



Original research

Awareness and knowledge on eye donation among Allied Health Sciences, medical, and nursing students in Goa

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Abstract

Purpose: To assess the awareness and knowledge on eye donation among students of Allied Health Sciences (AHS), medical, and nursing.

Methods: A cross-sectional descriptive study was conducted using a standard predesigned and pretested closed-ended structured questionnaire based on eye donation to obtain information about awareness and knowledge from AHS, medical, and nursing students of Goa.

Results: Three hundred and forty participants participated in the study. The majority of the participants [97.9% (95% CI: 95.8–99.2)] were aware of the existence of eye donation. Mass media (62.9%) was the foremost source of information. However, only 145 [42.6% (95% CI: 37.3–48.1)] participants were willing to donate their eyes. AHS, medical, and nursing students stood apart significantly in their awareness and knowledge. Only 60 [17.6% (95% CI: 13.7–22.1)] participants were aware that the whole eye can be removed from the donor while 215 [63.2% (95% CI: 57.9–68.4)] were wrongly aware that the cornea can be removed separately. Awareness about eye donation was not associated with willingness to donate eyes.

Conclusions: Although awareness regarding eye donation was satisfactory, there was lack of willingness to donate eyes. There is a need to bridge the gap between eye bank and donors.

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Keywords: Eye donation; Awareness; Knowledge; Corneal transplantation; Allied Health Science; Medical

Introduction

According to World Health Organization (WHO) estimates, every 5 s, someone goes blind.¹ There are currently about 45 million blind people in the world which increases by 1–2 million every year.² Damage to the cornea is the second most common cause of visual impairment and blindness which accounts for about 6–8 million of the total blind cases in the world.^{2,3} The majority of blinding corneal damage in the form

of trachoma affects 4.9 million individuals. Other major causes include ocular trauma, ulceration, xerophthalmia, ophthalmia neonatorum, onchocerciasis, leprosy, and use of traditional eye medicines.⁴

National Programme for Control of Blindness (NPCB) estimated that there are currently 120,000 corneal blind persons in India, and every year, there is an addition of 25,000–30,000 cases with corneal blindness.⁵ A major treatment option for restoring sight in those with corneal blindness is through corneal transplantation which can only be accomplished through cornea donation. Presently in India, the donor eye collection is around 22,000 eyes every year, which is insignificant with respect to the requirement.⁶ Therefore, collection of donor eyes is a priority in any organized effort to alleviate corneal blindness. The establishment of eye banks is implemental in the success of corneal transplants.

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Progress in transplants and procuring the corneas in Goa is slow-moving. In the past eleven years, only 40 eyes have been secured for transplantation in Goa.⁷ Most of the corneas are obtained from road accident victims; however, the time lag between completing formalities and carrying out the autopsy make them unfit for transplantation. Various myths and lack of public awareness associated with eye donation may lead to low donation rates.^{8,9} Therefore, there is a pressing need to create awareness and raise the understanding among the public to come forward to pledge their eyes for donation. There is a paucity of studies on eye donation awareness in Goa.

This study was therefore designed to assess the awareness and knowledge among students of Allied Health Sciences (AHS), medical, and nursing course. These students were chosen because well-informed students can motivate the public for certain as they are the future health care providers. They spend considerable time with critically-ill patients and hence can play a major role in sensitizing them and their relatives to the important cause of eye donation. They can directly interact and counsel a large number of people, and hence influence eye donation rates.

Methods

A cross-sectional descriptive study was conducted in Goa between January to May 2017 among AHS, medical, and nursing students. AHS course comprises 5 streams: Bachelor of Physiotherapy (B.PT), Bachelor of Occupational therapy (B.OT), Bachelor of Optometry (B.OPT), Bachelor in Medical Imaging Technology (BSc.MIT), and Bachelor in Anaesthesia Technology (BSc.AT). 3rd and 4th year B.OPT and 4th and final year medical students were excluded from the study.

A total of 990 subjects (340 AHS, 450 medical, and 200 nursing) were present in the target population. Sample size was calculated based upon prevalence of willingness of donating eye reported by Bharti et al⁸ which was 27%. Willingness was preferred over awareness for sample size calculation because the target location was a medical institute, so it can be assumed that most of them would be aware of the existence of eye donation. With a precision of 5% and a significance level (α) of 5% (0.05), minimum calculated sample size was 303. Assuming a non-response rate of 50%, 495 subjects were enlisted using systematic random sampling strategy and were approached to fill the questionnaire and informed consent was obtained.

A standard predesigned and pretested closed-ended structured questionnaire was self-administered to them to assess their awareness and knowledge on eye donation. Participants were requested to respond to any one option for the questions given. The questionnaire was adapted from Bharti et al⁸ which contained questions on willingness, awareness, and knowledge about eye donation (Table 1). Questions no. 4–6 were comprised of awareness on eye donation reflecting the impact and efficacy of the public campaign on existence of eye donation. Questions no. 7–10 were comprised of knowledge on eye donation, emphasizing more technical

Table 1

Comparison between number of participants and total source population characteristics in terms of sex, field of study, and year of education.

		Total population	Participants, n (%)
Course	AHS	340	165 (48.5)
	Medical	450	90 (20.0)
	Nursing	200	85 (42.5)
Sex	Male	195	61 (31.3)
	Female	795	279 (35.5)
Year of education	First	330	74 (22.4)
	Second	325	123 (37.8)
	Third	275	118 (42.9)
	Final	60	25 (41.7)

AHS: Allied Health Science, n: Number of participants, %: Percentage of participants.

facts and details about eye donation. One can be familiar with the idea of eye donation but may not be well informed about the procedure.

To ascertain the construct for the current settings, psychometric reliability of the questionnaire was pretested in terms of internal consistency and test retest reliability. Items displayed moderate to substantial reliability with a Cronbach's α value of 0.77 and intra class correlation ranged within 0.57–0.82.

Data were analysed using the statistical package SPSS (IBM SPSS Statistics for Windows, Version 20.0. IBM Corp). Frequency and percentages were used for all categorical variables. Comparative statistical tests for significant intergroup differences were performed with the help of Chi-squared or Fisher exact test. During analysis, neutral responses like “undecided” or “don't know” were taken as a negative response for odds ratio calculation to rule out association.

Results

Three hundred and forty participants participated in the study. Overall response rate was 68.7% (340 subjects). However, the response rate differed among the three groups (97.7% AHS, 40.0% medical, and 85.0% nursing).

Comparison between participants and the source population characteristics in terms of sex, field of study, and year of education is shown in Table 1. The majority of participants were female (279, 82.1%). Response rate was 68.88% (279) among females and 67.77% (61) among males. Mean age was 19.54 ± 0.9 years.

Table 2 compiles information about awareness and knowledge of the participants about eye donation. Mass media (62.9%) was the foremost source of information regarding eye donation. Out of 340 participants, only 145 (42.6%) were willing to donate their eyes whereas only 70 (20.6%) were willing to donate their relative's eyes. 3rd year (44.0%) and final year (48.0%) participants were more inclined towards donating eyes.

Twenty-nine (8.6%) participants were not aware of whom to contact for eye donation. Most of the participants, 301 (88.8%), knew that an eye specialist/doctor/surgeon should be contacted for eye donation. The majority of the participants, 189 (55.6%), were aware of the existence of eye banks in Goa i.e. the Rotary Eye Bank.

Table 2
Response of the participants on awareness and knowledge of eye donation.

	AHS (n = 165)	Medical (n = 90)	Nursing (n = 85)	Total (n = 340)	Chi square P value
	n (percentage [95% CI])				
1) How did you come to know about eye donation?					
a) Mass media/Television/Radio	94 [56.9 (49.0–64.6)]	67 [74.4 (64.2–83.1)]	53 [62.3 (51.2–72.6)]	214 [62.9 (57.6–68.1)]	0.012
b) Don't know	3 [1.8 (0.4–5.2)]	0 (0.0)	0 (0.0)	3 [0.9 (0.2–2.6)]	
c) Through this form	3 [1.8 (0.4–5.2)]	1 [1.1 (0.0–6.0)]	0 (0.0)	4 [1.2 (0.3–3.0)]	
d) Hospital/Clinics	20 [12.1 (7.6–18.1)]	6 [6.7 (2.5–13.9)]	14 [16.5 (9.3–26.1)]	40 [11.8 (8.5–15.7)]	
e) Organ donation campaigns	12 [7.3 (3.8–12.4)]	1 [1.1 (0.0–6.0)]	2 [2.4 (0.3–8.2)]	15 [4.4 (2.5–7.2)]	
f) Through lecture	19 [11.5 (7.1–17.4)]	9 [10.0 (4.7–18.1)]	11 [12.9 (6.6–22.0)]	39 [11.5 (8.3–15.3)]	
g) Friend	11 [6.7 (3.4–11.6)]	0 (0.0)	3 [3.5 (0.7–10.0)]	14 [4.1 (2.3–6.8)]	
h) Doctor	3 [1.8 (0.4–5.2)]	6 [6.7 (2.5–13.9)]	2 [2.4 (0.3–8.2)]	11 [3.2 (1.6–5.7)]	
2) Are you willing to donate your eyes?					
a) Yes	79 [47.8 (40.1–55.8)]	47 [52.2 (41.4–62.9)]	19 [22.3 (14.0–32.7)]	145 [42.6 (37.3–48.1)]	0.001
b) No	19 [11.5 (7.1–17.4)]	13 [14.5 (7.9–23.4)]	14 [16.5 (9.3–26.1)]	46 [13.5 (10.1–17.6)]	
c) Don't know	28 [17.0 (11.6–23.6)]	9 [10.0 (4.7–18.1)]	7 [8.2 (3.4–16.2)]	44 [12.9 (9.6–17.0)]	
d) Maybe/Need time	39 [23.6 (17.4–30.9)]	21 [23.3 (15.1–33.4)]	45 [53.0 (41.8–63.9)]	105 [31.0 (26.0–36.1)]	
3) Are you willing to donate your close relative's eyes?					
a) Yes	25 [15.2 (10.1–21.5)]	29 [32.2 (22.8–42.9)]	16 [18.8 (11.2–28.8)]	70 [20.6 (16.4–25.3)]	0.083
b) No	36 [21.8 (15.8–28.9)]	18 [20.0 (12.3–29.8)]	19 [22.3 (14.0–32.7)]	73 [21.5 (17.2–26.2)]	
c) Don't know	63 [38.2 (30.7–46.1)]	24 [26.7 (17.9–37.0)]	29 [34.1 (24.2–45.2)]	116 [34.1 (29.1–39.4)]	
d) Maybe/Need time	41 [24.8 (18.5–32.2)]	19 [21.1 (13.2–31.0)]	21 [24.7 (16.0–35.3)]	81 [23.8 (19.4–28.7)]	
4) Whom do you approach for eye donation?					
a) Hospital/Society	33 [20.0 (14.2–26.9)]	17 [19.0 (11.4–28.5)]	5 [5.9 (1.9–13.2)]	55 [16.2 (12.4–20.5)]	0.028
b) Doctor	10 [6.1 (2.9–10.9)]	13 [14.4 (7.9–23.4)]	4 [4.7 (1.3–11.6)]	27 [7.9 (5.3–11.3)]	
c) Specialist	22 [13.3 (8.5–19.5)]	11 [12.2 (6.3–20.8)]	11 [12.9 (6.6–22.0)]	44 [12.9 (9.6–17.0)]	
d) Don't know	8 [4.8 (2.1–9.3)]	4 [4.4 (1.2–11.0)]	8 [9.4 (4.2–17.7)]	20 [6.0 (3.6–8.9)]	
e) Parent/Close family	3 [1.8 (0.4–5.2)]	2 [2.2 (0.3–7.8)]	4 [4.7 (1.3–11.6)]	9 [2.6 (1.2–5.0)]	
f) Eye bank	89 [53.9 (46.0–61.7)]	43 [47.8 (37.1–58.6)]	53 [62.4 (51.2–72.6)]	185 [54.4 (49.0–59.8)]	
5) Who should remove the eye from the donor?					
a) Eye specialist	82 [49.7 (41.8–57.6)]	57 [63.3 (52.5–73.2)]	41 [48.2 (37.3–59.3)]	180 [52.9 (47.5–58.3)]	0.001
b) Doctor/Surgeon	73 [44.2 (36.5–52.2)]	24 [26.7 (17.9–27.0)]	25 [29.4 (20.0–40.3)]	122 [35.9 (30.8–41.2)]	
c) Optometrist	4 [2.4 (0.7–6.1)]	3 [3.3 (0.7–9.4)]	16 [18.8 (11.2–28.8)]	23 [6.8 (4.1–9.6)]	
d) Don't know	5 [3.0 (1.0–6.9)]	6 [6.7 (2.5–13.9)]	3 [3.5 (0.7–10.0)]	14 [4.1 (2.3–6.8)]	
e) Anyone	1 [0.6 (0.0–3.3)]	0 (0.0)	0 (0.0)	1 [0.3 (0.0–1.6)]	
6) Name any eye bank that you know in Goa.					
a) Don't know	54 [32.7 (25.6–40.5)]	29 [32.2 (22.8–42.9)]	41 [48.2 (37.3–59.3)]	124 [36.5 (31.3–41.8)]	0.001
b) Rotary Eye Bank	102 [61.8 (53.9–69.3)]	47 [52.2 (41.4–62.9)]	40 [47.1 (36.1–58.2)]	189 [55.6 (50.1–60.9)]	
c) Lions Eye Bank	5 [3.0 (1.0–6.9)]	14 [15.6 (8.8–24.7)]	3 [3.5 (0.7–10.0)]	22 [6.5 (4.1–9.6)]	
d) Sankara Nethralaya Eye Bank	4 [2.4 (0.7–6.1)]	0 (0.0)	1 [1.2 (0.0–6.4)]	5 [1.5 (0.5–3.4)]	
7) Within how much time after death should the eyes be removed?					
a) Don't know	14 [8.5 (4.7–13.8)]	4 [4.4 (1.2–11.0)]	6 [7.1 (2.6–14.7)]	24 [7.1 (4.6–10.3)]	0.022
b) Within 6 h	91 [55.2 (47.2–62.9)]	67 [74.4 (64.2–83.1)]	43 [50.6 (39.5–61.6)]	201 [59.1 (53.7–64.4)]	
c) Within 24 h/week	14 [8.5 (4.7–13.8)]	6 [6.7 (2.5–13.9)]	7 [8.2 (3.4–16.2)]	27 [7.9 (5.3–11.3)]	
d) As soon as possible	33 [20.0 (14.2–26.9)]	10 [11.1 (5.5–19.5)]	26 [30.6 (21.0–41.5)]	69 [20.3 (16.1–25.0)]	
e) Not sure	13 [7.9 (4.3–13.1)]	3 [3.3 (0.7–9.4)]	3 [3.5 (0.7–10.0)]	19 [5.6 (3.4–8.6)]	
8) What is removed from the donor eye?					
a) Don't know	29 [17.6 (12.1–24.3)]	8 [8.9 (3.9–16.8)]	4 [4.7 (1.3–11.6)]	41 [12.1 (8.8–16.0)]	0.012
b) Whole eye	19 [11.5 (7.1–17.4)]	21 [23.3 (15.1–33.4)]	20 [23.5 (15.0–34.0)]	60 [17.6 (13.7–22.1)]	
c) Cornea	107 [64.8 (57.0–72.1)]	57 [63.3 (52.5–73.2)]	51 [60.0 (48.8–70.5)]	215 [63.2 (57.9–68.4)]	
d) Lens	8 [4.8 (2.1–9.3)]	3 [3.3 (0.7–9.4)]	8 [9.4 (4.2–17.7)]	19 [5.6 (3.4–8.6)]	
e) Retina/Sclera/Tissues	2 [1.2 (1.0–4.3)]	1 [1.1 (0.0–6.0)]	2 [2.4 (0.3–8.2)]	5 [1.5 (0.5–3.4)]	
9) What is transplanted from the donor eye?					
a) Don't know	31 [18.8 (13.1–25.6)]	6 [6.7 (2.5–13.9)]	7 [8.2 (3.4–16.2)]	44 [12.9 (9.6–17.0)]	0.001
b) Retina	0 (0.0)	2 [2.2 (0.3–7.8)]	7 [8.2 (3.4–16.2)]	9 [2.7 (1.2–5.0)]	
c) Whole eye	9 [5.5 (2.5–10.1)]	1 [1.1 (0.0–6.0)]	7 [8.2 (3.4–16.2)]	17 [5.0 (2.9–7.9)]	
d) Cornea	110 [66.7 (58.9–73.8)]	75 [83.3 (74.0–90.4)]	53 [62.4 (51.2–72.6)]	238 [70.0 (64.8–74.8)]	
e) Iris/Lens/Any part	15 [9.1 (5.2–14.6)]	6 [6.7 (2.5–13.9)]	11 [12.9 (6.6–22.0)]	32 [9.4 (6.5–13.0)]	

(continued on next page)

Table 2 (continued)

	AHS (n = 165)	Medical (n = 90)	Nursing (n = 85)	Total (n = 340)	Chi square P value
	n (percentage [95% CI])				
10) How long the donor eye can be kept/stored before transplantation?					
a) Don't know	55 [33.3 (26.2–41.1)]	20 [22.2 (14.1–32.2)]	25 [29.4 (20.0–40.3)]	100 [29.4 (24.6–34.6)]	0.077
b) Up to 6 h	25 [15.2 (10.1–21.5)]	9 [10.0 (4.7–18.1)]	8 [9.4 (4.2–17.7)]	42 [12.3 (9.0–16.3)]	
c) Up to 7–12 h	19 [11.5 (7.1–17.4)]	11 [12.2 (6.3–20.8)]	15 [17.7 (10.2–27.4)]	45 [13.2 (9.8–17.3)]	
d) Up to 72 h	47 [28.5 (21.7–36.0)]	32 [35.6 (25.7–46.3)]	21 [24.7 (16.0–35.3)]	100 [29.4 (24.6–34.6)]	
e) Few days/Few weeks	10 [6.1 (2.9–10.9)]	9 [10.0 (4.7–18.1)]	4 [4.7 (1.3–11.6)]	23 [6.8 (4.3–10.0)]	
f) Few months/Few years	0 (0.0)	3 [3.3 (0.7–9.4)]	5 [5.9 (1.9–13.2)]	8 [2.4 (1.0–4.6)]	
g) As soon as possible	9 [5.5 (2.5–10.1)]	6 [6.7 (2.5–13.9)]	7 [8.2 (3.4–16.2)]	22 [6.5 (4.1–9.6)]	

AHS: Allied Health Science, CI: Confidence interval, n: Number of participants, %: Percentage of participants, P value: Probability value.

The ideal time for eye donation which is within 6 h of death was known to 201 (59.1%) participants. Only 60 (17.6%) participants were aware that the whole eye can be removed from the donor while 215 (63.2%) were aware that the cornea can be removed separately. Most of the participants, 238 (70.0%), knew that the cornea is the part of the eye which is used for transplantation. 100 (29.4%) participants did not know for how long the donor eye can be stored before transplantation. Third and final year participants were more aware of eye donation.

Table 3 summarizes awareness and knowledge of the participants regarding eye donation among different stream of AHS course. Among AHS, BSc.AT (68.4%) participants were most willing to donate their eyes whereas B.OT (26.8%) participants were most willing to donate their relative's eyes. All of the B.OPT (100%) students knew that an eye specialist/doctor/surgeon should be contacted for eye donation. The majority of the BSc.AT (65.9%) and B.OT (73.7%) participants were aware about the existence of eye banks in Goa i.e. the Rotary Eye Bank. Knowledge about ideal time for eye donation was reported highest among B.OT (68.3%) and B.OPT (62.1%) respondents. Knowledge about removal of the whole eye was poor (11.5%) among the AHS participants, although B.OPT (93.1%) and B.OT (73.2%) lead in the knowledge about corneal transplantation. The majority of the AHS participants (71.5%) did not have correct information about the storage time of the donor eye before transplantation.

Table 4 shows the association between willingness to donate eyes and awareness and knowledge of eye donation. Willingness to donate eyes was found to be associated with correct awareness about who should remove the eye from the donor. However, association was not found for Questions 7 and 8, and negative association was seen for Questions 5, 9, and 10. Association was not found between willingness to donation and gender as well as year of education [OR: 0.86 (0.57–1.37)]. No association was found between knowledge and gender.

Discussion

The present study reports the awareness and knowledge about eye donation among medical, AHS, and nursing students in Goa, India. According to NPCB state-wise statistics report of India 2017–18, only 6 donated eyes were collected while

the target was 30. In the last 10 years (2007–17), there has been no subsequent growth in the rate of eye donation throughout the state, which reflects lack of awareness among Goa's population.⁷ Most of the time, a large number of deaths occurs in the hospitals. Hence, existing well informed AHS, medical and nursing students, and hospitals staff are expected to influence eye donation rates.

The majority of participants (97.9%) were aware of the existence of eye donation in this study, similar to results by Anita et al. (96.8%), Sanjeev Kumar et al. (98%), and Vidusha et al. (99.3%).^{9–11} This can be attributed to mass media campaign which was the main source of information leading to a high level of concept among the respondents in the current study. Various studies in literature in India and abroad also reported mass media and publicity campaigns as the major sources of information.^{8–11} This braces the requirement of meticulous mass media expedition in creating eye donation awareness among students and general population.

Willingness to donate eyes among medical students varied from 9% to 88% among Indian studies and 13%–94% among abroad studies (Table 5).^{8–25} However, in this study, only 42.6% of the students were willing to donate their eyes. These high proportions in the few studies are reassuring owing to the fact that students who are themselves motivated will be in a preferable situation to instigate others to donate eyes. Anita et al. reported various reasons for donating and not donating eyes among nursing students in Bangalore.⁹ 'Eye donation is noble work' was quoted as the reason for willingness to donate eyes for the majority of respondents. Dislike of separating eyes from body and lack of awareness was perceived as the main reason for people not donating eyes. Religious reasons were also accounted for unwillingness to donate eyes in a few studies.^{9–11} Sadana et al. cited family members' objection as one of the reasons for not donating their eyes.¹² Similar results were stated by Singh et al. among medical students.¹³

Our study reports that only 20.6% students were willing to donate their close relative's eyes. A study conducted by Sanjeev et al. among medical, paramedical, and nursing students reported willingness to donate a close relative's eyes in 22% participants whereas only 10.4% subjects were willing to donate a close relative's eyes in a study by Boniface et al.^{10,14} A reason for this unwillingness to donate close relative's eyes could be that they think that they do not have the right to pledge their relative's eyes without their consent.¹⁰

Table 3
Awareness and knowledge of the participants about eye donation among different stream of Allied Health Science (AHS) courses.

	B.PT (n = 49)	B.OT (n = 41)	B.OPT (n = 29)	BSc.MIT (n = 27)	B.Sc.AT (n = 19)
	n (percentage [95% CI])				
1) How did you come to know about eye donation?					
a) Mass media/Television/ Radio/Movies	25 [51.0 (36.3–65.6)]	22 [53.7 (37.4–69.3)]	17 [58.6 (38.9–76.5)]	20 [74.1 (53.7–88.9)]	10 [52.6 (28.9–75.6)]
b) Don't know	3 [6.1 (1.3–16.9)]	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
c) Through this form	2 [4.1 (0.5–14.0)]	0 (0.0)	0 (0.0)	0 (0.0)	1 [5.3 (0.1–26.0)]
d) Hospital/Clinics	2 [4.1 (0.5–14.0)]	8 [19.5 (8.8–34.9)]	4 [13.8 (3.9–31.7)]	5 [18.5 (6.3–38.1)]	1 [5.3 (0.1–26.0)]
e) Organ donation campaigns	4 [8.2 (2.3–19.6)]	3 [7.3 (1.5–19.9)]	2 [6.9 (0.8–22.8)]	1 [3.7 (0.1–19.0)]	2 [10.5 (1.3–33.1)]
f) Through lecture	8 [16.3 (7.3–29.7)]	3 [7.3 (1.5–19.9)]	4 [13.8 (3.9–31.7)]	0 (0.0)	4 [21.0 (6.1–45.6)]
g) Friend	4 [8.2 (2.3–19.6)]	5 [12.2 (4.1–26.2)]	0 (0.0)	1 [3.7 (0.1–19.0)]	1 [5.3 (0.1–26.0)]
h) Doctor	1 [2.0 (0.1–10.9)]	0 (0.0)	2 [6.9 (0.8–22.8)]	0 (0.0)	0 (0.0)
2) Are you willing to donate your eyes?					
a) Yes	18 [36.7 (23.4–51.7)]	21 [51.2 (35.1–67.1)]	14 [48.3 (29.4–67.5)]	13 [48.1 (28.7–68.1)]	13 [68.4 (43.4–87.4)]
b) No	12 [24.5 (13.3–38.9)]	2 [4.9 (0.6–16.5)]	1 [3.5 (0.1–17.8)]	3 [11.1 (2.4–29.2)]	1 [5.3 (0.1–26.0)]
c) Don't know	11 [22.5 (11.8–36.6)]	6 [14.6 (5.6–29.2)]	5 [17.2 (5.8–35.8)]	3 [11.1 (2.4–29.2)]	3 [15.8 (3.4–39.6)]
d) Maybe/Need time	8 [16.3 (7.3–29.7)]	12 [29.3 (16.1–45.5)]	9 [31.0 (15.3–50.8)]	8 [29.6 (13.8–50.2)]	2 [10.5 (1.3–33.1)]
3) Are you willing to donate your close relative's eyes?					
a) Yes	6 [12.2 (4.6–24.8)]	11 [26.8 (14.2–42.9)]	4 [13.8 (3.9–31.7)]	2 [7.4 (0.9–24.3)]	2 [10.5 (1.3–33.1)]
b) No	20 [40.8 (27.0–55.8)]	5 [12.2 (4.1–26.2)]	3 [10.3 (2.2–27.4)]	3 [11.1 (2.4–29.2)]	5 [26.3 (9.1–51.2)]
c) Don't know	10 [20.4 (10.2–34.3)]	13 [31.7 (18.1–48.1)]	14 [48.3 (29.4–67.5)]	16 [59.3 (38.8–77.6)]	10 [52.6 (28.9–75.6)]
d) Maybe/Need time	13 [26.5 (14.9–41.1)]	12 [29.3 (16.1–45.5)]	8 [27.6 (12.7–47.2)]	6 [22.2 (8.6–42.3)]	2 [10.5 (1.3–33.1)]
4) Whom do you approach for eye donation?					
a) Hospital/Society	11 [22.5 (11.8–36.6)]	11 [26.8 (14.2–42.9)]	2 [6.9 (0.8–22.8)]	8 [29.6 (13.8–50.2)]	1 [5.3 (0.1–26.0)]
b) Doctor	1 [2.0 (0.1–10.9)]	1 [2.4 (0.1–12.9)]	3 [10.3 (2.2–27.4)]	2 [7.4 (0.9–24.3)]	3 [15.8 (3.4–39.6)]
c) Specialist	5 [10.2 (3.4–22.2)]	6 [14.6 (5.6–29.2)]	5 [17.2 (5.8–35.8)]	3 [11.1 (2.4–29.2)]	3 [15.8 (3.4–39.6)]
d) Don't know	3 [6.1 (1.3–16.9)]	0 (0.0)	1 [3.5 (0.1–17.8)]	3 [11.1 (2.4–29.2)]	1 [5.3 (0.1–26.0)]
e) Parent/Close family	1 [2.0 (0.1–10.9)]	1 [2.4 (0.1–12.9)]	0 (0.0)	1 [3.7 (0.1–19.0)]	0 (0.0)
f) Eye bank	28 [57.1 (42.2–71.2)]	22 [53.7 (37.4–69.3)]	18 [62.1 (42.3–79.3)]	10 [37.0 (19.4–57.6)]	11 [57.9 (33.5–79.7)]
5) Who should remove the eye from the donor?					
a) Eye specialist	26 [53.1 (38.3–67.5)]	21 [51.2 (35.1–67.1)]	11 [37.9 (20.7–57.7)]	18 [66.7 (46.0–83.5)]	6 [31.6 (12.6–56.6)]
b) Doctor/Surgeon	16 [32.7 (19.9–47.5)]	19 [46.3 (30.7–62.6)]	18 [62.1 (42.3–79.3)]	8 [29.6 (13.8–50.2)]	12 [63.1 (38.4–83.7)]
c) Optometrist	3 [6.1 (1.3–16.9)]	0 (0.0)	0 (0.0)	1 [3.7 (0.1–19.0)]	0 (0.0)
d) Don't know	3 [6.1 (1.3–16.9)]	1 [2.4 (0.1–12.9)]	0 (0.0)	0 (0.0)	1 [5.3 (0.1–26.0)]
e) Anyone	1 [2.0 (0.1–10.9)]	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
6) Name any eye bank that you know in Goa.					
a) Don't know	17 [34.7 (21.7–49.6)]	11 [26.8 (14.2–42.9)]	10 [34.5 (17.9–54.3)]	12 [44.4 (25.5–64.7)]	4 [21.0 (6.1–45.6)]
b) Rotary Eye Bank	29 [59.2 (44.2–73.7)]	27 [65.9 (49.4–79.9)]	18 [62.1 (42.3–79.3)]	14 [51.9 (31.9–71.3)]	14 [73.7 (48.8–90.9)]
c) Lions Eye Bank	1 [2.0 (0.1–10.9)]	2 [4.9 (0.6–16.5)]	1 [3.5 (0.1–17.8)]	0 (0.0)	1 [5.3 (0.1–26.0)]
d) Sankara Nethralaya Eye Bank	2 [4.1 (0.5–14.0)]	1 [2.4 (0.1–12.9)]	0 (0.0)	1 [3.7 (0.1–19.0)]	0 (0.0)
7) Within how much time after death should the eyes be removed?					
a) Don't know	4 [8.2 (2.3–19.6)]	8 [19.5 (8.8–34.9)]	1 [3.5 (0.1–17.8)]	0 (0.0)	1 [5.3 (0.1–26.0)]
b) Within 6 h	20 [40.8 (27.0–55.8)]	28 [68.3 (51.9–81.9)]	18 [62.1 (42.3–79.3)]	14 [51.9 (31.9–71.3)]	11 [57.9 (33.5–79.7)]
c) Within 24 h/week	2 [4.1 (0.5–14.0)]	1 [2.4 (0.1–12.9)]	2 [6.9 (0.8–22.8)]	8 [29.6 (13.8–50.2)]	1 [5.3 (0.1–26.0)]
d) As soon as possible	16 [32.7 (19.9–47.5)]	3 [7.3 (1.5–19.9)]	6 [20.7 (8.0–39.7)]	4 [14.8 (4.2–33.7)]	4 [21.0 (6.1–45.6)]
e) Not sure	7 [14.3 (5.9–27.2)]	1 [2.4 (0.1–12.9)]	2 [6.9 (0.8–22.8)]	1 [3.7 (0.1–19.0)]	2 [10.5 (1.3–33.1)]
8) What is removed from the donor eye?					
a) Don't know	17 [34.7 (21.7–49.6)]	7 [17.1 (7.2–32.1)]	1 [3.5 (0.1–17.8)]	2 [7.4 (0.9–24.3)]	2 [10.5 (1.3–33.1)]
b) Whole eye	4 [8.2 (2.3–19.6)]	6 [14.6 (5.6–29.2)]	1 [3.5 (0.1–17.8)]	5 [18.5 (6.3–38.1)]	3 [15.8 (3.4–39.6)]
c) Cornea	22 [44.8 (30.7–59.8)]	28 [68.3 (51.9–81.9)]	25 [86.2 (68.3–96.1)]	19 [70.4 (49.8–86.2)]	13 [68.4 (43.4–87.4)]
d) Lens	4 [8.2 (2.3–19.6)]	0 (0.0)	2 [6.9 (0.8–22.8)]	1 [3.7 (0.1–19.0)]	1 [5.3 (0.1–26.0)]
e) Retina/Sclera/Tissues	2 [4.1 (0.5–14.0)]	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
9) What is transplanted from the donor eye?					
a) Don't know	14 [28.6 (16.6–43.3)]	9 [22.0 (10.6–37.6)]	1 [3.5 (0.1–17.8)]	4 [14.8 (4.2–33.7)]	3 [15.8 (3.4–39.6)]
b) Retina	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
c) Whole eye	4 [8.2 (2.3–19.6)]	1 [2.4 (0.1–12.9)]	0 (0.0)	2 [7.4 (0.9–24.3)]	2 [10.5 (1.3–33.1)]
d) Cornea	22 [44.8 (30.7–59.8)]	30 [73.2 (57.1–85.8)]	27 [93.1 (77.2–99.2)]	18 [66.7 (46.0–83.5)]	13 [68.4 (43.4–87.4)]
e) Iris/Lens/Any part	9 [18.3 (8.8–32.0)]	1 [2.4 (0.1–12.9)]	1 [3.5 (0.1–17.8)]	3 [11.1 (2.4–29.2)]	1 [5.3 (0.1–26.0)]

(continued on next page)

Table 3 (continued)

	B.PT (n = 49)	B.OT (n = 41)	B.OPT (n = 29)	BSc.MIT (n = 27)	B.Sc.AT (n = 19)
	n (percentage [95% CI])				
10) How long the donor eye can be kept/stored before transplantation?					
a) Don't know	27 [55.1 (40.2–69.3)]	13 [31.7 (18.1–48.1)]	9 [31.0 (15.3–50.8)]	4 [14.8 (4.2–33.7)]	2 [10.5 (1.3–33.1)]
b) Up to 6 h	9 [18.3 (8.8–32.0)]	3 [7.3 (1.5–19.9)]	4 [13.8 (3.9–31.7)]	8 [29.6 (13.8–50.2)]	1 [5.3 (0.1–26.0)]
c) Up to 7–12 h	1 [2.0 (0.1–10.9)]	10 [24.4 (12.4–40.3)]	5 [17.2 (5.8–35.8)]	3 [11.1 (2.4–29.2)]	0 (0.0)
d) Up to 72 h	4 [8.2 (2.3–19.6)]	12 [29.3 (16.1–45.5)]	7 [24.1 (10.3–43.5)]	10 [37.0 (19.4–57.6)]	14 [73.7 (48.8–90.9)]
e) Few days/Few weeks	5 [10.2 (3.4–22.2)]	3 [7.3 (1.5–19.9)]	2 [6.9 (0.8–22.8)]	0 (0.0)	0 (0.0)
f) Few months/Few years	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
g) As soon as possible	3 [6.1 (1.3–16.9)]	0 (0.0)	2 [6.9 (0.8–22.8)]	2 [7.4 (0.9–24.3)]	2 [10.5 (1.3–33.1)]

B.PT: Bachelor of Physiotherapy, B.OT: Bachelor of Occupational therapy, B.OPT: Bachelor of Optometry, BSc.MIT: Bachelor in Medical Imaging Technology, BSc.AT: Bachelor in Anaesthesia Technology, CI: Confidence interval, n: Number of participants, %: Percentage of participants.

In the current study, 44.4% of the students were not aware of the existence of eye bank in Goa i.e. Rotary Eye Bank. Bharti et al.⁸ stated that the majority of the students (94%) were not aware of the existence of eye bank in their vicinity. Similarly, Kumar et al. also found that 94% students in a medical college in Bhopal were not aware of any eye bank in India.¹⁰ Singh et al. reported low (67.4%) awareness of existence of eye banks.¹³ This could be due to their lack of knowledge in this area as only 1st year medical students were included in the study.

Knowledge regarding the number of hours after death within which eyes should be removed for donation varied in proportion among different studies. 38%–87% were aware of the correct number of hours in literature.^{8–21} The current study reported knowledge in 59.1% participants. Anita et al. reported only 38.2% of nursing students knew that the ideal time of donation was within 6 h of death. Only 17.6% respondents were aware that the whole eye can be removed from the donor, although 70.0% knew that the cornea is the part of the eye which is used for transplantation.⁹ On the contrary, among Malaysian medical students, only 40.0% knew that the whole eye is removed, and 30.25% knew that cornea is used for transplantation.⁸ Among students from Bhopal medical students, only 20.0% knew that the whole eye is removed, and 63.2% knew that the cornea is used for transplantation.¹⁰

63.2% were wrongly aware that the cornea can be removed separately in this study. Similar reports (65.5%) were presented by Sadana et al.¹² On the contrary, only 25.25% of subjects were reported by Bharti et al.⁸

The knowledge that the transplantation should be done within 2–3 days of removal was known to only 29.4% of the students in our study compared to 44.4% students in a study done among medical students at Bangalore,¹¹ whereas in a study among medical students in Aurangabad, 33% students knew this fact.²⁶

Kumar et al. found that awareness and knowledge of medical students was statistically better than nursing and paramedical students in Bhopal.¹⁰ However in their study, the questionnaire was administered to the students after delivering a lecture session on eye donation. Jenifa et al. found that the level of awareness and attitude regarding eye donation was higher among paramedical than nursing students.¹⁹ Our study showed that overall willingness to donate own eyes and a close relative's eye was highest among medical, then AHS, and lowest in nursing participants. Similar results were obtained for awareness and knowledge related questions also. Among the AHS group, occupational therapy and optometry participants had relatively better knowledge and awareness regarding eye donation.

Across all three groups, awareness and knowledge of eye donation did not elucidate to willingness to donate eyes.

Table 4
Association between willingness to donate eyes and awareness and knowledge of eye donation.

		Yes n (%)	No n (%)	OR (95% CI)	P value
Who should remove the eye from the donor	Correct	135 (93.1)	167 (85.6)	2.26 (1.06–4.82)	0.031
	Incorrect	10 (6.9)	28 (14.4)		
Eye bank known in Goa	Correct	96 (66.2)	93 (47.7)	0.46 (0.30–0.77)	0.001
	Incorrect	49 (33.8)	102 (52.3)		
Within how much time after death should the eyes be removed	Correct	93 (64.1)	108 (55.4)	0.69 (0.44–1.07)	0.100
	Incorrect	52 (35.9)	87 (44.6)		
What is removed from the donor eye	Correct	27 (18.6)	33 (16.9)	0.89 (0.50–1.56)	0.680
	Incorrect	118 (81.4)	162 (83.1)		
What is transplanted from the donor eye	Correct	114 (78.6)	124 (63.6)	0.47 (0.29–0.77)	0.002
	Incorrect	31 (21.4)	71 (36.4)		
How long the donor eye can be kept/stored before transplantation	Correct	57 (39.3)	43 (22.1)	0.44 (0.28–0.70)	0.001
	Incorrect	88 (60.7)	152 (77.9)		
Gender	Male	25 (17.2)	36 (18.5)	1.09 (0.62–1.90)	0.44
	Female	120 (82.8)	159 (81.5)		

CI: Confidence interval, n: Number of participants, OR: Odds ratio, %: Percentage of participants, P value: Probability value.

Table 5
Willingness to donate eyes among medical students among previous studies.

Study name	Year	Location	Course	Year	n	Willing to donate (%)
Current study	2017	Goa	Medical, AHS & Nursing	All except pre final and final in B.OPT and medical	340	42.60
Bharti et al ⁸	2005	Malaysia	Medical	1st	103	33.10
Anita Gupta et al ⁹	2008	Bangalore	Nursing	1st and 2nd	188	85.10
Sanjeev Kumar et al ¹⁰	2012	Bhopal	Medical, paramedical and nursing	All	400	46.75
Vidusha et al ¹¹	2012	Bangalore	Medical	Pre and final	160	9.00
Sadana et al ¹²	2014	Tirupati	Medical	All	400	51.10
Singh M et al ¹³	2012	Ambala	Medical	All	467	67.00
Boniface et al ¹⁴	2014	Africa	Medical	All	107	13.10
Sudesh et al ¹⁵	2014	Chandigarh	Medical and paramedical	All	395	65.40
Aruna Gupta et al ¹⁶	2013	Gujarat	Medical	3rd	100	87.00
MM Singh et al ¹⁷	2007	Delhi	Medical	1st	180	87.20
Phani et al ¹⁸	2013	Kadapa	Medical	All	200	21.10
Jenifa et al ¹⁹	2016	Bhopal,	Nursing and paramedical	All	200	35.00
Sameena et al ²⁰	2013	Raichur	Paramedical	All	200	97.00
Muthukrishnan et al ²¹	2017	Puducherry	Medical	All	277	87.40
Kamal et al ²²	2013	Rajkot	Medical	1st and 2nd	450	92.00
Theodore et al ²³	2011	Greece	Medical	All	558	93.90
Okoye et al ²⁴	2010	Nigeria	Medical	All	131	33.60
Rajesh et al ²⁵	2016	Bhopal	Medical	All	467	61.90

AHS: Allied Health Science, B.OPT: Bachelor in Optometry, n: Number of participants, %: Percentage of participants.

However, willingness to donate eyes was more in medical (52.2%) than AHS (47.8%) and nursing (22.3%) students. This disproportion suggests that trenchant obstacles prevail between knowledge and willingness to donate eyes among the three groups as well as among AHS subgroups. Gogate et al. pointed out the need to have more “catalysts” in the crucial hours of death in order to facilitate eye donation rate.²⁷ Therefore, developing strategies to overcome the obstacles becomes necessary to enhance donation rates. Similar finding were reported by Boniface et al.¹⁴ Gupta et al. reported overall lack of awareness and unwillingness to donate eyes among 6th semester medical students in Gujarat which was attributed to lack of clinical exposure in the curriculum till the 3rd year.¹⁶ Students from medical college who are partly informed about eye donation will apparently not be good representatives for eye donation awareness when they become practitioners.

The majority of the participants were female (279, 82.1%). The high female to male ratio (4.2:1) among the target sample may account for the dissimilarity. Disproportion of the participant's among the three subgroups may be due to unequal numbers and diverse response rates among the target samples. Response rate was particularly low among the MBBS participants. Lack of interest, general denial, lack of time, and unavailability during the time of approach may be reasons for the poor response rate. With respect to the year of education, the number of first-year participants was low due to lack of time and unavailability.

To the best of our knowledge, ours is the first study to report awareness and knowledge of eye donation among students from medical college located in Goa. Eye donation rate in Goa is reported to be very slow i.e. supply rate is just one-fourth of the target in last decade.⁵ According to NPCB, there is only one eye bank registered in Goa which indicates a major lacuna.²⁸ This implies lack of access to eye banks in the immediate vicinity. All these factors together make a shortage of

transplantable corneas a subject of attention in Goa. Hence, there is a requirement to raise the level of public education on eye donation. Targeting students for eye donation awareness campaign from medical college can be treated as the first important step. They could motivate and convince themselves as well as patients to pledge their eyes towards eye donation. They can also contribute by taking part in creating awareness and motivating individuals during their clinical postings.

Since this study was conducted among college students representing health science educational background, these results cannot be generalized to students of other backgrounds and the general population. Another limitation was that this study could not assess certain associated factors like reasons for not willing to donate eyes, eligibility to donate, and religious viewpoints. The subject of eye donation comprehends a wide array of issues. As a result, there is a wide scope for future studies. Other relevant factors such as perception, attitude, and misconception regarding eye donation among students can be studied. Further studies to elicit the factors which prohibit people from eye donation can also be undertaken.

In summary, awareness and knowledge among the AHS, medical, and nursing students regarding eye donation was satisfactory; however, there was a lack of willingness to donate eyes. There is a need to enhance knowledge and encourage students to pledge their eyes so that we can bridge the gap between eye bank and donors. Future studies can be carried out to understand the perception about the unwillingness to donate eyes.

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