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Role of basic sciences in making of a clinician: Perspectives of medical students from North India

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Abstract:

BACKGROUND: Advances in scientific research necessitates updating of the curriculum and the Medical Council of India now Board of Governors have proposed a new competency-based undergraduate curriculum for the Indian Medical Graduate. The authors wanted the views of medical students about basic sciences teaching in the form of feedback, their perceptions and attitudes toward the basic sciences and their opinions about the relevance of these subjects, and finally any ideas about improvement in teaching of basic sciences.

MATERIALS AND METHODS: The present cross-sectional study was conducted in two medical colleges of Northern India and 250 medical students from each medical school were the study participants. Students of the 1st year were not included, but interns were included. A pretested questionnaire having twenty questions with answers in the form of "yes" and "no" was used. Chi-square was the test of significance.

RESULTS: Almost all the participants considered the basic sciences as an integral part of medical curriculum and a higher number of Government Medical College respondents opined that their knowledge made it easier to understand clinical subjects ($P < 0.05$). However, higher proportion of ASCOMS (Acharya Shri Chandra College Medical Sciences) of respondents emphasized that the focus should be on clinical subjects and that current student–teacher ratio be increased ($P < 0.05$). Majority of the respondents labeled Anatomy having the immense syllabus, while Physiology was designated as more relevant and having a better recall during clinical discourse ($P > 0.05$).

CONCLUSION: Basic sciences lay strong foundation for subsequent clinical learning. Medical education is best taught with hybrid use of lectures, tutorial, group discussions, audio-visual aids, and integrated teaching. The new proposed competency-based curriculum and the Attitudes, Ethics and Communication Module are likely to improve the overall medical education and health-care scenario.

Keywords:

Basic sciences, medical curriculum, medical students, perspectives

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Introduction

Ongoing scientific revolution going on in the medical field makes the background knowledge of the basic sciences taught during MBBS mandatory. Most of the medical colleges falling under Medical Council of India, now superseded by Board of Governors (BoG), teach three basic sciences subjects, Anatomy, Physiology, and Biochemistry during their 1st year of 4½ years of medical course, with minimal interdisciplinary interaction.[1] The reduced 1-year duration of 1st-year MBBS, makes it difficult for the teachers to introduce innovative methodologies into their medical curriculum, and most of the students during their clinical years were of the opinion that the basic subjects taught during the earlier years were forgotten and irrelevant and of no use to them.[2,3] This is an issue to utmost importance and requires immediate intervention. Modification of these basic sciences' course and content along with the

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teaching methods should be applied, and we need to update our medical teaching prompting the students toward active learning,[4,5] modifying the curriculum from time to time by teachers with the help of their students.[6] The students being at the receiving end of the educational system are one of best the judges of the teaching efficiency, so students' feedback is one of the best means to assess and improve the teaching methodology.[7,8] BoG has also proposed a competency-based new UG (undergraduate) curriculum for the Indian Medical Graduate (IMG). During the review of literature, there was dearth of research on feedback studies from medical students, especially in this part of the country. Hence, the present study was planned and conducted, keeping in mind the below-mentioned objectives.

Objectives

The objectives of the study were as follows:

i. Perception and attitudes of medical students toward the basic sciences taught during the 1st-year MBBS, along with their opinions regarding the relevance of basic sciences during their clinical years and also about the scope for improvement in the teaching of these basic science subjects
ii. To suggest recommendations, if any for the new proposed modified undergraduate curriculum from the feedback so obtained.

Materials and Methods

The present cross-sectional study was conducted across the two medical colleges, Acharya Shri Chander College of Medical Sciences and Hospital (ASCOMS) Sidhra, Jammu (J and K, India) and Government Medical College (GMC), Jammu (J and K, India), with the participation of 500 MBBS students, 250 from each college. Due permission was sought from the Institutional Ethical Committees of respective medical colleges before the conduct of the present study. The study was conducted between April and November 2018. The students of 1st year were not included, but the interns were included. The students were explained the purpose of feedback, informed verbal consent was taken and it was made clear to them that their confidentiality will be maintained as their names were not recorded.

A questionnaire of twenty questions was prepared by a team of senior faculty members who were experts in physiology from both the medical colleges and then was pilot tested on 25 students of final year MBBS, who were not the part of the study sample. The results of pilot study were analyzed by the expert team, and necessary changes were applied to the questionnaire before it was used in the present study. This questionnaire was then used and could be answered easily within a few minutes. Answers to these questions were either "yes" or "no." The students were approached in practical, tutorial classes, or clinical postings and were asked to fill the questionnaire in their free time.

The data thus collected were tabulated and analyzed. Chi-square was used as the test of significance and *P* values below 0.05 (<0.05) were considered statistically significant.

Results

About 99.8% of medical respondents from both the medical colleges opined that the 1st-year basic sciences' subjects to the MBBS curriculum were important. A higher proportion of students from the GMC said that the knowledge of the basic sciences made it easier for them to understand the clinical subjects as compared to their ASCOMS counterparts, and it was statistically significant ($P < 0.05$). Higher proportion of ASCOMS students stressed the need of the basic sciences as a foundation for improving their understanding of a disease's sign and symptoms which was significant statistically ($P < 0.05$). More number of GMC students in were in favor of the help provided by the recommended textbooks than their ASCOMS counterparts ($P < 0.05$) [Table 1].

About 77% participants of both the medical colleges were in favor of lectures and tutorials and opined that without the teachers' guidance, it was difficult for them to understand the basic sciences. 71.6% participants from ASCOMS compared to 60.4% from GMC stated that teachers were always there to solve their queries ($P < 0.05$). 69.2% participants from both the medical colleges had difficulty in

Table 1: Perception of the MBBS students toward three basic sciences' subjects taught in 1st-year MBBS

Questions	Response (yes), *n* (%)			*P*
	ASCOMS (*n*=250)	GMC (*n*=250)	Total (*n*=500)	
1. Importance of the 1st-year basic sciences' subjects to the MBBS curriculum	250 (100)	249 (99.6)	499 (99.8)	0.5*
2. Understanding the clinical subjects made easier by the knowledge of these basic subjects	231 (92.4)	246 (98.4)	477 (95.4)	0.00**
3. Foundation of basic sciences increases the understanding of a disease's signs and symptoms	247 (98.8)	233 (93.2)	480 (96)	0.00**
4. Sound knowledge of the basic sciences, a must to be a good clinician	235 (94)	242 (96.8)	477 (95.4)	0.13*
5. Recommended textbooks helpful	204 (81.6)	222 (88.8)	426 (85.2)	0.02**

*Not significant; **Significant. ASCOMS=Acharya Shri Chandra College Medical Sciences, GMC=Government Medical College

comprehending and retaining these subjects, while only 27% participants from the total were ready to choose one of the basic subjects as their postgraduate specialty [Table 2].

Only 53.2% respondents from ASCOMS as compared to 33.2% respondents from GMC stressed the focus to be on clinical subjects rather than the basic sciences' subjects ($P < 0.05$). Equal proportion of students from the two medical colleges was in favor of frequent use of audio-visual aids and more numbers of group discussions and tutorials along with the lectures. 90% respondents from GMC as compared to 82% from ASCOMS said that the relevance of these basic sciences' subjects would increase if these subjects were made part of an integrated curriculum with the clinical subjects ($P < 0.05$). 79.2% of ASCOMS participants, while only 58% of GMC participants wanted an increase in current student–teacher ratio ($P < 0.05$) [Table 3].

Anatomy was claimed to have an immense syllabus by 84.2% of the respondents and 40% of ASCOMS respondents in comparison to 20.4% of GMC respondents said Biochemistry also had a syllabus overload, which was statistically significant ($P < 0.05$). Higher number of respondents from GMC found Physiology to be very interesting than their ASCOMS counterparts ($P < 0.05$). It was Physiology which the majority of the students were able to recall as compared to Anatomy and Biochemistry during their clinical discussions ($P > 0.05$). During their clinical years, 88.8% participants found Physiology to be the most relevant of all the three subjects followed by Anatomy (72.4%) and Biochemistry (45.4%) [Table 4].

Discussion

What are basic sciences? Preclinical and Paraclinical sciences have been named as basic sciences, and these are the subjects during the learning of which students are not required to attend clinics, such as Anatomy, Physiology, and Biochemistry. Sometimes, Pharmacology, Pathology, and Microbiology are also called basic sciences, but these subjects also have clinical components, so they are not included in the category of basic sciences.[9] BoG has proposed a new undergraduate curriculum for MBBS students who are now to be addressed as IMG. According to BoG, the curriculum should be designed considering several things in mind, such as attaining broad competencies, with subject-wise retention, reducing knowledge overload by integrated teaching, and aligning learning and assessment to the outcome with specified achievement levels.[10]

Students' feedback is an important, least expensive, and primary way adopted by most researchers to assess their methodologies for enhancing the standard of teaching.[7,11]

When questioned about the importance of the three basic subjects to the MBBS curriculum, almost all the five hundred participants of the two medical colleges under study were in affirmative. Most of them argued that the knowledge of these subjects made it easier for them to understand the clinical subjects and further added that they were able to comprehend the signs and symptoms of the diseases better because of the strong foundation laid by these subjects. 95.4% even claimed that to become better clinicians, one needs to have a sound knowledge of these basic subjects. Our results were in agreement

Table 2: Attitudes of the MBBS students toward three basic sciences' subjects taught in 1st-year MBBS

Questions	Response (yes), *n* (%)			*P*
	ASCOMS (*n*=250)	GMC (*n*=250)	Total (*n*=500)	
1. Lectures and tutorials are beneficial	193 (77.2)	192 (76.8)	385 (77)	0.91*
2. Difficult to understand the basic sciences without teachers' guidance	187 (74.8)	194 (77.6)	381 (76.2)	0.46*
3. Teachers are always there to solve their queries	179 (71.6)	151 (60.4)	330 (66)	0.00**
4. Comprehension and retaining these subjects difficult	175 (70)	171 (68.4)	346 (69.2)	0.69*
5. Will choose one of these subjects as a postgraduate specialty	66 (26.4)	69 (27.6)	135 (27)	0.76*

*Not significant; **Significant. ASCOMS=Acharya Shri Chandra College Medical Sciences, GMC=Government Medical College

Table 3: Opinions of the MBBS students regarding improvement in teaching of the three basic sciences' subjects taught during 1st year

Questions	Response (yes), *n* (%)			*P*
	ASCOMS (*n*=250)	GMC (*n*=250)	Total (*n*=500)	
1. Focus should be on the clinical subjects rather than the basic sciences	133 (53.2)	83 (33.2)	216 (43.2)	0.00**
2. More frequent use of audio-visual aids	224 (89.6)	223 (89.2)	447 (89.4)	0.88*
3. More numbers of group discussions and tutorials along with lectures	230 (92)	237 (94.8)	467 (93.4)	0.20*
4. Relevance will increase if part of an integrated curriculum with clinical subjects	205 (82)	225 (90)	430 (86)	0.00**
5. Current student-teacher ratio should be increased	198 (79.2)	145 (58)	343 (68.6)	0.00**
6. Short span of 1 year less to understand these subjects	153 (61.2)	145 (58)	298 (59.6)	0.47*

*Not significant; **Significant. ASCOMS=Acharya Shri Chandra College Medical Sciences, GMC=Government Medical College

Table 4: Response of MBBS students regarding the relevance of the basic sciences taught during 1st year with the comparison among them

Questions	Response (yes), *n* (%)			*P*
	ASCOMS (*n*=250)	GMC (*n*=250)	Total (*n*=500)	
1. Immense syllabus				
Anatomy	211 (84.4)	210 (84)	421 (84.2)	0.90*
Physiology	116 (46.4)	133 (53.2)	249 (49.8)	0.13*
Biochemistry	100 (40)	51 (20.4)	151 (30.2)	0.00**
2. Very interesting				
Anatomy	130 (52)	121 (48.4)	251 (50.2)	0.42*
Physiology	197 (78.8)	224 (89.6)	421 (84.2)	0.00**
Biochemistry	109 (43.6)	98 (39.2)	207 (41.4)	0.32*
3. During clinical discussions able to recall				
Anatomy	140 (56)	159 (63.6)	299 (59.8)	0.83*
Physiology	207 (82.8)	203 (81.2)	410 (82)	0.64*
Biochemistry	89 (35.6)	97 (38.8)	186 (37.2)	0.45*
4. More relevant during clinical years				
Anatomy	171 (68.4)	191 (76.4)	362 (72.4)	0.45*
Physiology	226 (90.4)	218 (87.2)	444 (88.8)	0.26*
Biochemistry	104 (41.6)	123 (49.2)	227 (45.4)	0.88*

*Not significant; **Significant. ASCOMS=Acharya Shri Chandra College Medical Sciences, GMC=Government Medical College

with those reported by Shah *et al*., Shanker *et al*., and Sentí *et al*.[12-14] To recognize any abnormality, abnormal function, or deranged biological processes in the body, one must have a clear understanding and knowledge of the normal anatomy, functions, and biochemical reactions, which these basic subjects teach.

About 95.2% of the respondents opined that the recommended textbooks were helpful and 77% respondents also stressed the need of lectures and tutorials for imparting the knowledge of these basic sciences which was consistent with the findings of multiple studies.[11,15,16] Lectures are relatively less costly and are taught in a systematic and concise manner, while tutorials are a step ahead of lectures, as they address a small group and are more interactive as students are encouraged by the teachers to put forth their views and queries.[7,15,17] A good number of our respondents added that for better understanding of these subjects they required teachers' guidance and even claimed that teachers were always there to help them with their queries. Medical students, especially in their first few years of medical college, have raw brains which need to be nurtured and channelized in the proper direction, so teachers help them to attain this with their experience and knowledge. In our study, only 27% of participants were ready to opt for one of these basic subjects as their postgraduate specialty and somewhat similar findings were reported by Jha *et al*., Oyebola and Adewoye, and Zia *et al*.[18-20] Medical graduates prefer to choose clinical branches over basic sciences for their postgraduate specialty as clinical subjects appear to them as more lucrative and financially more paying, and they think that social recognition and job security is more with the clinical branches.

It was a very positive finding, that during their 1st-year undergraduate teaching, most of our participating undergraduates did not want the focus to be more on the clinical subjects rather than basic sciences. The idea of integrated teaching of the basic sciences along with the clinical sciences was welcomed by 86% of our participants, and these findings are in consonance with the results reported by other authors.[21,22] Harden had suggested 11 steps ladder separating the subject-based teaching and integrated teaching.[23] Integrated teaching prevents fragmentation of knowledge, creates interest among students, makes teaching–learning more interesting, and decreases burden on the students. A good proportion of our respondents wanted more frequent use of audio-visual aids and more number of group discussions and tutorials along with the lectures. It is seen that a learner tends to learn better with the multiple preferences of learning, audio-visual aids along with didactic lectures increase a learner's attention span, understanding and retention of the topic delivered. Group discussions and tutorials help in interactive brainstorming in students, so instead of being passive recipients they can formulate new ideas, clear their doubts and boost their knowledge.[15]

Most of the participants in the present study found difficulty in understanding the basic sciences in a short span of 1 year and added that the current student–teacher ratio should be increased. From the times of Flexner, it has been a consensus to have about at least 2 years foundation of basic sciences as an important necessity for expert clinical practice.[24] Anatomy was considered to have an immense syllabus by 84.2% of the participants, Physiology by 49.8%, and Biochemistry by 30.2%. Similar findings were reported by Gupta *et al*.,[25] It

is very difficult for the medical students and their teachers to differentiate between relevant and irrelevant information, the relevant might totally disappear and the irrelevant one gets transformed into a relevant fact because of ongoing rapid scientific advances, so teachers need to teach even some irrelevant topics.[16]

Most (84.2%) of the participating medical graduates found Physiology to be very interesting, some (50.2%) found Anatomy and some (41.4%) found Biochemistry to be interesting. In the study conducted by Gupta *et al*., 50.1% found Anatomy, 46.4% physiology, and 44.8% Biochemistry important and interesting.[25] It is a tendency for the students to bend toward a particular subject or topic which is made interesting and easy for them by the teachers and presented to them in a different clinically oriented manner.[26] Medical students, while studying the basic sciences in their earlier years in medical colleges, might not seriously consider the importance of these subjects in understanding the clinical sciences in their later years.

When respondents tried to recall the basic sciences during their clinical discussions, only 37.2% were able to recall Biochemistry, while about 82% were able to recall Physiology and 59.8% Anatomy. Our findings were consistent with the findings of Gupta *et al*. and Nuggedalla.[25,27] Spencer *et al*. in their paper wrote that mostly, there was a poor retention of the basic sciences, so it was suggested to fully integrate basic sciences during the whole duration of medical curriculum.[28] Medical education curriculum planners should focus more on the ways of increasing the level of knowledge improvement rather than the decreasing knowledge loss.[3]

During their clinical years 88.8% of our respondents found Physiology most relevant as compared to Anatomy (72.4%) and Biochemistry (45.4%). In the study by Gupta *et al*., 89.4% participants found Anatomy to be the most relevant followed by Physiology (85.7%) and Biochemistry (71.6%).[25] Chawla *et al*. concluded from their study that students were keen to learn only clinical practice-oriented skills.[4] Medical practitioner needs the strong knowledge of basic sciences to solve complicated or unusual clinical cases, though they generally undermine the importance of the basic sciences for diagnostic reasoning.[20] What we require in basic sciences curriculum is to incorporate the applied and clinical aspect in the teaching side by side, which can be achieved by vertical integration as suggested in the proposed curriculum. The findings of our study endorse the new proposed competency-based undergraduate curriculum for the IMG, where the effort is to make the medical education learner-centric, patient-centric, gender-sensitive, outcome-oriented, and environment appropriate with more emphasis on horizontal and vertical integration of different subjects, collaborative, interdisciplinary teamwork, and respect among professionals.[29]

Conclusion

In our study, the participants categorically put forth that the basic sciences form an integral part of the MBBS curriculum, they reasoned that the background foundation of basic sciences helped them in their better understanding of clinical sciences and improved their clinical acumen. The respondents from the two medical colleges affirmed the use of recommended textbooks, lectures, and tutorials and stressed on the guidance of teachers, who were generally there to solve their queries. They advocated the use of more audio-visual aids, group discussions, and tutorials with lectures and also integrated teaching with the clinical subjects, as it was difficult for them to comprehend and understand these subjects easily. The young medical graduates complained about the syllabus overload, especially of Anatomy, but found Physiology to be very interesting which they were able to easily recall during their clinical years and also found Physiology and Anatomy more clinically relevant. The participants regretted the short span of 1 year for 1st-year MBBS and also the decreased student–teacher ratio. Despite all this, the undergraduates were reluctant to choose one of the basic sciences subject as their postgraduate specialty.

Basic sciences lay strong foundation for subsequent clinical learning and are and will always be an integral part of the MBBS curriculum. Medical education is best taught with hybrid use of lectures, tutorial, group discussions, audio-visual aids, and integrated teaching. The new proposed competency-based curriculum and Attitude, Ethics and Communication Module should be implemented as soon as possible, as they are likely to improve the overall medical education and health-care scenario.

Limitations

Our study has already strengthened the implementation of the new proposed curriculum, but in our study, we have considered the MBBS students and Interns opinion, we can further broaden this study by including medical practitioner's opinion about the importance of basic sciences. We can further delve into the matter of undergraduates not choosing the basic sciences as their postgraduate specialty by asking them further questions.

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Conflicts of interest
There are no conflicts of interest.

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