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Perceptions of dental students' regarding anatomy learning and assessment in integrated curriculum adopted by Shaheed Zulfiqar Ali Bhutto Medical University, Pakistan

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ABSTRACT

BACKGROUND & OBJECTIVE: The integrated curriculum adopted by the university affects the learning process of dental students. They prefer the selective study of specific objectives rather than developing a deeper understanding of anatomy. Thus, students' perceptions would be helpful in improving curriculum delivery, at the university level, for beneficial future clinical roles.

METHODOLOGY: A qualitative exploratory study in a dental college affiliated with regional medical university spread over three months. Second-year BDS class (50 students) was purposively chosen, excluding first-year students. Fifteen item questionnaire was developed and distributed via Google form followed by inductive analysis.

RESULTS: Forty-eight students (96%) responded. Seven themes and eighteen subthemes emerged. Three themes expressed students' preference for group study, small group discussion and visual learning style. Content of anatomy was suggested to be divided into two years by few. In theme "Anatomy assessment weightage" majority consented on same number of multiple-choice questions of anatomy as other subjects as all found it difficult to prepare it in one day with other subjects. Most of them considered such anatomy assessment weightage to have a positive impact on their future practitioner role.

CONCLUSION: Dental students are satisfied with the content of anatomy in each block. The main concern raised is the misalignment between anatomy assessment weightage and its delivered content. This drives students to do selective anatomy study in each block. This concern should be considered by a university in redesigning future curriculum to equip students with the necessary knowledge of anatomy required by dentists in their future roles.

KEYWORDS: Dental Integrated curriculum, Perceptions, Learning strategies, Assessments.

INTRODUCTION

Human Anatomy remains constant in the core curriculum of all careers that are associated with health care delivery. It provides the platform for performing invasive and emergency procedure, physical examinations, radiological imaging [1] etc. Apart from professional need, there are certain litigious factors which make it necessary for the doctors to have knowledge of Anatomy [2]. Some of the factors that have effected the learning and teaching of anatomy worldwide are a reduction in allocated time, teaching staff and dissections [3,4].

The term integrated curriculum, described by Harden [5], is supported by many medical education associations worldwide [6] to keep in pace with the changing needs in health sector. An integrated curriculum establishes linkage between subjects and skills to help students learn concepts through holistic approach.

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The Pakistan Medical Commission has provided a framework for medical and dental colleges achieving horizontal and vertical integration in different phases [7]. Universities integrate curriculum, according to different levels of Harden's ladder of integration therefore to see the outcome of any integrated curriculum it is necessary to take input from all stakeholders [8]. Students constitute major stakeholders in higher education as they are at the receiving end of all academic activities. They have specific roles and responsibilities in an integrated learning environment. Therefore, their feedback can lead to appropriate curriculum settings required for a targeted population.

Shaheed Zulfiqar Ali Bhutto Medical University (SZABMU), Islamabad, adopted an integrated curriculum for its affiliated dental colleges in the year 2019 at level of temporal coordination according to Harden's ladder of integration. First-year BDS students must study four subjects as horizontal integration: Anatomy, Physiology, Biochemistry and Oral biology along with vertical integration of two of their dental subjects [9]. The integrated curriculum is delivered in three blocks with two modules each. The content and teaching hours of Anatomy per block are more than the three other major subjects. By the end of each block, the summative assessment is taken as one combined theory paper including all subjects, having 140 MCQs in all. Despite more teaching hours than other subjects, anatomy is assessed more or less equally as other 3 major subjects. So, in this type of assessment, students strive to learn selective anatomy topics, thus producing deficiency in their theoretical knowledge which forms the basis of their future clinical intervention as a dentist.

Little evidence is available regarding the perceptions of dental students about content and assessment of different models of integrated curriculum being delivered within Pakistan and practically no perceptions are recorded regarding the mode of delivery of integrated curriculum adopted by SZABMU. Therefore, this study was planned to gather perceptions of dental students, affiliated with SZABMU, regarding learning strategies and coping with Anatomy learning and assessment pertaining to this particular delivered integrated curriculum.

METHODOLOGY

A mixed-method exploratory study was carried out from May-July 2021 in a private Dental College in Islamabad, affiliated with SZABMU. Ethical permission was taken from ethical review board of the dental college (ERB HBS Appl.# EC.02/15/06/2021). Second-year BDS students were purposively chosen as they had already been exposed and experienced integrated curriculum delivery and integrated assessment. First-year BDS students were excluded as they were halfway in the process and were not assessed in all blocks.

A survey form constituting fifteen items (seven closed-ended and eight open-ended) was developed on Google forms following AMEE 87 guidelines used to develop questionnaires in educational research [10]. The steps followed were the conduction of a literature review regarding how students cope with different learning strategies to learn Anatomy along with other subjects in integration and how they manage integrated assessments. In addition, a few telephonic interviews with students (n=05), from another dental college affiliated with same university (SZABMU) were done to see their perspective about the topic. The questionnaire was then validated from five content experts (FCPS Anatomy). Items were improved based on feedback provided by content experts. Lastly, pilot testing was conducted (n=10) to manage any technical errors. Students involved in pilot testing were from another college affiliated with same university (SZABMU) and their responses were not included in analysis. After the minimal rearrangement of items and approval by all authors, a Google survey form was distributed as a link to the participants.

An inductive analysis was followed which, is an iterative process to sort qualitative raw textual data into a summary in the form of subthemes and themes to produce reliable and valid findings [11]. Participant numbers were labelled to anonymize the textual data by first author before sharing it with rest of the authors for data analysis. Frequencies and percentages were calculated for demographics and closed-ended questions. Manual thematic analysis was done for textual data received under open-ended questions using a systematic approach for qualitative text analysis [12]. All authors used in-vivo analytic coding (1st coding cycle). Later subthemes were formed by arranging codes. Data were again coded (2nd coding cycle). Subthemes were discussed among all authors. Member checking was enforced by sending raw data to 15 students. Themes were finalized after consensus.

RESULTS

Forty-eight students (96%) responded with a predominance of females (72.91%). Frequencies and percentages of closed-ended questions are given in Table-I. Results of the thematic analysis of open-ended questions are given in tables II-V in the form of themes, subthemes, and participants verbatim. A total of seven themes generated, along with eighteen subthemes. The themes and subthemes are described briefly as under.

1. Preferred Learning strategy

Half student strength (n=24; 50%) preferred group study to learn Anatomy during the first-year. While others preferred independent study and in pairs. They elaborated that during group studies, confusions are solved by discussion, and content is retained easily.

2. Preferred VARK Learning Style

More than half (n=27; 56.25%) preferred visual learning style to learn Anatomy as by looking at diagrams and pictures one can visualize, and conceptual learning takes place.

3. Preferred Teaching Method

The majority of students (n=35; 72.91%) preferred the small group discussion teaching methods to understand and retain Anatomy.

Table-I: Frequencies and percentage of closed-ended questions.

	Preferred learning strategies, styles and teaching methods to learn and retain anatomy during 1st year bds	(n)%
1	What was your preferred strategy to learn Anatomy during 1st year BDS?	
	Independent study	16(33.33)
	Group study	24(50)
	Study in pairs	08(16.67)
2	Was it more stressful to learn Anatomy as compared to other subjects during 1st Year BDS?	
	Yes	35(72.91)
	No	13(27.08)
3	By which teaching method did you understand and retain Anatomy?	
	Lectures	13(27.08)
	Small group discussion	35(72.91)
4	What is your preferred learning style for Anatomy? You can choose more than one box if you have more than one learning style.	
	Visual (Figures, pictures, graphs)	27(56.25)
	Aural (By hearing words delivered by teachers, discussion with classmates after lecture, listening to the recording of exam topics, remembering information through loud reading, teaching other people and discussion with teachers)	22(45.83)
	Reading or writing (Textbooks, lecture notes, study multiple choice exam questions)	20(41.66)
	Kinesthetic (going through practical experience to learn something, interacting with the environment, active and quick learning physical skills)	26(51.16)
Perception of students regarding anatomy content		
	Do you think the content (Topics) of Anatomy included in 1st Year BDS course should be altered?	
	Yes	11(22.91)
	No	37(77.08)
Perception of students regarding anatomy weightage in integrated assessments		
1	Do you think Anatomy should be given equal weightage (i.e., equal number of MCQs) as compared to the other three subjects (Physiology, Biochemistry, Oral Biology) in Block exam throughout 1st Year BDS and in final Professional Exam?	
	Yes	31(64.58)
	No	17(35.41)
2	Was it easy to prepare for Anatomy in one day along with other three subjects in the examination?	
	Yes	04(8.33)
	No	44(91.66)

They believed in small group discussions, each student gets proper attention and concepts get cleared more than in lectures.

4. Content Alteration

The majority of students (n=37; 77.08%) preferred not to change the content of Anatomy as it was well placed in all blocks. One student was of opinion that they have more subjects to study during first-year because of integration; therefore, Anatomy should be divided into first two years. Another one suggested to reduce Embryology and Histology content, while one thought to restricting anatomy only to Head and Neck Anatomy.

5. Weightage of Anatomy in Integrated assessments

The mostly students (64.58% (n=31) preferred equal weightage (equal number of MCQs) in integrated assessments highlighting the fact that all subjects are equally important and if anatomy is given more weightage in assessment, then rest of basic and dental subjects will be compromised as assessment drives learning. On the other hand, a few students said that Anatomy should be given more weightage because it has more sub-branches and thus more content as compared to other subjects. Few were of opinion that weightage in assessment has more impact on learning, so anatomy should have more weightage for the future progress of dental clinicians.

6. Preparation of Anatomy during Integrated Assessments

Almost all students (n=44; 91.66%) found it difficult to prepare Anatomy along with three other major and two minor dental subjects in one day during assessments. The students said that Anatomy needs a lot of revisions and the course is too extensive.

7. Impact of weightage of Anatomy in "assessment" on Clinical Practice

Being a second-year students most of them believed the present weightage of Anatomy in assessment will greatly impact their professional life later. One suggested to increase its weightage in assessment so that students study it as a priority as this subject will not be taught again, while few didn't approve of its impact on clinical practice as they consider that all subjects are equally important.

Table-II: Category I: Preferred learning strategies, styles, and teaching methods for Anatomy.

Themes	Sub-themes	Representative Quotes
Preferred Learning Strategy	Group study	"In group study lot of confusions are solved by discussion with classmates in easy way using mnemonics or abbreviation." (F, P#4)
		"Explaining to a friend and making acronyms with your friend helps to memorize information faster and acquired knowledge is converted to long term memory" (F, P#10)
		"Every student in the group brings in their point…sharing each other's knowledge increase conceptual learning" (F, P#13)
		"Anatomy is extensive subject therefore I prefer to study in groups because it becomes really easy to grasp the concepts this way" (F, P#1)
	Independent study	"I love to study alone with full focus as in a company of people you get distracted because it seems fun rather than a learning" (F, P#8)
		"Independent study won't bound you to a specific way of studying and it saves your time" (M, P#32)
	Study in pairs	"When we learn with partner, two brains are working together, and we are able to achieve more concentration and clear our concepts" (F, P#47)
Preferred VARK learning Style	Visual	"Any picture that goes in front of your eyes impacts your brain to remember easily than hearing and other senses" (F, P#21)
		By seeing diagrams, we can easily learn Anatomy and this way images are retained in our memory for a longer period of time" (M, P#38)
	Aural	"Our brain better understand with pictures and images because pictures help in visual placement of structures and their organization in the body" (F, P#48)
		"Hearing help to retain the concepts better" (M, P#29)
		Teaching to class fellows is best way and I prefer it as topics remain in our mind for long time" (M, P#17)
	Reading or Write	"Discussion with your mates and teacher helps you a lot" (M, P#22)
	Kinesthetic	"By reading paragraphs, by highlighting them retains them in our memory for a longer period of time. It helps in memorizing things" (F, P#18
		"Going through practical helped me a lot in understanding Anatomy" (M, P#32)
		"When you actually perform something related to the subject, it stays there in your head for a much longer time" (F, P#41)
Preferred Teaching Method		
	Lecture	"Lectures are limited and are to the point whereas SGDs are waste of a lot of time" (M, P#14)
		"Our lectures are more interactive starting with brainstorming and our professor use to ask surprise questions in between to help us retain the information" (F, P#28)
	Small group discussion	"Every student is under the eye of the teacher and there is lot of interaction and allow us to discuss problems with teacher" (M, P#35)
		"Lot of points during the lecture that we don't understand can be discussed during group discussion to better understand" (M, P#7)

Table-III: Category II: Perception of students regarding alteration in course content of Anatomy.

Themes	Sub-themes	Representative Quotes
Content alteration not required	Best designed curriculum for BDS	"I think Anatomy content is more than enough. The curriculum is best designed for a BDS student to understand the basic information which he/ she might find useful while doing practice on patients" (F, P#19)
		"I think the content of Anatomy was the most carefully planned across all blocks" (F, P#34)
Content alteration required	Anatomy should be divided in first two years	"I think it should be altered as the dental students have six subjects in 1st year as compared to MBBS students who have just three subjects. So, there is a lot of stress for students and Neuroanatomy is the toughest part of Anatomy. The Anatomy should be divided into first two years" (F, P#26)
	Histology and embryo should be reduced	"Embryo is useless for BDS students and Histology should also be reduced" (F, P#20)
	Prioritize only Head and Neck for BDS	"I think learning topic other than head and neck are not that important for professional life as they just burden the students. Shredding those unnecessary topics will allow students to thoroughly remember the things they would eventually be needing in their practice later" (F, P#15)

Table-IV: Category III: Perception of students regarding weightage (equal number of questions) of Anatomy in integrated dental assessments and preparation of Anatomy during the examination.

Themes	Sub-themes	Representative Quotes
Weightage of Anatomy in assessment in modular system	Need equal weightage	"Equal weightage should be given to Anatomy so that we can give time to other subjects which are ignored such as Biochemistry" (M, P#14)
		"Equal weightage should be given as all subjects are equally important in their respective ways" (F, P#25)
		"Anatomy is a difficult subject and if the weightage is increased in assessment, students will struggle to pass" (M, P#22)
	Need more weightage	"More weightage would make us take it more seriously and not something we just cram one year and do MCQs before the exam and then forget" (M, P#29)
		"As Anatomy has more branches than other subjects and the course is extensive, so it is fair to have more questions from the subject" (F, P#31)
		"Weightage determines the importance of that subject in the eyes of students, and they tend to prioritize subjects, so it should be more for better clinical practice in future" (F, P# 16)
Preparation of Anatomy during integrated assessments	Hard to revise and recall Anatomy in one day	"We had only one day to prepare for the exam, and Anatomy itself need a whole day for preparation and it was very difficult to prepare along with other subjects in one day" (F, P#11)
		"Anatomy needs lot of revisions and focus to learn and understand" (M, P#44)
		"It was very difficult to prepare Anatomy in one day with other subjects as the course is too extensive & we usually can't miss any detail of the topic unlike other subjects" ((F, P#36)

Table-V: Category IV: Perceptions of students regarding impact of present weightage of Anatomy in integrated dental assessments on future professional life.

Themes	Sub-themes	Representative Quotes
Weightage of anatomy in the assessment will impact clinical practice in professional life		"Students don't give attention to Anatomy and leave it as an optional subject due to low weightage. It is off course, a loss for students in future as it will not be taught in next year's again" (M, P# 12) "Anatomy and Physiology help in assessing, evaluating, diagnosing, and tracking patient's health. Knowledge of Anatomy is considered fundamental for understanding neurological or musculoskeletal disorders. So, there is a big impact of present weightage of Anatomy in examination and later on professional life" (F, P# 13)
Weightage of Anatomy in assessment has nothing to do with clinical practice in professional life		"Weightage won't affect the clinical practice, but clear concepts will do" (M, P# 17) "Since all subjects hold equal importance in our professional life, thus all subjects should have equal weightage" (F, P# 33)

DISCUSSION

The regulatory body of Dental colleges in Pakistan has given autonomy to universities to dispense integrated dental curriculum to fulfill global standards of dental education. SZABMU began a stepwise integration starting from first-year by integrating four Basic subjects with two dental Clinical subjects. Anatomy, as a discipline with humongous information is facing a tough time in this mode of integration. Perceptions of students in any ongoing evaluation of the educational process is most valuable. Whilst there is no prior, local, published reference point documenting Anatomy integration with other subjects in dental education with which to compare and discuss the results of this study but our results do provide a snapshot of student's point of view for future best integrated modules.

Preferred students learning strategies, styles, and teaching methods for Anatomy.

This part of our questionnaire was important as knowing the learning styles of students helps in identifying learning problems and outcome in academic performance. These questions helped us to identify if the problem identified are due to individual reasons or because of delivery of integrated curriculum. The most preferred learning style was visual followed by kinesthetic comprehension. Small group teaching and group study as learning strategies helped most of them to retain anatomical knowledge. Research [13] have concluded that the motivation and performance of student for a particular subject improves if it is delivered in accordance with their learning styles; a study done concluded that for effective delivery of anatomy concepts ,the instructors should be aware of diverse learning styles and how to manage them [14]. National research in undergrad dental colleges found that teaching strategies like problem-based learning (PBL)linking Basic and Clinical sciences with community health can bring significant change in educational approach of dental students [15].

Alteration in course content of Anatomy.

Dental practitioners surgical role starts from second-year of their undergraduate studies. This skill highlights the need to equip students with sufficient anatomical knowledge throughout their dental degree [16]. The majority of our students were satisfied with Anatomy content, distributed in different blocks, finding it appropriate for BDS students. Few believed subdomains like histology and embryology should be cut off so that they can concentrate more on their main head and neck region structure with which they will be concerned in future.

Different countries are still teaching anatomy as a single discipline in full depth, only in preclinical years [16,17]. However, a pool of educators associated with undergraduate dental schools in the United Kingdom, realizing anatomy importance, have developed 147 dental anatomical learning outcomes related to clinical significance relevant to dental graduates [18]. This comprehensive anatomical framework provides a scaffold where anatomy teaching exists within an integrated dental curriculum in the UK.

Our study participants' suggesting an alteration in anatomy content can be considered as a step stone for curricular amendment.

Anatomy assessment in integrated dental assessments.

Assessment is an integral tool which contributes significantly to evaluate the effectiveness of a given approach and highlighting its limitations. At the same time, it gives feedback to learners regarding their strengths and weaknesses [19].

As assessment drives learning, so the majority were of the opinion to have same number of anatomy multiple choice questions as other subjects, irrespective of its content, as if anatomy assessment weightage is increased then to pass exam students will be bound to leave some of other subjects and focus more on anatomy. For them all subjects need thorough study. Almost all found it difficult for studying anatomy along with other subjects, in one day, for assessment as it is very extensive and need lots of revisions and focus. Four subdomains of anatomy themselves require one full day for revision. Understanding student perceptions about assessments and the impact this has on their learning will help educators and institutions to modify their strategies in delivering integrated curriculum to produce future competent dental doctors.

Impact of present anatomy assessment weightage in integrated dental assessments on future professional life.

The andragogical approach to assessments can have a big impact on future roles of practitioners. A review was done to see this led to the consensus that use of variety of methods, written and practical, to assess anatomical knowledge and skill in different domains can produce fruitful results later [20].

Most were affirmative of the impact of anatomy assessment in integration in future professional life as the weightage of a subject in assessment makes students smart learners thus having a targeted approach. They consider the structure and normal functioning knowledge forms the basis of disease orientation.

The rest of the students considered that there is too much detail in anatomy and they are unsure as to how deep they have to go as compared to rest of subjects which they think are equally important thus they don't find anatomy to be assessed more than other subjects in terms of their professional requirement .

This study is limited as the sample is taken from one college, representing one third of the total population, but we set out to explore and gain understanding and has opened a gateway for further exploration to bring any improvement in integrated curriculum delivery of the said university, if required. It is the first study conducted in said university, which improvises the need for collection of similar data from other dental colleges affiliated with it.

CONCLUSION

We can safely draw the conclusion that Anatomy delivered in an integrated curriculum, adopted by SZABMU, is accepted by the students as it is appropriately delivered by teaching and learning strategies meant for the delivery of integrated curriculum. The point of concern is the imbalance between delivered anatomy content and anatomy assessed in integrated assessment, where students must pass overall with no compulsion to pass individually in each subject. The time required for anatomy preparation in integrated assessment drives students to do selective anatomy study in already "specific anatomy content" in each block as they can pass without it.

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Anbreen Aziz: Questionnaire development, table-I, thematic analysis and results write up.
Maryam Shan: Conception, critical revision of data.
Shazia Imran: Revision of manuscript and data interpretation.
Hina Kundi: Final revision and approval.
Resham Hafeez: Initial coding of transcripts, contribution in results write up.

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