

INNOVATION-INFORMATION AND HEALTH-SAVING TECHNOLOGIES IN DENTAL EDUCATION AND PRACTICE, PROSPECTS FOR DEVELOPMENT IN THE KYRGYZ REPUBLIC

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Today, in science, education and practice in dentistry, there are big changes associated with innovation-information and health-saving technologies, which requires corresponding changes in the training of a new generation of dentists. We studied the use of such technologies in dental education using a questionnaire survey of 5th-year dental students from universities of the Kyrgyz Republic. Results of the survey of 295 students revealed that in the process of studying, they gain certain knowledge about new technologies (50-75%) used in dentistry. At the same time, in a number of questions, respondents have low (53-69%) indicators of knowledge about innovation technologies, reaching 70 to 88% in individual questions. However, in general, it was noted that for the future dentist as a competent specialist, the achievements of science and practice in various fields of knowledge play a huge role, especially in medicine, which requires the use of modern training organization. Undoubtedly, in the 21st century, to improve dental education – to form, during pre-graduate training, competencies and professional qualities in various fields of knowledge, it is necessary to use innovation-information and health-saving technologies, which will contribute to the effectiveness of specialist training.

Keywords: dentistry, education, university, students, innovation-information technologies, questionnaire survey

In modern conditions, large-scale institutional changes are taking place in various spheres of society. Medicine and education are not an exception, where innovation-information and health-saving technologies are rapidly developing. The modern system of dental education has been especially intensively progressing in the XXI century in close connection with the development of the industry of high-tech innovative materials and equipment used in dental practice. This is evidenced by the latest programs of the European Dentist [1, 2, 3], in the context of their implementation and curricula revision in European countries [4, 5, 6] and the CIS [7, 8, 9].

The aim was to determine the knowledge of graduating 5th year dental students regarding innovation-information and health-saving technologies for maintaining oral health.

Materials and research methods

A knowledge assessment survey was conducted among 5th year students of the dental faculty of the I.K. Akhunbaev Kyrgyz State Medical Academy (n = 144) and the B.N. Yeltsin Kyrgyz-Russian Slavic University (n = 151). The total number of participants was 295 students, including 155 males and 140 females at the age of 22-26 years. For each question presented, an actual number of responses was taken into account. Students who participated in the questionnaire were informed about the significance of their interviews. Statistical data processing was performed using the Microsoft-10 Excel software package.

Research results and discussion

The development of the higher medical education system in the Kyrgyz Republic, the strengthening of its competitiveness, and the increase of the export of educational services are factors requiring integration of the undergraduate training of doctors into the global educational space [10, 11]. Today, dentistry is a branch of medicine, whose intensive development goes in parallel to innovations in the field of chemistry (inorganic, organic biopolymers), physics of materials, digital and nano-technologies and many others [12, 13].

In this regard, the need for modernization of dental education is obvious, requiring innovations in the educational process during the training of future dentists, focused on improving the competitiveness of graduates on the labor market. Prominence is given to the integrated system of pre-graduate training of specialists to make them ready, upon completion of training, to get involved into the professional environment and to apply new generation methods and technologies used in dentistry [14].

Regarding the notions of students about health-saving technologies, first of all, we looked at their opinions about the conditions of their studies in the university in respect of compliance with the requirements of SanPiN (Normative legal acts regulating the activities of health care organizations (Decree of the Government of the Kyrgyz Republic No. 201 dated 04/11/2016. "Sanitary and epidemiological requirements for healthcare facilities" – Appen-

dix 13). In this case, as can be seen from Fig. 1, in a total group, 39% of respondents found this item as being in compliance (males – 46.5% and females – 30.7%), and 20.7% not in compliance (19.4% and 22.1%) and 40.3% reported difficulty answering (34.2% and 47.1%), which shows that more than half of the students surveyed were close to the understanding about non-compliance with certain hygiene requirements to the general organization of the educational process and the poor use of modern designer training technologies (table 1). The majority of students indicated the lack of material-and-technical equipment – 71.2% (males – 67.7%, females – 75.0%) and poor organization of health technology teaching in dental subjects – 32.5%, 28.4%, 37.1%, respectively. Up to 18% of students indicated the administration of universities as being not interested in innovations, and 10% indicated insufficient teaching staff competence with the lack of motivation and practice (table 1).

Regarding receiving knowledge about health-saving technologies for clinical and healthcare problems in dentistry, during study at a university, by blocs of disciplines, students pointed out dentistry subjects – 46.4%

(males – 47.7%, females – 45.0%), and clinical medicine subjects – 43.1% (males – 42.6%, females – 43.6%). Next were areas of preventive medicine 38.3% (males – 42.6%, females – 33.6%) and fundamental medicine – 18.0% (males – 21.3%, females – 14.3%). At the same time, 11.6% to 15.7% of students, regardless of gender, believe that throughout the entire period of training they did not receive information about health-saving technologies (table 2).

At the same time, regarding thematic areas to learn skills in health innovation technologies, students indicated the highest rates for sanitary-hygienic conditions (hygiene) – 56.8% (males – 55.2%, females – 58.7%), definitely close rates were shown for dentistry – 34.9% (males – 32.5%, females – 37.7%), care of one's own health – 32.9% (males – 33.1%, females – 32, 6%) and morphology of the development of the dentofacial system – 32.5% (males – 37.7%, females – 26.8%). The highest values were demonstrated for multidisciplinary combinations of 2-4 thematic blocs, which amounted to 64.0% in the group as a whole, males – 63.6% and females – 64.5% (table 3).



Fig. 1. Fifth year dental students' assessment of the sanitary and hygienic conditions of studies in the university

Table 1

Fifth year dental students' assessment of the organization of the educational process at the university in a health-saving perspective

Indicators	Total		Males		Females	
	n	%	n	%	n	%
Material and technical equipment – insufficient	210	71,2	105	67,7	105	75,0
Administration is not interested in health saving innovations	53	18,0	28	18,1	25	17,9
Teaching staff is insufficiently competent in this matter	26	8,8	14	9,0	12	8,6
Imperfect organization of the educational process in dentistry	96	32,5	44	28,4	52	37,1
Own answer (little motivation and practice)	26	8,8	18	11,6	9	5,7

Note : 295 students surveyed, incl. males – 155, females – 140.

On the basis of knowledge gained during study at the university, fifth year students assessed their own oral health state (fig. 2) as “excellent” – 15.3% (males – 14.8%, females n – 15.7%), “good” – 61.4% (males – 61.3%, females – 61.4%). In this cohort these levels of oral health in sum make up 76.7% (males – 76.1%, females – 77.1%), and satisfactory – 23.4% (males – 23.9%, females – 22.9%). Regarding how well graduating students possessed skills in maintaining own oral health, 70 to 78% indicated a sufficient level, 21.9 to 30.0% – an insufficient level in oral health maintaining knowledge and skills (fig.3). Fur-

thermore, 63.9 to 72.1% respondents believe that the dentist’s work is a health risk profession and 21.4% – 27.1% – it is not, and up to 9% – do not know (fig.4).

A certain interest in the need for additional education in health-saving issues is expressed by fifth year dental students, in such areas as digital dentistry – 39.3% (males – 40.0%, females – 38.6%) and the new organization of dental services – 38.6% (males – 38.1%, females – 39.3%), both themes combined – 14.2% (males – 11.6%, females – 17.1%). Disinterest was shown by up to 10% of graduating students (table 4).

Table 2

Knowledge of fifth year dental students about health-saving technologies as they receive it during study at the university, by blocks of disciplines

Disciplines	Amount	Total		Males		Females	
		n	%	n	%	n	%
Fundamental medicine (anatomy, histology, physiology, biochemistry)	53	18,0	33	21,3	20	14,3	
General clinical medicine (therapy, pediatrics, surgery)	127	43,1	66	42,6	61	43,6	
Preventive medicine (healthcare and public health, healthy lifestyle, hygiene, epidemiology)	113	38,3	66	42,6	47	33,6	
Dentistry	137	46,4	74	47,7	63	45,0	
No, throughout the training period	40	13,6	18	11,6	22	15,7	

Note : 295 students surveyed, incl. males – 155, females – 140.

Table 3

Health-saving skills gained by fifth year students during study at the university, by thematic blocs

Thematic blocs	Amount	Total		Males		Females	
		n	%	n	%	n	%
1. Dentistry	102	34,9	50	32,5	52	37,7	
2. Care of own health of people	96	32,9	51	33,1	45	32,6	
3. Morphology of the development of the dentofacial system	95	32,5	58	37,7	37	26,8	
4. Sanitary conditions and hygiene skills	166	56,8	85	55,2	81	58,7	
5. Combinations of 2 to 4 blocs	187	64,0	98	63,6	89	64,5	

Note : 292 students surveyed, incl. males – 154, females – 138.

Table 4

The interest of fifth year dental students in further self-education on health-saving technologies

Indicators	Total		Males		Females	
	n	%	n	%	n	%
	295	100	155	100	140	100
1. Yes – in the theme of digital dentistry	116	39,3	62	40,0	54	38,6
2. Yes – in the organization of dental services	114	38,6	59	38,1	55	39,3
3. Combination of questions 1 and 2	42	14,2	18	11,6	24	17,1
4. Not interested	23	7,8	16	10,3	7	5,0

Note : 295 students surveyed, incl. males – 155, females – 140.

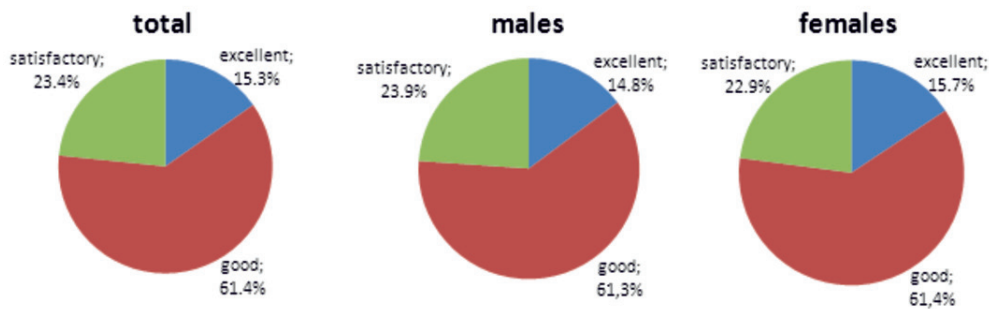


Fig. 2. Fifth year dental students' self-assessment of their oral health state

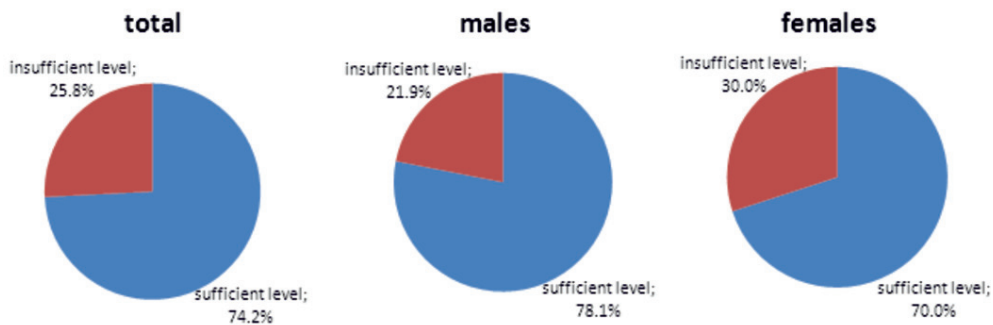


Fig. 3. Fifth year dental students' self-assessment of the level of skills and technologies at maintaining own oral health

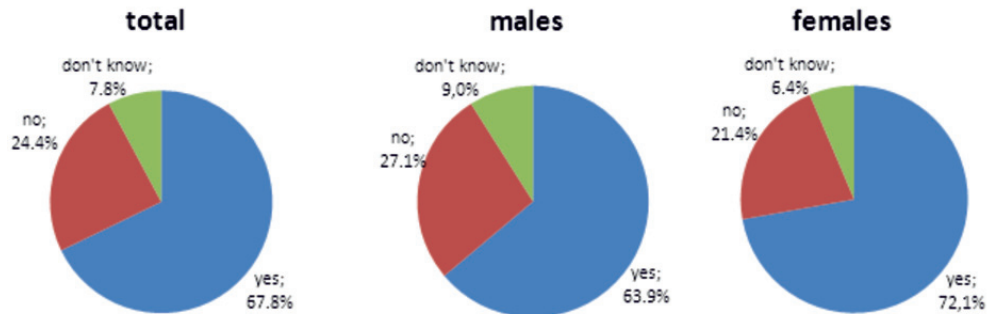


Fig. 4. Fifth year students' assessment of whether the dentist's profession poses health risk

Along with this, graduating students indicated that they were equally exposed to thematic health-saving activities during study at the university – 43.6 to 50.3% and during practice in healthcare facilities – 40.6 to 41.4%. Particularly noteworthy are options for effective forms of health-saving activities, where 82.6 to 92.1% students showed interest in attending master classes together with practical skills gaining in the healthcare setting (option A, fig.5). Moreover, regarding dentistry subjects, the greatest knowledge about health-saving technologies was gained by students in conservative dentistry – up to 65%, prosthetic

dentistry – up to 30%, surgical dentistry – up to 26%, etc. (option B, fig. 5).

It should be noted that 75.5% – 78.6% of students suggest a change in the organization of the educational process through the introduction of new innovation-information technologies that promote health-saving knowledge and skills in dentistry. Along with this, provision of such sources of knowledge as textbooks, manuals, etc. on electronic media and webinars – 39.3 – 40.0% and availability of phantom dental equipment and materials to develop practical skills – up to 23% (table 5).

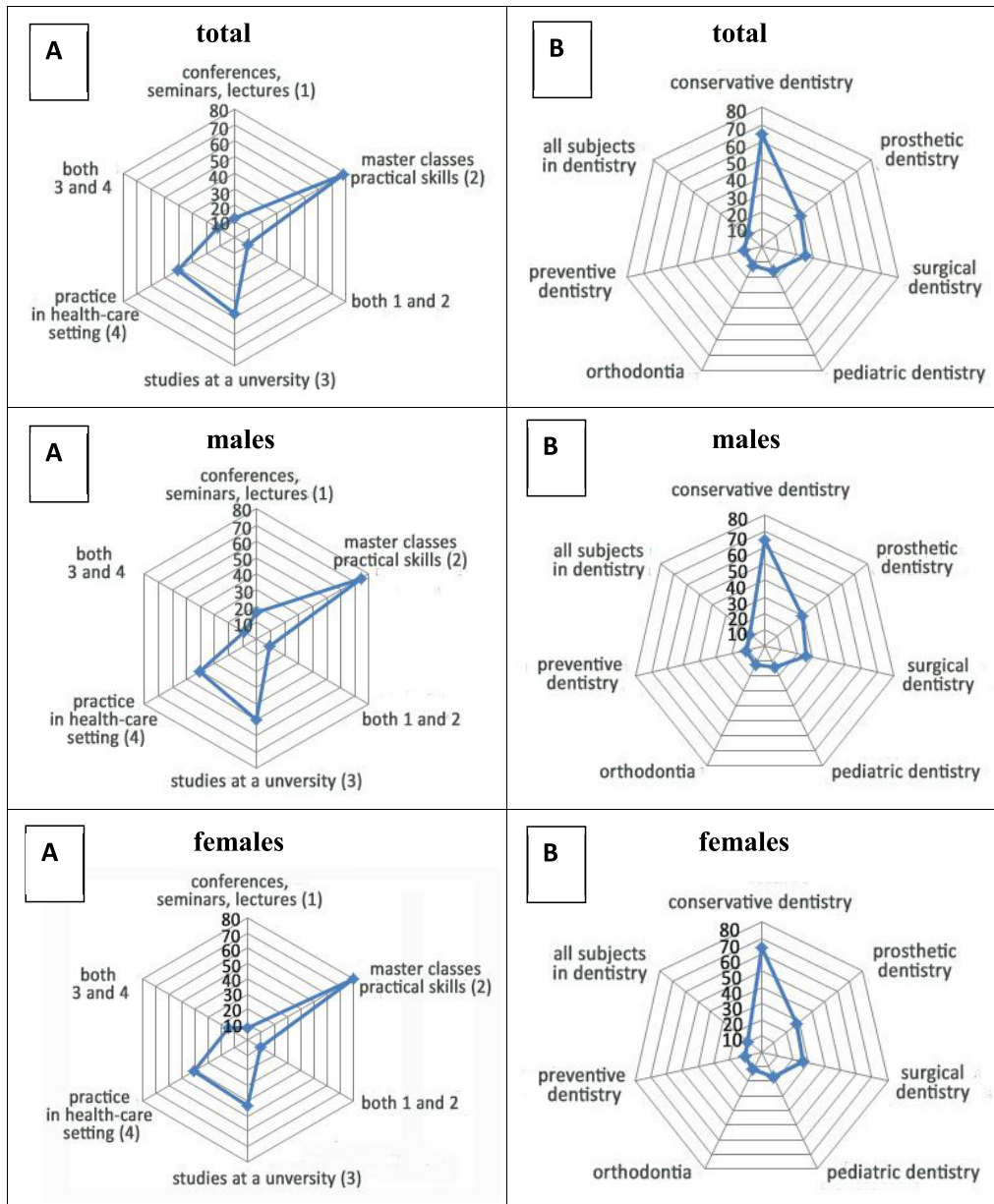


Fig. 5. Students' opinions on efficient forms of thematic activities on health-saving issues (A) and innovation technology knowledge in dentistry subjects (B)

Table 5

Proposals of fifth year dental students about the need to acquire knowledge at the university about health-saving technologies in dentistry

Indicators	Total		Males		Females	
	n	%	n	%	n	%
New knowledge in textbooks and manuals on electronic media	117	39,7	62	40,0	55	39,3
Organization of the educational process based on innovation-information technologies that contribute to gaining health-saving knowledge and skills in dentistry	227	76,9	117	75,5	110	78,6
Phantom dental equipment and materials to help form practical skills	60	20,3	28	18,1	32	22,9

Note : 295 students surveyed, incl. males – 155, females – 140.

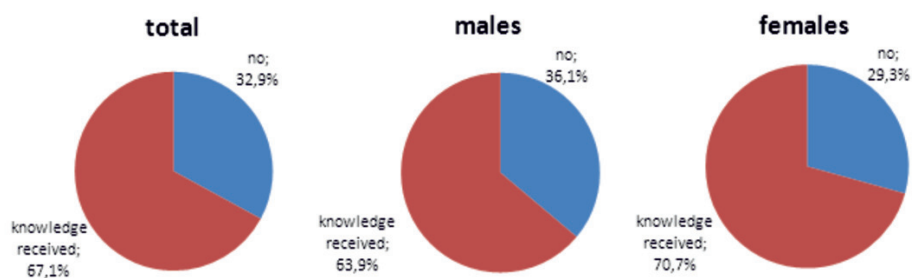


Fig. 6. Fifth year students' knowledge about health-saving technologies in dentistry

Table 6

Assessment of acquaintance with innovation technologies in dentistry

	total		males		females	
	n.	%	n	%	n	%
1. Non-metal ceramics (zirconia and alumina crowns)	290	100	153	52,8	137	47,2
yes	218	75,2	120	78,4	98	71,5
no	72	24,8	33	21,6	39	28,5
2. Smart Toothbrush	295	100	155	52,5*	140	47,5*
yes	216	73,2	116	74,8	100	71,4
no	79	26,8	39	25,2	40	28,6
3. Liquid filling for teeth ICON	294	100	154	52,4	140	47,6
yes	197	67,0	103	66,9	94	67,1
no	97	33,0	51	33,1	46	32,9
4. Intraoral camera – detailed image of the oral cavity	292	100	155	53,1	137	46,9
yes	171	58,6	85	54,8	86	62,8
no	121	41,4	70	45,2	51	37,2
5. Laser dental treatment	294	100	154	52,4	140	47,6
yes	151	51,4	81	52,6	70	50,0
no	143	48,6	73	47,4	70	50,0
6. Computer-aided design of 3D printing – Startasys, Emvisiontech and FormLabs	293	100	154	52,6	139	47,4
yes	137	46,8	72	46,8	65	46,8
no	156	53,2	82	53,2	74	53,2
7. Air abrasion technology – micro-abrasive treatment of teeth (Sandman)	292	100	153	52,4	139	47,6
yes	123	42,1	61	39,9	62	44,6
no	169	57,9	92	60,1	77	55,4
8. Diagnosis of caries by laser fluorescence spectroscopy	294	100	154	52,4	140	47,6
yes	116	39,5	65	42,2	51	36,4
no	178	60,5	89	57,8	89	63,6
9. Anesthetic – local with anti-allergic and anti-inflammatory effect (ubestezin, septonest, artikoin, ultrakain)	293	100	154	52,6	139	47,4
yes	114	38,9	64	41,6	50	36,0
no	179	61,1	90	58,4	89	64,0
10. tooth regeneration – bioactive dentin	292	100	154	52,7	138	47,3
yes	110	37,7	61	39,6	49	35,5
no	182	62,3	93	60,4	89	64,5
11. Demonstration of dental prosthesis and standards – DentSim Simulator	292	100	153	52,4	139	47,6
yes	90	30,8	60	39,2	30	21,6
no	202	69,2	93	60,8	109	78,4
12. VR camera – for training dentists	295	100	155	52,5	140	47,5
yes	88	29,8	53	34,2	35	25,0
no	207	70,2	102	65,8	105	75,0
13. Teledentistry – MouthWatch TeleDent	292	100	153	52,4	139	47,6
yes	58	19,9	33	21,6	25	18,0
no	234	80,1	120	78,4	114	82,0
14. CRISPR – genome editing for dental problems	291	100	153	52,6	138	47,4
yes	34	11,7	19	12,4	15	10,9
no	257	88,3	134	87,6	123	89,1

Interesting are the data of graduating students on health-saving technologies they learned during their study in dentistry sciences, where 67.1% (males – 63.9%, females – 70.7%) responded positively and only from 29.3 to 36.1% gave a negative assessment (fig. 6).

The need to use innovation- information technologies in the process of teaching dentistry is becoming increasingly widespread due to the introduction of health technologies into the practice of oral health maintenance. As can be seen from table 6, among graduates of the 5th year of the Faculty of Dentistry more than 70% demonstrate knowledge about “Smart Toothbrush” and “non-metal ceramics”, as well as “liquid filling” for teeth ICON – 66, 9-67.1% and the use of the intraoral camera for dental imaging of the oral cavity – 54.8-62.8%. Relatively less knowledge was revealed about “laser dentistry” – 50.0 – 52.6%. Accordingly, 20 to 50% of students in the above questions gave negative answers (table 6).

In contrast to these data, dental students have low knowledge of the revolutionary technologies used in dentistry (table 6). 53.2% of students do not have information on computer-aided design of 3D printing (Startasys, Emvisiontech and FormLabs) and microabrasive treatment (air abrasion) of teeth 57.9% (males – 60.1%, females – 55,4%).

In further review, negative responses increase (table 6) in such issues as laser spectroscopy diagnostics – 60.5% (males – 57.8%, females – 63.4%) and anesthetics – 61.1% (males – 58.4%, females – 64.0%), as well as tooth regeneration – 62.3% (males- 60.4%, females – 64.5%) and DentSim Simulator standards – 69.2% (males – 60.8%, females – 78.4%).

In addition, low awareness of students is found regarding the use of VR cameras – 70.2% (males – 65.8%, females – 75.0%) and teledentistry (MouthWatch TeleDent) – 80.1% (males – 78,4%, females – 82.0%). An obvious knowledge gap of 87.6% – 89.1% among fifth year dental students is about the latest CRISPR method of genome editing in dealing with oral pathologies (table 6).

Thus, results of the survey of students of dental faculties of universities of the Kyrgyz Republic support that for the future dentist as a competent specialist, the achievements of science and practice in various fields of knowledge play a huge role, especially in medicine, which must be used in the modern organization of education. Undoubtedly, in the 21st century, to improve dental education – to form, during pre-graduate training, competencies and pro-

fessional qualities in various fields of knowledge, it is necessary to use innovation-information and health-saving technologies, which will increase the effectiveness of specialist training.

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