

## CHAPTER 2

### CORNEAL TRANSPLANTATION

#### *Editors:*

Dr. Shamala Retnasabapathy  
Dr. Choong Yean Yaw  
Dr. Michael Law Sie Haur

#### *Expert Panel:*

Dr. Shamala Retnasabapathy (Chairperson)  
Dr. Choong Yean Yaw (Co-chairperson)  
Dr. Jonathan Choon Siew Cheong  
Dr. Chuah Kay Leong  
Dr. Michael Law Sie Haur  
Dr. Mariam Ismail  
Assoc. Prof. S C Reddy  
Dato' Dr. Veera Ramani  
Dr. Sahimi Sulaiman  
Dr. U. Thiageswari

### Contents

#### 2.0 Introduction

#### 2.1 Cornea Transplant Activities and Trends

- Transplant rates
- Type of transplant

#### 2.2 Recipients' Characteristics

- Demographics
- Primary diagnosis

#### 2.3 Transplant Practices 2004 - 2005

- Pre - transplant data
  - Donor details
- Transplant practices

#### 2.4 Cornea Transplant Outcome 2004

- Outcome - Graft Survival
- Outcome - Vision

#### 2.5 Cornea Transplant Complications 2004

List of Tables

Table 2.1.1: New Transplant Rate per million population (pmp), 1998-2005.....	44
Table 2.1.2: Types of Cornea Transplant, 1998-2005 .....	45
Table 2.2.1: Gender distribution, 1998-2005 .....	46
Table 2.2.2: Ethnic distribution, 1998-2005 .....	47
Table 2.2.3: Age distribution of cornea transplant recipient patients, 1998-2005 .....	48
Table 2.2.4: Primary diagnosis, 1998-2005 .....	49
Table 2.2.5: Indications of cornea transplant, 2004-2005.....	50
Table 2.3.1.1: Number of cornea transplants with complete data set .....	51
Table 2.3.2.1: No of previous grafts in grafted eye, 2004-2005 .....	51
Table 2.3.2.2: Ocular co-morbidity, 2004-2005 .....	51
Table 2.3.2.3: Pre-operative vision, 2004-2005.....	52
Table 2.3.3.1: Source of Donor Cornea Tissue, 2004-2005 .....	53
Table 2.3.3.2: Donor age distribution, 2004-2005 .....	54
Table 2.3.3.3: Preservation media, 2004-2005 .....	55
Table 2.3.3.4: Cause of death in cornea donors, 2004-2005.....	55
Table 2.3.4.1: Type of surgery, 2004-2005.....	56
Table 2.3.4.2: Type of Combined surgery, 2004-2005 .....	56
Table 2.3.4.3: Recipient Cornea Trephined Size, 2004-2005 .....	57
Table 2.3.4.4: Difference in trephined sizes of recipient and donor corneas, 2004-2005 .....	57
Table 2.3.4.5: Suture Technique, 2004-2005.....	57
Table 2.4.1.1: Stock and flow .....	58
Table 2.4.2.1: Post transplant graft status (Optical and Non-Optical).....	58
Table 2.4.2.2: Post Transplant graft Status by Optical and Non-Optical Indication .....	58
Table 2.4.2.3: Causes of graft failure.....	59
Table 2.4.3.1: Available data on post corneal transplant vision .....	60
Table 2.4.3.2: Post transplant Unaided Vision (Optical and Non-Optical) .....	60
Table 2.4.3.3: Post transplant Best Corrected Visual Acuity (Optical and Non-Optical) .....	61
Table 2.4.3.4: Post transplant Unaided Vision by Optical and Non-Optical indication .....	63
Table 2.4.3.5: Factors for Post-op Best Corrected Visual Acuity of worse than 6/12... ..	64
Table 2.5.1: Stock and Flow .....	65
Table 2.5.2: Post transplant complications .....	65
Table 2.5.3: Post transplant graft rejection types.....	65

List of Figures

Figure 2.1.1: New transplant rate, 1998-2005 .....	44
Figure 2.2.1: Ethnic distribution, 1998-2005 .....	47
Figure 2.2.2: Age distribution of cornea transplant recipient patients, 1998-2005.....	48
Figure 2.2.3: Primary Diagnosis in Recipients, 1998-2005 .....	50
Figure 2.3.3.1: Source of Donor Corneal Tissue, 2004-2005 .....	53
Figure 2.3.3.2: Donor age distribution, 2004-2005.....	54
Figure 2.3.3.3: Preservation media, 2004-2005 .....	55
Figure 2.4.3.1: Post transplant Unaided Vision .....	61
Figure 2.4.3.2: Post transplant Best Corrected Visual Acuity .....	62
Figure 2.4.3.3a: Post transplant Unaided Vision by Optical indication.....	63
Figure 2.4.3.3b: Post transplant Unaided Vision by Non-Optical indication .....	64

## 2.0 INTRODUCTION

Cornea transplantation surgery allows restoration of vision in patients with corneal blindness. Corneal transplantation in Malaysia dates back to the 1970's. Today it is widely performed by ophthalmologists throughout the country both in the government and private sectors with each centre maintaining its own data. Until recently there was no central data collection on a standardised format.

The National Transplant Registry (NTR) was established in December 2003. The cornea transplant section of the NTR was given the task of establishing a systematic centralised data collection centre for all cornea transplantation performed in the country.

A total of 46 centres registered and agreed to provide information on retrospective and prospective cornea transplant activities. A total of 46 contributing surgeons participated in the NTR – Corneal Transplant section. Participation was voluntary.

**Retrospective data** (from 1998 to 2003) on cornea transplant activities were collected to identify the trend of cornea transplant surgery in the past few years. Retrospective data collected was recorded on the **Retrospective Cornea Transplant Notification Form (Form R-mds)**. This was limited to *minimal data set* which were i) demographic data, ii) type of cornea transplant surgery and iii) primary diagnosis for cornea transplantation. All surgeons agreed to provide all information required in the retrospective cornea transplant notification form.

**Prospective data** (from the year 2004) on cornea transplant activities involved gathering information on all cornea transplants performed in Malaysia on two forms. The first form was the i) **Cornea Transplant Notification Form (Form N-cds)** which is completed at the time of surgery and gathers information on the recipient, operative procedure and the donor. Most surgeons sent a complete data set from 2004 as required in the prospective Cornea Transplant Notification Form. Some surgeons chose to provide only minimal data set as per the retrospective cornea transplant notification form (Form R-mds). The second form was the ii) **Cornea Transplant Outcome Form (Form O-cds)** which is completed at the end of 12 months and annually thereafter. Follow-up only ceases upon failure of graft, death or loss to follow-up of the patient. Most surgeons sent a complete data set from 2004 as required in the prospective Cornea Transplant Outcome Forms. Some surgeons chose to provide only minimal data set as in the Cornea Transplant Outcome minimal data set Form (Form O-mds).

The Corneal section of the NTR will be discussed under 5 sections.

*Section 2.1* and *Section 2.2* covers notification data on cornea transplantation over 8 years from 1998 to 2005. Effort was made to ensure that all cases of cornea transplantation were reported. To the best of our knowledge, this report provides information on all cornea transplants performed in the country.

*Section 2.3* covers prospective notification data on cornea transplantation (*from 2004 onwards*) from surgeons who sent a complete data set.

*Section 2.4* covers prospective outcome data on cornea transplantation (*from 2004 onwards*).

*Section 2.5* covers prospective outcome data on cornea transplantation complications (*from 2004 onwards*). These data were confined to surgeons who sent a complete data set (Form O-cds).

**2.1 CORNEA TRANSPLANT ACTIVITIES AND TRENDS (1998 – 2005)**

The number of cornea transplants performed showed an increasing trend from 119 in 1998 to 221 in 2001, following which there was a slight decline in 2003 followed by a progressive increase each year to 192 in 2005 (Table 2.1.1).

Penetrating keratoplasty was the most frequent type of cornea transplant surgery and was performed in 94% of cases (Table 2.1.2).

Table 2.1.1: New Transplant Rate per million population (pmp), 1998-2005

Year	1998	1999	2000	2001	2002	2003	2004	2005
New transplants	119	122	126	221	203	165	184	192
New transplant rate pmp	5	5	5	9	8	7	7	7

Figure 2.1.1: New transplant rate, 1998-2005

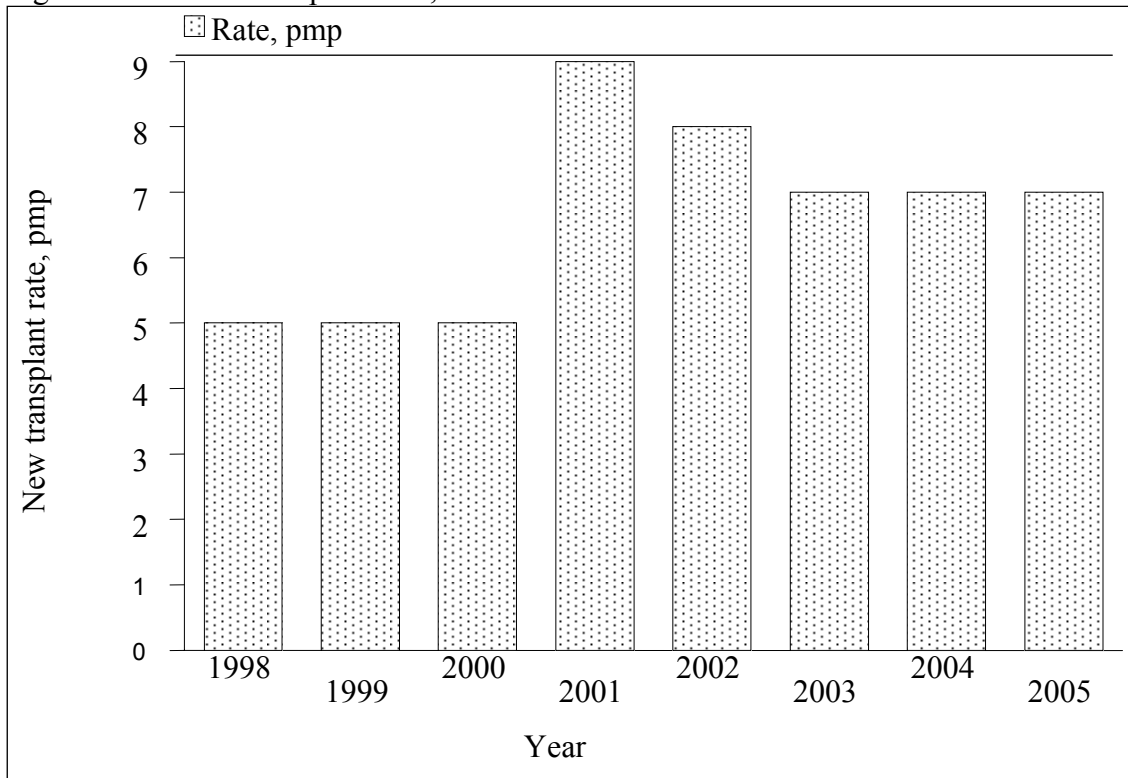


Table 2.1.2: Types of Cornea Transplant, 1998-2005

Year	1998 (N = 119)		1999 (N = 122)		2000 (N = 126)		2001 (N = 221)		2002 (N = 203)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Penetrating Keratoplasty	114	96	116	95	120	95	207	94	196	97
Lamellar Keratoplasty	1	1	5	4	5	4	14	6	5	2
Patch Graft for Cornea	0	0	0	0	0	0	0	0	0	0
Patch Graft for Sclera	0	0	0	0	0	0	0	0	0	0
Cornea Scleral Keratoplasty	0	0	1	1	0	0	0	0	0	0
No data	4	3	0	0	1	1	0	0	2	1

Year	2003 (N = 165)		2004 (N = 184)		2005 (N = 192)		TOTAL (N = 1332)	
	No.	%	No.	%	No.	%	No.	%
Penetrating Keratoplasty	156	95	165	90	173	90	1247	94
Lamellar Keratoplasty	8	5	10	5	13	7	61	5
Patch Graft for Cornea	0	0	2	1	3	2	5	0
Patch Graft for Sclera	0	0	0	0	1	0	1	0
Cornea Scleral Keratoplasty	1	0	7	4	2	1	11	1
No data	0	0	0	0	0	0	7	0

## 2.2 RECIPIENTS' CHARACTERISTICS

There was a preponderance of male recipients each year and this ranged from 59% to 69% (Table 2.2.1).

Ethnic Chinese (39%) were the predominant race undergoing cornea transplant surgery followed by Malays (32%) and Indians (22%) (Table 2.2.2, Figure 2.2.1).

The mean age was 45 years (SD 21) with a range from as young as 2 months of age to as old as 92 years (Table 2.2.3, Figure 2.2.2).

The 9 commonest primary indications for surgery were keratoconus (16%), cornea scar (16%), other (non-pseudophakic) bullous keratopathy (13%), microbial keratitis (12%), pseudophakic bullous keratopathy (12%) and failed previous cornea grafts (8%), cornea perforation (non microbial keratitis related) (8%), Corneal dystrophy (4%), cornea perforation (microbial related) (4%) and congenital opacity (1%) were the least common indications (Table 2.2.4, Figure 2.2.3).

There may be one or more indications for cornea transplant surgery. The most frequent indication was *optical*, followed by *tectonic* and/or *therapeutic* indications (Table 2.2.5).

Table 2.2.1: Gender distribution, 1998-2005

Year	1998 (N = 119)		1999 (N = 122)		2000 (N = 126)		2001 (N = 221)		2002 (N = 203)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Gender										
Male	78	66	80	66	81	64	143	65	122	60
Female	41	34	42	34	45	36	78	35	81	40
No data	0	0	0	0	0	0	0	0	0	0

Year	2003 (N = 165)		2004 (N = 184)		2005 (N = 192)		TOTAL (N = 1332)	
	No.	%	No.	%	No.	%	No.	%
Gender								
Male	114	69	112	61	114	59	844	63
Female	51	31	72	39	77	40	487	37
No data	0	0	0	0	1	1	1	0

Table 2.2.2: Ethnic distribution, 1998-2005

Year	1998 (N = 119)		1999 (N = 122)		2000 (N = 126)		2001 (N = 221)		2002 (N = 203)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Ethnic group										
Malay	28	24	34	28	41	33	70	32	74	36
Chinese	47	39	46	38	50	40	92	42	83	41
Indian	36	30	35	29	28	22	49	22	35	17
Bumiputra Sabah	0	0	0	0	0	0	0	0	0	0
Bumiputra Sarawak	0	0	0	0	0	0	1	0	0	0
Others	8	7	7	5	6	5	5	2	9	5
No data	0	0	0	0	1	0	4	2	2	1

Year	2003 (N = 165)		2004 (N = 184)		2005 (N = 192)		TOTAL (N = 1332)	
	No.	%	No.	%	No.	%	No.	%
Ethnic group								
Malay	52	32	66	36	62	32	427	32
Chinese	67	41	58	32	73	38	516	39
Indian	34	20	43	23	41	21	301	22
Bumiputra Sabah	0	0	1	1	1	1	2	0
Bumiputra Sarawak	0	0	4	2	5	3	10	1
Others	11	7	10	5	10	5	66	5
No data	1	0	2	1	0	0	10	1

\*Others: Non Malaysian

Figure 2.2.1: Ethnic distribution, 1998-2005

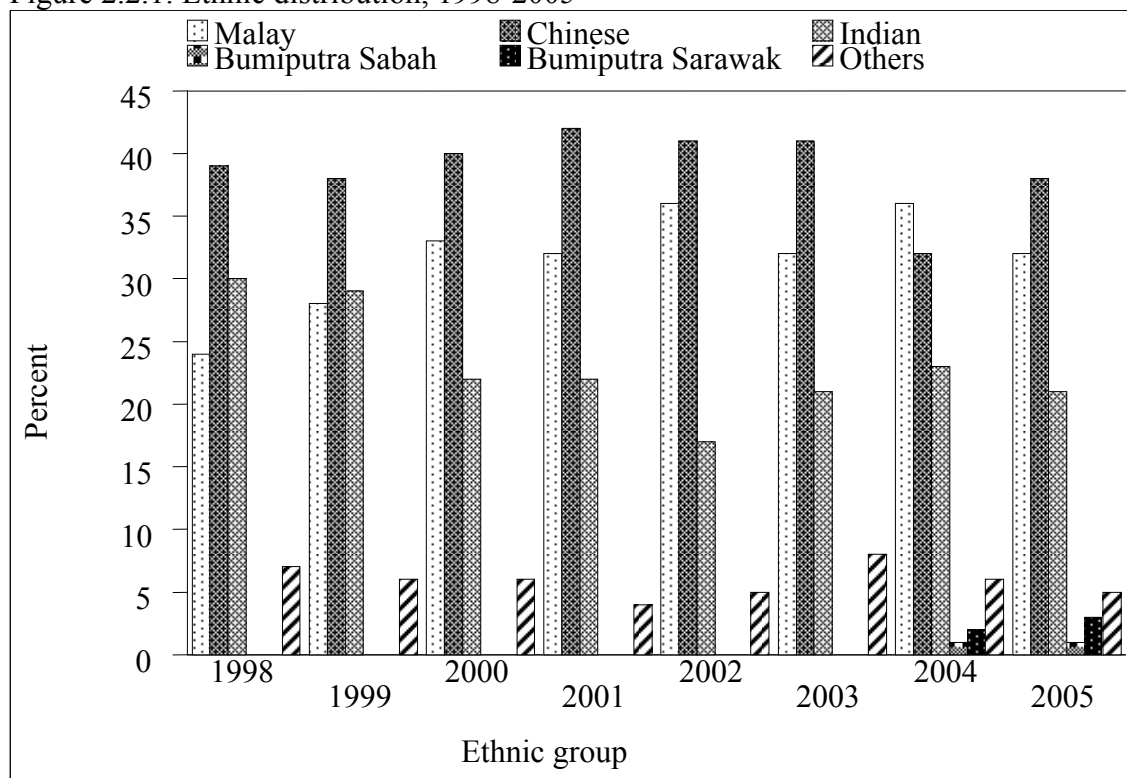


Table 2.2.3: Age distribution of cornea transplant recipient patients, 1998-2005

Year	1998 (N = 119)		1999 (N = 122)		2000 (N = 126)		2001 (N = 221)		2002 (N = 203)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Age group (years)										
0-9	4	3	5	4	6	5	8	4	9	4
10-19	13	11	17	14	9	7	29	13	16	8
20-39	28	24	34	28	34	27	49	22	53	26
40-59	38	32	32	26	40	32	61	28	57	28
>=60	36	30	34	28	37	29	74	33	68	34
Mean	45		43		44		45		46	
SD	21		22		20		21		21	
Median	45		43		45		50		46	
Minimum	4 months		5		2 months		5 months		1	
Maximum	82		92		86		85		86	

Year	2003 (N = 165)		2004 (N = 184)		2005 (N = 192)		TOTAL (N = 1332)	
	No.	%	No.	%	No.	%	No.	%
Age group (years)								
0-9	6	3	6	4	8	4	52	4
10-19	21	13	15	8	14	7	134	10
20-39	36	22	55	30	59	31	348	26
40-59	51	31	52	28	45	24	376	28
>=60	51	31	56	30	66	34	422	32
Mean	45		45		46		45	
SD	21		21		21		21	
Median	46		44		49		46	
Minimum	5 months		2 months		2 months		2 months	
Maximum	84		86		84		92	

Age=date transplant-date birth; age if provided

Figure 2.2.2: Age distribution of cornea transplant recipient patients, 1998-2005

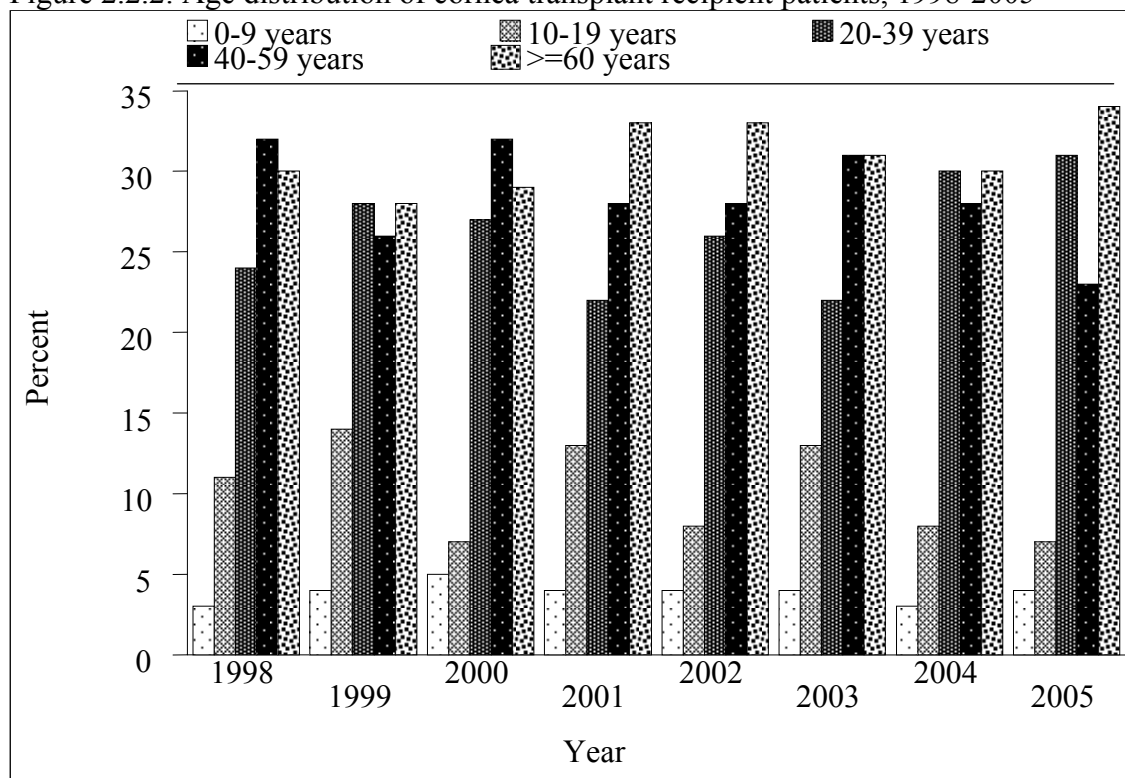


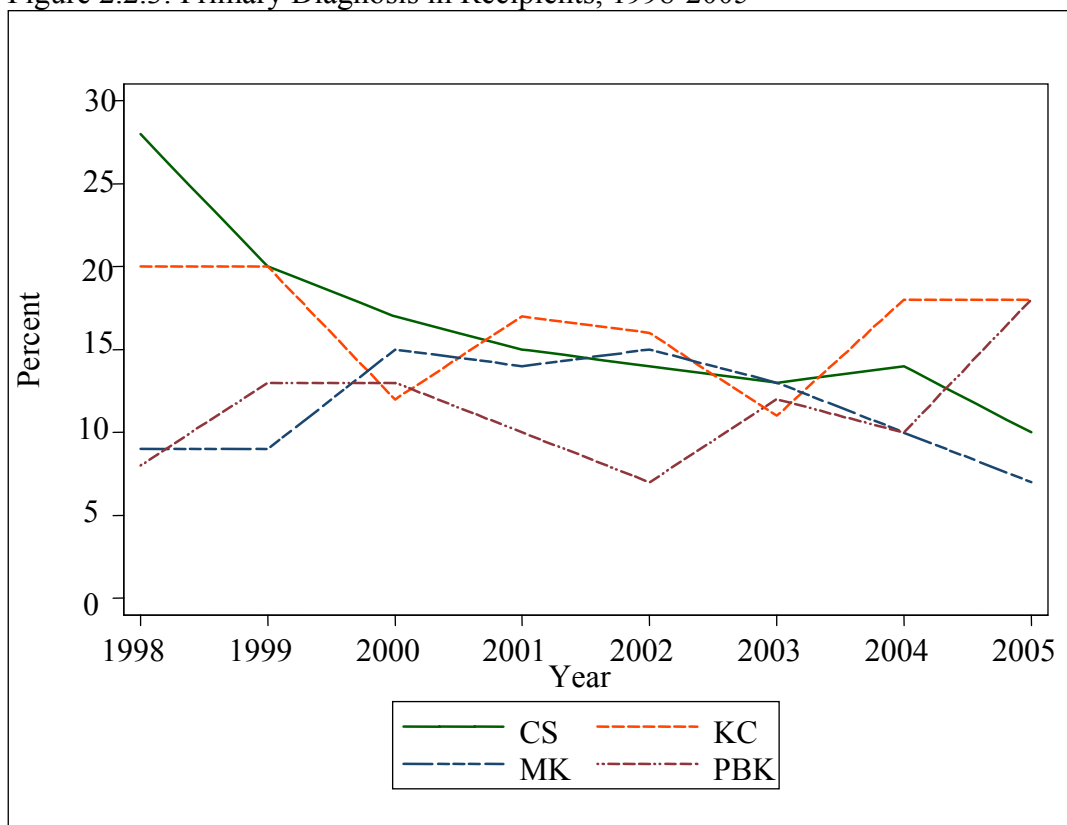
Table 2.2.4: Primary diagnosis, 1998-2005

Year	1998 (N=119)		1999 (N=122)		2000 (N=126)		2001 (N=221)		2002 (N=203)	
	No.	%	No.	%	No.	%	No.	%	No.	%
Primary Diagnosis										
Corneal scar	33	28	25	20	21	17	34	15	28	14
Keratoconus	24	20	24	20	15	12	38	17	32	16
Microbial keratitis	11	9	11	9	19	15	30	14	31	15
Other (non pseudophakic) bullous keratopathy	14	12	4	3	19	15	37	17	47	23
Corneal perforation (non microbial)	6	5	7	6	8	6	12	5	12	6
Pseudophakic bullous keratopathy	10	8	16	13	17	13	23	10	15	7
Failed previous graft	14	12	12	10	13	10	17	8	15	7
Corneal dystrophy	5	4	6	5	5	4	12	5	9	4
Congenital opacity	1	1	1	1	1	1	1	0	0	0
Microbial keratitis + Corneal perforation	1	1	6	5	1	1	6	3	4	2
Others	3	3	8	7	7	6	15	7	14	7
No data	0	0	2	2	1	1	1	0	0	0

Year	2003 (N=165)		2004 (N=184)		2005 (N=192)		TOTAL (N=1332*)	
	No.	%	No.	%	No.	%	No.	%
Primary Diagnosis								
Corneal scar	21	13	25	14	20	10	207	16
Keratoconus	18	11	34	18	34	18	219	16
Microbial keratitis	21	13	18	10	13	7	154	12
Other (non pseudophakic) bullous keratopathy	25	15	16	9	14	7	176	13
Corneal perforation (non microbial)	27	16	13	7	18	9	103	8
Pseudophakic bullous keratopathy	19	12	19	10	35	18	154	12
Failed previous graft	14	8	12	7	14	7	111	8
Corneal dystrophy	7	4	8	4	6	3	58	4
Congenital opacity	1	1	8	4	3	2	16	1
Microbial keratitis + Corneal perforation	4	2	17	9	20	10	59	4
Others	10	6	34	18	35	18	126	9
No data	0	0	1	1	0	0	5	0

\*1219 patients have 1 primary diagnosis, 104 have 2 primary diagnoses, 4 patients had 3 diagnoses, and 1 patient had 4 diagnoses

Figure 2.2.3: Primary Diagnosis in Recipients, 1998-2005



CS = Corneal Scar  
 KC = Keratoconus  
 MK = Microbial keratitis  
 PBK = Pseudophakic bullous keratopathy

Table 2.2.5: Indications of cornea transplant, 2004-2005

Indication of transplant	2004 (N = 184)		2005 (N = 192)		Total (N = 376)	
	No.	%	No.	%	No.	%
Optical	119	65	131	68	250	66
Tectonic	26	14	23	11	49	13
Therapeutic	29	16	22	11	51	14
Tectonic + Therapeutic	9	5	9	5	18	5
Optical + Tectonic	1	0	1	1	2	1
Optical + Tectonic + Therapeutic	0	0	1	1	1	0
Others	0	0	4	2	4	1
No data	0	0	1	1	1	0

## 2.3 TRANSPLANT DATA, 2004-2005

### 2.3.1 Stock and Flow

There was an increase in the number of cornea transplant notification - complete data sets returned from 75% in 2004 to 82% in 2005 (Table 2.3.1.1). Data in this section covers notification data from surgeons who sent a complete data set.

Table 2.3.1.1: Number of cornea transplants with complete data set

	2004		2005		Total	
	No.	%	No.	%	No.	%
Total no. of cornea transplants performed	184	100	192	100	376	100
No. of cornea transplants with notification complete data set	138	75	158	82	296	79

### 2.3.2 Pre-transplant data

Regrafts were performed in 10% of cases (Table 2.3.2.1). Corneal vascularisation was the most frequently encountered per-operative ocular co-morbidity, followed by ocular inflammation and glaucoma (raised intraocular pressure).

Eighty percent of cases were legally blind (vision 3/60 or worse) prior to cornea transplantation (Table 2.3.2.3).

Table 2.3.2.1: No of previous grafts in grafted eye, 2004-2005

Graft Number	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
0	123	89	143	90	266	90
1	11	8	12	8	23	8
2	3	2	2	1	5	2
3	0	0	1	1	1	0
4	1	1	0	0	1	0

Table 2.3.2.2: Ocular co-morbidity, 2004-2005

	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
Ocular co-morbidity						
Any ocular co-morbidity (a to c below)	88	64	102	65	190	64
a) Cornea vascularisation	77	56	78	49	155	82
• Superficial vascularisation	44	32	48	30	92	48
• Deep vascularisation	42	30	38	24	80	42
b) History of glaucoma	29	21	36	23	65	34
c) Current ocular inflammation	41	30	49	31	90	47

\*Patient might have multiple ocular co-morbidity

Table 2.3.2.3: Pre-operative vision, 2004-2005

	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
Unaided VA						
6/6	3	2	0	0	3	1
6/9	1	1	1	1	2	1
6/12	0	0	2	1	2	1
6/18	0	0	1	1	1	0
6/24	3	2	5	3	8	3
6/36	4	3	6	4	10	3
6/60	7	5	16	10	23	8
5/60	1	1	0	0	1	0
4/60	3	2	1	1	4	1
3/60	2	1	2	1	4	1
2/60	1	1	2	1	3	1
1/60	4	3	9	6	13	4
CF	47	34	47	29	94	33
HM	47	34	46	29	93	32
PL	13	10	15	9	28	9
NPL	2	1	1	1	3	1
No data	0	0	4	3	4	1

2.3.3 Donor details

Eye Banks in the United States of America (USA) were the most frequent sources of the corneal tissues (Table 2.3.3.1). The majority of donors were elderly patients with a median age of 58 years (Table 2.3.3.2). Optisol GS was the commonest cornea tissue storage medium used at 80% (Table 2.3.3.3). The major causes of death of the donors were related to the cardiac or circulatory system (28%) followed by malignancy (15%) and cerebrovascular system (14%) (Table 2.3.3.4).

Table 2.3.3.1: Source of Donor Cornea Tissue, 2004-2005

Source of donor	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
Local	20	14	19	12	39	13
USA	95	69	112	71	207	70
Sri Lanka	22	16	27	17	49	17
No data	1	1	0	0	1	0
If Local, ethnic group:						
• Malay	0	0	4	21	4	10
• Chinese	14	70	8	42	22	56
• Indian	5	25	6	32	11	28
• No data	1	5	1	5	2	6

Figure 2.3.3.1: Source of Donor Corneal Tissue, 2004-2005

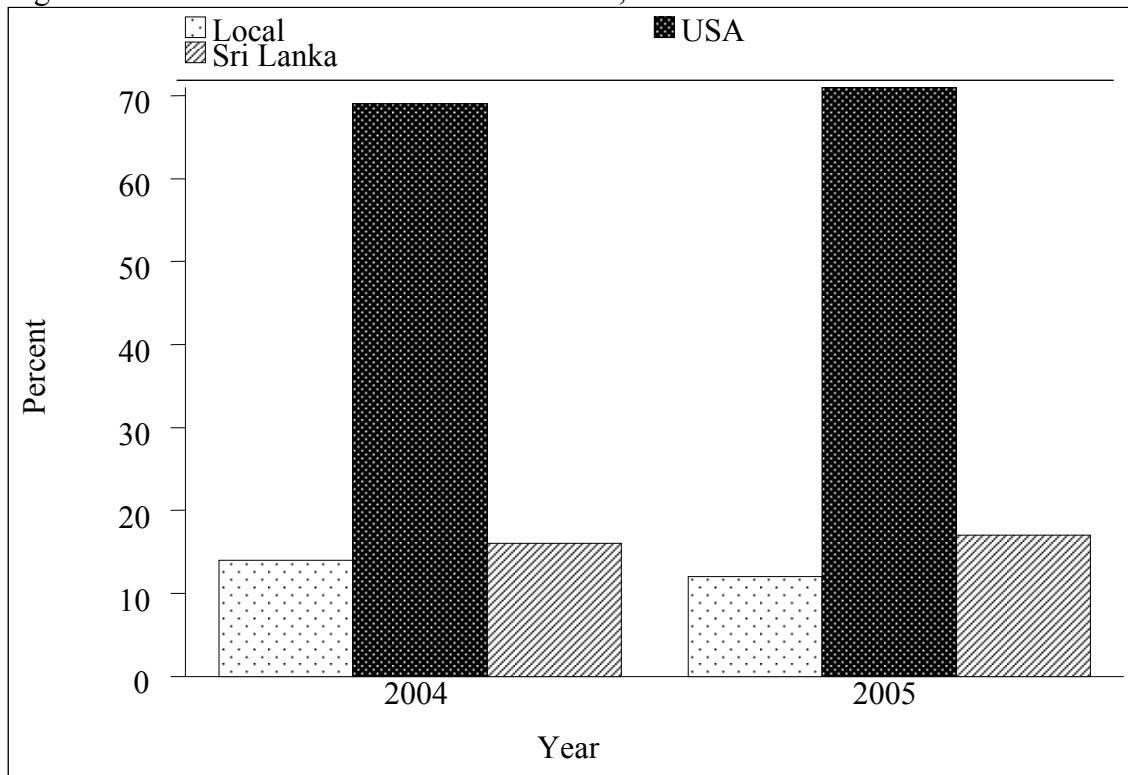


Table 2.3.3.2: Donor age distribution, 2004-2005

Age, years	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
0-9	2	1	3	2	5	2
10-19	6	4	4	3	10	3
20-39	11	8	7	4	18	6
40-59	52	38	77	49	129	44
>=60	67	49	67	42	134	45
Mean	56		57		57	
SD	15		14		15	
Median	59		57		58	
Minimum	8		3		3	
Maximum	78		79		79	

Figure 2.3.3.2: Donor age distribution, 2004-2005

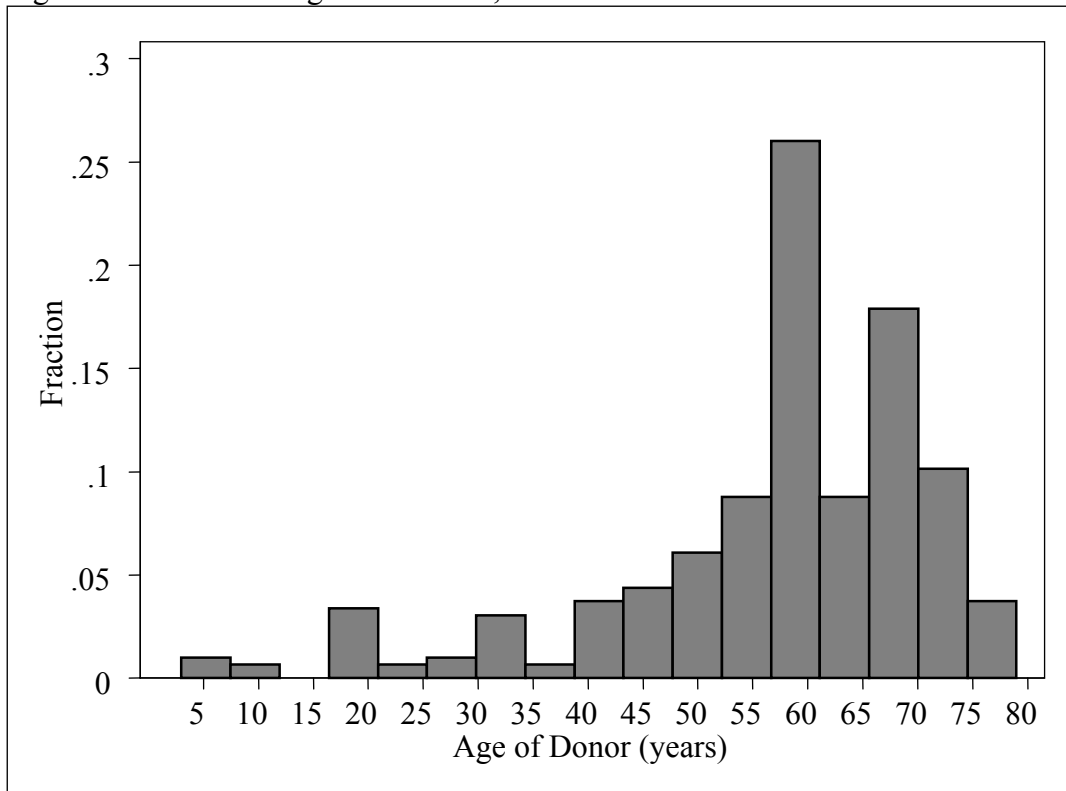


Table 2.3.3.3: Preservation media, 2004-2005

Preservation media	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
Optisol GS	110	80	127	80	237	80
MK Medium	22	16	25	16	47	16
Moist Chamber	4	3	3	2	7	2
No data	2	1	3	2	5	2

Figure 2.3.3.3: Preservation media, 2004-2005

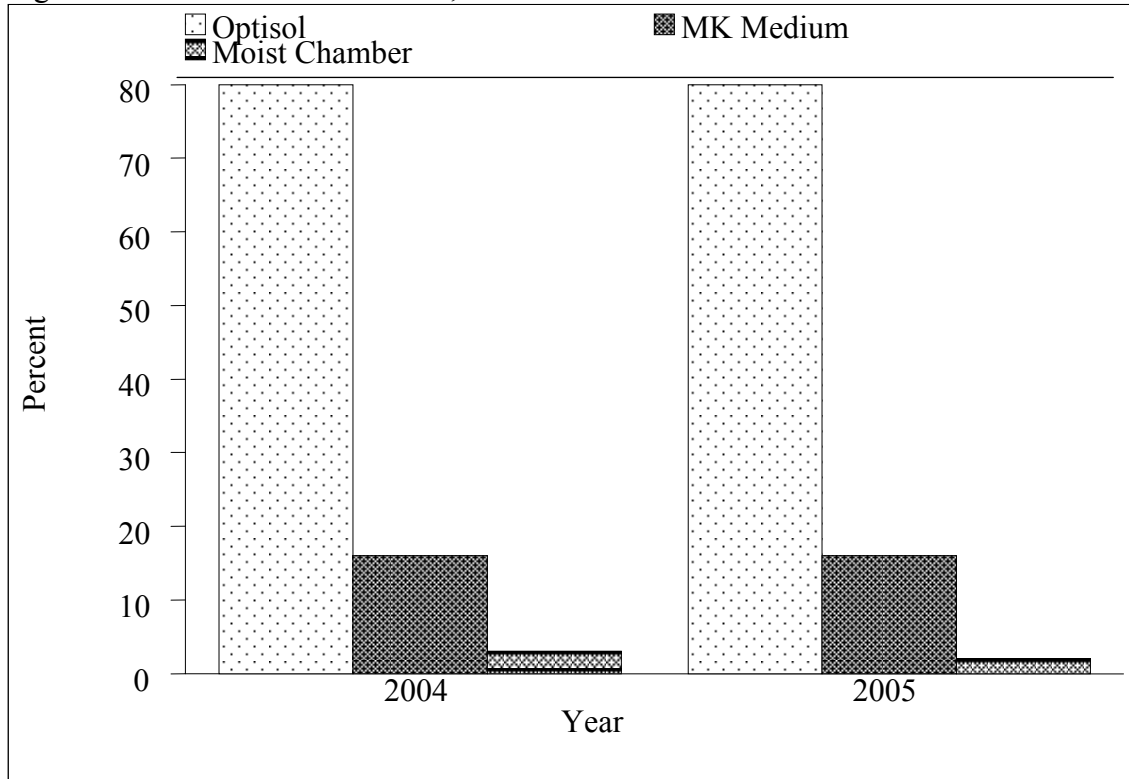


Table 2.3.3.4: Cause of death in cornea donors, 2004-2005

Cause of death	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
Cardiac / Circulatory System	47	35	37	23	84	28
Cerebrovascular System	17	12	23	15	40	14
Malignancy	19	14	26	16	45	15
Trauma / Accident	20	14	10	6	30	10
Respiratory System	15	11	8	5	23	8
Others	17	12	13	8	30	10
No data	3	2	41	27	44	15

## 2.3.4 Transplant Practices

Penetrating Keratoplasty (PK) was the commonest type of surgery performed (88%) (Table 2.3.4.1). Cornea transplantation was performed in combination with other surgical procedures in 19% of cases. Cataract extraction, with or without intraocular lens implantation (IOL), was the commonest combined procedure (51%) (Table 2.3.4.2).

The recipient graft size ranged from 2mm to 10mm, with the mean recipient cornea graft size being 7.5mm (SD 1) (Table 2.3.4.3). The majority cases had the donor tissue over-sized by 0.5mm (Table 2.3.4.4). The commonest suture technique was interrupted sutures (Table 2.3.4.5).

Table 2.3.4.1: Type of surgery, 2004-2005

Type of surgery	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
Penetrating Keratoplasty	120	88	139	88	259	88
Lamellar Keratoplasty	10	7	13	8	23	7
Patch Graft for Cornea	2	1	3	2	5	2
Patch Graft for Sclera	0	0	1	1	1	0
Cornea Scleral Keratopalsty	6	4	2	1	8	3

Table 2.3.4.2: Type of Combined surgery, 2004-2005

Type of surgery	2004 (N=138)*		2005 (N=158)**		Total (N = 296)	
	No.	%	No.	%	No.	%
Combined surgery	No.	%	No.	%	No.	%
No. of patients with combined surgery	31	22	26	16	57	19
(a) Glaucoma surgery	2	1	3	2	5	9
(b) Cataract Extraction	16	12	13	8	29	51
(c) IOL	14	10	9	6	23	40
(d) Retinal Surgery $\pm$ Internal Tamponade	1	1	1	1	2	4
(e) Anterior vitrectomy	9	7	3	2	12	21
(f) Others	5	4	8	5	13	23

\*14 patients had 2 types of surgeries and 1 patient had 3 types of surgeries, combined with the corneal transplant surgery

\*\*11 patients had 2 types of surgeries combined with the corneal transplant surgery.

Table 2.3.4.3: Recipient Cornea Trephined Size, 2004-2005

Graft size, mm	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
2	1	1	1	1	2	1
3	0	0	1	1	1	0
4	1	1	2	1	3	1
5	0	0	0	0	0	0
5.5	1	1	0	0	1	0
6	3	2	0	0	3	1
6.25	0	0	1	1	1	0
6.50	2	1	5	3	7	2
6.75	1	1	3	2	4	1
7	25	18	36	23	61	22
7.25	10	7	10	6	20	7
7.50	36	26	18	11	54	18
7.75	10	7	11	7	21	7
8	19	14	7	4	26	9
8.25	4	3	4	3	8	3
8.50	6	4	6	4	12	4
8.75	0	0	1	1	1	0
9	8	6	3	2	11	4
9.25	0	0	0	0	0	0
9.50	0	0	2	1	2	1
9.75	0	0	0	0	0	0
10	1	1	0	0	1	0
No data	10	7	47	29	57	19
Mean	7.5		7.3		7.4	
SD	1		1		1	
Median	7.5		7.25		7.5	
Minimum	2		2		2	
Maximum	10		9.5		10	

Table 2.3.4.4: Difference in trephined sizes of recipient and donor corneas, 2004-2005

Difference in Graft size, mm	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
Same size	9	7	8	5	17	6
0.25	29	21	19	12	48	16
0.5	87	62	84	53	171	59
0.75	1	1	0	0	1	0
1	1	1	0	0	1	0
2	1	1	0	0	1	0
No data	10	7	47	30	57	19

Table 2.3.4.5: Suture Technique, 2004-2005

Suture Technique	2004 (N=138)		2005 (N=158)		Total (N = 296)	
	No.	%	No.	%	No.	%
Interrupted only	132	96	138	88	270	92
Continuous only	0	0	0	0	0	0
Combined	6	4	18	12	24	8

## 2.4 CORNEA TRANSPLANT OUTCOME 2004

Eighty two percent of patients who had transplants performed in 2004 maintained follow up for at least 12 months (Table 2.4.1.1). Of these patients, 20% of the corneal grafts (all diagnoses) failed at the end of one year (Table 2.4.2.1).

The cases were grouped into two based on indication for surgery - Optical and Non-Optical (Table 2.2.5). Cornea transplantation in optical cases is primarily performed to restore vision. The primary indication in non-optical cases is not restoration of vision (e.g. in infective keratitis). At the end of one year graft survival was 92% in the Optical group and 57% in the Non-Optical group.

The cause of graft failure was elicited only from surgeons who submitted a complete data set (Table 2.5.1).

### 2.4.1 Stock and Flow

Table 2.4.1.1: Stock and flow

Year	2004	
	No.	%
New transplant	184	100
On follow up	150	82
Lost to follow up	34	18
Dead	0	0

### 2.4.2 Outcome – graft survival

Table 2.4.2.1: Post transplant graft status (Optical and Non-Optical)

	2004 (N = 150)	
	No.	%
Graft survival	120	80
Graft failure	30	20

Table 2.4.2.2: Post Transplant graft Status by Optical and Non-Optical Indication

	2004 (N = 150)			
	Optical (N = 99)		Non-Optical (N = 51)	
	No.	%	No.	%
Graft survival	91	92	29	57
Graft failure	8	8	22	43

\* Subjects with both optical & non-optical indications were classified into the optical group

Table 2.4.2.3: Causes of graft failure

		<b>2004</b>	
		No.	%
Graft Failure		30	20
Cause of Failure	Primary graft failure or Primary Endothelial decompensation	4	13
	Recurrence of primary disease	4	13
	Late Endothelial decompensation	8	27
	Glaucoma	5	17
	Infection	4	13
	Graft rejection	6	20
	Others	7	23
	No data	3	10

\*Each patient may have more than one cause of graft failure

\* Data represents causes from surgeons who provided a complete data set

### 2.4.3 Outcome – Vision

Vision outcome of cornea transplant were analysed based on available data provided by the surgeons (Table 2.4.3.1). Eighteen percent of cases (all indications) had an unaided vision of 6/18 or better (Table 2.4.3.2) and 67% of cases had a best corrected visual acuity of 6/18 or better (Table 2.4.3.3).

In cases where the indication for surgery was optical, 75% had an unaided vision of 6/60 or better and for the non-optical cases this was only 35% (Table 2.4.3.4).

Table 2.4.3.1: Available data on post corneal transplant vision

	Unaided Vision (N = 150)		Best Corrected Visual Acuity (N = 150)	
	No.	%	No.	%
Data available	137	91	45	30
No data	13	9	105	70

Table 2.4.3.2: Post transplant Unaided Vision (Optical and Non-Optical)

Post transplant Unaided Vision	2004 (N = 137)	
	No.	%
6/6	3	2
6/9	5	4
6/12	5	4
6/18	11	8
6/24	20	15
6/36	18	13
6/60	24	18
5/60	0	0
4/60	0	0
3/60	3	2
2/60	1	0
1/60	1	0
CF	16	12
HM	19	14
PL	6	4
NPL	5	4

Figure 2.4.3.1: Post transplant Unaided Vision

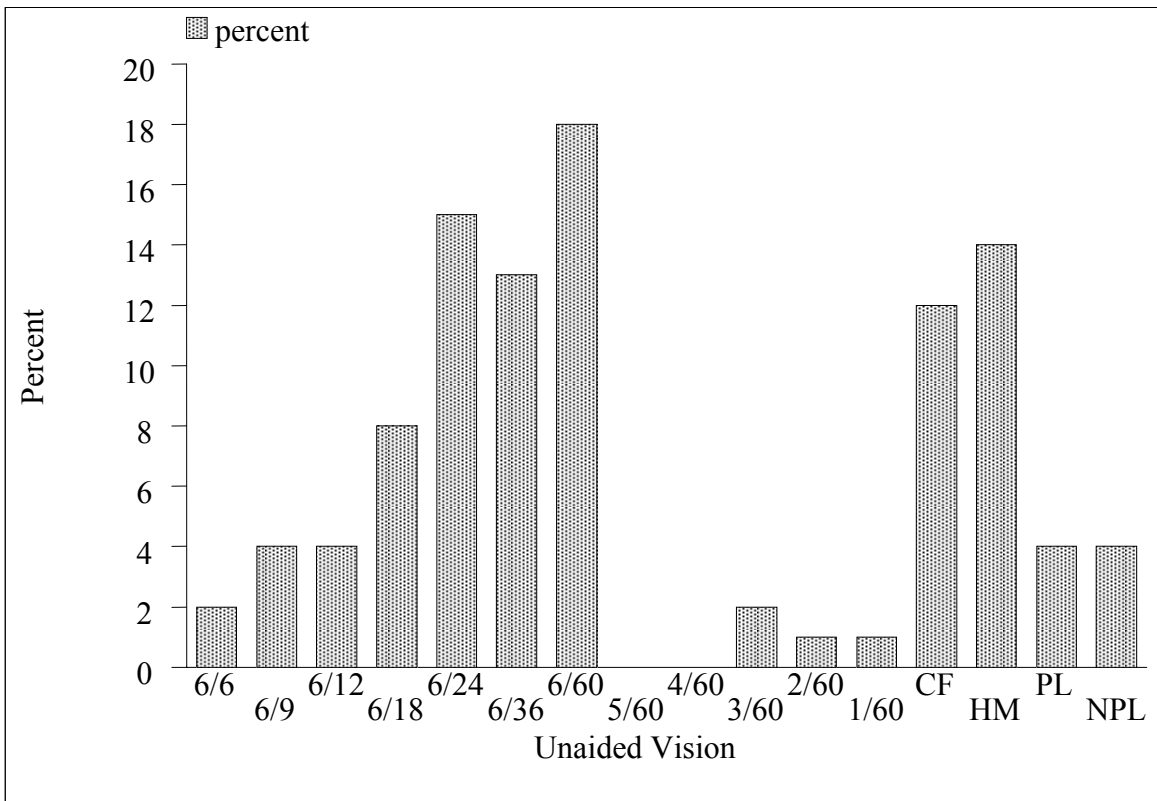


Table 2.4.3.3: Post transplant Best Corrected Visual Acuity (Optical and Non-Optical)

Post transplant best corrected Visual Acuity	2004 (N = 45)	
	No.	%
6/6	4	9
6/9	7	16
6/12	13	29
6/18	6	13
6/24	5	11
6/36	3	7
6/60	3	7
5/60	0	0
4/60	0	0
3/60	0	0
2/60	0	0
1/60	1	2
CF	2	4
HM	1	2
PL	0	0
NPL	0	0

Figure 2.4.3.2: Post transplant Best Corrected Visual Acuity

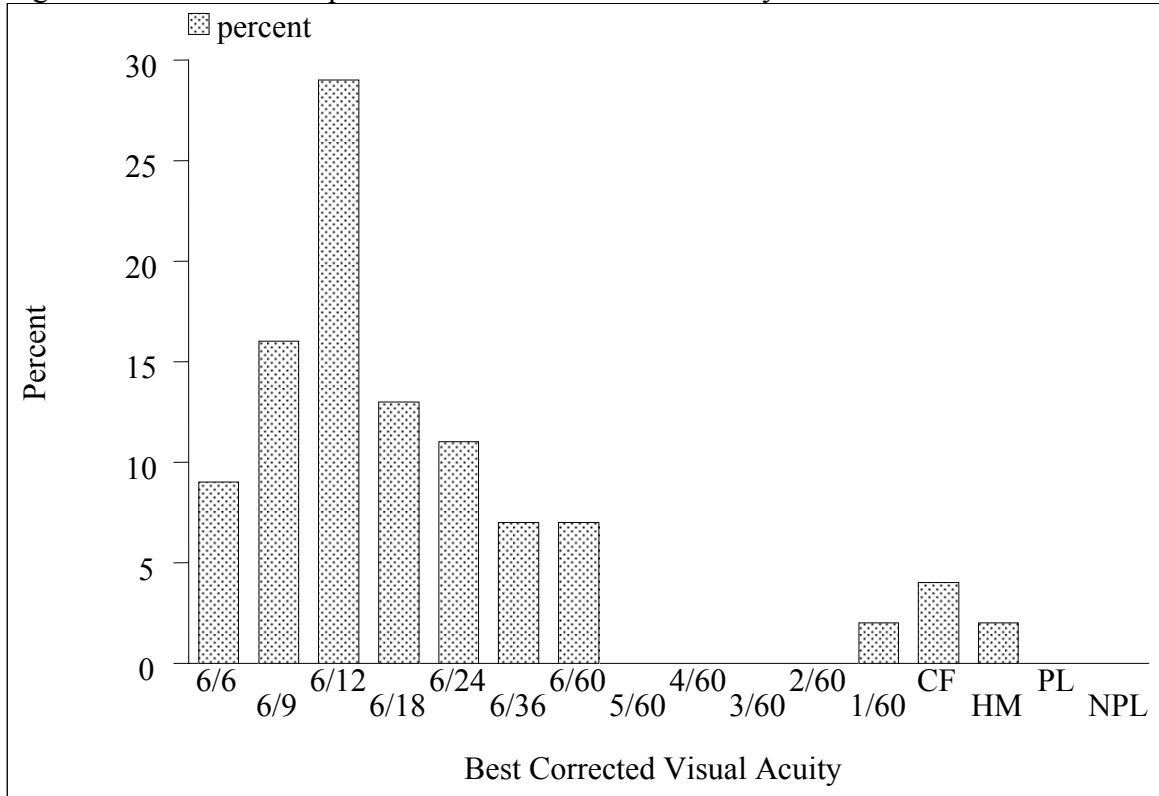


Table 2.4.3.4: Post transplant Unaided Vision by Optical and Non-Optical indication

Post Transplant Unaided Vision	2004 (N = 137)			
	Optical (N = 94)		Non-Optical (N = 43)	
	No.	%	No.	%
6/6	0	0	3	7
6/9	2	2	3	7
6/12	4	4	0	0
6/18	9	10	2	5
6/24	18	20	2	5
6/36	16	18	1	2
6/60	19	21	4	9
5/60	0	0	0	0
4/60	0	0	0	0
3/60	2	2	1	2
2/60	0	0	1	2
1/60	1	1	0	0
CF	10	11	6	14
HM	7	8	12	28
PL	1	1	5	12
NPL	2	2	3	7

\* Missing unaided vision excluded

Figure 2.4.3.3a: Post transplant Unaided Vision by Optical indication

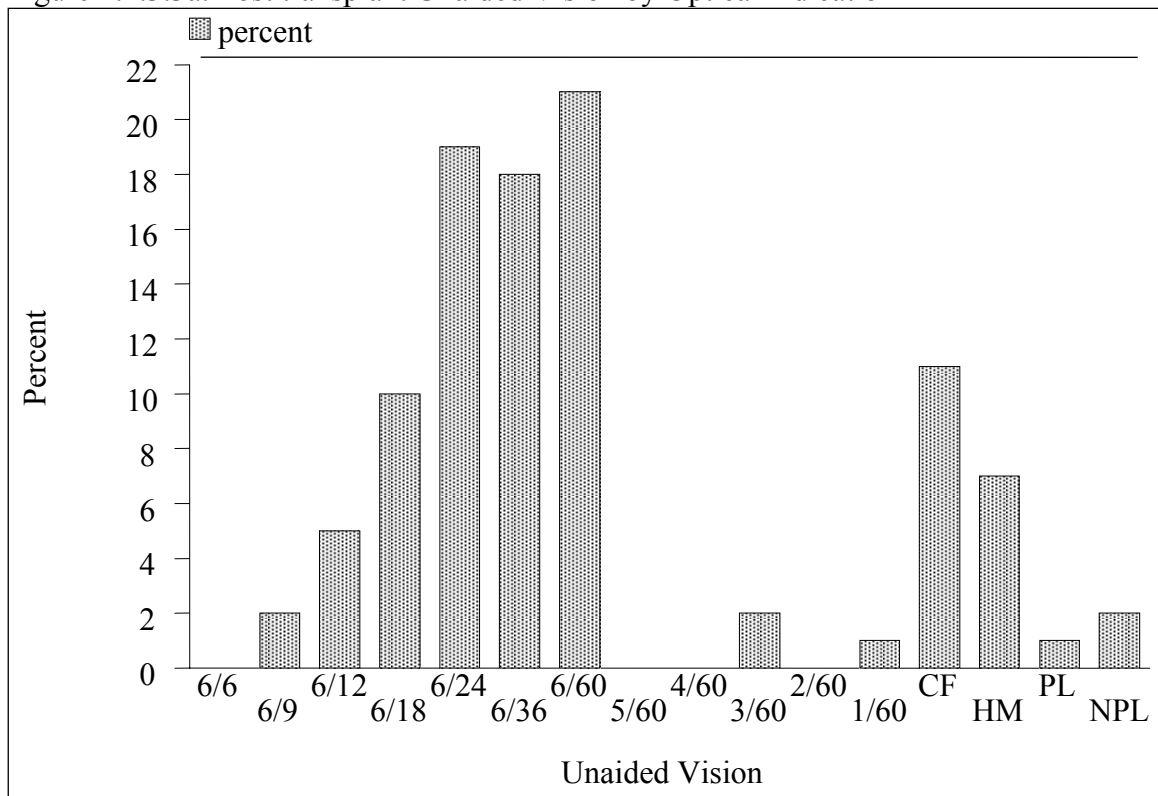


Figure 2.4.3.3b: Post transplant Unaided Vision by Non-Optical indication

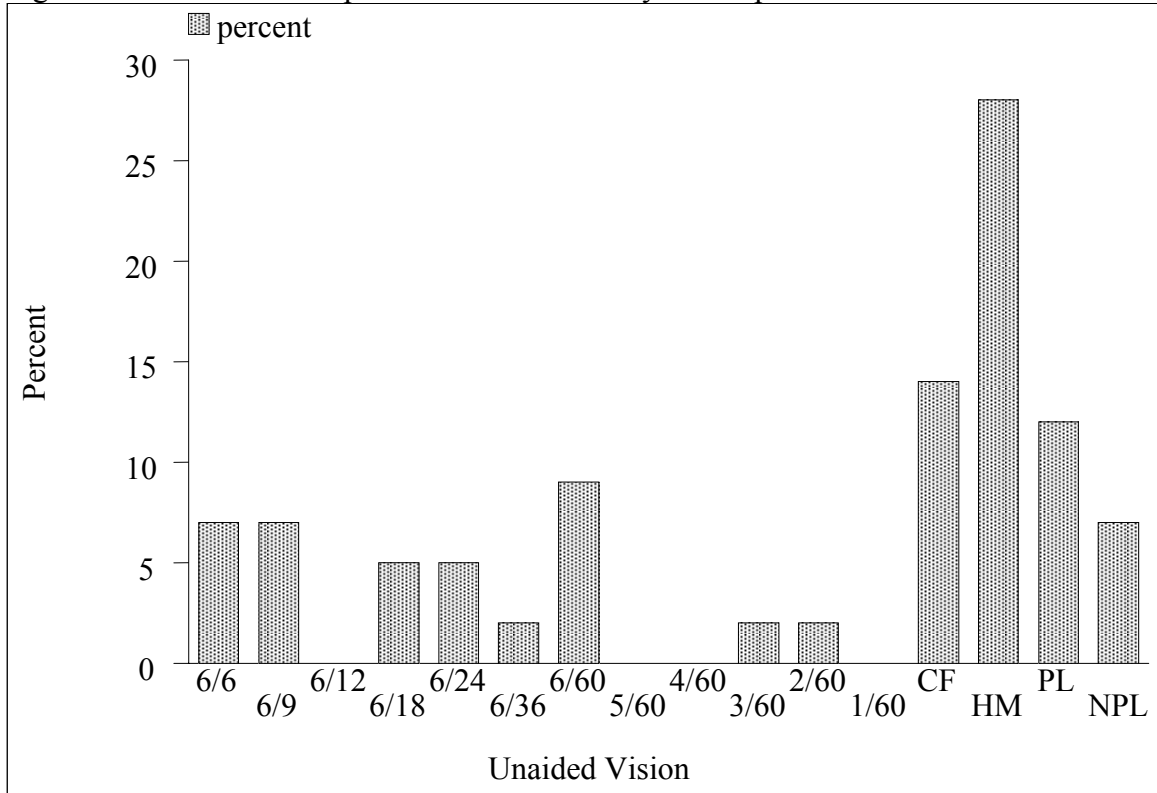


Table 2.4.3.5: Factors for Post-op Best Corrected Visual Acuity of worse than 6/12

		2004	
		No.	%
Post BCVA worse than 6/12		21	47
Factors	High astigmatism	4	20
	Glaucoma	1	5
	Retinal Detachment	0	0
	Cataract	4	20
	Cornea Decompensation	2	10
	DM Retinopathy	0	0
	Others	5	25
	No data	7	35

\*Patient with BCVA worse than 6/12 might have more than one factor

## 2.5 POST CORNEA TRANSPLANT COMPLICATIONS

Fifty-nine percent of cases experienced at least 1 episode of complications post-operatively (Table 2.5.2).

Table 2.5.1: Stock and Flow

	2004	
	No.	%
Total no. of cornea transplants performed	184	100
No. of cornea transplants on follow-up	150	82
No. of outcome with complete data set	79	43

Table 2.5.2: Post transplant complications

		2004	
		No.	%
Any complications		47	59
Complications	Epithelial Problem	7	15
	Wound Dehiscence	1	2
	Suture infiltration / abscess	4	9
	Endophthalmitis	0	0
	Microbial keratitis	6	13
	Vascularisation	5	11
	Post-keratoplasty glaucoma	13	28
	Graft Rejection	8	17
No data		18	38

\* Each patient may have more than one complication

Table 2.5.3: Post transplant graft rejection types

		2004	
		No.	%
Graft Rejection		8	10
Types	Epithelial	2	25
	Stromal	1	13
	Endothelial	5	63
	No data	1	13

\* Each patient may have more than one type of rejection