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LEARNING WITH BONES – CURRENT SCENARIO

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ABSTRACT

Background - Detailed knowledge of Anatomy forms a prerequisite for better understanding and appreciation of further specialities of medicine. Traditionally bones were routinely used in anatomy classes as learning resource material. This is a common observation that day by day bones are not available in sufficient numbers for students. No study yet is undertaken to assess the role of bones in learning anatomy. Objective- To assess the availability of bones with undergraduate medical students, its role and effects on learning outcome and recommendations thereof. Methods- A questioner based opinion survey of faculties involved in teaching human anatomy was planned. The questioner was based on availability and awareness for bones, sources of bones and recommendations. Results- Survey result pointed out that 100% faculty believed that bones are essentially required for teaching and learning anatomy. Only 10-15 % of students are using the bones in classes as learning resource material and this proportion is decreasing year by year. Commonest difficulty expressed by students is unawareness of sources for procuring bones. Despite the importance of bones in learning anatomy 90% of faculties are not aware of authorised places to buy bones. 55% of faculties suggested that establishment of departmental bone bank for students will overcome the problem of shortage of bones. Conclusion- currently bones are underutilised as learning resource material in anatomy because of less availability which can be improved by setting up departmental bone banks for students.

KEYWORDS: Anatomy, Bones, Learning Resource Material.

INTRODUCTION

Anatomy is one of the basic and fundamental subjects in medicine. Detailed knowledge of Anatomy forms a prerequisite for better understanding and appreciation of further specialities of medicine. The conventional Learning Resource Materials used in anatomy are cadavers, bones, models, charts and atlases. Currently technologies like 3D software, quick time virtual reality software are being installed and used by some of the medical colleges in India.[1] Study of osteology is an integral part of undergraduate medical curriculum and bones are the tools for learning Anatomy.[2] This is a common observation that day by day certain learning resource materials like bones and cadavers are not available in sufficient numbers for students to get their hands on while learning.[3-6] Bones are not available freely as other LRMs in Anatomy because of legal considerations involved.[7]

Scarcity of cadavers is improving in some places because of voluntary body donation programme is yielding fruits to them. [8] But still the technology for retrieving good quality bones from dissected cadavers is to be developed so as to be applied on large scale. There are some companies or vendors where they sell real bones Skeletons.[9] Many establishing medical colleges buy the bonesets from them. But it is difficult for the students to buy from them because of cost.[3]

Most of the students fail to understand the negative impact of not understanding the osteology which may lead to incompetent anatomists and surgeons leaving patients to face disastrous outcome.[10-11]

Hands-on learning on cadavers in dissection, on models in embryology classes and on bones in Osteology classes has definitely the better learning outcome. Present situation is very discouraging with respect to availability of cadavers and bones for students to experience the hands-on learning which may lead to hampering of learning process and learning outcome.

Therefore this questioner based pioneer study was undertaken to assess availability of bones with

undergraduate medical students, its role and effect on learning outcome and recommendations by faculties teaching anatomy.

METHODS

The questioner based descriptive study was undertaken during July 2015 to March 2016 at JIPMER, Pondicherry, with volunteer faculties of anatomy, presently teaching in different medical colleges across India. This being novel pioneer study in the field, a sample questioner was prepared and piloted amongst the small group of faculties. After some modifications the questioner was distributed to the 196 faculties either by email or by hand during various scientific meetings throughout the period of study.

The semi structured questioner included demographic information of participants and 10 open / close ended questions which were broadly targeted at

1. Availability and awareness of importance of bones at the time of learning.
2. Awareness about the sources of bone sets amongst the students and faculties.
3. Recommendations.

Out of 136 questioners received back from participants through email, whats up or by hand, 120 completely answered questioners were considered for statistical analysis which was carried out with the help of Microsoft excel and SPSS software version 19.0.

RESULTS

Total 136 questioners received for analysis with respondent rate of 69.39%. Out of 120 participants considered for statistical analysis, 86 were male and 34 were female. 55% of participants were having less than 5 years of teaching experience (Figure 1).

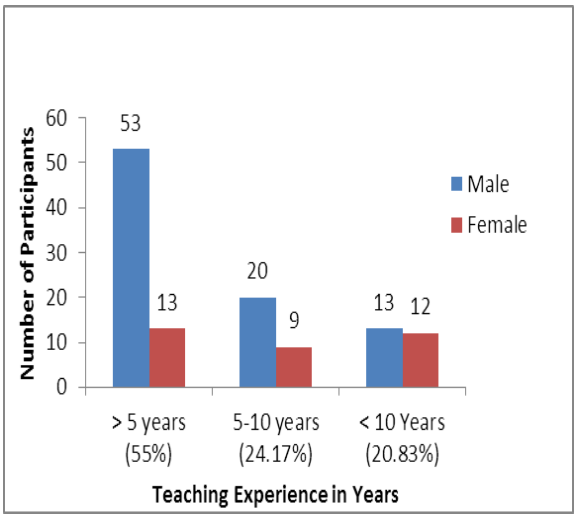

Figure 1: Distribution of participant faculties based on sex and teaching experience

Table 1 shows data regarding questions on availability and importance of bones during teaching and learning process. Most of the participant faculties (98.9%) are of the opinion that bones are compulsorily required for teaching and learning undergraduate anatomy. Currently only 15% students are coming with bones to anatomy classes and this proportion is decreasing year by year. No participant has observed the use of plastic or fabricated artificial bone set. Almost all (96%) faculties think that learning outcome is adversely affected by lack of bone during the teaching and learning.

Table 1: Responses regarding questions on availability and importance of bones during teaching and learning process

Sr. No	Question	Response	
1.	Are bones essential for learning undergraduate anatomy?	Yes (98.9%)	No (01%)
2.	Does the learning outcome is affected by lack of bones during teaching and learning	Yes (96%)	No (4%)
3.	Number o students bringing bones to classes	15%	Decreasing year by year
4.	Number of students using artificial bones	Nil	

Almost 85% of students don't have bones during anatomy classes. Most of them (90%) do not own the boneset; some (8%) will share with friends and fewer students (2%) will find it difficult to carry. The commonest reason shared by students for not owning the bone set is unawareness of sources of bone sets (71.67%). Some of the students (16.67%) were finding it very costly (Table 2).

Table 2: Difficulties shared by students for bonesets

Sr. No.	Reason	Percentage (n=120)
1.	Don't know from where to purchase	(n=86) 71.67 %
2.	Very costly	(n=20) 16.67%
3.	It is not compulsory	(n=8) 6.67%
4.	Issued from the department	(n=6) 5.83%

Table: 3 represents data regarding knowledge and awareness of sources of bone sets amongst participant faculties

1.	**Private medical book shop**	**(n=36)**	**30%**
2.	Senior students	(n=34)	28.33%
3.	Grave yards	(n=24)	20%
4.	Departmental staff	(n=19)	15.83%
5.	Agents	(n=4)	3.33%
6.	Online	(n=2)	1.66%
7.	Young Scientific Brothers, Kolkata	(n=1)	0.83%

Table 4 represents consolidated data for suggestions and recommendations to improve less availability of bones during teaching and learning process and the outcome of that. Participants were also asked to opine on any change in curriculum of Anatomy. Large portion of participants have mentioned setting of departmental bone bank (54.17%) and Medical Council of India regulations (30.83%).

Table: 4 Recommendations by participant faculties for improvement of availability of bones to the students

1.	Setting up departmental bone banks for students	(n=65)	54.17%
2.	Medical council of India regulations	(n=37)	30.83%
3.	Use of plastic bones	(n=8)	6.67%
4.	Software based applications	(n=6)	5%
5.	Legal provision to supply bones to medical students	(n=4)	3.33%

DISCUSSION

Anatomy forms the strongest pillar of entire medical education. It forms a platform of knowledge required for any further medical speciality. For many years anatomy as a subject in medical curriculum has seen many ups and downs and being slowly squeezed in terms of duration and contents.[12]

There are global crises in teaching and learning in Anatomy which is attributed to less time being allocated to the subject, decreased resources and decreased opportunities to dissect cadavers. This is also evident from vast increase in claims associated with the lack of anatomical knowledge.[11]

There is also gradual change in learning resources utilised to teach or learn anatomy.[13] Conventional learning resources included cadavers, drawing and pictures as in atlas, dry skeleton and bones, prosected body parts, models, plastinated specimens and radiographs. Bones are essential learning resource material in anatomy. In India each first year medical student is firmly advised to procure a skeleton for personal study. The abrupt shortage for bonesets partly stems from recent spurring of new medical colleges and partly because of shortage of cadavers at medical colleges in India.[14]

Bones are essential to inculcate interest regarding the field of osteology in the minds of the students. Study of bones, its general structure, morphology and attachments are an integral part of myology. This helps in the formation of concepts of relations. Moreover study of bones is also required for forensic anthropology.

In present study 98.9% participants feel that bones are essential for learning Anatomy. In concurrence to global sentiments, 96% participant faculties of the current study have ratified the fact that limited resources in terms of bones have the detrimental outcome on understanding Anatomy. (Table 1).

In current study 15% students were bringing bones to classes (Table 1). Bharti et al.[7] reported that 86.3% students have used bones while studying the anatomy. Bhat et al.[13] in her study found that 50.7 % of the students owned the complete half boneset.

In the advent of shortage of real bones use of artificial bones is being seen as an alternative. In current study no faculty have observed the students using the artificial bonesets. Bharti et al.[7] in her study reported that 4.1% students are using artificial bones and Patil et al.[3] noted this proportion to be 14.66% (22/150 students). Use of plastic bone emerged for some time that did not particularly went good with students as well as medical teachers. Patil et al.[3] observed that 36.6% students saying that artificial bones are not good enough for learning. Many companies came up with plastic or fabricated bones but almost all of them were of ornamental use or very costly. They lack the quality in size, shape and surface features. Moreover they lacked variations and anomalies.[13]

Bones are essential learning resource material while learning anatomy. Commonest difficulty faced by students was the availability of bones. In present study 71.67% students reported that they don't know the source to purchase the bonesets. Similar types of findings were also reported by Bhat et al.[13] and Patil et al.[3] This is the guanine problem faced by students. Even as a faculty we are finding it difficult to procure a bone set. Whatever the bones students are using now they are percolating through generations from senior to junior batch and not in a very good condition.[13] Earlier we had a definite source of bone sets either an attendant from

dissection hall or some agent of them. These were illegal sources but still we were getting bone. These days due to strict legal restrictions, those sources are also dried up.[7]

It can also be seen from the current study that 16.67% of students find it very costly to purchase boneset. Cost concerns of bonesets were also reported in similar manner by previous studies.[3,7,13] Other rationales put forth by students were no compulsion (6.67%) and available from the department (5.83%) (Table 2)

Teachers of anatomy are the first to whom the students contact for difficulties in getting the bonesets. As a teacher it becomes a moral responsibility also to guide them to proper source. When faculties' awareness for the sources of bonesets was tested, most frequent responses were Private medical book shop (30%) and senior students (28.33%). Only one respondent had named the store from where real boneset can be purchased (Table 3). All the conventional sources of bonesets mentioned in figure 4 (Sr. No. 1-5) are illegal and are depleting very fast. This might be the reason for less availability of bonesets.

Legal sources of bonesets for academic purpose for medical students in India are question of further research and needs to be explored. [13] Further, most of us are firm on not curtailing the role of osteology in teaching as well as in summative examinations of Anatomy (Table 1). In view of the present scenario the participating faculties were asked for recommendations for improving the situation of inadequate supply of bonesets or any change in undergraduate curriculum. Setting up a departmental bone bank for students (54.17%) and Medical Council of India regulations (30.83%) were the commonest suggestions. (Figure 5). In India it is illegal to transport the human remains since 1985. Therefore procuring bonesets for personal use for students is difficult. Supply through medical colleges can be the ideal scenario.[13] Some of us have suggested use of plastic bone (6.67%) but these bones lack features and are of no use for teaching. Virtual reality software applications (5%) can be tried but they will need proper technological support in every medical college. Further physical perception of bone is not possible in such applications (Table 4).

CONCLUSION

The result of the current study indicated that bones are an important learning resource material in teaching and learning anatomy. Currently very few sources are available for real bones. An effort should be made to create legal sources of real bones for medical students for their personal academic use. Computer software application can be used as adjuvant.

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