

# Lost Opportunities for Cornea Retrieval: A Cross-sectional Study from District Hospital, Tumakuru, Karnataka

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## ABSTRACT

**Introduction:** Corneal blindness in developing countries mainly affects the younger population. About 95% of corneal blindness can be avoided. The economic burden to society is much higher with corneal blindness compared to cataracts. Corneal transplant (Keratoplasty) is the primary vision restoring procedure to rehabilitate patients with corneal blindness. The procedure requires viable corneal tissue. The corneal tissues are procured either by voluntary eye donations or through the Hospital Cornea Retrieval Programme (HCRP). The objective of HCRP is to encourage potential eye donations from hospital deaths by utilising a combined method of motivation and grief counselling.

**Aim:** To find the possibility of cornea retrieval in the district hospital of Tumakuru, Karnataka, India.

**Materials and Methods:** This cross-sectional study analysed the number of hospital deaths at district hospital, Tumakuru, Karnataka, India, between January 2016 and December 2016. The study was

conducted at the same hospital from May 2017 to July 2017. Patient demographics, systemic illnesses, treatment received, and cause of death were obtained from the 757 medical records. Analysis was done for potential corneal donors as per the National Programme for Control of Blindness (NPCB) guidelines.

**Results:** The total number of deaths were 679, which included 375 (55.23%) males and 304 (44.77%) females with maximum death in age group 71-80 years. Of the total deaths, those between 3 and 40 years of age were 196 (28.86%). After excluding the contraindications of cornea retrieval as per NPCB guidelines, 1016 corneas could have been retrieved out of 508 (74.8%) deceased.

**Conclusion:** Hospital cornea retrieval programme can immensely contribute to fill the deficiency of donor corneal tissue. The present study concluded that upto 74.8% of corneas could have been potentially retrieved and indicates a vast potential to reduce the deficit of corneal tissues.

**Keywords:** Blindness, Eye donation, Hospital cornea retrieval programme, Keratoplasty

## INTRODUCTION

Total 130 crores are blind, and 29 lacs have visual impairment due to corneal opacity in South-East Asia [1]. The National Blindness and Visual Impairment Survey 2015-2019 in India showed that corneal opacity stood second place (7.4%) in the age group more than 50 years. In the younger population (0-49) years, most cases of blindness were due to non trachomatous corneal blindness (37.5%), causing a tremendous economic burden [2]. Even though very meticulously managed, medically, ocular trauma, corneal ulcer, trachoma, leprosy and onchocerciasis leave behind a corneal scar in advanced cases. The successful treatment of corneal blindness is keratoplasty. The success of the surgery depends on skilled surgeons, modern operating rooms, reliable eye bank facilities, well equipped and established all the time available clinical services for long term management of complications of keratoplasty [3]. There is a nearly fourfold rise in demand for cornea in India. It is estimated that annually, 2,70,000 corneas need to be procured to conduct 1,00,000 keratoplasties. There is an alarming imbalance in the requirement and contribution of corneas, causing a major problem [4]. The source of the cornea is either voluntary donation or Hospital Cornea Retrieval Programme (HCRP). The voluntary donation is presently inefficient as the utilisation of tissue is low. Hospital cornea retrieval programme model shows higher tissue utilisation [5].

Our Department is Cataract-Oriented Department. It needed an advocacy to start cornea retrieval and hence it was a novel idea to initiate HCRP, for which appropriate statistics had to be presented. As a preliminary step in addressing pressing public health problems, the present hospital-based study on the potential for cornea retrieval in the district hospital, Tumakuru, was conducted to plan for the hospital corneal retrieval program in Tumakuru district hospital, Karnataka, India.

## MATERIALS AND METHODS

It was a hospital-based, cross-sectional study conducted at district hospital, Tumakuru, Karnataka, India from May 2017 to July 2017. The permission for necessary logistics from the concerned authorities to access the case records from the Medical Record Department was obtained. Ethical clearance was obtained from the Institutional Ethical Committee of Sri Siddhartha Medical College, (SMC/IEC-April/6/2017). The data was procured for the duration of one year, from January 2016 to December 2016.

**Inclusion and Exclusion criteria:** The study included all hospital deaths of patients more than two years of age to 90 years. All the case records of ages less than two years and more than 90 years were excluded from the study.

The demographic profile, cause of death, and presence of any systemic disease which has bearing on cornea retrieval were collected in data. The cause of deaths that are contraindicated for the retrieval of corneas was analysed and recorded. The contraindications depended on National Programme for Control of Blindness (NPCB) guidelines for the norms of eye banking in India [Table/Fig-1] [6]. Based on the cause of deaths, deceased from whom cornea could have been retrieved and from whom unretrievable were noted.

## STATISTICAL ANALYSIS

Descriptive statistics were applied for data obtained.

## RESULTS

The total number of deaths recorded was 679. The demographic profile distribution of deceased, age and gender wise, is presented in [Table/Fig-2]. According to the guidelines laid down by NPCB guidelines for standard eye banking in India 2009 for the contraindications for cornea retrieval, the causes of death were

| Reasons   | Details   |
|---|---|
| Contraindications for corneal tissue retrieval from donors with these diseases, it is potentially hazardous to eye bank personnel   | <ol style="list-style-type: none"> <li>1. Acute viral hepatitis</li> <li>2. Acquired immunodeficiency syndrome of HIV</li> <li>3. Acute viral encephalitis or encephalitis of unknown origin</li> <li>4. Creutzfeldt-Jacob disease</li> <li>5. Rabies</li> </ol>  |
| Absolute contraindications for transplantation of the retrieved corneas, conditions with potential risk of transmission of local or systemic communicable disease from donor to recipient | <ol style="list-style-type: none"> <li>1. Death of an unknown cause</li> <li>2. Death with neurological disease of unestablished diagnosis</li> <li>3. Active meningitis or encephalitis</li> <li>4. Encephalopathy of unknown origin or progressive encephalopathy</li> <li>5. Active septicaemia</li> <li>6. Active hepatitis</li> <li>7. Creutzfeldt-Jacob disease</li> <li>8. Rabies</li> <li>9. Active military tuberculosis or tubercular meningitis</li> <li>10. Hepatitis B surface antigen positive donors</li> <li>11. Human T-lymphotropic virus type 1 or 2 infection</li> <li>12. Hepatitis C seropositive donors</li> <li>13. Human Immunodeficiency Virus (HIV) seropositive donors</li> <li>14. Active ocular or intraocular inflammation conjunctivitis, scleritis, iritis, uveitis, vitritis, choroiditis and retinitis (at the time of death)</li> </ol> |
| Conditions with potential risk of transmission of non communicable disease from donor to recipient  | <ol style="list-style-type: none"> <li>1. Death due to cyanide poisoning</li> <li>2. Intrinsic eye disease</li> <li>3. Retinoblastoma</li> <li>4. Malignant tumours of the anterior ocular segment or known adenocarcinoma in the eye of primary or metastatic origin</li> <li>5. Leukemias</li> <li>6. Active disseminated lymphomas</li> </ol>  |
| Behavioural/History, laboratory and medical exclusion criteria  | <ol style="list-style-type: none"> <li>1. Men who have had sex with other men in the preceding 5 years (homosexual behaviour)</li> <li>2. Intravenous drug abusers in the preceding 5 years.</li> <li>3. Persons with haemophilia or related clotting disorders who have received human-derived clotting factor concentrate.</li> <li>4. Commercial sex workers in preceding 5 years.</li> <li>5. Persons suspected to have HIV infection.</li> <li>6. Children born to mother with HIV infection.</li> </ol>   |

**[Table/Fig-1]:** Contraindications of cornea retrieval according to Standards of Eye Banking in India 2009 [6].

categorised and 508 (74.8%) were retrievable and 171 (25.18%) were unretrievable [Table/Fig-3]. Total 99 deaths had septicaemia, 46 deaths had Human Immunodeficiency Virus (HIV) infection, positive hepatitis B surface antigen (HBsAg) or tuberculosis and eight deaths, caused by meningitis or encephalitis, were rejected as either corneal tissue retrieval from donors with these diseases, is potentially hazardous to eye bank personnel or were the conditions with the potential risk of transmission of local or systemic infection from donor to recipient. Nine deaths were due to snake bite, all contraindicated for retrieval as they were cobra bite, being neurotoxic, and nine deaths of malignancy were rejected. Among the total number of

| Variables                | Number of deaths (%)        |
|--------------------------|-----------------------------|
| <b>Age group (years)</b> |                             |
| 3-10                     | 10 (1.47)                   |
| 11-20                    | 19 (2.79)                   |
| 21-30                    | 75 (11.04)                  |
| 31-40                    | 92 (13.54)                  |
| 41-50                    | 98 (14.43)                  |
| 51-60                    | 106 (15.61)                 |
| 61-70                    | 128 (18.85)                 |
| 71-80                    | 132 (19.44)                 |
| >80                      | 19 (2.79)                   |
| <b>Gender</b>            | <b>Number of deaths (%)</b> |
| Male                     | 375 (55.23)                 |
| Female                   | 304 (44.77)                 |
| Total                    | 679 (100)                   |

**[Table/Fig-2]:** Age and gender distribution of registered deaths during study period.

eligible donors, 196 (38.5%) were below 40 years. All the 39 deaths due to poisoning were organophosphorus consumption, and out of them, 31 (79%) were younger than 40 years. A total of 72 deaths were due to head injury, and among them 45 (62.5%) of them were younger than 40 years, hence they were expected to have good quality of cornea eligible for eye donation.

| Causes of death   | Number of deaths |
|---|------------------|
| <b>Retrievable cases</b>  |                  |
| Respiratory failure   | 135              |
| Cerebrovascular accidents   | 94               |
| Head injury   | 72               |
| Liver and abdomen   | 62               |
| Myocardial infarction, congestive cardiac failure, valvular heart disease                           | 58               |
| Metabolic encephalopathy, epilepsy, eclampsia   | 48               |
| Poisoning   | 39               |
| <b>Unretrievable cases</b>  |                  |
| Sepsis and septic shock   | 99               |
| Human Immunodeficiency Virus (HIV), Hepatitis B surface antigen positive, Disseminated tuberculosis | 46               |
| Snake bite  | 9                |
| Malignancy  | 9                |
| Meningitis, Encephalitis  | 8                |

**[Table/Fig-3]:** Distribution of patients based on cause of death in retrievable and unretrievable cases.

## DISCUSSION

A 6.8 million people currently have a visual disability because of corneal opacity in our country. Out of them, about 1 million have both eyes affected [7]. The burden is further increased annually by 20,000, according to the NPCB estimation [8]. Both trauma and ulcer are relatively gaining importance as other traditional causes of corneal blindness are reducing because public health programmes addressing trachoma, onchocerciasis, and leprosy are effective. Corneal ulcer is considered a silent epidemic in developing countries. About 90% of corneal blindness because of trauma and corneal ulcer globally, occur in developing countries [3]. Keratoplasty remains the key to address the corneal opacity caused by various aetiologies. The procurement of viable donor cornea is a prime issue for the procedure. Regardless of the rise in the number of eye donations over the past few years, there is a tremendous disparity between requirements and fulfilment of corneas. Multiple initiatives are taken at various levels to strengthen eye donations and eye banking to provide viable corneas.

Eye banks receive most donor corneas from voluntary donations, either from residences or hospitals. Voluntary eye donation has numerous barriers. Voluntary eye donation requires the timely decision of next kin who is grieving and often cannot donate. Unavailability of the death certificate and medical records, aged donors are other major setbacks [9]. Voluntary eye donations at residence settings might have high temperatures and humidity. The adverse environmental condition might lead to an increase in the postkeratoplasty infection rate [10].

Sangwan VS et al., contemplated that each eye bank should develop HRCP in 10 major hospitals. Hospital cornea retrieval programme should contribute 50% of all donor cornea [11]. Hospital cornea retrieval programme is a robust system for procuring cornea for both collection and utilisation when compared to voluntary donation [12]. In Karnataka, the number of corneas harvested was 5561 as per NPCB data from 2018-19, which is lower when compared to other states like Tamil Nadu (10,504) Telangana (8,058). The utilisation rates are disappointingly low as only 999 transplants have occurred in Karnataka in the same year [13]. So a significant chunk

of corneas is unsuitable for utilisation. The success of graft clarity depends on the age of the donor, Death to Enucleation Time (DET), Death to Preservation Time (DPT), surface disorders and endothelial counts [14]. The above issues can be addressed at various levels like improving the networking with eye donation centres, awareness generation campaigns in community and educational Institutes and HRCP [10]. This fact is also substantiated by Oliva MS et al., who advocated that the development of professional eye bank managers and hospital cornea recovery programs will not only spontaneously increase the cornea retrieval rates but also its utilisation rates [5]. Vaishnavi R et al., found a strong correlation between hospitals retrieved cornea and clear graft. The factors contributing are timely cornea retrieval from young corneas because of effective HRCP in the system. The reduced DET and DPT, vital contributors to better quality graft, were also attributed to HRCP [15].

The above studies highlight the importance of HRCP and a pressing need to start the programme at Tumakuru district hospital. The programme initiation begins with finding the number of potential corneas that can be retrieved at the centre. Kavitha CV et al., in the year 2015, conducted a hospital-based study and found that 86% of corneas can be retrieved [16]. The present study found that the potential corneas that could have been retrieved were 74.8%, i.e., 1016 corneas out of 508 deceased persons.

According to cornea donor study group analysis, donor age did not differ in the success rate of moderate risk transplants [17]. However, the results from Specular Microscopy Ancillary Study points out that among the successful cases, cell loss after five years is slightly lower in eyes that had received younger donor corneas [18]. The present study shows that in our potential donor pool, 196 (28.86%) were below 40 years. About 79% of head injury deaths and 62% of poisoning deaths were of the younger age group (<40 years). Nearly one-third of potential donor cornea belonged to the younger age group. The study discovers a significant number of potential donor corneas and suggests a "lost opportunity" to retrieve those corneas. The present study is a prelude to present the data to the higher authorities to take appropriate steps to implement the HRCP programme at our hospital.

### Limitation(s)

There might be an over estimation of potential donors as the assessment was made only on the medical records. Some patients died within a brief admission period, precluding extensive medical history and investigations for ruling out communicable diseases.

## CONCLUSION(S)

The present study has spotted a considerable pool of potential eye donors. The realisation and pursuit of implementing cornea retrieval from this potential donor pool is necessary to bridge the gap between the donors and those waiting for corneal transplantation.

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