

15 VISUAL ACUITIES

15.1 Introduction

In this study, it was possible to carry out accurate assessment of vision in the large proportion of cases, which in turn made it possible to categorise them into various groups of visual acuities. In 125 patients (13%), however, this was not possible for a variety of reasons including the age, the general co-operation of the patient and these were placed in categories '6' and '7'. In 14 patients (2%) visual acuities were not available (Table 15-1).

WHO Categories of Visual Acuities	West Bank		Gaza Strip		Total Series	
	No.	%	No.	%	No.	%
Category '1' (6/18 and better)	16	5	26	9	44	7
Category '2' (6/18 to 6/60)	90	26	82	28	175	26
Category '3' (<6/60 to 3/60)	31	9	26	9	57	9
Category '4' (<3/60 to LP)	108	31	73	25	193	29
Category '5' (NLP)	56	16	43	15	106	16
Category '6' (able to see)	18	5	22	8	48	7
Category '7' (unable to see)	19	6	15	5	39	6
Unable to test	6	2	2	1	9	1

Table 15-1: Categories of visual acuities in the total series

The results of visual acuities have been analysed at first on the basis of the acuity alone; then other visual morbidities, such as the findings of visual fields, were included and accordingly, patients were moved to other categories depending whether they were partially sighted or blind (Table 15-3). Such patients existed mainly in category '1'.

Category	Category 1 6/18 +		Category 2 <6/18 to 6/60		Category 3 <6/60 to 3/60		Category 4 3/60 to LP		Category 5 NLP		Category 6 ^a Can't see		Category 7 ^b Can't see		UD		Region's Totals	
Children <16																		
West Bank	10	5	66	31	17	8	53	25	29	14	16	8	16	8	4	2	211	100
Gaza Strip	19	12	59	36	12	7	36	22	16	10	11	7	10	6	1	1	164	100
Total OPT	29	7	128	32	29	7	98	24	49	12	35	9	31	8	6	1	405	100
WG/G Ratio	0.5:1		1.1:1		1.4:1		1.5:1		1.8:1		1.5:1		1.6:1		4.0:1		1.3:1	
Adults 16+																		
West Bank	6	5	24	18	14	11	55	41	27	20	2	2	3	2	2	2	133	100
Gaza Strip	7	6	23	18	14	11	37	30	27	22	11	9	5	4	1	1	125	100
Total OPT	15	6	47	18	28	11	95	36	55	21	13	5	8	3	3	1	264	100
WG/G Ratio	0.9:1		1.0:1		1.0:1		1.5:1		1.0:1		0.2:1		0.6:1		2.0:1		1.1:1	
Total WB	16	5	90	26	31	9	108	31	56	16	18	5	19	6	6	2	344	100
Total GS	26	9	82	28	26	9	73	25	43	15	22	8	15	5	2	1	289	100
Grand Total	44	7	175	26	57	9	193	29	104	16	48	7	39	6	9	1	669	100
WG/G Ratio	0.6:1		1.1:1		1.2:1		1.5:1		1.3:1		0.8:1		1.3:1		3.0:1		1.2:1	

Percentages in Italic bold and represent the percentage of the category within each region. ^a Category 6: believed can see but visually impaired.
^b Category 7: believed to have significant vi. UD: Undetermined.

Table 15-2: WHO categories of visual acuities by numbers of patients and region

Category → VA Range →	Cat. '1' 6/18 +	Cat '2' <6/18 - 6/60	Cat '3' <6/60 - 3/60	Cat '4' <3/60 - LP	Cat '5' NLP	Cat '6' ^a Mild VI	Cat '7' ^b Marked VI	UD	Region's Totals
Children <16									
West Bank	8 4	57 27	24 11.2	60 28.0	29 13.6	16 7.5	16 7.5	4 1.9	214 100
Gaza Strip	17 10	58 35	14 8.5	37 22.6	16 9.8	11 6.7	10 6.1	1 0.6	164 100
All OPT	25 6	118 29	38 9.4	103 25.4	49 12.1	35 8.6	31 7.7	6 1.5	405 100
WG/G Ratio	0.5:1	1.0:1	1.7:1	1.6:1	1.8:1	1.5:1	1.6:1	4.0:1	1.3:1
Adults 16+									
West Bank	5 4	22 17	11 8.3	61 47.0	27 20.3	2 1.5	3 2.3	2 1.5	133 100
Gaza Strip	6 5	21 17	15 12.0	39 31.2	27 21.6	11 8.8	5 4.0	1 0.8	125 100
All OPT	13 5	43 16	26 9.8	103 39.0	55 20.8	13 4.9	8 3.0	3 1.1	264 100
WG/G Ratio	0.8:1	1.0:1	0.7:1	1.6:1	1.0:1	0.2:1	0.6:1	2.0:1	1.1:1
<16 Percentage	66	73	59	50	47	73	79	67	61
Total West Bank	13 4	79 23	35 10.1	121 34.9	56 16.1	18 5.2	19 5.5	6 1.7	347 100
Total Gaza Strip	23 8	79 27	29 10.0	76 26.3	43 14.9	22 7.6	15 5.2	2 0.7	289 100
Total all OPT	38 6	161 24	64 9.6	206 30.8	104 15.5	48 7.2	39 5.8	9 1.3	669 100
WG/G Ratio	0.6:1	1.0:1	1.2:1	1.6:1	1.3:1	0.8:1	1.3:1	3.0:1	1.2:1

Percentages in Italic bold and represent the percentage of the category within each region. ^a Category 6: believed can see but visually impaired. ^b Category 7: believed to have significant visual disability. UD: Undetermined

Table 15-3: WHO categories of visual acuities by numbers of patients and region adjusted by incorporating visual field loss

Category of VA → VA Range →	NVI 1'		VI '2' & '6'		SVI '3'		Blind 4'+5'		SVI/BL 3'+4'+5'+7'		UD	Region's Total		
	6/18 +		<6/18 - 6/60		<6/60 - 3/60		<3/60 - NLP		<6/60 - NLP					
Children <16														
West Bank	8	3.7	73	34.1	24	11.2	89	41.6	129	60.3	4	1.9	214	100
Gaza Strip	17	10.4	69	42.1	14	8.5	53	32.3	77	47.0	1	0.6	164	100
All OPT	25	6.2	153	37.8	38	9.4	152	37.5	221	54.6	6	1.5	405	100
WB/GS Ratio	0.5:1		1.1:1		1.7:1		1.7:1		1.7:1		4.0:1		1.3:1	
Adults 16+														
West Bank	5	3.8	24	18.0	11	8.3	88	66.2	102	76.7	2	1.5	133	100
Gaza Strip	6	4.8	32	25.6	15	12.0	66	52.8	86	68.8	1	0.8	125	100
All OPT	13	4.9	56	21.2	26	9.8	158	59.8	192	72.7	3	1.1	264	100
WB:GS Ratio	0.8:1		0.8:1		0.7:1		1.3:1		1.2:1		2.0:1		1.1:1	
Percentage of <16	66		73		59		49		54		67		61	
West Bank Total	13	3.7	97	28.0	35	10.1	177	51.0	231	66.6	6	1.7	347	100
Gaza Strip Total	23	8.0	101	34.9	29	10.0	119	41.2	163	56.4	2	0.7	289	100
All OPT	38	5.7	209	31.2	64	9.6	310	46.3	413	61.7	9	1.3	669	100
WB/GS Ratio	0.6:1		1.0:1		1.2:1		1.5:1		1.4:1		3.0:1		1.2:1	

Percentages in **italic bold** and represent the percentage of the category within each region. Category '6': believed can see but visually impaired. Category "7": believed to have significant visual disability. UD Undetermined

Table 15-4: WHO categories of visual acuities by numbers of patients and region combined as previous table)

Table 15-4 shows the figures in Table 15-3 together with those added from WHO category '6' (believed to see) after being analysed and acuities worked out on the basis of the clinical condition especially in those who have siblings suffering from the same condition.

15.2 Categories Of Visual Acuities

15.2.1 Category '1' (no VI, 6/18 and better)

The smallest of visual acuity categories in this study is category '1' (6/18 and better) with a total of 44 patients (29 of whom were <16 years of age and 15 of whom over 16). In the under 16 group, there was a preponderance of these cases in GS (n=19) versus the WB (n=10). The patients in this category formed 6% of the total series and 7% of the total number of children. Analysis of the visual acuities in this category is as follows (Table 15-5):

Patients with 6/18 Vision - 23 patients (16 are <16 years of age)

Over 50% of patients in this category border the visual impairment category '2'. Two patients (nos. 256, 257) can more appropriately be considered partially sighted belonging to Category '3' as a result of the visual disability and field impairment caused by the ectopia lentis. An additional 3 patients, (Nos. 191,379,556) have contracted visual fields due to retinal dystrophy, and the last from optic atrophy (Table 15-6) and can also be considered blind (category '4'). This leaves 18 patients who truly fit the criteria of nvi.

Patients with 6/12 vision and better

Only one patient fell into this category with 6/9 vision and had generalised contraction of the visual field as a result of retinal dystrophy which placed him within the svi category.

Visual Acuities in the NVI Category (Before Adjustments to incorporate other parameters)				
Visual Acuities	<16	16+	Total	%
6/18	17	7	24	54.5
6/12	6	2	8	18.1
6/9	3	2	5	11.4
6/6	3	2	5	11.4
6/5	0	1	1	2.3
Category '6'	0	1	1	2.3
All	29	15	44	100
Remainders*			38	6

*(Moved to other categories – 4 children, 2 adults)

Table 15-5: Range of visual acuities in the WHO category '1' (NVI)

Clinical Findings	Study No.	Original VA*	VA Adjusted**
Optic atrophy + extra digit	379	1	4
Bilateral infratemporal pigmentary retinopathy, vitreous fibre bands, tubular vision	556	1	4
Retinal dystrophy - night blindness tubular vision, mental subnormality, RPE stippling	191	1	4
Ectopia lentis and high myopia (2 cases)	256 257	1	3

* Category of the originally recorded VA.

** Category of the adjusted VA.

Table 15-6: Clinical findings in category '1' with visual acuities before and after adjustment by incorporating visual fields and categories 6 and 7

Patients with other visual acuities in the NVA Category '1'

The remainder of category '1', consisted of 8 patients with 6/12 vision, 3 of them with conditions indicating some visual field contraction, including 1 with early childhood onset RP, 1 with right dense cataract and left aphakia and 1 with bilateral aphakia. There was only one patient with 6/9 vision who had contracted visual fields to 20-25 degrees and 1 patient with 6/6 vision had right phthisis and left buphthalmos with contracted visual fields.

In summary, NVA category '1' forms, after adjustment, 6% of the total (4% in the WB and 8% in the GS. Sixty-six patients in this category are under 16 years of age.

15.2.2 Category '2' (VI, <6/18 to 6/60)

This is a large category which before transferring patients from category '6' (i.e. those believed to see) to the category (Table 15-2), had a total number of 154 thus forming 25% of the total (23% WB, 28% GS). Twenty nine percent of <16 fell in this category (WB 27%, GS 35%). The proportion of children in this category was 73%. The breakdown of visual acuities in this category is shown in Table 15-7.

After inclusion of patients from category '6', (Table 15-3, 15-4) an additional 43 patients were added. This has made it 209 patients representing 31.2% of the patients in the series (WB 28%, GS 44%). It formed 37.8% of childhood visual acuities (WB 34.1%, GS 42.1%).

VA	No. of Patients	%
6/60	62	47
6/36	44	33
6/24	27	20
Total	133	100

Table 15-7: Patients and proportion of various acuities in category '2' (VI)

15.2.3 Category '3' (SVI, <6/60 to 3/60 - Partially Sighted)

This category based on visual acuities alone had 50 patients. However after adjusting category '1' on the basis of visual morbidity, 14 patients fell within the criteria of svi (partially sighted). The revised category '3' encompasses a total of 64 patients. It forms 9.6% of the total series (WB

10%, GS 10%) and 9.4% of childhood cases (WB 11.2%, GS 8.5%). The percentage of <16 was 59% of the total (Tables 15-3 and 15-4). Nearly a third of visual acuities in this category borders with blindness. Three quarters of patients had the recognised acuities of this category, and about a quarter had better acuities but with additional visual morbidity such as contracted visual field.

15.2.4 Category '4' (<3/60 to PL, Blindness)

This category comprises 206 patients (31% of the series), with 35% in the WB and 26% in the GS). It includes 25% of those under the age of 16 in whom this category formed 39% of the total categories (WB 47% and GS 31.2% (Tables 15-3, 15-4).

15.2.5 Category '5' (NLP, Absolute Blindness)

This is a sizeable category with 104 patients forming 15.5% of the total series and 12.1% of the total children (WB 13.6% and GS 9.8%). Children formed a high proportion at 47% of the patients in this category (Table 15-3).

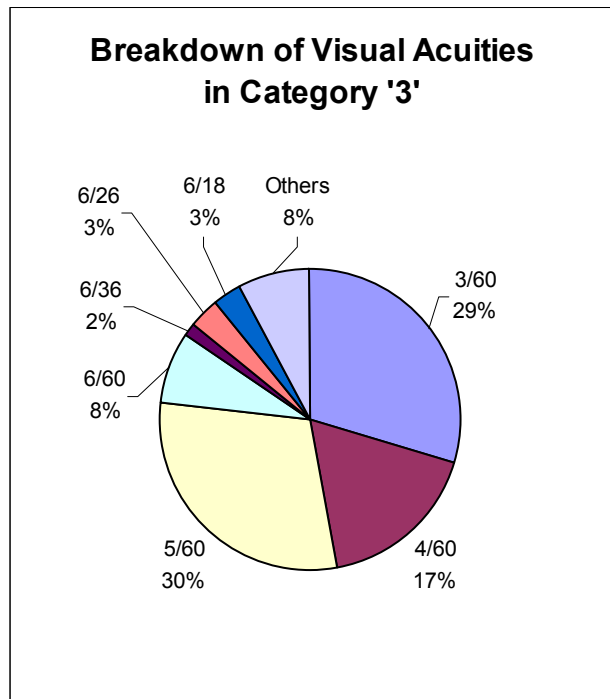


Figure 15-1: Breakdown of visual acuities in category '3' (SVI)

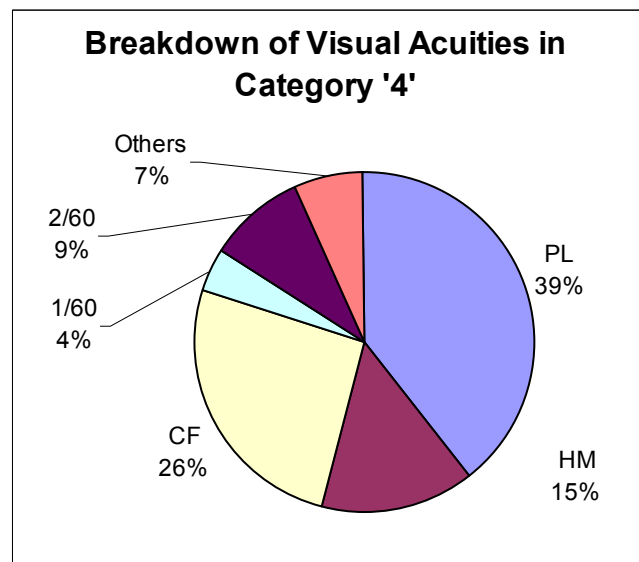


Figure 15-2: Breakdown of visual acuities in category '4'

15.2.6 Patients with Light Perception

This is not a WHO visual acuity category but it has its own characteristics. The number of patients with PL only was 76 patients forming 11% of the total series, a significant proportion of the total. There is a preponderance of females in this group (M/F ratio 1:0.75, males n=33, females n=43) created by the abundance of females over the age 16 in this category (females 21, males 9, ratio 1:0.45). In the under 16, the numbers of males and females are about equal with a M/F ratio of 1:1.1. Patients <16 formed 60% of the total.

15.2.7 Category '6' (cannot be tested, believed sighted)

In category '6', there were 5 adults and 46 children. Analysis of this subgroup shows that among the 5 adults, 1 could possibly fall into the VI (category '2', if not the SVI category '3' (svi), by virtue of having congenital cataract, left aphakia and right buphthalmos. Among the 46 children, it was possible to speculate the possible visual acuity in 19 of them. It can be conjectured that 15 at least of the 19 may belong to the vi category '2', and 4 to the svi category '3'. Forty-three of the children in this category were below the age 9 years, and 30 were below the age of 4 years.

15.2.8 Category '7' (cannot be tested, believed blind)

There were 36 patients in this category. Thirty-two were below the age of 16 (88%) and 4 were adults. Of these 28 were below the age of 8 years.

It therefore appears from further analysis of this category, which took into account factors such as age, onset of the condition, clinical pattern and comparison with similar cases in the series, that it was possible to assume the probable acuity in these eyes. Therefore, among the 36 cases in this category, it can be assumed that 7 will fall into the SVI category '3', 28 into the Blind category '4' and 1 into NLP category '5'. The estimated visual acuities in categories 6 and 7 are listed in Table 15-8.

	<u><6/18-6/60</u>		<u><6/60-3/60</u>		<u><3/60-PL</u>		<u>NLP</u>	
	<u><16</u>	<u>16+</u>	<u><16</u>	<u>16+</u>	<u><16</u>	<u>16+</u>	<u><16</u>	<u>16+</u>
Category '6':	15	3	4	1	0	0	0	0
Category '7'	0	0	5	2	26	2	1	0

Table 15-8: Distribution of visual acuities in the WHO categories '6' and '7'

15.2.9 'Blindness' (categories '4' and '5')

The total number of blind patients who are blind is 310 forming 46.3% of the total series. Numbers of adults and children are nearly equal (49% children). Regional distribution of patients showed 177 patients from the WB (51%) and 119 from GS (41.2%). In the <16, 37.5% were blind (WB 41.6%. GS 32.3%). In the 16+, blindness formed 59.8% of patients in the cohort (WB 66.2, GS 52.6%).

15.2.10 Combined SVI/Blindness

This heading incorporates visual categories '3', '4', '5, and those are 'believed to be unable to see' in category '7'. This group in other words encompasses all the patients who are blind and partially sighted. Their number was 413; that is 61.7% of the series. The proportion of children in this group was 54% making 221 cases in the total series. In the WB, this group formed 60.3% and in GS 47% of the <16 age cohort. In the 16+ cohort, the percentage of partially sighted/blind was, as expected, higher at 72.7% (WB 76.7% and GS 68.8%).

15.2.11 Revised WHO Categories of Visual Impairment

The WHO has revised the categories of visual impairment which divides Blindness into 3 categories. According TO this new classification, the number of patients in the additional categories is as follows:

Category '3'	< 3/60 – 1/60	26	(8.7%)
Category '4'	< 1/60 – LP	167	(56.2%)
Category '5'	NLP	104	(35%)

15.2.12 Graphical Summary

Figure 15-3 summarises patient's distribution in the various VA categories

Figure 15-4 shows the proportion of the various categories of VA among the major anatomical sites of pathology.

Figure 15-5 depicts a comparison of VA categories between the WB and GS.

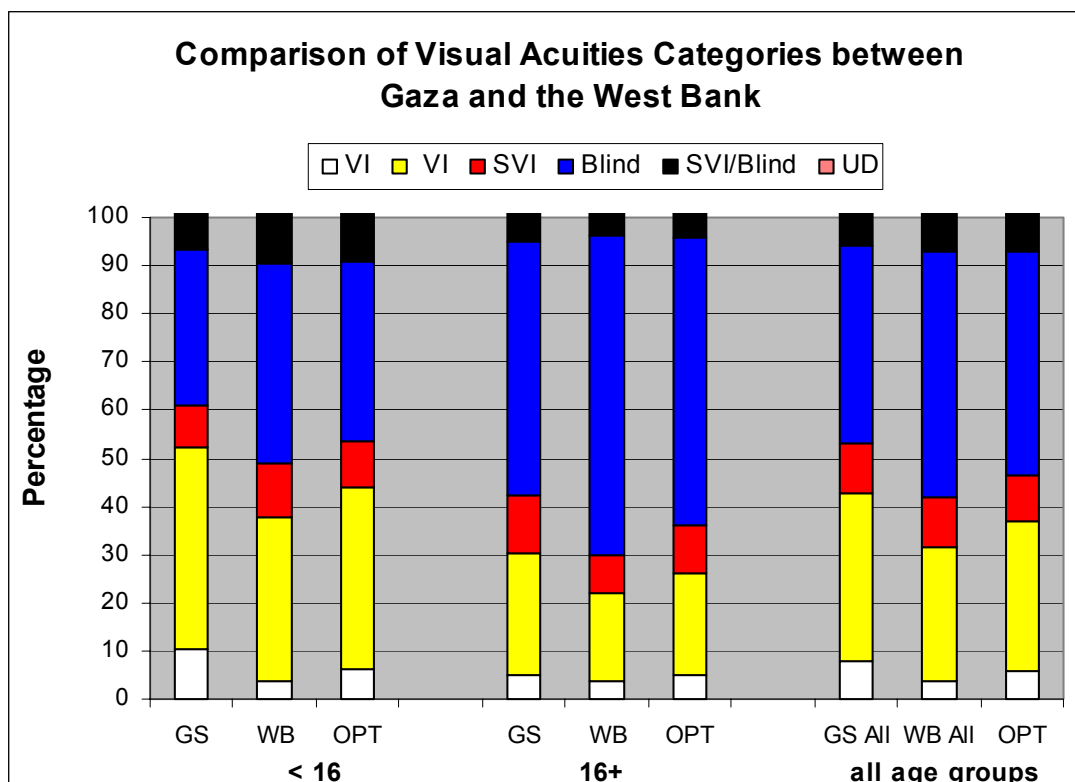


Figure 15-3: Distribution of visual acuity by region and age

15.3 Visual Impairment in Children

The afore mentioned visual impairment in children mentioned above is summarised in Table 15-9, which shows children's visual categories and highlights the percentage of blindness and SVI/BL in children. The total figures for combined svi/blind are 56% in the WB, 46.7% in the GS and 52.4% in the whole OPT combined.

In the under 10 age group, blindness occurred in 94 children in this age cohort (n=251) making 37.5% of the total (WB 39.7% of 126 cases, GS 36.8% of 106 cases).

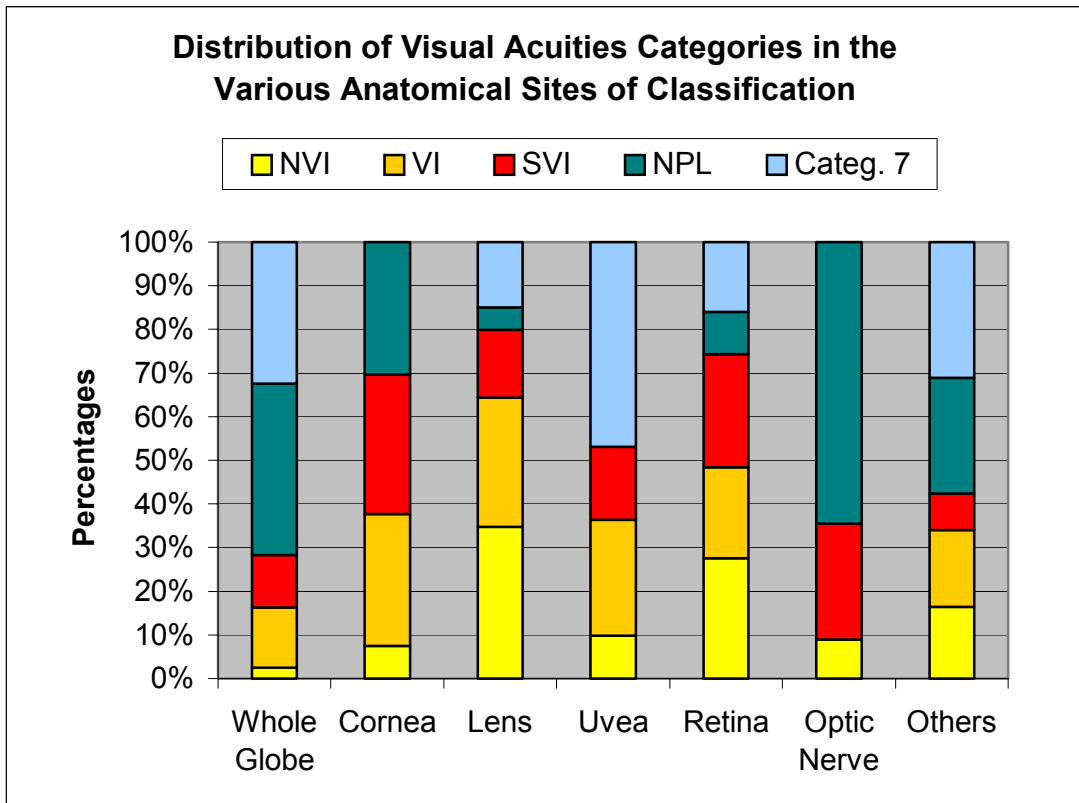


Figure 15-4: Distribution of patients by anatomical site of pathology

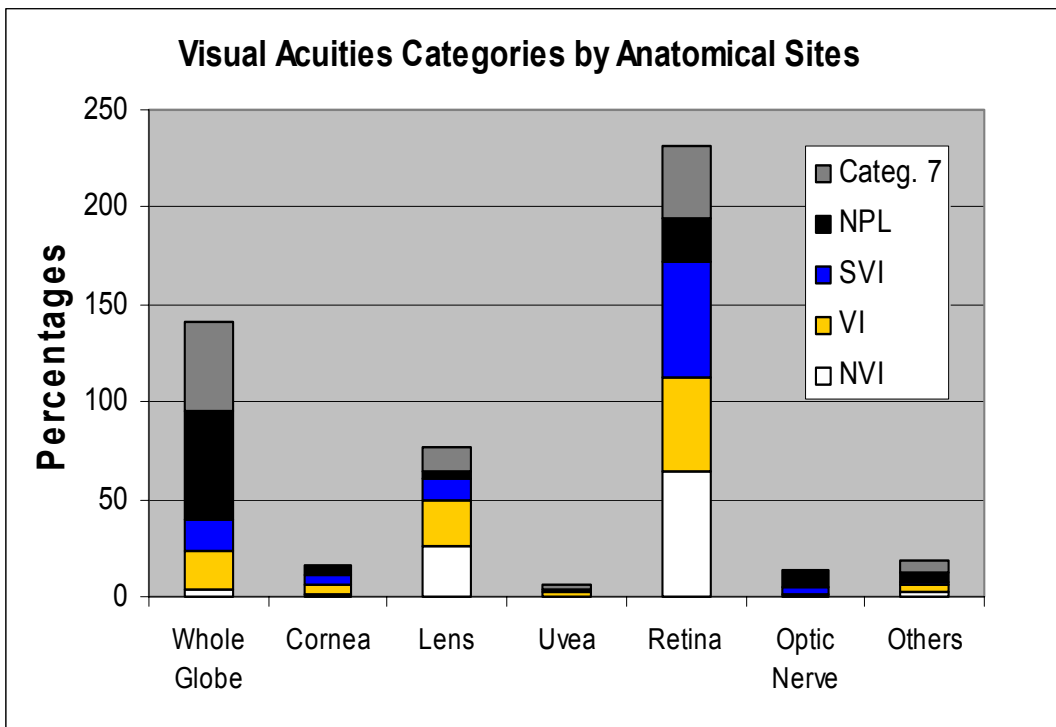


Figure 15-4: Distribution categories of visual acuities by anatomical site

Visual Acuties	Children						Total series			
	West Bank		Gaza Strip		Total		WB	GS	Total	
No visual impairment (6/18 and better)	10	4.18	22	12.2	32	7.16	16	27	44	6.58
Visual Impairment (<6/18-6/60)	69	28.9	58	32.2	128	28.6	89	76	166	24.8
Severe visual impairment (<6/60-3/60)	21	8.79	13	7.22	34	7.61	34	28	62	9.27
<3/60 – PL	66	27.6	40	22.2	112	25.1	111	76	195	29.1
NLP	33	13.8	19	10.6	56	12.5	56	43	103	15.4
Unable to test	3	1.26	2	1.11	6	1.34	3	7	11	1.64
Category 6	23	9.62	14	7.78	47	10.5	23	18	52	7.77
Category 7	14	5.86	12	6.67	32	7.16	15	15	36	5.38
Total all categories	239	100	180	100	447	100	347	290	669	100
Total of categories with definitive VA	199		152		362		306	250	570	
Blindness (<3/60 to PL)	99	41.4	59	32.8	168	37.6	167	119	298	44.5
% of blindness excluding estimates		49.7		38.8		46.4				52.3
Total SVI/blindness	134	20	84	12.6	234	35	216	162	396	59.2
% of SVI/Blind excluding estimates		23.5		14.7		41.1				69.5

Table 15-9: Visual categories and percentage of blindness and blind/SVI in <16 years before adjustment

15.4 Clinical Conditions in the Visual Categories

15.4.1 Pathology in NVI Category '1' (Figure 15–6)

The three major sites of pathology that formed the bulk of this category were the retina 43% (n=19), the lens, 23% (n=10) and the whole globe, 20% (n=9). Nineteen patients had retinal pathology as the primary disorder followed by the lens with 10 cases and the whole globe with 9 cases. The remaining 6 patients were distributed amongst the other anatomical sites.

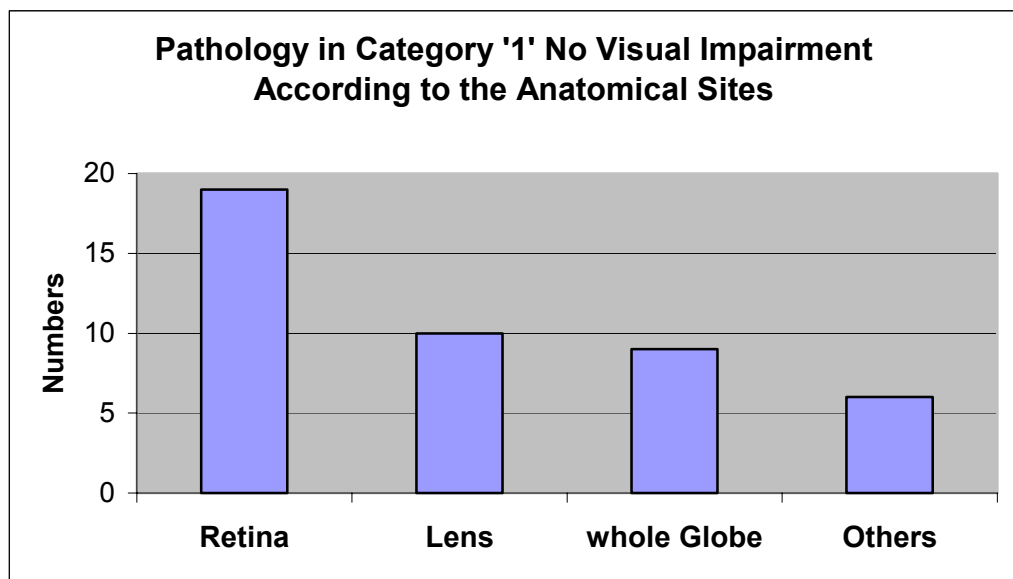


Figure 15-6: Anatomical sites of pathology in category '1' visual acuities

Amongst the retinal conditions, 7 were retinal dystrophies (rod-cone 3, rod monochromatism 2, others 2), 6 myopia, 4 albinos, and 1 acquired.

15.4.2 Pathology in the VI Category '2' (<6/18 to 6/60)

Conditions dominating this category were; retina (93 patients, 78% of whom retinal dystrophies), lens (n=50, 80% with CC) and the whole globe (n=8) (Figure 15-7), the same as category '1'.

Among the retinal pathologies in this category, there were 27 cases with cone-rod dystrophy, 24 with rod-monochromatism, 16 with albinism, and 16 with macular degeneration. Myopia and rod cone dystrophies accounted

for 4 cases each. The lens had the largest number of cases (n=50) which included 40 with congenital cataract and 10 with other lenticular problems.

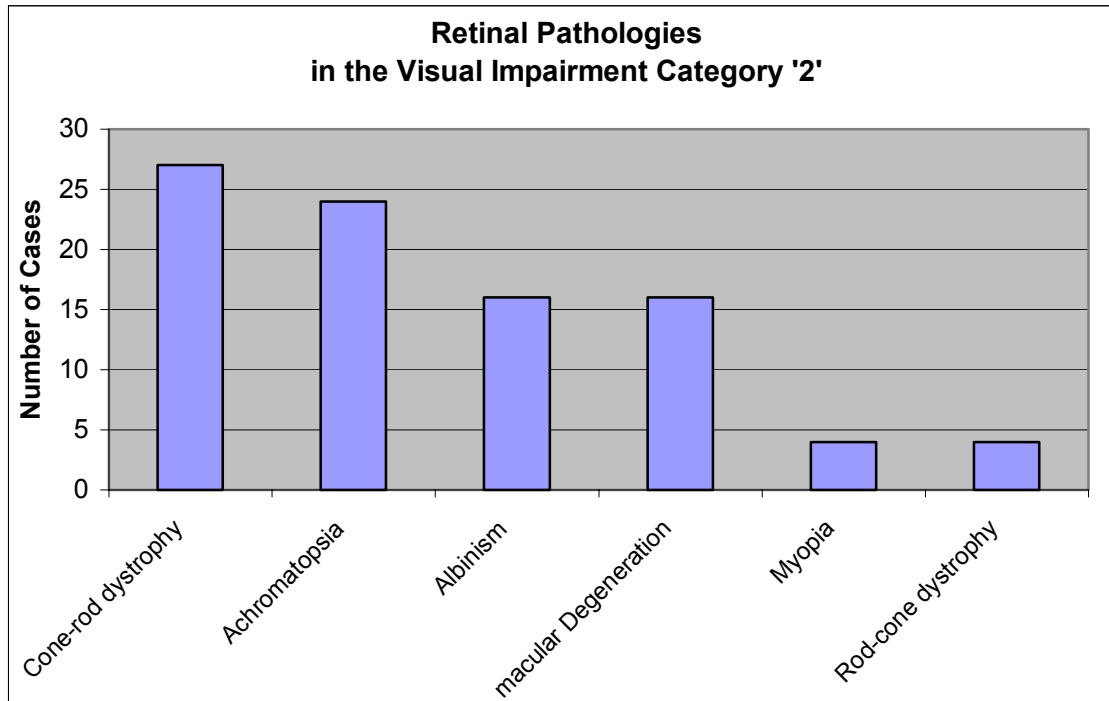


Figure 15-7: Retinal pathologies in category '2' visual acuities (VI)

15.4.3 Pathology in the SVI Category '3' (<6/60 to 3/60) - (Partially Sighted)

Retinal conditions followed by lens and whole globe conditions were the predominant sites of pathologies in this category with 56% (n=36), 19% (n=12) and 17% (n=11) respectively. Figure 15-8 demonstrates the various retinal pathologies in this category.

15.4.4 Pathology in Blind Category '4' (<3/60 to LP, Blindness)

Of the anatomical sites affected in this group, the retina scored the highest at 62%, followed by the whole globe with congenital glaucoma forming two thirds of that group (Figure 15-9). The lens takes the third position at 11% followed by the uvea at 9%. The majority with corneal and optic nerve pathologies had visual acuities in this category with 5% each. Retinal dys-

trophies formed the vast majority of the retinal cases (n=114, 89%) and over half of the total category.

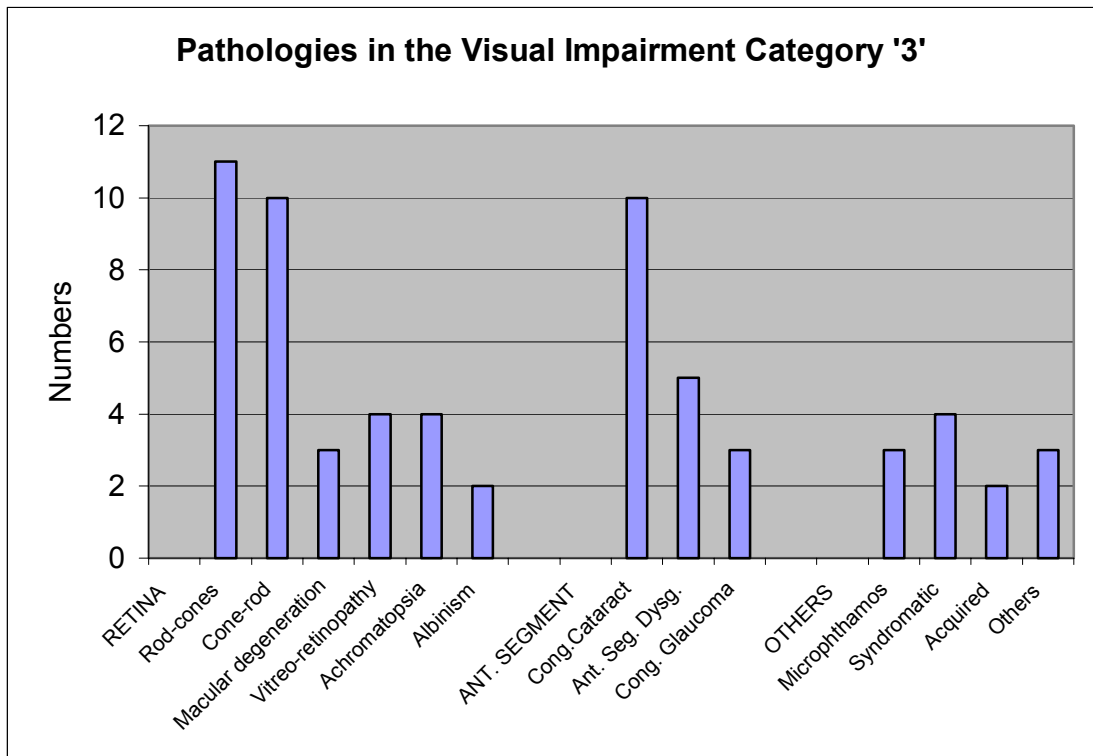


Figure 15-8: Pathologies in the SVI category '3' of visual acuities

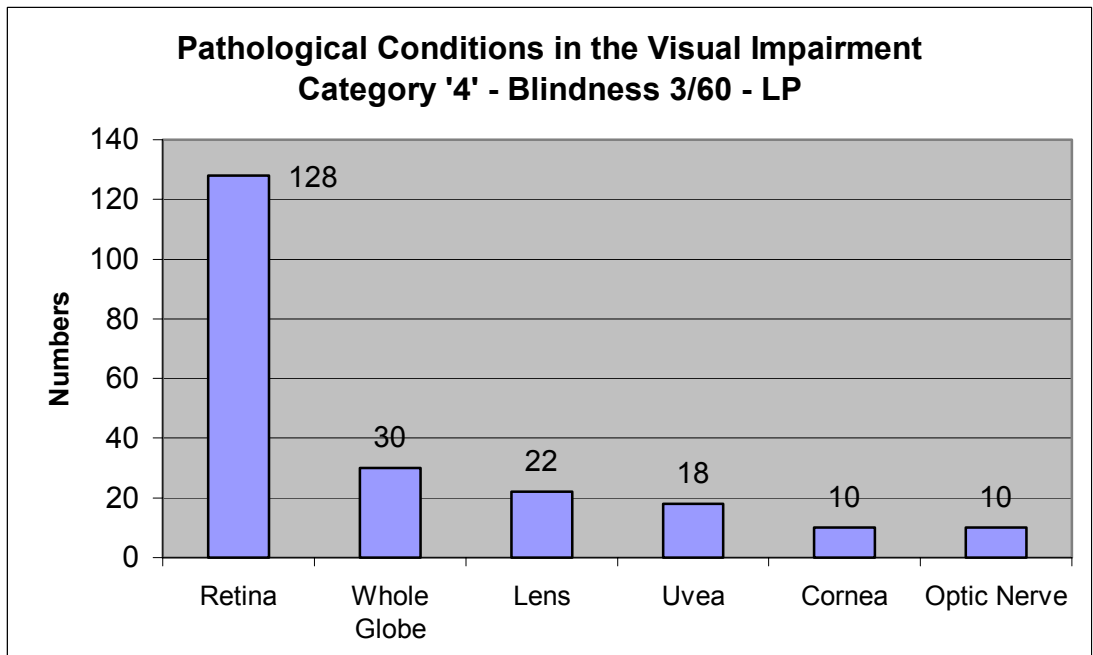


Figure 15-9: Pathologies in the Blind category '4' of visual acuities

15.4.5 Pathology in Category '5' (NLP, Blindness)

The largest clinical entity in this category is acquired conditions (n=31). Two thirds of the acquired conditions were in the 16 plus age group. Among the whole globe cases, microphthalmia/anophthalmia was the largest category followed by congenital glaucoma, phthisis bulbae and disorganised eyes.

Among the retinal dystrophies, rod-cone was the predominant condition (Figure 15-10).

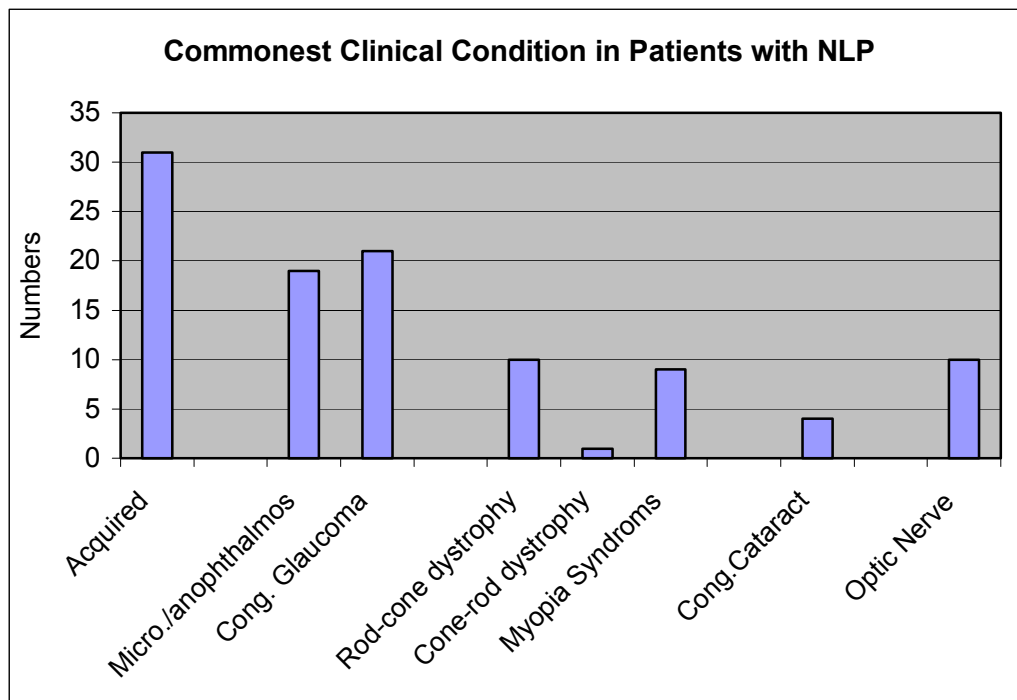


Figure 15-10: Common clinical conditions in patients with NLP

15.4.6 Patients with Perception of Light

Unlike the NLP category where the largest anatomical site for pathology was the whole globe, retinal conditions are the major source of morbidity in this group of patients contributing to 62% of the total cases. This is mainly caused by retinal dystrophy (n=44), with Leber's congenital amaurosis (LCA) forming the largest clinical condition with 32 patients. Other retinal conditions are cone-rod dystrophies (CRD) (n= 8), retinal detachment (n= 2) syndromatic (n= 2) and other retinal conditions (n= 3). Buphthalmos (CG) came second to retina in this category contributing 13 patients from the

total of 18 in the whole globe category. The rest of the whole globe conditions were microphthalmos 2, phthisis 1, and removed eyes 1. The third anatomical site was the cornea with 5 patients. Optic nerve conditions amounted to 3 cases and lens contributed 2 patients. Eighty percent of patients (n= 61) in this group were the product of consanguineous marriage and 9 were married from the same village.

15.4.7 Pathology in Category '6' (cannot be tested, believed sighted)

These 19 cases exhibited a spectrum of clinical conditions as follows: 2 patients with buphthalmos (1 of whom had bilateral corneal scarring), 2 albinos with hypoplastic maculae, 2 with rod-cone dystrophy, 3 with cataract (1 of whom also has unilateral microcornea), 10 with CC who are aphakic (2 of whom had thickened posterior capsules and 1 with optical iridectomy). Forty-three of the children in this category were below the age of 9 years, and 30 were below the age of 4 years.

15.4.8 Pathology in Category '7' (cannot be tested, believed blind)

The predominant conditions causing the visual disability in this category were congenital glaucoma (n=16), retinal dystrophies (n= 8) particularly rod-cones, lens conditions (n= 4), optic nerve disorder (n= 2) and other retinal conditions (n= 5), in addition to 1 with uveal coloboma.

Among the 36 patients, it can be postulated that 19 had svi (2 LCA, and 2 with PCG with buphthalmic eyes. Another 15 could fall into the VI category '2' (2 albinos with hypoplastic maculae, 3 with congenital cataract (2 of whom had microphthalmos (MC) and 1 with microcornea). The remaining 2 patients were aphakic following congenital cataract surgery, one of whom had a thick posterior capsule and the other optical iridectomy.

15.5.9 Pathology in the 'Blind' Category (categories '4' and '5')

The pathologies in this group have been addressed separately under groups '4' and '5'. Figure 15-11 demonstrates the proportion of each of these categories in each of the anatomical sites of pathology in the blind series.

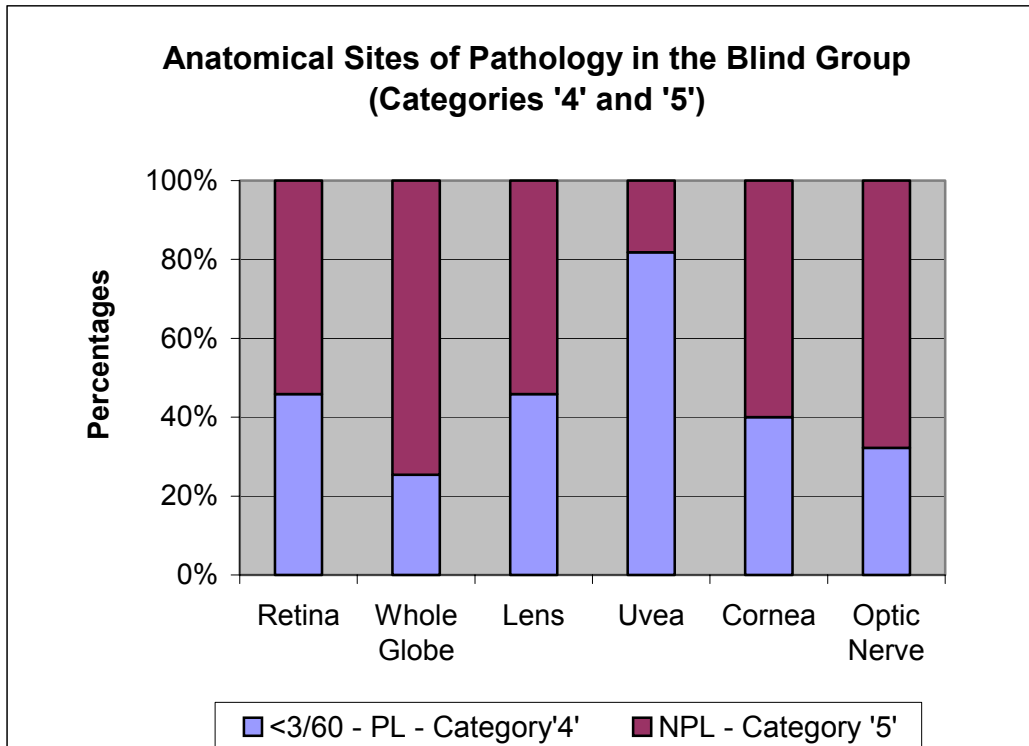


Figure 15-11: Anatomical sites of pathology in categories '4' and '5' of visual acuities (Blind)

15.5.10 Pathology in the SVI/Blind Combined Category (Categories '4' and '5')

Figure 15-12 depicts the proportion of the two Blind visual categories in the common clinical conditions. Of those with acquired conditions in this combined group, 15 had corneal conditions. These form 68% out of the total cornea in the series (n=22).

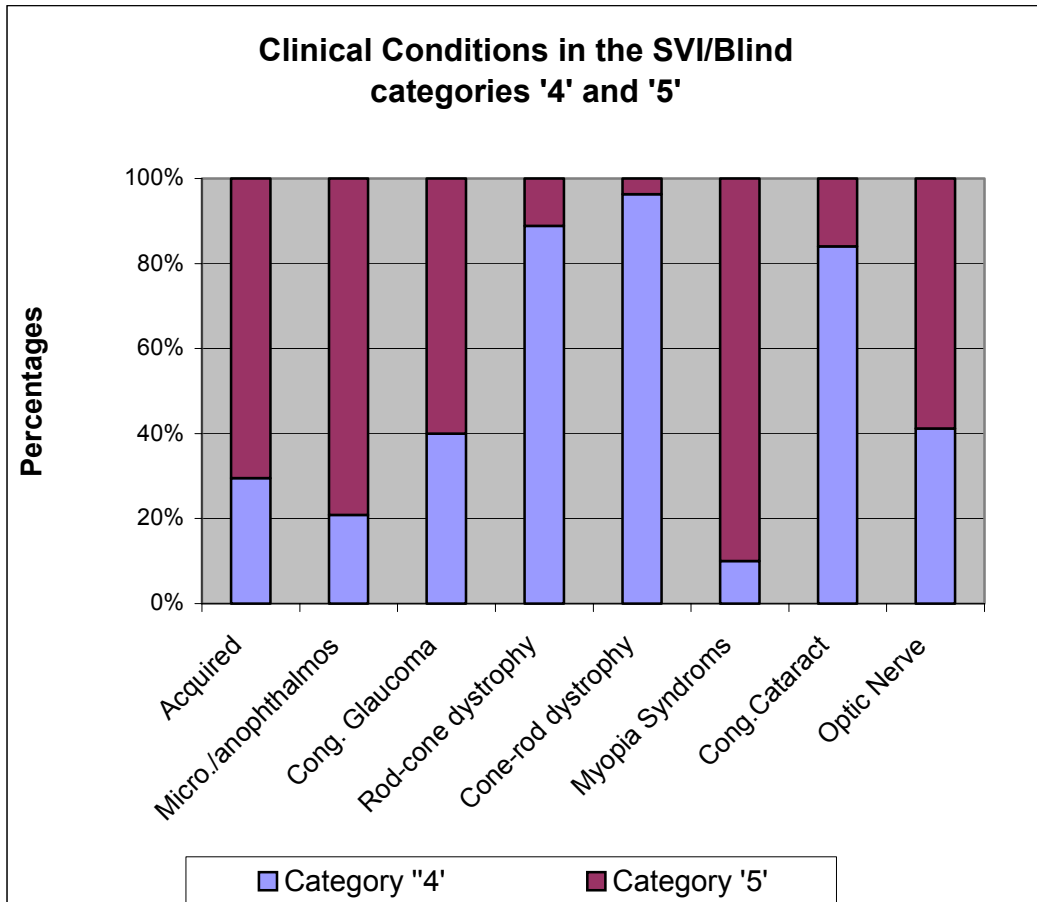


Figure 15–12: Clinical conditions in the svi/blind category of visual acuities