Original paper

Better pathology education during undergraduate education: Clinical dentists' expectations

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The education curriculum of the faculty of dentistry includes both general pathology and oral pathology courses. In our planned study, we aimed to determine the needs of dentists who graduated from the faculty of dentistry and received specialisation training for pathology information in their active professional lives and the importance of pathology education according to their fields of specialisation.
Survey questions: Applications were made to 115 dentists who graduated from the faculty of dentistry, received specialist training, and worked in the clinic.
While the benefit of pathology training in the dentist's professional life was oral and maxillofacial surgery, it was followed by periodontology, radiology, and oral diagnosis specialties. They also stated that they sent samples and evaluated reports in the fields of oral and maxillofacial surgery, periodontology, radiology, and oral diagnosis.
In our study, the areas where specialist physicians benefit from pathology training in the clinic are those where the subjects overlap more with the sections in the training curriculum. It is necessary to provide adequate training in basic medical sciences to train dentists as physicians who do not perceive the patient only in terms of mouth and teeth, but can evaluate the patient as a whole and provide the right guidance at the right time. Integration should be ensured between basic sciences, dentistry, and clinical sciences. For pathology education to be permanent and useful, a curriculum should be designed with innovative teaching methods that are department-specific and practice-based, appropriate to the needs of the clinic.
Dentistry graduates can improve patient outcomes and enhance their personal development by deepening their understanding of pathology education.

Key words: dentistry, education, pathology.

Introduction

Medical pathology is an area of research that investigates the causes, mechanisms, and effects of disease as a link between basic and clinical sciences. Pathology education is often divided into 2 sections. General pathology covers the basic responses of cells and tissues to damaging factors underlying disorders. Systemic (specific) pathology refers to the study of tissue-specific responses of specialised tissues and organs to certain stimuli. Oral pathology is critical in dentistry [1].

It should not be forgotten that basic medical sciences form the foundation of clinical practice. Analytical thinking and causal reasoning are impossible to acquire without a solid background in basic medical sciences. Therefore, it would be appropriate to provide basic medical knowledge in the early stages of education, correlate it with clinical practices, and

ensure the integration of basic medical sciences while developing the training program [2].

Dentistry graduates should be able to establish correct causal relationships and think analytically about the diseases and conditions they have learned. They should also have sufficient knowledge in all basic science fields, including anatomy, histology and embryology, physiology, pharmacology, medical biology and genetics, microbiology, biophysics, biochemistry, and pathology.

The faculty of dentistry's education program includes courses in both general pathology and oral pathology [3]. The purpose of our planned study is to identify the demand for pathology knowledge among dentists who have graduated from the faculty of dentistry and have received specialist training in their active professional lives, as well as to assess the value of pathology education based on specialties.

Material and methods

Survey questions will be administered to dentists who have graduated from the faculty of dentistry, both those who have received specialist training and those who have not and who are currently working in a clinic. Survey forms were distributed via e-mail or online messaging platforms to specialist dentists working in university dentistry faculty clinics, as well as private and public dentistry clinics. Participation in the study was entirely voluntary. Dentists of both genders will participate in the study, with no age restrictions.

To statistically reveal individual differences for the research topic, compensate for potential data losses during the follow-up period, and conduct the study with 95% power, the sample size has been determined as 108 participants. G*Power version 3.1.5 (Program written by Franz Faul, Universität Kiel, Germany, Copyright 1992–2012) was used for the power analysis.

The survey was administered to 115 dentists who graduated from the faculty of dentistry, undertook specialist training and worked in a clinic. The study included dentists of both genders, with no age restrictions. The data for the study were created using Google Forms and collected via online forms. The survey included the following questions:

- Which university did you graduate from?
- How many years have you been in the profession?
- In which class(es) did you receive your pathology education? (More than one option can be selected).
- Was there an Oral Pathology department at the Faculty of Dentistry where you studied?
- What methods were used in pathology education? (More than one option can be selected).
- How interested were you in pathology courses during your faculty education?
- Do you think the pathology education you received at the faculty of dentistry where you studied was sufficient?
- How beneficial do you think pathology education is in a dentist's professional life?
- Which topics should be covered more in pathology courses? (More than one option can be selected).
- Have you ever sent a patient's biopsy/material to a pathology laboratory?
- Have you ever followed or evaluated your patient's pathology result/report?
- What are your additional suggestions and opinions regarding pathology education in the faculty of dentistry and the use of pathology knowledge in professional life?

The survey results were transferred to a computer environment for analysis. Statistical analysis was carried out using the SPSS 22.0 software package. Percentages were used to determine the distribution of responses.

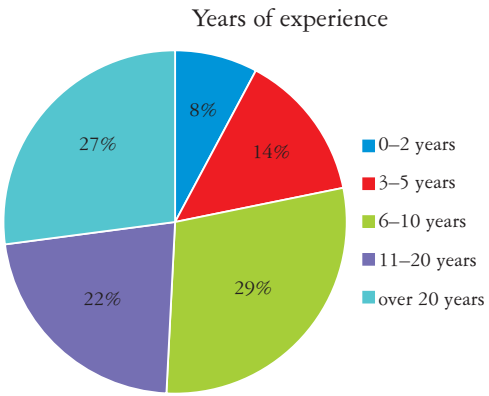

Fig. 1. Distribution of dentists' experience in the profession

Results

Among the physicians participating in the survey, 80 (70.2%) were women and 34 (29.8%) were men. The average age was recorded as 37.8 years (ranging from 24 to 66).

While 38 participants were general dentists, 76 had specializations in various fields: 13 in oral and maxillofacial surgery, 9 in oral diagnosis and radiology, 12 in endodontics, 3 in orthodontics, 12 in pedodontics, 13 in periodontology, 10 in prosthetic therapy, and 5 in restorative therapy.

Of the faculties providing undergraduate education, 76 were located in central provinces, while 39 were in peripheral provinces. A total of 34 physicians had studied in faculties with an oral pathology department, whereas 80 physicians had attended faculties without one. The number of years physicians had spent in the profession is presented in Fig. 1.

When asked in which years of their undergraduate education they received pathology training, responses generally indicated 2 different years. Although pathology education was most frequently provided

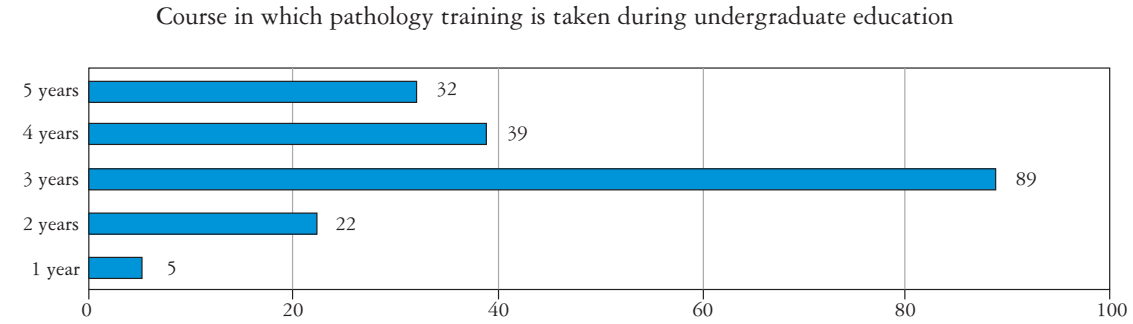

Fig. 2. Distribution of the grade(s) in which pathology education is received in the faculty

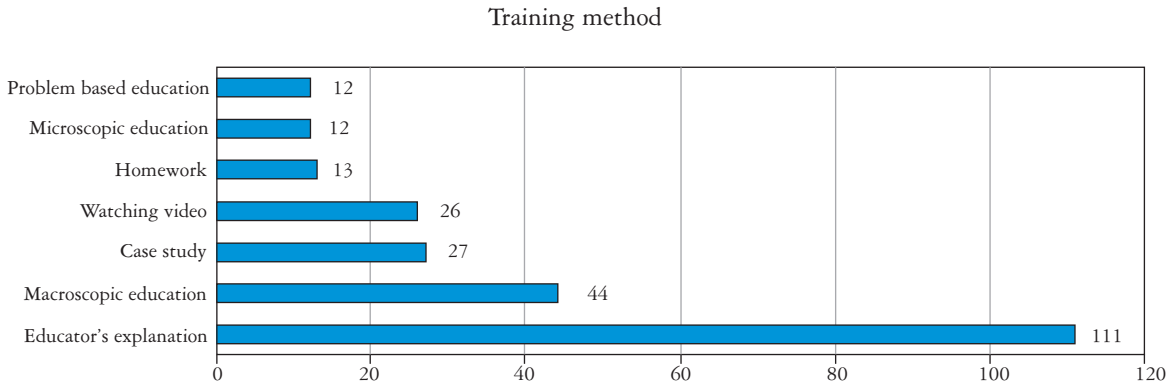

Fig. 3. Distribution of pathology undergraduate education methods at the faculty of dentistry

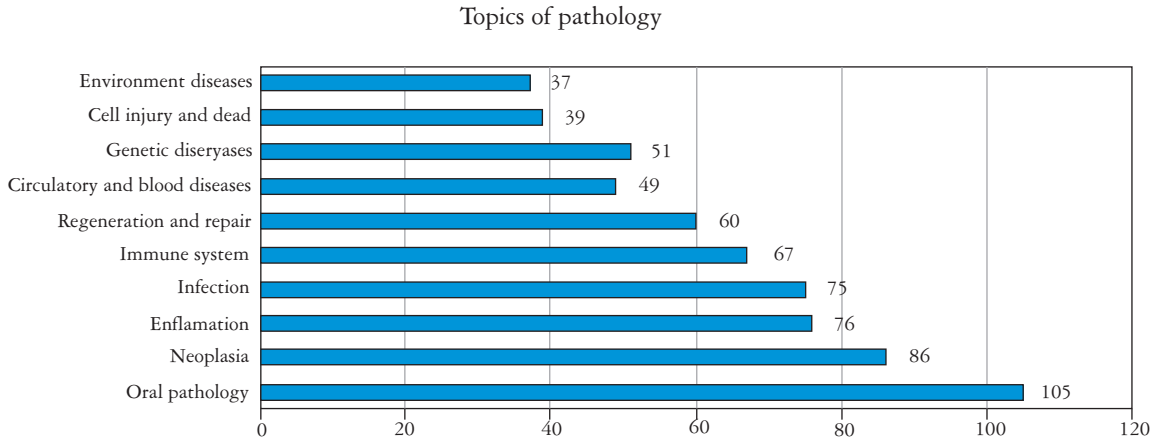

Fig. 4. Distribution of answers to the question "Which topics should be included more in pathology courses?"

in the third semester, different faculties had varying curriculum structures. The overall distribution is shown in Fig. 2.

When asked about the teaching methods used in pathology education, it was observed that although various methods were employed, instructor-led explanations were the most common. The teaching methods used are illustrated in Fig. 3.

Regarding which topics should be emphasised in pathology education, the most common response was oral pathology followed by neoplasia, inflammation, and immune system-related topics. The distribution of the topics is shown in Fig. 4.

The physicians participating in the survey were educated at 21 different universities, 10 of which had an oral pathology department. It was observed that oral pathology departments were less common in peripheral universities ($p = 0.040$).

When evaluating the significance of pathology education in a dentist's clinical practice, it was found

that the field benefiting the most from this knowledge was oral, dental, and maxillofacial surgery, followed by periodontology, oral diagnosis, and radiology specialisation ($p < 0.000$).

When asked whether they send biopsies/materials from their patients to the pathology laboratory in their clinical practice and how frequently they evaluate pathology results/reports, participants indicated that samples were most frequently sent and reports were most often reviewed in the fields of oral, dental, and maxillofacial surgery, as well as periodontology ($p < 0.000$), followed by radiology and oral diagnosis.

It was reported that fewer biopsies were sent and pathology reports were reviewed less frequently in the fields of orthodontics, prosthetic dental treatment, restorative dental treatment, pedodontics, and endodontics (Tables I, II).

In the study, when physicians were asked about the changes that should be made in pathology education, most participants stated that pathology education was inadequate, particularly highlighting the lack of practical applications. They suggested that students should better associate pathological processes with clinical applications through more case-based learning.

There was a general consensus that topics such as neoplasia and malignancies, inflammation, immune system diseases, and infectious diseases should be covered in greater detail within oral pathology courses. Participants emphasised the necessity of having an oral pathology department in every faculty and underscored the importance of expert and experienced faculty members in the field. Additionally, the most frequently mentioned recommendation was the organisation of continuing education programs after graduation.

Table I. In clinical research, the distribution of dentists reading/interpreting pathology reports of their patients

Dentistry	Reading/ Interpreting Pathology Reports		Total, *n* (%)	*p*-value
	No, *n* (%)	Yes, *n* (%)		
Oral, dental, and maxillofacial surgery	0 (0)	12 (10.4)	12 (10.4)	
Radiology and oral diagnosis	0 (0)	10 (8.7)	10 (8.7)	
Endodontics	5 (4.3)	7 (6.1)	12 (10.4)	
General dentistry	23 (20.0)	15 (13.0)	38 (33.0)	
Orthodontics	3 (2.6)	0 (0)	3 (2.6)	
Pedodontics	2 (1.7)	3 (2.6)	5 (4.3)	
Periodontics	7 (6.1)	14 (12.2)	21 (18.3)	
Prosthetic dentistry	2 (1.7)	7 (6.1)	9 (7.8)	
Restorative dentistry	3 (2.6)	2 (1.7)	5 (4.3)	
Total	45 (39.1)	70 (60.9)	115 (100.0)	0.000

Table II. Distribution of dentists sending their patients' biopsies/materials to the pathology laboratory in their clinical studies

Dentistry	Take a biopsy		Total, *n* (%)	*p*-value
	No, *n* (%)	Yes, *n* (%)		
Oral, dental, and maxillofacial surgery	0 (0)	12 (10.4)	12 (10.4)	
Radiology and oral diagnosis	4 (3.5)	6 (5.2)	10 (8.7)	
Endodontics	7 (6.1)	5 (4.3)	12 (10.4)	
General dentistry	29 (25.2)	9 (7.8)	38 (33.0)	
Orthodontics	3 (2.6)	0 (0)	3 (2.6)	
Pedodontics	2 (1.7)	3 (2.6)	5 (4.3)	
Periodontics	7 (6.1)	14 (12.2)	21 (18.3)	
Prosthetic dentistry	5 (4.3)	4 (3.5)	9 (7.8)	
Restorative dentistry	3 (2.6)	2 (1.7)	5 (4.3)	
Total	60 (52.2)	55 (47.8)	115 (100.0)	0.000

Regarding engagement with pathology lectures, 31% of participants reported having attended some lectures, while 66% stated that they had not attended at all. Some participants mentioned attending lectures occasionally.

Most participants stated that pathology education was insufficient and that greater emphasis should be placed on clinical practice. They highlighted the need for more comprehensive oral pathology training, emphasising that it would be particularly beneficial for clinical applications. It was emphasised that more importance should be given to oral pathology training and that it would be especially beneficial to provide this training for clinical practice.

It was suggested that training should be conducted through more case sharing, macroscopic differential diagnosis, and biopsy practices. There was a common consensus among the participants that pathology courses are useful and necessary. However, some dentists felt that the training was insufficient and that more practical information should be provided, especially regarding oral pathology. Additionally, it was emphasised that these courses should be delivered in greater detail and by expert instructors in dentistry faculties.

Participants highlighted the importance of continuous education, case-based training, and specialised training in the field of pathology. Furthermore, there was a strong opinion that pathology departments should be established in faculties and that the number of oral pathology units should be increased.

Discussion

Understanding the reasons and mechanisms observed in dentistry, introducing them and developing treatment plans all rely on the scientific discipline of pathology. However, dental education often fails to adequately address this critical issue. The significance and duration of this potential, troublesome process, in relation to its clinical application areas, have been examined and assessed. By integrating fundamental medical sciences with clinical sciences, dental education aims to provide a comprehensive health education [4].

In general, the diagnosis and treatment of diseases are services offered by all clinical dental professions and disciplines. When creating the curriculum, it should be kept in mind that oral pathology covers a wide range of topics related to illness, including epidemiology, aetiology, genetics, immunology and innate host defences, pathogenesis, structural changes at macroscopic and microscopic levels, sequelae, complications, and the relationships between them [5].

It is crucial for training programs to have a foundation in pathology, especially in subjects directly related to dentistry, such as mouth infections, periodontal disorders, and malignancies [6]. The branches that benefit most from pathology training and handle pathological data in the clinic are the departments that perform surgical procedures, such as oral and maxillofacial surgery, periodontology, and the oral diagnosis department. This situation underscores the importance of teaching pathology and other fundamental medical sciences early on and connecting them to practical procedures [7, 8].

The study's findings indicate that the pathology course is primarily introduced in the third semester. Four or five semesters are particularly crucial in the second year. However, at some faculties, the pathology course begins in the second semester. In these cases, the pathology course is often excluded from the curriculum because it should be based on a foundation of other fundamental scientific courses. It is often postponed until the third term [9, 10]. Because current basic science curricula are typically based on the programs of medical schools or traditional dental schools, they cannot be fully incorporated into the Dentistry National Basic Education Program (DUCEP) [11].

Teaching undergraduate and graduate dental students in a way that prepares them for practicing as dentists or dental specialists remains the greatest challenge facing oral pathology educators today. There has been considerable debate among educators about the subjects and issues that should be covered in oral pathology education for dental students. Numerous sources have suggested curricula that address hundreds of entities, including the most prevalent lesions affecting the oral and maxillofacial region, and require detailed instruction across 18 categories, each with 9 subheadings [12].

Because many or all of these topics are addressed in other courses, it should be emphasised that oral pathology is integrated with other specialisations. After completing their education, most students will go on to practice general dentistry. However, the general dentist's daily needs should not be the sole basis for determining the depth of content taught. Consideration should also be given to the role of identifying rare orofacial disorders, hospital-based dentistry, general professional education, the scope of postgraduate exams, and the variety of postgraduate specialties available to dental graduates [5, 13].

As indicated in our study's results, focusing on topics such as neoplasia, malignancies, inflammation, immune system disorders, infectious diseases, and oral pathology may increase student interest in the course and enhance professional knowledge in clinical settings.

Students' negative perceptions of a course that covers a wide range of topics, lacks practical applications, and is not clinically focused need to be addressed [14, 15]. Based on the findings from our study, it was observed that dental students showed

little interest in the pathology course during their undergraduate studies. This could be attributed to prejudices against foundational courses, as well as the unsuitability and overload of the dental curriculum.

One of the primary changes that can improve the effectiveness of pathology education in dentistry is the implementation of a case-based learning paradigm. A study involving 136 dental students demonstrated that regular feedback to students created a productive learning environment and that case-based learning effectively connected oral pathology knowledge with other clinical disciplines [16].

A prevalent recommendation from the physicians in the survey was the adoption of case-based education. Critical skills such as recognising intraoral lesions, obtaining samples, and analysing pathology reports should be supported by both theoretical and practical training. Additionally, students should be involved in surgical case follow-ups. When there is a suspicion of cancer, instruction on differential diagnosis is recommended. This study focuses on the relevance of pathology in everyday clinical practice, and the necessity of such instruction has been proven in practice-based departments. Laboratory instruction should also undergo modifications. Students should have easier access to updated equipment in both macroscopic and microscopic labs [5].

Despite not being offered in every faculty, the establishment of an oral pathology department is one of the key recommendations from the study's results. It has been proposed that all faculties develop departments dedicated to oral pathology and integrate this instruction with practical dentistry procedures. It was suggested that offering classes taught by experts in oral pathology would significantly improve the quality of education. Furthermore, it has been recommended that additional instruction in oral pathology be incorporated into specialist training.

With advancements in technology, faculties without pathological laboratory facilities are now adopting simulation training, using tools like virtual reality and augmented reality [10]. The use of digital teaching methods, such as virtual microscopes and interactive online resources, can enhance dental students' proficiency and satisfaction [10, 17–21]. This approach provides an alternative for dental offices that lack an oral pathology department or are unable to use medical faculty laboratories.

Another reform suggested is the inclusion of pathology education in continuing education courses. Frequent seminars and classes on pathology topics should be planned for graduates [22]. Some disciplines have placed special emphasis on this topic, as outlined in physician guidelines. Pathology education has gained increasing relevance in the fields of oral diagnosis and surgery following doctoral education. The need to update professional knowledge in pathology through post-graduate continuing education has been emphasised. Mass trainings, conferences, and seminars have been found to be beneficial.

By properly teaching pathology, dentists will be able to diagnose illnesses earlier, develop more precise treatment plans, and provide better care to their patients. The use of modern technologies, sharing case-based learning approaches, and integrating pathology education with clinical practice are all essential to raising the standard of education in this field. According to DUCEP, pathology instruction should be integrated with the social and basic sciences, and students' professional practice competencies should be enhanced [3].

This study highlights the essential role of pathology education in dentistry, particularly oral pathology, in enhancing diagnostic accuracy and treatment planning in clinical practice. Despite its importance, oral pathology education is not uniformly available across all dental faculties, and its integration into clinical practice remains insufficient. The study's findings suggest that developing dedicated oral pathology departments in all dental faculties and incorporating more case-based learning, along with the involvement of expert instructors, can significantly improve the quality of education.

The advancement of technology offers opportunities for faculties without pathology laboratory facilities to adopt innovative teaching methods, such as virtual reality and augmented reality, which could enhance student learning experiences. Furthermore, integrating pathology education into continuing education programs for dental professionals and emphasising its relevance in specialist training will help maintain up-to-date knowledge in this field.

Pathology education should not only be foundational but should also be linked to clinical practice, enabling dentists to diagnose and treat patients more effectively. By combining contemporary teaching methods, case-based learning, and practical application in clinical settings, the standard of dental education can be raised, ultimately leading to improved patient outcomes. Aligning pathology instruction with basic and social sciences, as outlined in DUCEP, will help enhance students' professional competencies and better prepare them for the challenges of modern dentistry.

Disclosures

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2. Assistance with the article: None.
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4. Conflicts of interest: None.

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