



Medical Students' Perspectives on the Utility of a Bone Library in learning Anatomy: A Cross-Sectional Study

Dr. Shilpa Gosavi

Professor and Head, Department of Anatomy, Bharati Vidyapeeth Deemed To Be University Medical College, Pune, India

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ABSTRACT:

Introduction: As the basis for anatomy and Orthopedics, the study of real human bones is essential for medical education. However, access can be difficult for undergraduate medical and paramedical students due to limited availability and high costs. To give students access to real bone specimens for study, Department of Anatomy at a Medical College, Pune has set up a special facility known as a Bone Library.

Objectives: The purpose of this study is to assess how students evaluate the Bone Library, taking into account its challenges, accessibility, and usefulness.

Methods: 230 first-year MBBS and Physiotherapy students who frequently use the Bone Library participated in a cross-sectional, quantitative study. To evaluate usage patterns, perceptions, and accessibility, a pre-validated, structured online survey containing multiple-choice, open-ended, and Likert scale questions was used. SPSS version 29 was used for the descriptive statistical analysis of the data.

Results 96.5% students found the Bone Library useful for learning anatomy and 96.1% appreciated the quality of available specimens. 86% of students found it easily accessible, though they provided suggestions for further increasing the time and the number of bones.

Conclusions: The Bone Library is a valuable resource for medical students. It enhances anatomical education by providing access to real bone specimens.

1. Introduction

Knowledge of Anatomy is essential for both clinical education and future medical practice. In the era of hybrid learning its essential to use the most effective teaching resources and methods in order to achieve the expected learning outcome for the future doctors.^[1] The study of real human bones is essential for medical education, forming the foundation of orthopaedics and anatomy, giving information about structural integrity, muscle attachments, and pathological variations.^[2]

However, it is hard for undergraduate medical and paramedical students to get to real bones because of limited availability of real bones and high costs. Cadaveric dissection and physical specimens have been the main ways to teach anatomy for a long time, but lack of resources and ethical issues resulted in novel techniques like digital simulations and 3D models.^[3,4] Even with these advances, touching real human bones continue to be the best way to learn spatial awareness and tactile skills.^[5,6]

Through a robust "Body Donation program" since 1989, Department of Anatomy at Bharati Vidyapeeth DU Medical College, Pune, India, has established a unique facility, a Bone Library, to provide students with real bone specimens for study during working hours, encouraging self-directed learning.

2. Objectives

This study aims to evaluate students' perceptions of the Bone Library, including its usefulness, accessibility, and challenges.

3. Methods

After ethical committee approval, a pre-validated, structured online survey, including a Likert scale, multiple-choice, and open-ended questions, was administered to assess usage patterns, perceptions, and accessibility^[1]. Data was descriptive and statistical analysis was done using SPSS version 29.



This cross-sectional, quantitative study was conducted at Bharati Vidyapeeth DU Medical College, Pune, India, following approval from the Institutional Ethics Committee (BVDUMC/IEC/62/25-26, dated 28-02-2025). The study population comprised 230 first-year MBBS and Physiotherapy students who regularly use the bone library for learning osteology.

On the basis of earlier studies, a pre-validated, structured online survey was developed [1,8]. It comprised demographic questions, multiple-choice questions to identify problems and usage patterns, open-ended questions for suggestions, and Likert-scale questions (e.g., a 5-point scale from "strongly disagree" to "strongly agree") for assessing perceived usefulness.

Data collection occurred via Microsoft Forms. Participation was voluntary and anonymous. Descriptive statistics (frequencies, percentages) were analyzed using SPSS version 29.0. Thematic analysis was applied to open-ended responses.

4. Results

One hundred and eighty-six out of the two hundred and thirty students who were invited responded, yielding an 80.9% response rate. out of the respondents, 62.2% were MBBS students and 37.8% were first-year Physiotherapy students. The majority (78.5%) said they used the bone library at least twice a week. When the purpose of using the Bone library was explored, majority students (69.54%) mentioned the reason as they don't have to carry bones everyday for tutorial and self-study, 49.42% use it to study during free time in college, 37.36% said that they do not have bone set with them, while remaining responses were regarding convenience, in case of missing bones from their bone set etc. (Fig. 1)

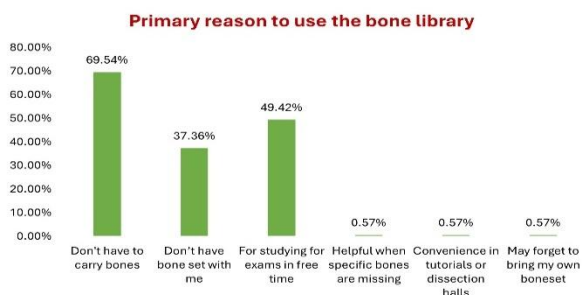


Fig. 1: Chart showing Primary reason to use the Bone library

A significant majority (96.5%) agreed or strongly agreed that the bone library was helpful for learning Anatomy. Benefits in understanding anatomical variations (76.3%) and visualising bone landmarks (89.2%), were mainly highlighted by the students. 68.3% of respondents gave accessibility a positive rating, while 31.7% pointed out a few drawbacks.

Students pointed out the problems included insufficient bone specimens (55.2%), restricted availability hours (50.8%), and suboptimal bone condition (12.0%). Other issues like lack of assistance from staff (3.2%) and lack of certain bones (0.55%), were less common.

In the open-ended question section, students mainly suggested to increase the number of specimens (56.37%), extend library hours (37.07%) and better maintenance (19.10%) of the specimen. Better labelling and organization (11.1%), more assistance from staff (2.86%) too was mentioned by the students. (Fig. 2)



Fig. 2: Chart showing suggestions for improvement of the Bone library

5. Discussion

The results of the present study demonstrated that the bone library is a useful learning resource, but having certain areas for potential improvement. Results showed that 96.5% of students preferred the use of the bone library in the learning of anatomy, which indicated that real bone specimens increase experiential learning in osteology. And as compared to digital resources these bones facilitate understanding of three-dimensional structures. This finding was consistent with a study of undergraduate students in which 89.9% of participants found real human bones very useful while identifying various bony features. [8] Similarly, hands-on tools are appreciated in countries with limited resource such as the Gulf Cooperation Council countries due to cadaver shortages. [2,5,7]



In a similar manner, Abdullah et al noted that 72.8% of students had good knowledge of gross anatomy after using skeletal models. They also have mentioned that subject knowledge could be further improved by integrating physical specimens with newer technologies such as virtual reality (VR) simulations or 3D-printed fractures. [1] In the present study students have shown high acceptability which suggests that the library has contributed to foundational knowledge and may have helped them to fill in the blanks left by purely virtual courses during a pandemic such as COVID-19. [9] Some of the challenges mentioned by the students, such as lack of specimens (55.2%) and limited hours (50.8%), are indicative of larger challenges in anatomy education. Previous studies also report specimen deterioration and limited access caused by hours restrictions. [5,12] A few students have reported poor condition (12.0%) of bones which may also indicate that maintenance is required due to broken or brittle bones that may limit student participation. [5]

These barriers are addressed by student suggestions for a greater number of bone specimen and extended access which will create a more inclusive learning environment. Along with this digitalization of specimens complementing physical access will reduce overcrowding [10,13]. These kinds of interventions will need to incorporate cost-effective procurement methods such as in-house bone processing from donated cadavers to sustain library resources [5].

The limitations of our study include a single institution study and the use of self-reported data, which may introduce bias. Longitudinal studies comparing bone library users with non-users would confirm long-term effects on academic performance.

The Bone Library is a valuable resource for medical students. It enhances anatomical education by providing access to real bone specimens. Student feedback will help refine and improve the facility available in the department, ensuring better support for medical learning.

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The authors sincerely thank those who donated their bodies to science so that anatomical research could be performed. Results from such research can potentially increase mankind's overall knowledge which can then improve patient care. Therefore, these donors and their families deserve our highest gratitude. [1]

Conflict of Interest

None declared.

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