral cephalometric radiography as a support for orthodontic treatment is dominantly owned by the class of 2022 (68.42%) and 2021 (59.09%). Meanwhile, the class of 2023 has a good level of knowledge, which is less (38.78%). The class of 2022 has a better level of knowledge than the class of 2021 because the class of 2022 has just studied lateral cephalometric radiography, while the class of 2021 studied lateral cephalometric radiography a year ago, so the author assumes that the class of 2022 remembers more about lateral cephalometry material than the class of 2021, who may experience forgetfulness of lateral cephalometry material. The class of 2023 has received lectures on lateral cephalometry, but only the basics were taught, and not in depth, as in the class.

This is because when students have just learned a material, the information is still in active short-term memory, making it easier to access. Conversely, for students who have studied the material for a long time, the information has been transferred to long-term memory, which requires more effort to be accessed again because it is more hidden. Therefore, newly learned information is easier to remember than information that has been learned for a long time.[8] In addition, it can be caused by differences in semester level; the higher the semester or education level of a person, the more extensive their knowledge will be.[9]

Based on the results of the research questionnaire, almost all respondents answered the questions correctly. The question regarding the meaning of cephalometry was categorized as good because almost all respondents answered correctly (78.89%). This shows that the frequency of respondents' knowledge about the meaning of cephalometry is categorized as good. Researchers

assume that the definition of cephalometry is basic cephalometric material that has been studied in extraoral radiography in the dental radiology block so that students can know exactly what cephalometry is. Understanding cephalometry is one of the materials learned first before learning more about other radiographic materials.[10]

Questions regarding the types of cephalometric radiographs were categorized as good because almost all respondents answered correctly (92.22%). Cephalometry is easier to distinguish specifically because students already have a deeper understanding of the material regarding the types of lateral cephalometry radiographs, which are only divided into 2, namely, postero-anterior cephalometry and lateral cephalometry. The material regarding the types of cephalometric radiography has been taught in detail, such as image-taking techniques and the functions of both types of cephalometry. A deeper understanding of the theory can help students distinguish the types of lateral cephalometry radiographs correctly.[5,11]

Respondents' knowledge regarding the main purpose of lateral cephalometry was categorized as sufficient because more than half of the respondents managed to answer correctly (71.11%). This is because respondents who answered incorrectly may not understand the main purpose of lateral cephalometry. This lack of understanding is because students do not have a sufficient basic understanding of lateral cephalometry, so they find it difficult to answer correctly regarding the main objectives of lateral cephalometry. Lack of basic understanding can cause students to have difficulty understanding the next material that will be given.[3,4,12]

Respondents' knowledge about the role of lateral cephalometry as a support for orthodontic treatment was categorized as sufficient because more than half of the respondents answered correctly (65.56%). This is because students do not explore the material about the role of lateral cephalometry as a support for orthodontic treatment. Students do not explore this material because when learning the role of cephalometry, the material takes place, and students are less focused on explaining this material. Lack of focus can occur due to excessive use of gadgets during the learning process, which can distract students and reduce focus on the material being taught.[4,13]

The question regarding lateral cephalometry parameters was answered correctly by almost all respondents, so it was categorized as good (86.67%). This result can be obtained because students who answer correctly can understand and know the cephalometric parameters that are often used in the form of SNA and SNB angles.[14] A good understanding allows students to be able to analyze and evaluate the material taught, so that students will explore the material better and be able to answer questions.[15]

The question regarding the angle determining the anteroposterior position of the mandible in Steiner analysis was only partially answered correctly, so it was categorized as less (55.56%). Many respondents answered incorrectly because they did not explore the use of the SNB angle in Steiner analysis. This is because respondents only know in general about the parameters or references used in Steiner analysis in the form of SNA and SNB angles, but still lack further deepening regarding the specific purpose of using the SNB angle, so many respondents answered incorrectly. The lack of deepening of the material is because students only study and listen to the material at that time, and do not repeat the learning of the material. Lack of deepening of the material can cause the material learned to tend to be easily forgotten, thus affecting a person's lack of knowledge of the material.[16]

Respondents' knowledge of hard tissue cephalometry points was categorized as sufficient, because more than half of the respondents answered correctly (67.78%). Respondents lacked memory and understanding of hard tissue points. This lack of memory and understanding is due to the fact that the hard tissue involved in cephalometry involves a fairly complex cranial structure, so that students have difficulty with this material and require repetition of material in order to understand more deeply related to hard tissue cephalometry points.[5,16]

Respondents' knowledge of convex facial profiles was categorized as good because almost all respondents answered correctly (77.78%), while questions about concave facial profiles were categorized as sufficient (71.11%), because more than half of the respondents answered correctly. This is because a person's facial profile is only divided into three parts, which makes it easier for students to distinguish between the three types of facial profiles. However, sometimes some students are still confused about distinguishing specifically between concave and convex facial profiles due to a lack of further understanding of the angles formed in concave facial profiles. The lack of understanding is due to a lack of practice in interpreting cephalometric radiograph results. Students who lack practice in interpreting will find it difficult to analyze and determine the angle formed in the facial profile.[17,18]

Respondents' knowledge of lateral facial proportions was categorized as lacking because only some respondents answered correctly (52.22%). Many respondents answered incorrectly because they did not remember or even knew specifically about the division of facial proportions. This is because when the material about facial proportions is given, students may only study and listen to the material at that time and not repeat the learning of the material, so that the material will tend to be quickly forgotten. Repetition of material is needed to strengthen memories related to the material that has been given.[16]

Questions regarding the Steiner soft network analysis method are categorized as lacking because only a portion of the respondents answered correctly (52.55%). This is because students have difficulty recalling the analysis methods used for soft and hard networks. The lack of retention is

caused by students not independently reviewing the material provided and tending to remember the material only during the learning process (Firdayanti et al., 2019). To analyze soft tissue, the Steiner analysis method is often used because it is easy and quick to use. This analysis has become an important benchmark in determining diagnosis, monitoring treatment, and predicting the final outcome of orthodontic treatment.[19]

The respondents' knowledge about head analysis in Steiner analysis is categorized as good because almost all respondents answered correctly (76.67%). Many respondents answered correctly because this material had been studied in the lessons on Steiner analysis. This material has been taught in detail and explained thoroughly so that students have a deeper understanding of the subject. A deeper understanding of the theory can help students differentiate the division of head analysis in Steiner analysis correctly and accurately.[11]

Interest is a state in which a person has a desire for something accompanied by a desire to know, learn, and prove further.[20] Interest is one of the factors that influences a person's knowledge.[21] Based on the research results, it was found that all cohorts have a high interest factor in learning about lateral cephalometry, with the highest interest being in the 2022 cohort (94.74%). The researcher assumes that the 2022 cohort has the highest learning interest because they are currently studying the material on lateral cephalometry, resulting in a higher level of interest compared to other cohorts. This is supported by Gowa, who states that someone who is interested and has a high level of interest in a learning activity will give it significant attention and be willing to sacrifice time and effort for that learning activity.[22] The results of this study also illustrate that good knowledge is influenced by high learning interest (97.56%). The results are in line with Siska's research, which concluded that there is a positive relationship between learning interest and knowledge.[23] The higher a person's interest, the higher their knowledge will be.

Learning methods are a strategy for students to understand the material provided by using the learning methods that they prefer. Learning methods are a factor that can influence a person's knowledge.[21] Based on the research results, it was found that all cohorts have a non-overnight study method factor, with the highest non-overnight study method factor belonging to the 2022 cohort (78.95%). The researcher assumes that the 2022 cohort has a high enthusiasm for studying, and they prepare themselves well in advance before the exam takes place. The habit of studying little by little, making summaries while studying, and preparing early before the exam is more effective and makes students more ready when facing exams or lectures than using the last-minute cramming method, which tends to force oneself to study in a relatively short time. This is supported by Octavia & Amalia, who state that studying regularly in small increments on a subject can make understanding more effective and efficient.[24] The all-nighter study method actually has a negative impact on someone, such as being less meticulous in solving problems, the understanding of the taught material not lasting long, and making the body less healthy, which results in disrupted concentration the next day.

The results of this study also illustrate that good knowledge is possibly influenced by learning factors, the factor of learning methods, not the overnight study method (78.05%). This is in line with Azizah, who concluded that the learning method used by an individual can determine the learning outcomes.[25] The right method will lead to successful learning outcomes and satisfactory knowledge acquisition, whereas an inappropriate method will result in less successful learning and inadequate knowledge.

CONCLUSION

The findings showed that, in general, dental medicine students are knowledgeable about lateral cephalometric radiography. This level of knowledge is good, and in this study, the results showed that the class of 2022 most dominantly exhibited a non-cramming method and a high level of learning interest.

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FOOTNOTES

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