

## Practice pattern of cataract surgeons when operating on seropositive patients

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**Purpose:** The aim of this study is to know practice pattern of cataract surgeons when operating on patients, positive for blood-borne viral infections (BBVIs), namely, hepatitis B virus, hepatitis C virus, and human immunodeficiency virus. We also studied their awareness, knowledge, and attitude toward universal precautions and guidelines. **Methods:** The telephonic survey enrolled practicing cataract surgeons, who were interviewed to record responses pertaining to their practice using an open-ended questionnaire. We studied statistical significance of difference of frequency of prick injuries in topical versus peribulbar anesthesia, and phacoemulsification versus manual small incision cataract surgery by employing Chi-square test. Significance of proportion was calculated using z-test. For all statistical calculations, significance level was set at 0.05%. **Results:** Of 623 ophthalmologists contacted, responses of 479 (79%) ophthalmologists were analyzed. Maximum participants were in private practice (48%). During whole practicing carrier, 313 (65%; 95% confidence interval [CI]: 61–70) participants admitted having suffered injury with needle or sharp instruments; of these, 204 (65%; 95% CI: 60–70) participants did not report their injury. Wearing “double gloves” during cataract surgery was the most common barrier adopted by participants. **Conclusion:** We found high prevalence of occupational-related sharp injuries among ophthalmologists in this survey. Majority of them were aware of universal precautions, but adherence to postexposure prophylaxis was lacking.

**Key words:** Blood-borne viral infections, cataract, practice pattern

Blood-borne viral infections (BBVIs) are recognized as an occupational risk factor among health-care workers (HCWs), particularly among those who are either exposed to body fluids of infected patients or use sharp instruments or needles on these patients. The prevalence of hepatitis B virus (HBV) among HCWs is 2–4 times higher than the general population.<sup>[1]</sup> The higher prevalence of such infections among HCWs results from accidental sharp injuries (ASI) with infected needles or other sharp instruments.<sup>[2]</sup> The prevalence of BBVI (human immunodeficiency virus [HIV], hepatitis C virus [HCV], and HBV) among patients of cataract surgery is around 6%.<sup>[3]</sup> The incidence of needle stick injuries (NSI) in eye care is 0.07/1000 surgeries.<sup>[4]</sup> Horizontal transmission is another concern with these infections.<sup>[5]</sup> However, there is lack of any clinical evidence on horizontal transmission during cataract surgeries, and only evidence exists in experimental sequential phacoemulsification.<sup>[6]</sup> Prevention against accidental exposure or transmission of these infections requires awareness, vigilant behavior, and safe practice. The present study was undertaken to understand practice pattern of cataract surgeons when operating on persons positive for BBVI.

## Methods

The survey is part of our ongoing study on cataract surgery in seropositive patients, approved by institutional ethical committee. An interview-based survey was designed to understand practice pattern of sample Indian cataract

surgeons in seropositive patients. To contact participants, social media platform “WhatsApp” was used. Several state/zonal/subspecialty societies have interaction groups on WhatsApp. Through the key person contact of such groups of ophthalmologists, we carried out a preinterview sensitization drive. During this, we circulated information about telephonic interview with members of WhatsApp group. This addressed objective and nature of interview and provided a base for later telephonic communication. An open-ended, one-to-one telephonic interview was made to collect the data between September 2017 and June 2018 [Fig. 1]. Interviews were carried out by four ophthalmologists well versed with objective of study. Interview calls were made at convenient time as fixed between participant ophthalmologist and interviewer. We asked participating ophthalmologists about their practice background, needle stick/sharp injuries, and their awareness about universal precautions and its adoption [Appendix]. The participation in this interview was voluntary and participants consented to use information for analysis and publication; however, confidentiality and anonymity of responses were maintained.

Statistical analysis was done using online statistical calculators (<https://www.socscistatistics.com/>, <https://www>

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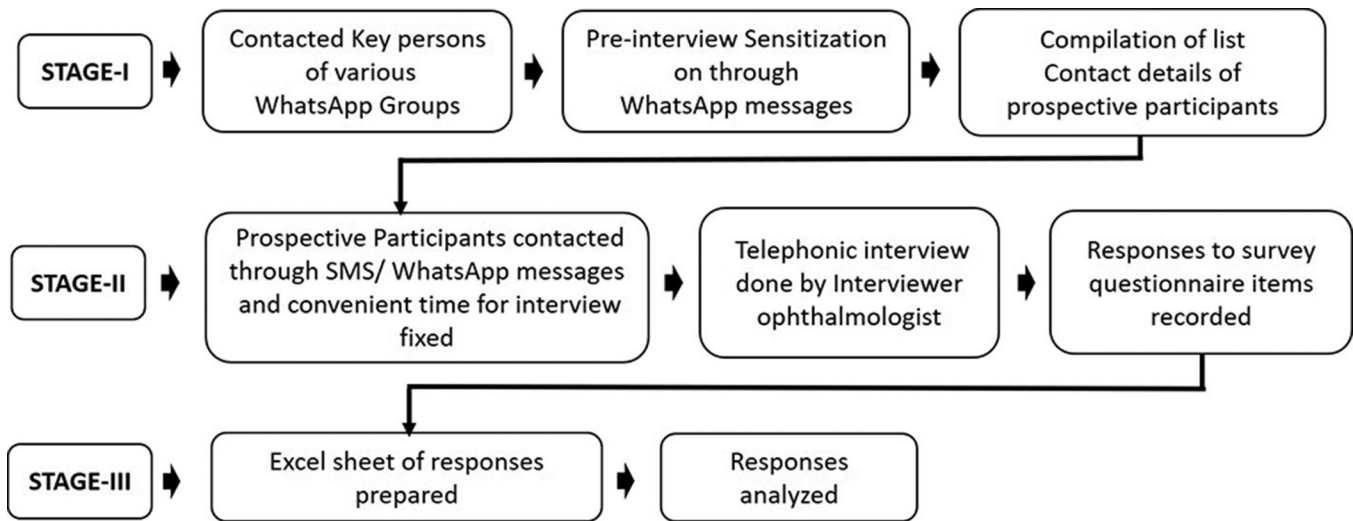


Figure 1: Flowchart of survey methodology

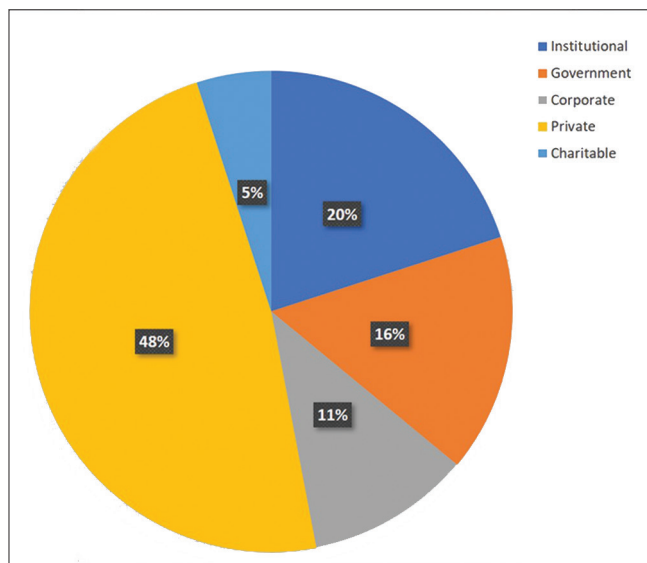


Figure 2: Type of practice or working setups of participating ophthalmologists

medcalc.org/). Chi-square test was applied to calculate difference between different groups. General z-test was done to calculate significance level of prick injury proportion. Significance level was set at 0.05% for all statistical tests.

## Results

A total of 623 ophthalmologists practicing in 17 different states or union territories of India were informed through message on WhatsApp. Of these, 492 ophthalmologists were interviewed on phone, and 131 (21%) did not participate, giving a response rate of 79% (95% confidence interval [CI]: 76–82). Among 492 ophthalmologists, we excluded 13 responses, because they were either not doing cataract surgery or had stopped doing. Hence, final analysis included responses of 479 ophthalmologists, which included 318 (66%) men and 163 (34%) women ophthalmologists. The median age of participants was 40 (range: 26–69) years. The median time spent per phone

call was 4.44 (range 2.58–13.38) min. The average (standard deviation [SD]) number of years in practice after postgraduation in ophthalmology was  $13 \pm 10$  (range: 1–46) years. The working setup for maximum number of participating ophthalmologists was private practice (48%) [Fig. 2].

The peribulbar block was the most common mode of giving local anesthesia for cataract surgery, practiced by 197 (41%; 95% CI: 37–46) participants. The choice of local anesthesia, between peribulbar and topical, depends upon type of cataract for 179 (37%; 95% CI: 33–42) participants, whereas 103 (22%; 95% CI: 18–26) said that they always used topical anesthesia for cataract surgery. Similarly, for 151 (32%; 95% CI: 27–36), choice of cataract surgery between phacoemulsification and manual small-incision cataract surgery (SICS) was determined by type of cataract. In contrast to this, 220 (46%; 95% CI: 41–51) participating eye surgeons said that they performed cataract surgery by phacoemulsification only, and 108 (22%; 95% CI: 19–27) did by manual SICS only.

Approximately 22% (104 of 479; 95% CI: 18–26) of participants had suffered an injury with needle or sharp tip of instruments during cataract surgery in last 1 year. Overall, 313 (65%; 95% CI: 61–70) participants admitted having suffered injury with needle or sharp instruments, at least once during whole of the practicing carrier. The z-statistics was 635.873 ( $P < 0.0001$ ). Prick injury occurred in 129 (65%) of peribulbar anesthesia practitioners compared with 35 (34%) of topical anesthesia practitioners. Prick injuries among those giving peribulbar anesthesia were significantly higher ( $P: 0.007$ ), with relative risk ratio of 1.927 (95% CI: 1.445–2.569). However, due to recall bias, it was not clear how many prick injuries actually happened while giving peribulbar anesthesia. There was no statistically significant difference of injuries sustained among surgeons' exclusively practicing phacoemulsification or manual SICS ( $P: 0.3$ ).

Only 123 (26%) participants were aware about existence of a system for reporting such injuries. Of 313 participants who sustained injuries, 103 (33%; 95% CI: 28–38) reported to appropriate agency or authority existing within their working setup. While 204 (65%; 95% CI: 60–70) participants did not

report to anyone, 6 (2%; 95% CI: 0.7–4) were unaware of the practice of reporting accidental surgical injuries. The attitude toward postexposure protocol (PEP) did not vary with the type of practice (*P*: 0.41).

Seropositive cases were considered as occupational risk by 410 (86%; 95% CI: 83–90) participating ophthalmologists, whereas 44 (9%; 95% CI: 7–12) did not consider it as risk. Another 25 (5%; 95% CI: 3–7) were not clear about this. A total of 286 (60%; 95% CI: 55–65) participants said that they routinely carried out preoperative screening for BBVIs before cataract surgery, whereas 87 (18%; 95% CI: 15–22) participants denied any such screening before cataract surgery. Screening only in high-risk patients was done by 97 (20%; 95% CI: 16–24) participants. However, there were no common criteria for high-risk patients. It could be residential address of patient, age group, general physical condition, or systemic illness. Selective screening only for HIV was reported by 10 (2%; 95% CI: 1–4) participants.

Ninety-three (19%; 95% CI: 16–23) participants were not aware about universal precautions. A total of 370 (77%; 95% CI: 73–80) participants were not aware about seroprevalence of BBVIs and its distribution pattern in their practice area.

A total of 202 (42%; 95% CI: 38–47) participants were unaware about precautions to be observed during cataract

surgery by phacoemulsification in seropositive patients. Sixty-three (13%; 95% CI: 10–16) participants took no additional measures when operating cataract in seropositive patients. Most commonly observed practice when operating cataract in seropositive patients was wearing “double gloves,” reported by 328 (69%; 95% CI: 64–73) participants. Other practices included wearing impervious gowns, eye protection, and use of special kits [Table 1].

Although 43 (2%; 95% CI: 1–4) participant avoided operating on seropositive cataract patients and referred them to other equipped centers, 135 (28%; 95% CI: 24–32) participating ophthalmologists performed cataract surgery in seropositive patients in the end or as last case of the day. Several other practices were reported when operating cataract in seropositive patients [Table 2].

### Discussion

Among health-care professionals, ophthalmologist sustains highest number of sharp injuries.<sup>[7,8]</sup> When operating cataract in seropositive patients, they face dual responsibility of safeguarding themselves against sharp injuries and at same time preventing cross-transmission of infections among patients. This article attempted to study awareness, knowledge, attitude, and practice pattern of Indian cataract surgeons when operating on seropositive patients.

There are more than 21,000 ophthalmologists who are members of All India Ophthalmological Society (AIOS), the largest association of eye surgeons in India.<sup>[9]</sup> A survey revealed that 76% of Indian ophthalmologists are doing cataract surgery.<sup>[10]</sup> An estimated number of ophthalmologists practicing cataract surgery in India are around 16,000.<sup>[11]</sup> Thus, this survey included approximately 3% of the cataract surgeons in India from 17 states and union territories. The gender distribution was roughly representative of member ophthalmologists of AIOS, which has nearly 65% male members.<sup>[10]</sup> The survey included ophthalmologists from across all types of practice settings, though majority were those doing individual private practice. Nearly 80% of Indian ophthalmologists are estimated to be in individual or group private practice.<sup>[12]</sup>

The choice of local anesthesia was peribulbar for majority (41%) of participants, and for another 30%, type of cataract was detrimental in choice between peribulbar and topical anesthesia. This means that nearly three-fourth of the respondents were exposed to the risk of NSI during peribulbar block. We found significantly higher incidence of ASI among those practicing peribulbar anesthesia. Due to recall bias, true incidence of injuries suffered during peribulbar block could not be estimated. In many cases, peribulbar blocks might have been given by assisting staff. We did not find any statistically significant difference of ASI among ophthalmologists performing cataract surgery by manual SICS or phacoemulsification technique. Both the techniques involve the use of sharp instruments and put the surgeon or assistant at risk of ASI. In our study, nearly 65% of participating ophthalmologists had suffered accidental sharp injuries at least once while operating cataract during their career, including 22% who had at least one accidental injury in preceding year. Rishi *et al.* reported incidence of NSI among ophthalmologists in India at 0.07/1000 surgeries in a tertiary eye-care setup.<sup>[4]</sup>

**Table 1: Frequency of additional measures taken when operating cataract in patients positive for blood-borne viral infections**

Measures taken during surgery	Number (%)
No additional precautions	63 (13)
Double gloving	333 (69)
Use of special kits	165 (34)
Use of impervious gown	148 (31)
Eye protection	72 (15)

**Table 2: Measures adopted by cataract surgeons to prevent cross-transmission of infections during cataract surgery**

Measures to prevent cross-transmission of blood-borne infections	Number (%)
Operate seropositive cases in the end or last	135 (28)
Refer seropositive cases to other equipped or higher centers	43 (9)
Double autoclave all instruments and probes, tubing, etc.	33 (7)
Chemical sterilization* of instruments before autoclave	30 (6)
Discard tubing after operating on seropositive cases	16 (3)
Separate hand-pieces for seropositive cases	13 (3)
Double cleaning/washing of hand-piece and tubes before autoclave	10 (2)
Perform manual SICS in seropositive patients	10 (2)
Use of ultrasonic cleaner before autoclave	04 (0.7)

\*Used variably acetone, glutaraldehyde, and surgical spirit. SICS=Small incision cataract surgery



In our study, one-fourth of the participant ophthalmologists were not aware what to do after sustaining an ASI. Of those who suffered ASI, nearly 65% were aware about the process to be followed or a system of reporting the accidental injuries but voluntarily abstained. It may be debatable to consider this as negligence. Interestingly, type of practice was not determinant of attitude and adherence to the postexposure protocols. Ghauri *et al.* reported that 63% of HCWs abided to postexposure universal first-aid guidelines in their study of sharp injuries in ophthalmic practice.<sup>[13]</sup> Postexposure universal guidelines lay down the steps to be followed following sharp injuries. In brief, it includes immediate scrubbing, encouraging bleeding, and contacting occupational hazard in-charge person of the hospital.<sup>[13,14]</sup> We propose the “adoption, compliance, and surveillance (ACS) strategy” to minimize incidence of ASI and implementation of PEP among exposed HCWs. Adoption of universal precautions can reduce ASI among HCW. Hepatitis B vaccination is effective against HBV infection. Provision of in-house standing operating instructions can help to achieve better compliance. It may also include strategies to improve awareness about existence and availability PEP system. Surveillance can be done by external audiences, which may include professional or state-run health-regulatory bodies.

Does operating on seropositive patients qualify to be an occupational risk? Exposure to blood-borne infections in HCWs is considered as biological occupational hazard.<sup>[15]</sup> Transmission of blood-borne infections by needle stick and sharp injuries has been reported.<sup>[16]</sup> Majority of participant ophthalmologists considered operating cataract on seropositive patients as occupational hazard. That is perhaps the reason that 80% of ophthalmologists subject cataract patients to preoperative screening for BBVIs before cataract surgery. Of these, 20% did selective screening in patients considered as high risk, even though criteria for high risk were not uniform. The cost-effectiveness of universal screening is debatable.<sup>[3,17]</sup> A minority is screened only for HIV infection, but seroconversion risk after exposure is minimal for HIV from among HIV, HCV, and HBV.<sup>[18]</sup>

Universal precautions refer to a concept of blood-borne disease control, which requires that all human blood and other potentially infectious material be treated as if known to be infectious for HIV, HBV, HCV, or other blood-borne pathogens, regardless of the perceived “low-risk” status of patient or patient population.<sup>[19]</sup> The scope of universal precautions does not include tears or any ocular fluid including aqueous humor, unless visibly contaminated with blood.<sup>[19,20]</sup> It means that observance of universal precautions during cataract surgery is similar to any other surgical procedure where use of sharp instruments and needles is involved. During phacoemulsification, incision puts either clear corneal or scleral, and later may involve little more chances of contact with blood from episcleral or limbal vessels.

Protective barriers such as gloves, gown, mask, and protective eyewear are recommended in universal precautions. Nearly 70% cataract surgeons used double gloves when operating cataract in seropositive patients in our study. Double gloving compared to single gloving has been found to effectively protect against percutaneous perforations.<sup>[21]</sup> Use of special prick proof gloves is helpful in preventing prick injuries.<sup>[22]</sup> Such gloves can be used while

operating on seropositive patients, to prevent cross-infection, following accidental needle stick or sharp instrument injury during cataract surgery. Universal precautions discuss guidelines to prevent prick injuries to HCW at work place.<sup>[23]</sup> Relevance of wearing impervious gowns and protective eyewear during cataract surgery may be uncertain. Phacoemulsification through clear corneal incision is almost bloodless surgery though tiny limbal vessels often ooze. Phacoemulsification through sclera tunnel, manual SICS, or ECCE involves conjunctival dissection, and during this step, episcleral vessel often oozes. However, the risk of cross-infection through blood exposure during conjunctival dissection is not known.

A small percentage (2%) of cataract surgeons referred seropositive patients to other equipped or higher centers. This practice probably stems out from psychological concerns rather than actual risks. The risk of occupational infection from known viral pathogens for surgeons is low and can be further reduced by employing effective barriers, modifying patterns of behavior, and prompt responses to blood-exposure events.<sup>[24]</sup>

Experimental study has demonstrated viral transmission during sequential phacoemulsification cataract surgeries.<sup>[6]</sup> We noticed several strategies being used by ophthalmologists as safeguard against cross-transmission of blood-borne infections. All of these may not be evidence-based. The strategies of using separate hand-piece, phacoprobe-tips or to operate seropositive patients in the end may be useful in preventing cross-infection among seronegative patients. We noticed different chemical compounds being used to disinfect instruments. HIV, HCV, and HBV are susceptible to a number of chemical compounds in prescribed concentrations.<sup>[25]</sup> All these three viruses are lipid viruses and have least resistance to disinfection methods.<sup>[26]</sup> Center for Disease Control recommends following standard sterilization and disinfection procedures for patient-care equipment contaminated with body fluids of a person infected with blood-borne infections.<sup>[27]</sup> Surgical instruments that are used in sterile tissue, body cavities, or blood stream can be heat sterilized; and if instruments are heat sensitive, they can be disinfected with high-level disinfectants such as 2% glutaraldehyde or 7.5% hydrogen peroxide.<sup>[27]</sup> This way, most cataract surgery instruments come under category of semicritical instruments, and heat sterilization should be sufficient to achieve disinfection. When using chemical disinfectant, manufacturers’ instructions should be referred about compatibility to particular material.

## Conclusion

In conclusion, this study found that most ophthalmologists believe that operating cataract on seropositive patients is an occupational hazard. The prevalence of risk of prick injury is high among ophthalmologists. Majority of them are aware of universal precautions, but adherence to postexposure prophylaxis is lacking. There is ambiguity about sterilization and disinfection techniques for phacoemulsification.

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### Conflicts of interest

There are no conflicts of interest.

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## Appendix

### Questionnaire to Assess Ophthalmic Surgeon's Opinion and Practice Regarding Occupational Exposure to Hepatitis B/C and HIV

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#### Questionnaire to Assess Ophthalmic Surgeon's Opinion and Practice Regarding Occupational Exposure to Hepatitis B/C and HIV

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Age and gender

Type of practice - institutional/private/government/corporate/charitable

Number of years in practice

Sharp/Needle injuries during cataract surgeries

- (a) In last 12 months
- (b) During whole carrier till now

Do you always report sharp injuries?

- (a) If yes, to whom
- (b) If no, why?

Do you consider operating cataract in seropositive patients as occupational hazard/risk

Do you carry out routine screening of cataract surgery patients before surgery?

- (a) No
- (b) Yes - universal/all patients
- (c) High-risk patients only/Selective

Are you aware of universal guidelines for doing surgery in seropositive patients?

Are you aware of percentage and pattern of seropositive cases in your area?

What type of block you use during cataract surgery?

Which cataract surgery technique you prefer for cataract extraction in seropositive patients?

Are you aware of any guidelines for phacoemulsification in these patients?

What precautions do you observe during phacoemulsification in seropositive patients?

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