Visual impairment and health inequalities: findings from UK Biobank (UKBB)

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BACKGROUND

UK Biobank study is the largest single resource for the study of health and disease. Between 2006 and 2010, more than half a million people aged 40-73 years who were registered with the UK National Health Service and living within a 25 miles radius of one of the study centres were recruited into the study.

A subsample of participants underwent ophthalmic examination, including presenting distance visual acuity. This study therefore provides an unparalleled opportunity to address questions about risk factors for all-cause visual impairment, in a contemporary adult population.

Aim: To investigate the frequency of and socio-demographic factors associated with visual impairment (VI) in adults in the UK.

METHODS

117,409 participants attended a test centre for an ophthalmic examination including a habitual (presenting) distance visual acuity assessment using the UKBB computerised system based on a logMAR chart. Those unable to take the test reported the reason; 143 reported absence of eye/s.

Subjects excluded

>> Report of having but not wearing prescribed optical correction (N=1,413)

>> Unknown or unreliable distance VA measure in at least one eye (N=5,145)

>> Incomplete data on socio-demographic factors (N=2,180)

Thus, **110,134 participants (94%)** were included in the analysis.

Socio-demographic factors obtained by touchscreen questionnaire included:

>> Age and gender

>> Ethnicity (White/mixed/Asian or Asian British/Black or Black British/Chinese /Other)

>> Townsend Index of social deprivation (higher score is associated with higher deprivation

>> Educational attainment (None/'O' levels/'A' levels/higher level)

>> Employment status (employed, retired, unable to work, unemployed/unpaid work/student)

Table 1: Categorisation of visual impairment using presenting distance visual acuity (logMAR) or self-report of absent eye/s (blindness)

Visual loss category	Visual acuity LogMAR	
Bilateral normal	0.0 – ≤0.2	Normal
Unilateral near normal	≤ 0.2 vs >0.2 to ≤ 0.3	Normal
Bilateral near normal	>0.2 to ≤ 0.3	Normal
Unilateral visual impairment	0.0 to ≤0.3 vs >0.3	Unilateral VI
Socially significant visual impairment (SSVI)[1]	>0.3 to <0.5 in the better-seeing eye	Socially Significant VI
Visual impairment (VI)	≥0.5 to ≤1.0 in the better-seeing eye	Visual Impairment (VI,SVI and blind)
Severe visual impairment (SVI)	>1.0 to ≤1.3 in the better-seeing eye	Visual Impairment (VI,SVI and blind)
Blindness	>1.3 in both eyes	Visual Impairment (VI,SVI and blind)

Reported absent eye/s were categorised as blind

Statistical methods:

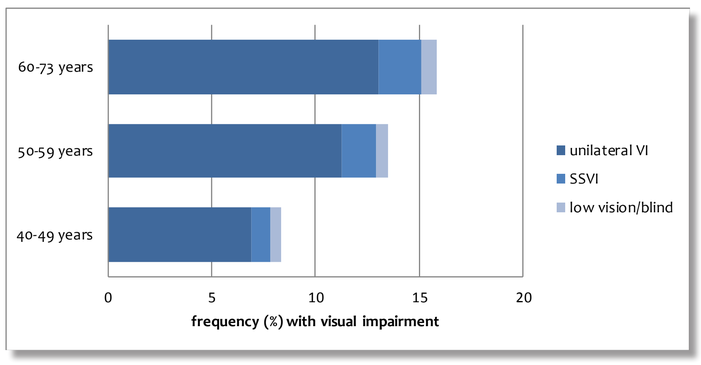
Multinomial multivariable analysis was undertaken with robust standard errors used to allow for correlation within test centre. Adjusted Risk Ratios (RR) with 95% confidence intervals are reported.

RESULTS

The frequency of those with normal bilateral vision decreased by age group: 91.5% (23,474) in 40-49 years, 86.4% (30,924) in 50-59 years, and 84% (42, 763) 60-73 years.

Risk of VI across the acuity spectrum was consistently associated with increasing age.

Figure 1: Frequency of visual impairment



Associations between demographic factors and vision function status (Table 2)

Compared to those with normal vision (logMAR ≤0.3), visual impairment with an increasing level of severity, was associated with being female, having no educational qualifications and a higher Townsend deprivation score.

Compared to those of White ethnicity those of any Black and Minority Ethnic (BME) groups were more likely to be visually impaired. Adjustment for self-report of having been diagnosed with any eye disease indicated these associations were independent of underlying eye disease.

These patterns of associations are also seen with milder levels of visual impairment, i.e. when normal vision (logMAR ≤0.2) is compared with unilateral or bilateral near normal vision (>0.2 to ≤ 0.3), [data not shown].

Employment status: After adjustment for socio-demographic factors and report of long-standing illness (compared to being employed) those unable to work or unemployed were more likely to be visually impaired (Odds Ratio 1.23 [1.1, 1.4], 1.4 [1.1, 1.8] or 2.6 [1.7, 3.8]) or (OR 1.14 [1.1, 1.2], 1.3 [1.1, 1.6], 1.7 [1.2, 2.3] for unilateral VI, Socially Significant VI and VI respectively).

Table 2: Associations between demographic factors and vision function status, comparing each VI group to bilateral normal acuity

N = 110,134		Unilateral VI		Bilateral SSVI		Bilateral VI	
	N	n	adj RR [95% CI]*	n	adj RR [95% CI]	n	adj RR [95% CI]
Gender:							
Male	50,064	5,570	1	813	1	311	1
Female	60,070	6,624	1.01 [0.99, 1.04]	1,013	1.07 [1.00, 1.14]	414	1.14 [1.02, 1.3]
Ethnicity:							
White	99,117	10,869	1	1,530	1	596	1
Mixed	995	98	1.0 [0.8, 1.2]	12	0.9 [0.5, 1.7]	11	**1.8 [1.2, 2.4]**
Asian/Asian British	4,073	499	**1.2 [1.05, 1.3]**	107	**1.8 [1.6, 2.1]**	45	**1.7 [1.2, 2.4]**
Black/Black British	3,811	459	**1.1 [1.05, 1.2]**	129	**2.2 [1.9, 2.5]**	45	**1.6 [1.1, 2.2]**
Chinese	491	73	**1.6 [1.1, 2.1]**	12	**2.0 [1.2, 3.1]**	3	1.1 [0.4, 3.4]
Other	1,647	196	**1.1 [1.0, 1.2]**	36	**1.5 [0.9, 2.4]**	25	**2.1 [1.6, 2.9]**
Townsend Index			**1.037 [1.03, 1.05]**		**1.075 [1.06, 1.09]**		**1.1 [1.06, 1.13]**
Educational qualifications:							
None	16,425	2,326	1	470	1	183	1
O level	29,314	3,131	**0.9 [0.8, 0.9]**	471	**0.7 [0.6, 0.9]**	183	**0.7 [0.5, 0.9]**
A level/HNC	19,920	2,197	**0.9 [0.8, 1.0]**	293	**0.6 [0.5, 0.8]**	125	**0.6 [0.5. 0.9]**
Higher level	44,475	4,540	**0.8 [0.79, 0.84]**	592	**0.6 [0.5, 0.6]**	234	**0.5 [0.4, 0.8]**

*Adjusted Risk Ratio and 95% confidence interval. Estimates adjusted for all factors in the table, age used as a continuous variable, with additional adjustment for self-report of any diagnosed eye disease.

CONCLUSIONS

All-cause visual impairment across the spectrum of visual acuity, compared to normal vision, is associated with increasing age, being female, key markers of poor socio-economic status and being in any BME group. These patterns of association are not explained by risk of underlying eye disease.

Poor socio-economic status[2] and BME[3] are known to be linked to health inequality; thus these findings provide evidence for the inclusion of ophthalmic disorders/visual health in key UK initiatives tackling Health Inequalities.

REFERENCES

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