

# A Survey on the Role and the Status of Cadavers in Medical Education: An Indian Scenario

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## ABSTRACT

**Introduction:** Cadavers are very much essential for medical students to learn the anatomy, especially with respect to its relationships. It has also gained scope into other uses in the form of workshops and training for postgraduates in the field of the surgical sciences. In order to know the status and the role of cadavers, a survey was undertaken in randomly selected medical and dental colleges.

**Methods:** A prevalidated questionnaire was sent by post to the medical and the dental colleges regarding the status of the cadavers, the courses which were offered, the presence of voluntary body donation programs, their registrations, the concept of organ donation, its practices and the mode of disposal of the cadavers. The data which was thus collected was statistically analyzed by various factors, by using univariate statistical analysis.

**Results:** The number of colleges which responded to the questionnaire were 57.3% (n=96). It was noted that 63.8% had just barely sufficient numbers of cadavers for the purpose of dissection during the 1st year of the anatomy course. The ideal student cadaver ratio has been referred to as 10:1, whereas the existing average ratio was 20:1. Only 49% of the institutions had an ideal student cadaver ratio. A voluntary body donation program was observed in 70.9% of the institutions. These institutions were aware of organ donations, mainly in the form of eye donations.

**Conclusion:** This study revealed poor conditions for the learning process. The cadavers act as the instruments of learning as well as the donors of life in the form of organ donations. If they are propagated and implemented in the right way, voluntary body donations can be a good source of cadavers.

**Key Words:** Cadavers, Anatomy, Voluntary body donations

## INTRODUCTION

A strong basic science foundation becomes the most essential for the training of effective and competitive medical professionals. A thorough knowledge on the human anatomy can be gained only by exploring the real human body. But the provision of human cadavers for the purpose of study alone is a scarcity.

Human cadavers are very much needed to teach anatomy and in the initial period, medical institutions may have tried all methods to procure bodies [1]. Many medical schools had encouraged illegal means such as robbery murders and unearthing fresh dead bodies to address the issue of the scarcity of cadavers in the past. In order to avoid this, certain regulations were made in the name of the Anatomy Act [1].

Initially, the Anatomy Act was proposed and drafted. It lays down the conditions and the pre-requisites for utilizing the unclaimed bodies for the purpose of dissection [2]. This act authorizes the medical colleges which are under the government and other private medical colleges to receive the unclaimed bodies which are in police custody for the purpose of an anatomical examination and dissection and other similar purposes [3, 4].

The Mysore Anatomy Act was later modified as the Karnataka Anatomy Act in 1998. As per this act, any unclaimed body can be handed over to an approved institution which is in the gazette by an authorized officer under whose custody the unclaimed body lies. The purpose of handing over the body would be for anatomy dissection or for similar medical education uses [4, 5]. Many other states also have this Anatomy Act which serves the same purpose

as of the one which has been mentioned above. But there is no legislation which has been made by the central government regarding this. This source of the unclaimed bodies may not be sufficient to match the need of the uprising number of medical colleges and the number of students which have to be taught in each college. As a result, there is a dearth of bodies which are available for study purposes for the medical students. In order to overcome this, there was a revolution that came in as a boon to the field of medical education in the form of voluntary body donation.

Voluntary Body Donation is a programme wherein the general population can will their bodies to serve the purpose of medical education and scientific studies. Here, the public is providing the most important resource which is needed for innovation in the medical practice.

With all these uses culminating into the service of humanity, the cadavers which are obtained by body donations and unclaimed bodies are precious gifts to humankind. The review of the literature did not reveal any kind of information regarding the status of the cadavers. In this aspect of developing voluntary body donation organizations, a survey was conducted from the medical and the dental colleges of the country.

## MATERIAL AND METHODS

A list of the entire medical and the dental colleges in the country was extracted from the Medical Council of India's website [6]. All the institutions were arranged in an alphabetical order. From the list, by employing the simple random sampling procedure, 96 institutions were randomly selected.

## The Rationale for the Sample Size

The pilot study which was carried out by the first author to find out the status of the student cadaver ratio revealed that nearly 49% of the colleges had a 10:1 student-cadaver ratio. Based on this, a sample size for the present study was estimated with a precision of  $\pm 10$  and a desired confidence level of 95%. The estimated sample size worked out to be 96.

A pre-validated questionnaire was prepared regarding the status of the cadavers, the courses which were offered, the presence of voluntary body donation programs, their registrations, the concept of organ donation, its practices and the mode of disposal of the cadavers. The questionnaire was sent to 96 medical and dental colleges in India by post with a preamble which addressed the purpose of doing the survey. The funding for the postal charges and the stationery was provided by the institution. Emails were also sent to the heads of the institutions to avoid a postal delay and misplacements. The questionnaire data which was thus received was collected and thoroughly checked for all the information and any missing information was collected by telephonic communication. Further, the data was entered in an EXCEL file. The data was statistically analyzed through frequency distribution tables and the appropriate percentage was computed. 95% confidence intervals (95% CI) were estimated wherever necessary. The ethical guidelines were adhered to. The confidentiality of the information which was given by the colleges has been maintained.

## RESULTS

Out of the 96 medical (M) and dental (D) colleges, only 55 colleges (46-M, 9-D) answered the questionnaire (57.3%). Among all the states, Maharashtra gave the highest number of responses. Since the responses were poor, another effort was made to send the soft copy of the questionnaire by e-mails to the heads of the institutions. The results of the questionnaire have been tabulated as [Table/Fig-1 to 5]. Based on the responses, the following inferences were made.

The questionnaire was responded to by 57.3% of the colleges (n=96). Out of these colleges, 36.6% had 2 courses and 29.1% had all the 3 courses: medical, dental and physiotherapy courses [Table/Fig-1]. 63.79% had just barely sufficient cadavers for the purpose of dissection during the 1st year of the anatomy course. The ideal student cadaver ratio has been referred to as 10:1, whereas the existing average ratio was 20:1 (it ranged from 8:1 to 50:1). Only 49% of the institutions had an ideal student cadaver ratio. Most of the colleges had a mixture of unclaimed and donated

Sl. No.	No. of courses	Number	Percentage
1	Single course	18	32.7%
2	Two courses	20	36.4%
3	Three course	16	29.1%

[Table/Fig-1]: Showing the number of courses in the Institutions

Source of cadavers	Donated bodies A	Unclaimed B	Bought from other colleges C	Unclaimed and bought B&C	Donated and bought A&C	Donated and Unclaimed A&B	A+B+C
No. of institutions	8	2	8	3	7	23	4
Percentage	14.5%	3.6%	14.5%	5.5%	12.7%	41.8%	7.3%

[Table/Fig-2]: Showing spectrum of source of cadavers

bodies (41.81%) [Table/Fig-2]. Voluntary body donation programs were observed in 70.9% of the institutions [Table/Fig-3]. The colleges which had voluntary body donations had them in the early stages. The institutions with 300 and above registrations were barely 5.12%. Most of the institutions had less than 100 registrations [Table/Fig- 4]. The institutions were aware of organ donations, but only a few were practicing it, mainly in the form of eye donations [Table/Fig-5].

## DISCUSSION

### The Requirement of Cadavers

Cadavers are needed for dissection through which the medical students study the human body and the relationship of the structures with each other. Apart from this, the cadavers may be used to practice surgical procedures and endoscopy. Cadaver workshops are conducted by the institutes which teach the surgical sciences, to train postgraduates. A cadaver workshop was conducted to teach bedside procedures and its effect was evaluated. It was seen that the workshop was effective for the students in acquiring knowledge, skills and attitude towards the bedside procedures [7]. In this way, cadavers can be utilized in many ways for the development of the proficiency of the skills in medical science.

The colleges with all the courses (medical, dental and physiotherapy) were 29.1%, two courses were 36.4% and one course were 32.7%. The cadavers are essential for the medical, dental and the physiotherapy courses [TableFig-1]. 63.8% had just barely sufficient cadavers for the purpose of dissection during the 1st year of the anatomy course.

	Presence of VBD program	Conducting awareness programs	Hospital facilities for the donors
No. of Institutions	39	31	16
Percentage	70.9%	79.5%	41.03%

[Table/Fig-3]: Showing the scenario of Voluntary Body Donation

No. of Registrations	0-100	101-200	201-300	301-600	>601
No. of Colleges	29	3	2	2	3
Percentage	74.4%	7.7%	5.1%	5.1%	7.7%

[Table/Fig-4]: Range of voluntary body registrations in medical institutions per year

	Awareness regarding Organ Donation	Presence of organ Donation	Type of Organ Donation commonly done	Not Responded
No. of Institutions	37	17	Eye donation	2
Percentage	67.3%	45.9%	-	3.6%

[Table/Fig-5]: Cadaver Organ Donation

As per the consensus which was obtained, to the best of our knowledge, the review of literature has revealed that there was no information regarding the studies which had been carried out in this direction. As such, the findings of the present study could not be compared with any of the published findings.

The ideal student cadaver ratio was referred to as 10:1 (it ranged has been from 5:1 to 20:1), whereas the existing average ratio was 20:1 (it ranged from 8:1 to 50:1). An ideal student cadaver ratio was seen in 49% of the institutions. When they were asked about the necessity of cadaver dissections, the institutions unanimously opined positively for cadaver dissections. They responded that cadaveric dissections could not be replaced by any of the virtual methods. The virtual methods could only be of assistance to the cadaveric dissections; they could not replace them.

From the above said data, it was quite obvious that there was a dearth of cadavers. The existing cadavers are no match to the need of cadavers. And the paradox is that though there are many pro-technology assisted methods of visualizing the human body, experts still feel that the cadaver dissection method of learning is the gold standard. So, definitely there is an enormous need of cadavers. A-V aids and virtual dissection methods can never replace the conventional dissection method.

### Sources of the Cadavers

Initially, the major source of the cadavers for the purpose of medical education was mainly unclaimed bodies, as per the Anatomy Act. The Anatomy Act mentions that the unclaimed bodies which are in police custody should be utilized for the purpose of dissections. But the rules being stringent, the rights being transferred to the government run medical colleges and the rising number of the private colleges, there is a shortage of bodies. As a result, the new concept of voluntary body donations came into existence, wherein the general population would pledge their bodies for medical education after their demise.

A 3-year analysis of the source of cadavers for medical education by the University of Ibadan revealed that unclaimed bodies and accident victims were the main sources [8].

In the recent years in India, cadavers are procured mainly by three ways, obtaining unclaimed bodies, buying them and from body donations. From the survey results, it was revealed that 41.81% of the institutions had a combination of donated and unclaimed bodies [Table/Fig-2]. This was followed by donated bodies and buying bodies from other institutions. Certain states have restricted the right to the unclaimed bodies to the government medical colleges and their further distribution is made to other institutions on payment. All these suggest that donated bodies are a potential source of bodies and that if they are propagated in the right way, they may address the issue of the scarcity of bodies.

### The Concept of Body Donation

The practice of body donation has been in existence from decade, but it has been in limelight only from the past few years. As of now, it is still in the budding stage. Data analysis has revealed that 70.90% institutions had voluntary body donations [Table/Fig-3]. But when the details were asked regarding the number of registrations per year and the male female ratio, it was revealed that the registrations ranged from just five to 1551, with an average of 80-100 registrations [Table/Fig-4]. Most of the voluntary body organizations have been held at an institutional level, with none at the district or the state level. The male: female ratio has been

found to be 1.78. All these suggest that the concept of voluntary body donation exists; awareness through conducting programs at the media level and giving talks to different organizations would assist and favor the increase in the number of registrations. Many sections of the population are still not aware of this concept, while some are aware and they are restricted by traditional concepts. A continued motivation would help them in bringing them out of their conservative nutshell.

There have been voluntary body donation organizations at the institutional level, but none at the district, state or the national level. If there is body donation organization at the district level, a concept which is called body pooling can be done. If all the medical, dental and the physiotherapy colleges become members and open such an organization, then the whole process of the registration, receiving of the bodies and the storage of the same can be done under one roof. Through this, every college has a fair chance to get the required number of bodies as per the MCI standards. A cadaver lab can be constituted, where the surgical and the endoscopy trainees can register with nominal fees and practice under supervision. As a result, the students at the undergraduate and the postgraduate levels will be facilitated in the development of the proficiency of cognitive and psychomotor skills.

### Other Uses of the Cadaver-Organ Donation

Organ donation is defined as the donation of organs after death to the needy. This is also called as cadaver organ donation, as the donation happens after brain death. Many organs like eyes, kidneys, liver, pancreas, heart valves, skin and intestines can be donated. But the awareness is such that many people are ignorant about organ donation. When medical institutions were surveyed, it was seen that 67.27% of them were aware of the concept of organ donation.

When the existence of organ donation programs in the institutions was explored, only 45.94% of the institutions who were aware of organ donations were found to be practicing them, that too in the form of eye donations [Table/Fig-5]. Donations with respect to the other organs were almost not done. This could be because of a lack of technical knowledge regarding the concept of organ donations. The necessary infrastructure which was needed may not have been existent in the institutions.

With the number of people who needed organs, who were on the waiting list increasing year by year, there is a need to raise the issue of organ donation at the regulatory body levels, so that the implementation occurred in all the capable institutions. The need of organs has increased over the number of the potential organ donors, which could be because of a decrease in the potential organ donors. This could be because of an increase in the safety measures of the traffic rules, resulting in a decrease in the road traffic accidents that were usually prone to the brain dead criteria.

This scenario indicates that more interest and regulations need to be sketched out to increase the number of potential donors. One main reason for the decreased consent to the organ donation by the potential donors is that the decision is made by the relatives of the donors. The relatives being in an emotional shock of losing their dear ones do not have clarity of mind and also are not aware of the potential donor's last wishes. They are in a dilemma whether the dear ones wanted to donate organs or not. As a result, the rejection rate for organ donation is on the raise [9].

In order to avoid such circumstances of losing potential donors, countries like the United States, are now proposing a legislation

of mandatory choice and the Uniform Anatomical Gift Act, which states that the control or the decision to donate organs can be made by the donors than the donor's relatives. Even after the establishment of the act, the relatives still try to meddle with the decision after the death of the potential donors.

This uses the mandatory choice which is asked in the form of a question in certain government application forms such as the driver license application, etc. This method gives an individualistic approach to the decision of organ donation after death, which needs to be honoured [10].

This would go with the rule of the Council on Ethical and Judicial Affairs of the American Medical Association, which states that "the individual's interest in controlling the disposition of his or her own body and property after death suggests that it is ethically preferable for the individual, rather than the family, to decide to donate organs". Strategies for cadaveric organ procurement [11].

This is because the public's willingness to donate is high but it is not happening to the same extent in reality at the time of death, the reason being that which has already been mentioned above.

All this can be done by increasing the awareness, not only of the public but also of the professionals, especially the health care professionals in terms of identifying a potential organ donor, approaching the relatives and turning the legislation of mandatory choice into action. With these methods being implemented, definitely the difference in the ratio of the organ receivers to the organ donation will be nullified.

### Body Disposal Methods

There has been a lot of discussion on the mode of disposal of the remains of the bodies after their dissections. When an opinion was asked, incineration was suggested as the ideal method. In practicality, incineration was implemented in 45.45% institutions, deep burial in 30.90% and a mixture of both in a few of the institutions. The reason behind the deep burial was that the bony skeletons could be retrieved after the complete decomposition of the bodies. Thus, the acquired bones could be used for the study of osteology as well as for research. Experts have mentioned that such bones tend to become porous.

Safe Management of Health Care Waste-Information and Learning Units have prescribed the rules for the disposal of biomedical waste under the BIOMEDICAL WASTE (Management and Handling) RULES, 1998, Ministry of Forests and Environments, Government of India, July 27, 1998. They have been stated under the Schedules I and II (under rules 5 and 6). These mention that incineration and deep burial are the treatment and the disposal options for human anatomical waste. The human anatomical waste includes cadavers and the waste which remains after dissection and research [12].

But the paradox is that a clause has been mentioned that before the incineration, no chemical treatment should be done. But the human cadavers of the Department of Anatomy are pretreated with formalin and other chemicals. In the standards of incineration, it has been specifically stated that all wastes which have to be incinerated should not be treated with chlorinated disinfectants. This might indicate that formalin might not have a toxic effect of releasing dioxanes and furones into the waste gas which is released by the secondary chamber of incineration.

Deep burial can be an option in towns where the population is less than 5 lakh. The standards of deep burial indicate that it should be done in a trench which is 2 meters deep. The trench should be only half filled with waste and covered within 50cm on the surface with lime before the rest of the pit is covered with soil [12].

### CONCLUSION

From the above discussion, it is obvious that cadavers have a major role to play, not only as the instruments of learning, but also in the life giving concept of organ donation. There is a need for creating an increased awareness on voluntary body donation. The colleges which have this program have only few registrations. By developing a VBD programme in each institute, the dearth of the cadavers can be solved to a major extent. Public campaigns and the use of media for the creation of the awareness will definitely benefit the institutions. A concept of cadaver pooling can be considered at the district/state level and at the national level, so that the cadaver shortage problems may be solved. The need of cadavers is essential not only for the purpose of dissection, but also for research and the training of the students with respect to surgical and bedside procedures. For organ donation, awareness and the implementation of rules such as a mandated choice can be used effectively, if the decision is taken to make legislation at the central government level.

### ACKNOWLEDGEMENT

I thank the institution and Dr S Kumar –President-Medical Education, sincerely for the encouragement and the financial support which was provided, which was very much essential for collecting the required data for this study. I also thank Dr. N.S. Murthy, Director, Research, M.S. Ramaiah Medical College, Bangalore, for his valuable guidance and suggestions while carrying out this project.

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**FINANCIAL OR OTHER COMPETING INTERESTS:**

None.

Date of Submission: **May 04, 2012**

Date of Peer Review: **Jun 07, 2012**

Date of Acceptance: **Jul 28, 2012**

Date of Publishing: **Sep 30, 2012**