Original Article

Cataract surgical training among residents in India: Results from a survey

Akshay Gopinathan Nair[*1,2,3,4], Deepak Mishra*[*5], Prabu A*[6]

Purpose: To assess the quantum of cataract surgical training opportunities for trainees enrolled in ophthalmology residency programs in India. **Methods:** An anonymous online survey was sent across to resident ophthalmologists across India through various social media platforms. The results were tabulated and analyzed. **Results:** A total of 740 resident ophthalmologists participated in the survey. In all, 40.1% (297/740) were independently performing cataract surgeries. Of those who were not performing independent cataract surgeries, 62.5% (277/443) were in the third year of residency. A significantly higher proportion of trainees who were not operating independent cataract surgeries were enrolled in MD/MS programs as compared with DNB courses (65.6% vs. 43.7%; $P < 0.0001$). Of those who were operating independent cases; 97.1% had exposure to manual small incision cataract surgery (MSICS), whereas only 14.1% performed phacoemulsification. It was noted that 31.3% of residents reported that on an average a trainee in their training program performed less than 100 independent cataract surgeries throughout the residency. Apart from cataract surgery, the most performed surgeries by residents were pterygium excision (85.3%), followed by enucleation/evisceration (68.1%). When it came to training aids, 47.2% (349/740) of the respondents reported no access to wet lab, animal/cadaver eyes, or surgical simulators for training. **Conclusion:** The amount of surgical exposure in terms of cataract surgery across residency programs in India is low with most of the ophthalmology residents who participated in this survey not operating cataracts independently; even in their final year of residency. Exposure to phacoemulsification in residency programs is very limited across the country. Although some programs do provide well-rounded surgical exposure to trainees, such centers are scarce; the stark variations in infrastructure, training opportunities, and surgical numbers warrant an overhaul in the structure and curriculum of residency programs in India.

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Ophthalmology residency involves imparting the following skills to trainees: basic examination techniques, diagnostic skills and procedures; interpretation of investigations, evidence-based treatment protocols, ocular pharmacotherapy; as well as basic and advanced surgical skills. Traditionally in residency, knowledge and skills have been imparted to trainees in a stepladder pattern: beginning with the anatomy and physiology of the eye along with learning basic examination techniques in the first year of training. Observing standard operating procedures in the operating room along with initial surgical steps are also components of the first year of residency. Subsequently, the second year is when surgical training begins in its earnest: with supervised surgical steps and eventual progression to independent surgeries. As expected, in the final year of residency, trainees are expected to perform surgical procedures independently—with a focus on cataract surgeries. In India, this training has traditionally been apprenticeship-based and the change to a more contemporary, well-rounded teaching model has been slow and patchy.[1] With each passing year, there are more ophthalmology residency seats available in India and more centers offering them. However, there is considerable amount of variation in the quality of residency programs across the country.[1-3] There have been repeated calls to standardize the ophthalmology curriculum and also to change the focus from a knowledge-based assessment to a skill-based assessment while exiting residency.[2,3]

Given that ophthalmology is a surgical branch, it is imperative that achieving surgical competency, especially for cataract surgery is necessary during residency training.

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However, a previously conducted survey of residency trainers in India showed that while there was near unanimity about the content of clinical skills training, nonmedical skills, and academics; there was a significant variation in the extent of surgical training that should be imparted to the residents.[4] Cataract surgery remains the most commonly performed elective surgery globally and in India, cataract continues to be responsible for 66.2% of blindness in people above 50.[5,6] Therefore surgical proficiency in cataract surgery is extremely crucial for a successful and well-rounded residency program. There have been many surveys conducted previously to assess the state of ophthalmic residency, especially surgical training in India. A survey conducted by the Academic and Research Committee of the All India Ophthalmology Society (AIOS) showed that residents performed a median of 55 independent manual small incision cataract surgeries (MSICS), the most commonly performed surgical procedure that Indian ophthalmology residents are trained in.[7] In comparison, in the United States, each resident performs an average of 180 procedures as the primary surgeon prior to graduation and assists in another 78 procedures.[8]

The first step in transformation is self-assessment and self-realization. Given the need for improving the state of surgical training in India, it is important to understand the ground realities from the residents' perspectives. With this background in mind, the survey was conceived and designed to assess the state of cataract surgical training and to ascertain the quantum of cataract surgeries that are performed by residents across all years of training in India.

Methods

An online survey (Google Forms) was circulated among Indian trainee ophthalmologists. An invitation to participate was circulated through multiple groups of ophthalmology trainees on social media platforms, namely, through WhatsApp and Telegram from 15th June 2022 to 22nd June 2022. The description accompanying the link clearly mentioned that the survey was intended only for those currently enrolled in residency training programs. The survey was open for a period of 7 days. The survey forms were entirely anonymized with no need for the respondents to enter either their names or email addresses. All questions were multiple-choice questions with no open-ended questions that required descriptive answers**.** At the end of 7 days, all the data were tabulated into a Microsoft Excel (Microsoft, Redmond, WA, USA) spreadsheet and analyzed. The association between categorical variables was assessed using Fisher's exact test or Chi-squared test. We considered a $P < 0.05$ as statistically significant. All statistical analysis was performed with GraphPad Prism 6 (GraphPad Inc., La Jolla, CA). Since the study did not involve patients, participant identification, and responding to the questionnaire was entirely voluntary, IRB was waived off by the authors' institute (AGN).

Results

Trainee background

A total of 740 valid responses were received; of which, 485 (67.5%) of the respondents were female. Most of the trainees were enrolled in MD/MS programs (505/740; 68.2%) followed by primary Diplomate of the National Board (DNB) course with 118/740 (15.9%) respondents and secondary DNB course (post-diploma) with 81/740 (10.9%) of the trainees [Fig. 1]. Most of the trainees who responded to the survey were from government or municipal medical colleges (44.3%), followed by private ophthalmology institutes (22.6%), private multispecialty colleges or hospitals (19.5%), and government-owned ophthalmology institutes (11.5%) [Fig. 2]. A significant proportion of the respondents were in their third or final year of residency training (476/740; 64.3%) and only 6.9% (51/740) trainees were in the first year of training [Fig. 3]. When asked if they were independently performing cataract surgery training, 297/740 (40.1%) replied affirmatively [Fig. 4].

Cataract surgical training

The respondents were asked about the year of training in which residents start performing independent cataract surgery at their residency institute. In all, 34.6% (256/740) trainees said that in their current residency program, no independent cataract surgeries were performed by residents [Fig. 5]. Among the others, 13.1% of them reported that independent surgeries were done by trainees in their first year of residency; 21.6% and 30.7% indicated that independent surgeries were given to trainees only in their second and third years of training respectively. It was noted that a significantly higher proportion of trainees in MD/MS programs were not independently performing cataract surgery as compared with those enrolled in DNB programs (65.6% vs. 43.7%; $P < 0.0001$).

The survey was structured in such a way that the trainees who indicated that they were performing independent cataract surgery were asked four additional questions, which were not open to the respondents who indicated that they were not currently operating cataract surgeries independently. For this cohort, the first question was regarding the cataract surgical technique they were independently performing. The results were as follows: Manual Small Incision Cataract Surgery – MSICS: (97.3%); Phacoemulsification (14.1%), and Extracapsular Cataract Extraction – ECCE: (10.4%) [Fig. 6]. The trainees were asked to indicate how many independent cataract surgeries does a trainee typically get to perform throughout the course of their residency program. The most common response was between 101 and 250 surgeries (25.9%; 77 responses). However, 31.3% of the responses indicated that on an average a trainee performed less than 100 independent cataract surgeries throughout residency [Fig. 7].

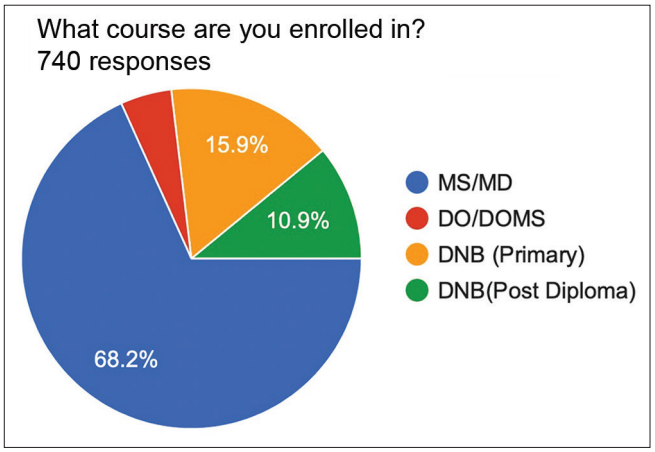

Figure 1: Graphical representation of trainees based on the residency course enrolled

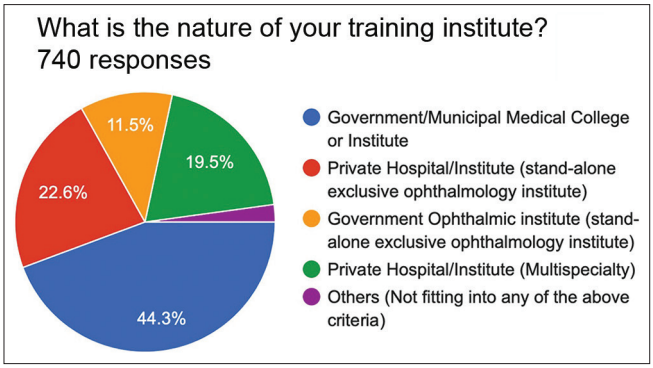

Figure 2: Split-up of trainees based on the type of parent institute of the trainees

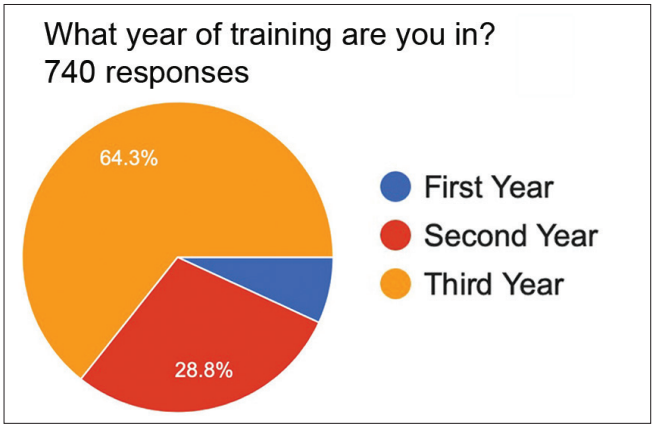

Figure 3: Figure depicting the year of training of the respondents at the time of responding to the survey

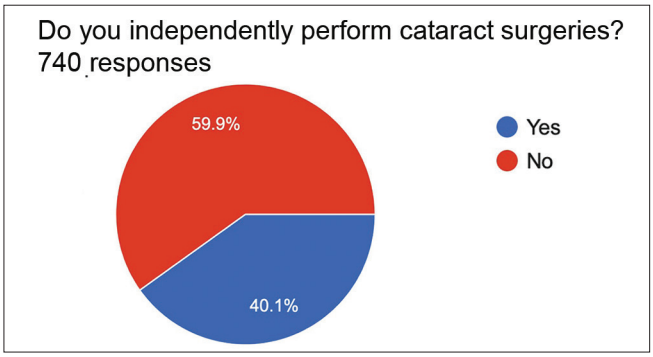

Figure 4: Responses of the trainees when asked if they were currently performing independent cataract surgery

Trainees were also asked if they were allowed to handle their own surgical complications: 38.4% said that complications were taken over by senior colleagues or faculty members; 29% of the trainees were allowed to handle their complications under supervision; and only 10.8% of the respondents were allowed to independently handle their complications [Fig. 8].

Other surgeries

Apart from cataract surgery, the most performed surgeries by residents were pterygium excision (85.3%), enucleation/evisceration procedures (68.1%), dacryocystorhinostomy (DCR)/dacryocystectomy (DCT) (45.6%), and cornea/sclera/eyelid tear repairs (56.4%). The least performed surgeries were refractive procedures (3.4%) and retinal detachment surgeries (8.9%). However, 47 respondents (6.4%) indicated that they did not have the opportunity to operate on any of the listed surgeries [Fig. 9]. The trainees were asked about the facilities and infrastructure that they have available to help them develop their surgical skills [Fig. 10]. Animal eyes for surgical practice were available to 34.9%; 15.8% had access to human cadaveric eyes for training. Specialized surgical skill development courses were available to 10.1% of the trainees and only 8% had access to simulation-based surgical skill development. However, 47.2% (349/740) of the trainees reported no access to any of these abovementioned avenues for surgical training or practice.

Discussion

The aim of this study was to assess the level of surgical training opportunities, namely, for cataracts that ophthalmology residents in India are receiving. The authors believe that the timing of this survey is important: this survey was conducted in June 2022—nearly 2 years after the COVID-19 lockdown imposed across the country. Residents currently in their third year of training were likely to have been in their first or second year of residency during the first wave of COVID-19. During the peak of the COVID-19 lockdown, one survey of trainees across India showed that the majority of ophthalmology trainees across the country felt that the COVID-19 lockdown adversely affected their learning, especially surgical training. The residents were asked to quantify this impact on their surgical training and 62.4% felt there was at least a 50% reduction in their surgical training during the lockdown.[9] Therefore, by conducting this survey in 2022, the authors believe this result truly reflects the current state of cataract surgery in the aftermath of the COVID-19 pandemic.

The survey reported that only 40.1% (297/740) of residents who participated in the survey were performing independent cataract surgery. However, it is important to note that question clearly mentioned "*independently* performed cataract surgeries," and it is possible that many residents, especially in their first or second years of training replied in the negative even though they were being introduced to surgical steps in a supervised manner. Expectedly, over two-thirds of these trainees (67%), who were independent cataract surgeons, were in their final year of training. Although nearly all trainees were performing MSICS in their residency, only 14.1% of the operating residents reported exposure to phacoemulsification. Even those who did receive surgical exposure to phacoemulsification probably had very limited access to it. Gogate *et al*. reported that while the mean number of phacoemulsification surgeries performed during residency was 30 cases; the median figure was 1.[7] This appears to be an issue across the Indian subcontinent: Pant and Bhatta reported that in Nepal, 42% of ophthalmology residents had performed less than 25 cataract surgeries as a primary surgeon during residency and only 36.5% felt confident enough to perform cataract surgery independently after completion of residency. In addition, although all trainees were primarily trained in MSICS; only 28.4% reported receiving limited exposure to phacoemulsification in Nepal.[10]

Type of training institute

In all, 256/740 (34.6%) of the respondents reported that in their residency programs, residents did not perform independent cataract surgeries at all. The subgroup analysis showed that 49.3%

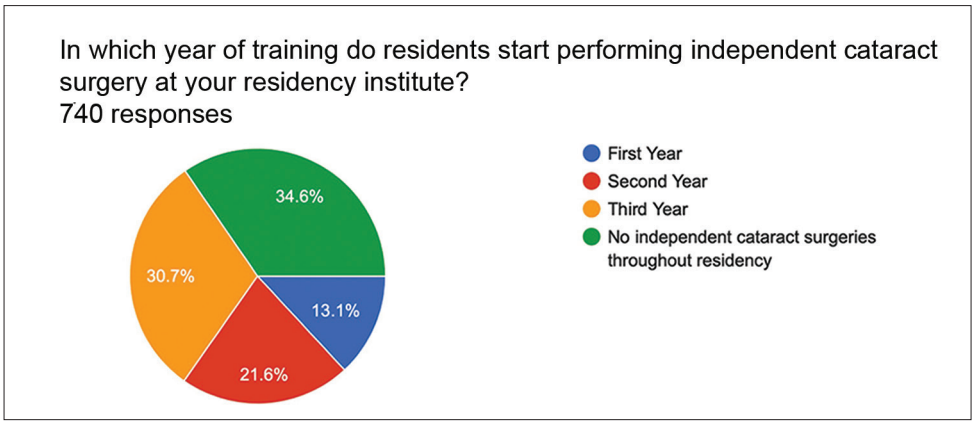

Figure 5: Year of training when trainees operated independently

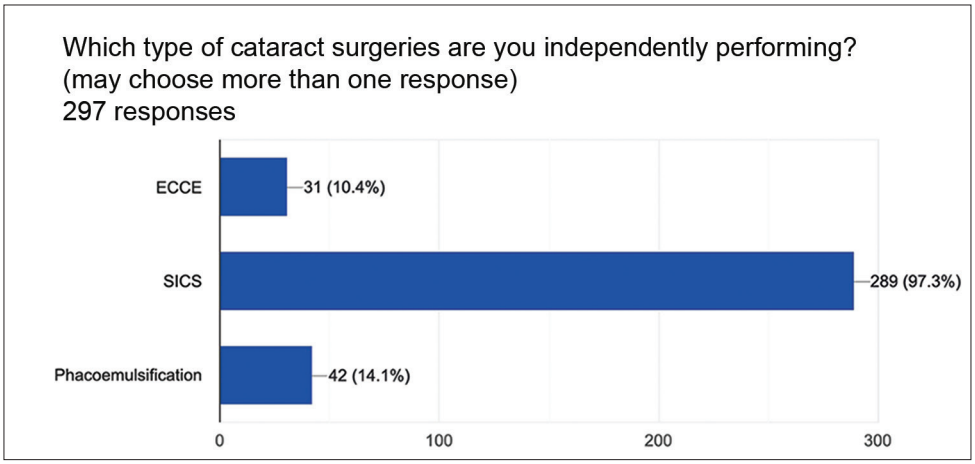

Figure 6: The type of surgery that the trainees were exposed to during residency

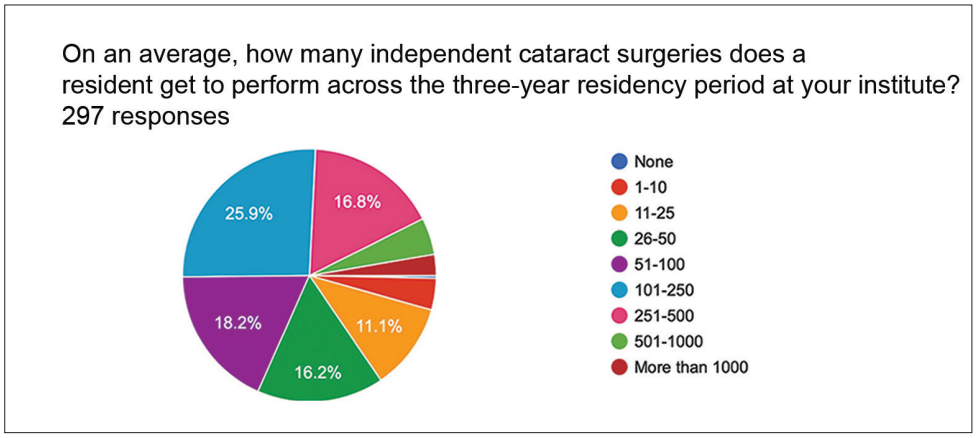

Figure 7: Graphical representation of the number of independent cataract surgeries that the responding trainees had performed at the time of taking the survey

of the trainees who were currently training in multispecialty private hospitals/medical colleges reported that residents did not perform independent cataract surgeries at all throughout residency; in contrast, only 15.6% of trainees in exclusively ophthalmic private institutes reported the same. Although there are many renowned private medical colleges in India, there continues to be a public perception that suggests the quality of medical doctors graduating from private medical colleges is not up to standard.[11]

Basic and advanced cataract surgical surgeries:

The results clearly show a lack of standardization when it comes to ophthalmology residency programs in India, especially the number of cataract surgeries performed by trainees. In all, 64.3% (476/740) of the respondents were in their third year of residency; at the same time, 59.9% (443/740) of the respondents said that they did not perform independent cataract surgeries. Of those who were not performing independent

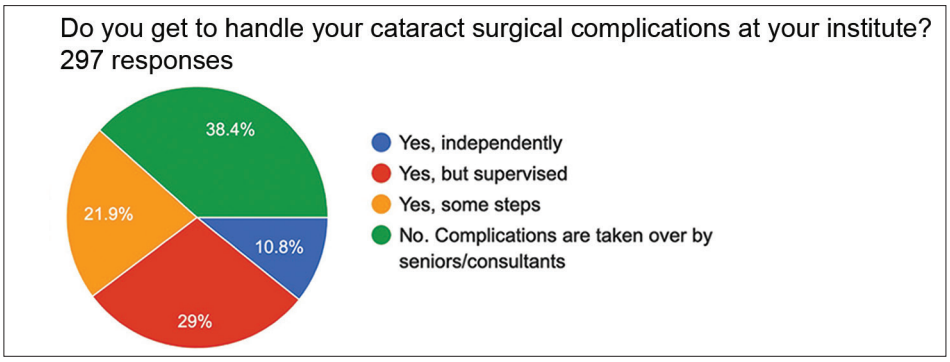

Figure 8: Responses of the trainees when asked if they were allowed to handle surgical complications during residency

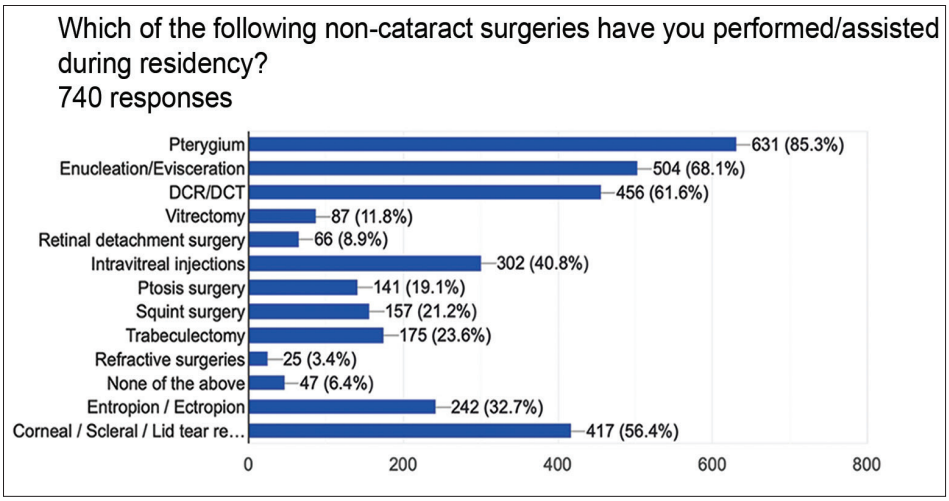

Figure 9: Graphical representation of the noncataract surgeries performed by residents during their training period

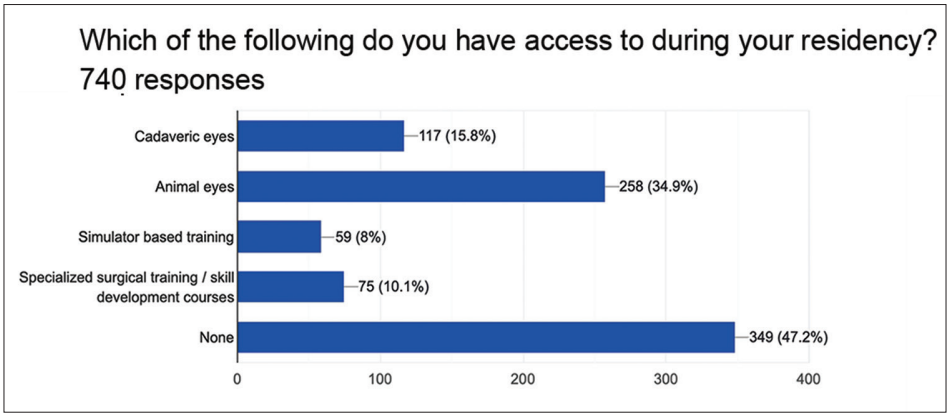

Figure 10: The facilities and infrastructure that respondents have access to help them develop surgical skills

cataract surgeries at the time of responding to the survey, 62.5% (277/443) of them were in their third year of residency. For comparison, a survey that looked at the exposure of residents to advanced cataract techniques in the United States (US) reported that 95% of graduating residents in the US were competent enough to implant toric intraocular lenses (IOLs) and in 69.5% of the residency programs across the US, residents had either performed or observed femtosecond-assisted cataract surgery.[12]

In terms of managing complications, only 39.8% of the residents who were operating indicated that they managed their own complications—either independently or under supervision. In the United States, among graduating residents, 62.0% of the respondents had at least some experience with sutured IOLs; 46.3% with capsular tension rings; 51.2% with capsular tension segments, and 68.3% with IOL exchange.[12] Lee *et al*.[13] although reporting long-term trends of surgical results of cataract surgeries performed by residents in a teaching hospital showed that complication rates were 27.4% in the first year of training, which eventually decreased to 7.3% in the final year of training. Poorly managed intraoperative cataract complications

represented the fifth most important cause of visual impairment in a report published by de Oliveira *et al*.[14] Graduating residents, therefore, must be proficient in managing their own intraoperative complications and the present survey indicates that in India, this may not be the case in the current scenario.

Global comparison

In India, the exit exams focus primarily on knowledge assessment. The theory and practical components are designed to assess the knowledge levels and examination skills of trainees but not the surgical skills. In fact, there is no such minimum number of cataract surgeries that are prescribed by any of the universities awarding qualification degrees in India. In comparison, in the United States, to be accredited by the Accreditation Council for Graduate Medical Education (ACGME), residency programs must require residents to perform at least 86 cataract surgeries as the primary surgeon.[15] Similarly, in the United Kingdom, there is a requirement that residents must perform 350 full cataract surgeries prior to qualification.[16,17]

A previous survey in India showed the mean number of MSICS surgeries performed by residents was 75 and the median was 55; this number clearly being well below the United States and United Kingdom requirements.[7] Our survey not only highlights that most residents perform fewer than the required number of surgeries for competency but also highlights the variations in the number of surgeries performed by trainees. It is true that there are ophthalmology residency programs in India where trainees have reported a high number of surgical training opportunities: 9.7% (72/740) residents indicated that their residency programs allow residents to operate over 250 cataract surgeries independently, which is on par with other residency programs in the United States and Canada.[12,18] A survey of Canadian ophthalmology residents reported that the mean number of cataract extraction surgeries performed as the primary surgeon by surveyed residents, across all years of training was 102 surgeries.[19] On the other end of the spectrum, however, we have 11.4% (84/740) of residents who reported fewer than 50 cataract surgeries throughout their residency program.

Surgical training tools

Surgical training is a comprehensive process: It begins in the operating room while observing surgeons perform surgeries, assisting, setting the surgical trolley, cleaning, and draping the patient, and understanding the basic surgical principles involved in the operating room. In addition, before commencing live surgery, trainees are expected to perform and master basic hand-eye coordination skills as well as simple surgical steps in the wet lab on cadaveric eyes and animal eyes. Simulation-based surgical training is an extremely effective method in shortening the learning curve and reducing the number of surgical complications in real life. A study performed in the United Kingdom show that the addition of surgical simulation training to the training curriculum was directly associated with a significantly reduced rate of complications, including posterior capsule tears and vitreous prolapse in novice surgeons.[20] In India, Nair *et al*.[21,22] reported that novice surgeons trained on the HelpMeSee simulator for MSICS performed fewer errors in their first 20 attempts in live surgery compared with trainees who underwent standard training as per their institutional protocols without simulators. In many training programs in the United Kingdom, training on an ophthalmic surgical simulator is mandatory for third-year ophthalmology residents before live cataract surgery. In contrast, our survey showed that advanced training facilities such as surgical simulation were available only to 8% (59/740) of the trainees. Even basic wet lab facilities such as surgical practice on cadaver eyes and animal eyes were not available in most residency programs (47.2%).

Limitations

Our survey has the inherent drawbacks of any self-reported survey. In addition, the survey assesses only the surgical exposure that residents have during their training program and does not assess the other components of a residency program. This study was focused on the quantitative analysis of surgical experience, so the results do not represent the quality of training received. While achieving surgical competency is the desired endpoint for trainees, the number of surgeries performed can only be considered as a surrogate measure for assessing competency. Going ahead, more studies are required to assess training outcomes and to monitor the quantum of surgical training; especially as the specter of COVID-19 keeps receding. The authors agree that the conclusions from the current study place a lot of importance on independent surgical experience, which may be considered disproportionate, and perhaps not a true reflection of the quality of a residency program.

Conclusion

In summary, the present survey shows that nearly over a third of the ophthalmology residents in India reported that their residency programs do not allow them to independently perform cataract surgeries. Whether this trend is a direct effect of the COVID-19 pandemic and will soon correct itself remains to be seen.[9,23] The aim of every residency program is that the graduating ophthalmologists are competent and can render consistent quality service to their patients. However, the stark variations in infrastructure, training opportunities, and surgical numbers suggest that the residency programs need to be improved.[24] The findings of the present study provide a comprehensive overview of the cataract surgical training experience in India and may be useful as a guide for institutes, educators, and ophthalmological societies in curriculum development and quality improvement.

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Conflicts of interest

There are no conflicts of interest.

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