

## **Assessment of knowledge and attitude towards alternative to animal experimentation in research and education among interns and post graduate medical students in a teaching hospital, Tamilnadu, India**

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### **ABSTRACT**

**Background:** Use of animals for various purposes like food, transportation, pets, sports, recreation and companionship is as old as the human beings itself. Animals also serve as a tool for education, research, medical procedures, toxicological screening, for several decades. Since pain, distress and death of animals occur commonly during scientific experiments, various guidelines have been proposed and posed many restrictions over the experimental use of animals. To assess the knowledge and attitude towards alternative to animal experimentation in research and education among interns and postgraduate medical students in a teaching hospital.

**Methods:** A cross sectional study was carried out by self-administered questionnaire among interns (92) and postgraduate medical students (53) in a teaching hospital in July 2018. The data was analysed by descriptive statistics and expressed in percentage.

**Results:** Among 145 participants, interns 92 (63.4%), postgraduates 53 (36.6%). 70.2% interns and 68.8% postgraduates had adequate knowledge about alternative animal experimentation and 67% and 67.1% of interns and postgraduates had knowledge about animal experiments. 69.4% interns and 68.8% postgraduates had positive attitude towards alternative animal experimentation. 83.8% interns and 70.9% postgraduates were agreed to have various barriers to alternative animal experimentation.

**Conclusions:** Majority of interns and postgraduates have appreciable knowledge of alternative to animal experimentation, but their attitude is scarce. It is imperative to incorporate continuous training through workshops for budding medical professionals to provide innovative scientific knowledge in research and education towards alternative to animal experimentation.

**Keywords:** Alternative animal experimentation, Attitude Interns, Knowledge, Postgraduates

### **INTRODUCTION**

Use of animals for various purposes like food, transportation, pets, sports, and companionship is as old as the human beings itself. Animals like mice, rats, rabbits, zebra fish, birds, guinea pigs, amphibians, dogs, cats and monkeys serve as a tool for medical procedures, toxicological screening and researches, and to obtain

vaccines, antibiotics.<sup>1-5</sup> The number of animals used in research has gone up with the advancement in medical technology. The animals surviving the clinical testing are euthanized at the end of an experiment to avoid the later pain and distress.<sup>6</sup> Since the animals have the rights against pain and distress, their use for experimentation is unethical.<sup>7</sup> In 1876, an act for prevention of cruelty to animal was formed in the UK.<sup>8</sup> It came into existence in

India, France and USA in 1960, 1963 and 1966, respectively.

The organizations like ICH (International Conference on Harmonization of technical requirements for registration of pharmaceuticals for human use), CPCSEA (Committee for Purpose of Control and Supervision on Experiments on Animal), NIH (National Institute of Health), and OECD (Organization for Economic Cooperation and Development) provide the guidelines for animal house keeping, transportation, and for their use in scientific experiments. The concept of replacement of animals was first discussed in 1957 by Charles Hume and William Russell.<sup>8</sup>

Animal replacement is defined as, 'any scientific method employing non-sentient material which may replace use of conscious living vertebrates in animal experimentation'. A strategy of 3 Rs - reduction, refinement and replacement of laboratory use of animals is being applied to make the animal experiments more humanly.<sup>9</sup> This approach motivates the use of minimum number of animals i.e. 'reduction'.<sup>10</sup>

The use of animals must be 'refined' carefully in such a way that pain and distress they experience during the experiment should be minimized.<sup>11,12</sup> Higher animals should be 'replaced' with alternative methodologies and lower organisms.<sup>13,14</sup> Overall, replacement substantially reduces the use of animals in various process. The 4th R of Research implies addition of 'responsibility' (introduced in 1995) to the original three R's of Russell and Burch, has grown into a new era of performance-based outcomes, in reasonable use of laboratory animals.

Alternative to animal testing procedures provide an alternative means for drug formulation and chemical testing. Advantages are, time efficiency, less no of animals and manpower, and cost effectiveness. In vitro models, cell cultures, imaging techniques.<sup>15</sup> Computer models and chromatography techniques are used to select the potential drug candidates and calculation of dosage.<sup>16,17</sup>

With the help of computer aided drug designing (CADD) software programs we can tailor a new drug for the specific binding site and finally animal testing is done to obtain confirmatory results.<sup>18</sup> Structure Activity Relationship (SARs) computer programs predicts biological activity of a drug candidate based on chemical moieties attached to the parent compound. Quantitative Structure Activity Relationship (QSAR) is the mathematical description of physicochemical properties of a drug and its biological activity.<sup>19</sup>

Computer models over conventional animal models are the speed and relatively inexpensive procedures.<sup>20,21</sup> It is nowadays a worldwide trend to reevaluate the use of animals in education and research. In this changing scenario, replacing traditional animal study procedures

with alternate studies with proven educational efficacy will improve the quality of research.

Hence, this study is aimed to assess the knowledge and attitude towards alternative to animal experimentation in research and education among interns and postgraduate medical students in a teaching hospital.

## **METHODS**

This cross-sectional study was conducted among 145 participants, interns (n=92) and postgraduate medical students (n= 53) in the Department of Pharmacology, Karpaga Vinayaga institute of Medical Sciences and Research Centre, Maduranthagam, Tamilnadu, India in July 2018. The study was conducted after obtaining the permission from the Institutional ethical committee. Objectives and procedure of the study was explained to the participants and those who were willing to fill the informed consent were included in the study.

### ***Inclusion criteria***

Interns and Postgraduates in Karpaga Vinayaga Medical College.

### ***Exclusion criteria***

Interns and postgraduates those who are not willing to participate.

The questionnaire was subdivided into 3 categories in which the first part included the perceptions of interns and postgraduate students about animal studies and alternative methods. The second part included their attitude towards the same. Third part highlighted the important obstacles about practicing alternative animal experiments. All information which has been obtained from participants was managed with high level of confidentiality.

### ***Statistical analysis***

Data were analyzed and the mean and percentage of response were calculated. A  $p < 0.05$  value was considered statistically significant.

## **RESULTS**

### ***Characteristics of the medical student***

The characteristics of the interns and postgraduate medical students at Karpaga Vinayaga Institute of medical sciences and research centre is listed in Table 1 showing that interns 63.4% (n=92), post graduate medical students 36.6% (n=53).

Figure 1 Illustrates the characteristics of the interns and postgraduate medical students at Karpaga Vinayaga Institute of medical sciences and research centre showing

that interns 63.4% (n=92), post graduate medical students 36.6% (n=53) are participated in this study.

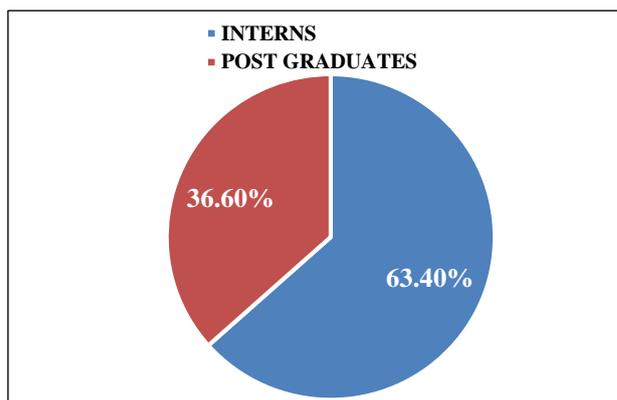
Figure 2 illustrate the % of interns and postgraduate medical students having knowledge about alternative to animal study procedures. 83% of postgraduates and 73.9% of intern are having knowledge that alternative to animal procedures are concerned with QSAR. 50.9% postgraduates and 65.2% interns are confident that this will help for self-assessment through MCQ. 64.1% of postgraduates and 63% of interns said that alternative studies are interesting, and 54.7% postgraduate and 62% interns said that is easy. 90.6% postgraduates and 87% interns are confident that alternative studies will be better for examination.

Figure 3 Illustrates the % of interns and postgraduate medical students having knowledge about animal study procedures. 75.5% of postgraduates and 58.7% of intern are having knowledge that animal procedures are concerned with 4Rs. 56.6% postgraduates and 60.9% interns expressed that animal studies has better understanding 52.8% of postgraduates and 73.9% of interns said that animal studies are time consuming and 56.6% postgraduate and 69.9% interns said that it is self-explanatory. 67.9% postgraduates and 54.4% interns expressed their views that animal studies are effectively

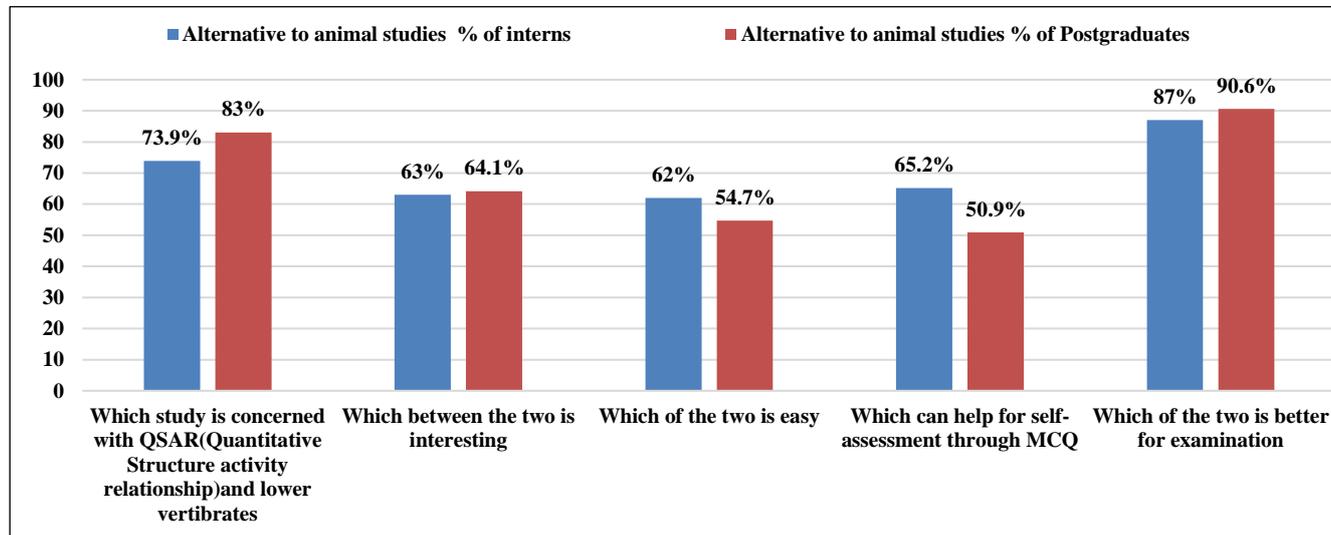
used in research. 90.6% postgraduates and 84.8% interns are confident that animal studies are concerned about ethics.

**Table 1: Characteristics of participants.**

Participants	No. of Participants	% of Participants
Interns	92	63.4
Post graduate students	53	36.6
Total	145	100



**Figure 1: Percentage.**



**Figure 2: Knowledge about alternative studies (% of interns and post graduate students).**

Figure 3 Illustrates the % of interns and postgraduate medical students having knowledge about animal study procedures. 75.5% of postgraduates and 58.7% of intern are having knowledge that animal procedures are concerned with 4Rs. 56.6% postgraduates and 60.9% interns expressed that animal studies has better understanding 52.8% of postgraduates and 73.9% of interns said that animal studies are time consuming and 56.6% postgraduate and 69.9% interns said that it is self-explanatory. 67.9% postgraduates and 54.4% interns expressed their views that animal studies are effectively

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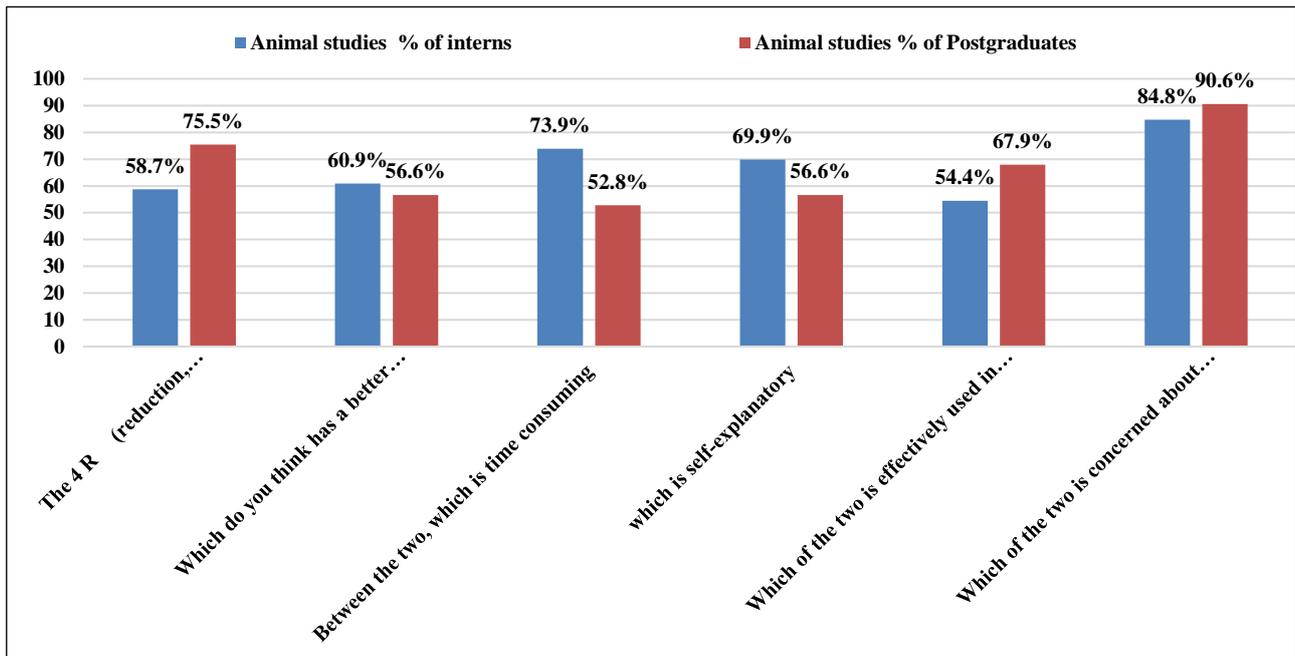


Figure 3: Knowledge about animal studies (% of interns and post graduate students).

Figure 4 Illustrates 69.6% interns and 68.8% postgraduates had positive attitude that alternative study improves communication skills and it promotes critical appraisal skills. They are having positive attitude that alternate studies secure better chance for postgraduate research. They said that alternate studies not tested in a scientific manner should be discouraged.

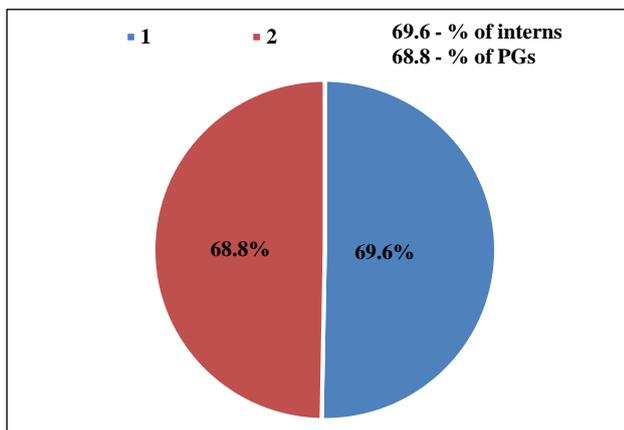


Figure 4: Percentage of interns and postgraduates having positive attitude.

Figure 5 Illustrates that 31.2% of postgraduates and 30.5% of interns have negative attitude that alternative study does not improve communication skills and it does not promote critical appraisal skills. They are having negative attitude that alternate studies do not secure better chance for postgraduate research. They said that alternate studies not tested in a scientific manner should not be discouraged.

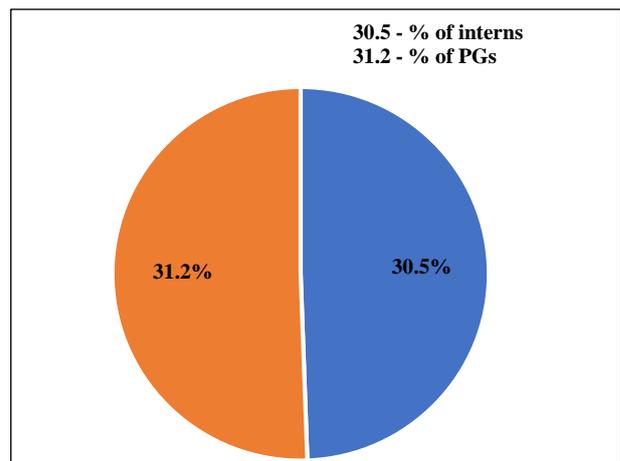
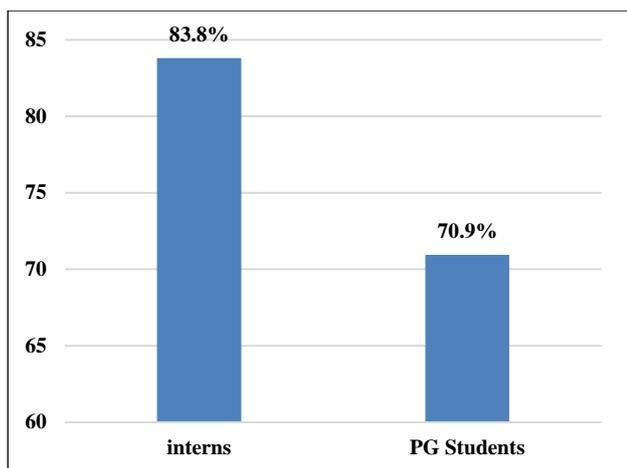


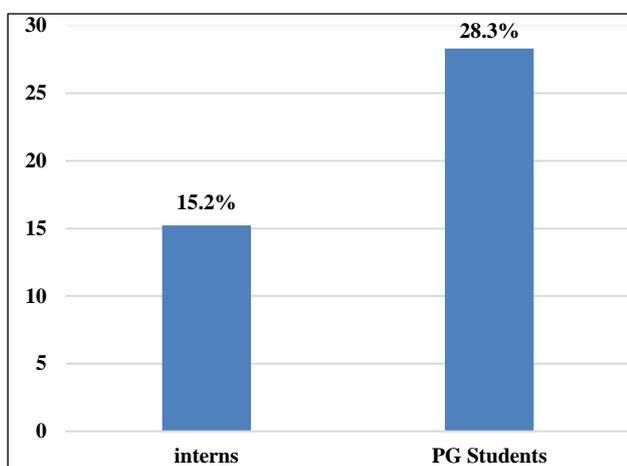
Figure 5: Percentage of interns and postgraduates having negative attitude.

Figure 6 Illustrates 83.8% interns and 70.9% postgraduates commented that lack of research training, lack of time, motivation, statistical support, mentorship, lack of workshop /CME and lack of scientific evidence and appropriate equipment are the perceived barriers to alternative to animal study procedures.

Figure 7 Illustrates that, 28.3% postgraduates and 15.2% interns are of opinion that lack of research training, lack of time, motivation, statistical support, mentorship, lack of workshop /CME and lack of scientific evidence and appropriate equipment are not considered to be the perceived barriers to alternative to animal study procedures.



**Figure 6: Perceived barriers to alternative animal studies - % of interns and postgraduates who said yes.**



**Figure 7: Perceived barriers to alternative animal studies - % of interns and postgraduates who said no.**

## DISCUSSION

The use of animals for preclinical studies and drug development is time consuming, and cause pain and distress to them. Animal ethics is an issue as important as human welfare. For the welfare of one species, others should not be sacrificed. So effective implementation of 3 Rs with the fourth R, that is their rehabilitation as an added measure for their care is the need of the day. Alternative procedures do help to reduce the number of animals in research and education. They are proposed to overcome the drawbacks associated with animal experiments and to avoid unethical procedures. If the alternative animal study procedures are implemented in an effective manner, it would definitely improve the quality of research. Thus medical professionals are expected to be aware of basic knowledge, advantages and disadvantages of alternative animal study procedures.

In a previous study done in 2016, 99% faculty members and 25% undergraduate medical students shared their

views that alternative studies has better understanding. 100% of faculties and medical UGs answered that alternative animal study procedure like computer assisted learning is easy and it will help in a better way for self-assessment through MCQ.<sup>22</sup> Moreover they also answered that it is time independent and self-explanatory. 94% of participants in both groups answered that alternative animal study procedure like computer assisted learning is better for examination.<sup>22</sup>

In a study done in Uttarakhand in 2018, 80% of students answered that they did not know about the treatment of animals. 57% of them considered that it is inhuman to use animals in research. 39% of the students considered them to be humane. 48% of them answered that animal experimentation bring benefit to mankind. 43% students gave their opinion about sensitisation with animal welfare.<sup>23</sup>

In another study ,88 % of participants agreed that alternative animal study procedure is an effective method of teaching and easy to remember. 93% participants favoured that alternative experiments can be observed repeatedly without animal loss. 88-90% of participants commented that prefixed doses, expensive method of teaching, lack of practical knowledge, lack of interaction with live animals, and lack of expertise to handle technical errors related to computers are the obstacles in alternate animal study procedures.<sup>2</sup>

In present study, It is encouraging that both groups had prior knowledge about animal study and alternative to animal experiment procedures. Though they consider that use of animals is important for learning despite the fact that they experienced discomfort when using them, both interns and postgraduate students strongly agree that animals should be replaced by alternative methods of teaching.

Majority of participants in both groups commented that alternative study improves communication and critical appraisal skills. They strongly emphasise that religious belief is a hindrance for animal study procedures and scientifically unproven alternative studies to be discouraged. Majority of postgraduates and interns agreed that lack of training, lack of time, motivation, statistical support, mentorship, lack of workshop and CME, lack of scientific evidence and equipment are the perceived barriers to alternative animal study procedures.

Regarding their answers to the questions, 60.9% of interns and 57% of postgraduates shared their views that animal studies has a better understanding. This is inferior on comparing with the previous study.<sup>24</sup> 70% of interns and 57% of postgraduates answered that animal study is self-explanatory and 65% interns and 51% postgraduates answered that alternative studies help for self-assessment through MCQ. This is also inferior to the previous study.<sup>22,24</sup> In present study only 87% interns and 91% postgraduates answered that alternative animal study

procedures are better for examination. This coincides with the Sharma D et al, study in which it is 94%.

In present study, 85% interns and 91% postgraduates answered that animal study is concerned with ethics. This is appreciable when comparing with a study done in 2018, where 57% of participants considered that it is inhuman to use animals in research and 43% students gave their opinion about sensitisation with animal welfare. 70% of interns and 69% of postgraduates are having positive attitudes towards alternative animal study procedures. This is inferior to previous study in which 88 % of participants have positive attitude that it is an effective method of teaching and easy to remember and 93% of them favoured that alternative experiments can be observed repeatedly without animal loss.<sup>24</sup>

In present study, 84% interns and 71% postgraduates considered lack of training, time, motivation, statistical support, workshop, CME, mentorship, scientific evidence and equipment are the perceived barriers to alternative animal study in research and education. This coincides with previous study in which 88-90% of participants said that prefixed doses, expensive method of teaching, lack of practical knowledge, lack of interaction with live animals, and lack of expertise to handle technical errors related to computers are the obstacles in alternate animal study procedures.<sup>24</sup>

In this study, it is noteworthy to observe that our interns and postgraduates have comprehensive knowledge about alternative animal study procedures, but their attitude towards alternative study procedures is scarce. More efforts need to be undertaken for effective implementation of alternative animal study procedures through continuous training programmes and workshops that would shape them to achieve innovative scientific skills in research and education. The limitation of our study was that the sample size was small, representing a single private medical institute which can be biased

## CONCLUSION

Majority of interns and postgraduates have appreciable knowledge about alternative animal study procedures, but their attitude towards the advantages, disadvantages of alternative animal study procedures in research and education is scarce. Hence it is imperative to incorporate continuous training through workshops and CME programmes for budding medical professionals to provide innovative scientific knowledge in research and education towards alternative animal study procedures.

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