

Retinal detachment in Scotland is associated with affluence

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ABSTRACT

Aim: Socio-economic deprivation plays a major role in health and disease, but its role in retinal detachment has not been studied. Data from the Scottish Retinal Detachment Study were used to investigate any association between retinal detachment, macular status at presentation and deprivation.

Methods: Prospective multicentre population-based observational study. Data were collected on all patients with primary retinal detachment presenting in Scotland between 1 November 2007 and 31 October 2008. Every patient was allocated a validated deprivation ranking according to their postcodes based on the Scottish Index of Multiple Deprivation (SIMD), which takes into account income, employment, health, education, housing, geographic accessibility and crime in 6505 postcode-based datazones. The patients were divided into four quartiles according to their SIMD ranking.

Results: 572 patients were included. The annual incidence of detachment declined from 15.4/100 000 in the most affluent quartile to 13.6/100 000 in the second, 9.3/100 000 in the third and 6.9/100 000 in the most deprived (χ^2 for trend = 50.2, $p < 0.0001$). The trend was more marked for men than for women but was present in both sexes. There were no differences in the rate of macula-off detachments or the number of quadrants detached. Rates of pseudophakic and myopic detachment were evenly distributed across all quartiles.

Conclusions: Retinal detachment appears to be associated with affluence. This has not been previously reported and may be partly responsible for the variation in estimates of the incidence of retinal detachment. It may also have implications for service planning. The reason for this association is unknown.

Rhegmatogenous retinal detachment (RRD) is a potentially blinding condition with an average reported annual incidence of 10 per 100 000 population.¹⁻⁵ Myopia, age, pseudophakia and certain collagen disorders are known risk factors which may predispose to RRD. Visual recovery and successful surgical repair of RRD are affected by delayed presentation, which leads to a more extensive detachment and involvement of the macula. Improvements in the outcome of retinal detachment repair are more likely to arise from earlier diagnosis than advances in reattachment surgery.⁶

Social deprivation is known to have a significant impact on many diseases.⁷ Low socio-economic status is associated with an increased incidence of blindness and visual impairment.^{8,9} Social deprivation has been associated with delayed presentation in sight-threatening diabetic eye disease,¹⁰ glaucoma^{11,12} and anisometropic amblyopia.¹³ We

undertook this study to examine the influence of social deprivation on the incidence of retinal detachment and to determine if deprivation is associated with delayed presentation.

METHODS

Participants

A prospective multicentre study was established to investigate the clinical and epidemiological features of retinal detachment. This paper is part of this large study, and subsequent publications will address presentation, aetiology and genetic issues in more detail. Data were collected on all incident cases of RRD presenting to one of six vitreoretinal surgical sites in Scotland (Glasgow, Edinburgh, Dundee, Aberdeen, Ayr and Inverness) over a 1-year period between 1 November 2007 and 31 October 2008. Every patient presenting with primary RRD to these units was invited to participate in the study. All cases were confirmed by clinical examination by a consultant vitreoretinal surgeon. Demographic data (age, sex, address and ethnicity) as well as clinical data (duration of symptoms, configuration of RRD, past ocular history and intraocular surgery, and lens status) were collected on all consenting participants. In patients with macula-on detachments, the initial symptoms were often minor, and it was difficult to obtain a precise estimate of the duration of the detachment. Because the duration of symptoms was unreliable, we used the proportion of macula-off detachments, and the number of quadrants detached as indicators of delayed presentation. This was based on the natural history of rhegmatogenous detachment, which usually originates in one quadrant and extends to involve the remaining retina. Full details of the study methodology have been published elsewhere.¹ We have not included outcomes data, as this study was designed to examine the aetiology, presentation and epidemiology of retinal detachment rather than the outcomes of treatment.

Population data for each datazone was taken from the 2001 census (Scottish Neighbourhood Statistics (<http://www.sns.gov.uk>)).

Deprivation score: SIMD ranking

The Scottish government has developed the Scottish Index of Multiple Deprivation (SIMD). The country is divided into 6505 geographic zones, based on postal codes. The average population of each datazone is 780. The datazones are ranked according to a global deprivation score, which is a weighted sum of the seven domain scores. These scores are derived from 37 different indicators. The domain weightings used in SIMD 2006, expressed

Table 1 Annual incidence of rhegmatogenous retinal detachment

Scottish Index of Multiple Deprivation quartile	1	2	3	4	Total
Total population					
No of detachments	89	117	169	197	572
Total population	1 284 075	1 260 842	1 239 562	1 277 532	5 062 011
Annual incidence/100 000	6.9	9.3	13.6	15.4	11.3
Males					
No of detachments	48	67	106	119	340
Total population	603 610	602 622	603 052	623 210	2 432 494
Annual incidence/100 000	8.0	11.1	17.6	19.1	14.0
Females					
No of detachments	41	50	63	78	232
Total population	680 465	658 220	636 510	654 322	2 629 517
Annual incidence/100 000	6.0	7.6	9.9	11.9	8.8

Total population: χ^2 for trend = 50.17, $p < 0.0001$; male population: χ^2 for trend = 34.71, $p < 0.0001$; female population: χ^2 for trend = 15.03, $p = 0.0001$.

as a percentage of the final score, are: current income (28%), employment (28%), health (14%), education (14%), geographic access (9%), crime (5%) and housing (2%). The score is a ranking only, so a score of 4 does not mean that the area is twice as deprived as a zone with a score of 2. Further details of the SIMD can be found on the Scottish government website (<http://www.scotland.gov.uk/Topics/Statistics/SIMD/>).

From the patient's post code, it was possible to identify their SIMD datazone. For this study, the datazones were grouped into four quartiles, with the first quartile being the most deprived and the fourth the least deprived.

Statistical analysis

Categorical data were analysed with χ^2 test, and the χ^2 for trend.

RESULTS

Demographics

Clinical and postcode data were obtained for 572 patients. The difference in incidence of RRD between the lowest and highest quartiles is shown in table 1. The annual incidence increased from 6.9/100 000 in the most deprived quartile to 15.4 in the least deprived quartile. The trend appears to be stronger in males than females, but is significant in both genders.

There were no differences in the proportion of macula-off detachments (table 2) or the number of quadrants detached (table 3). In two patients, the macular status was unknown, and in 14 patients, the extent of the detachment was not documented.

Pseudophakia

The lens status was not recorded in four eyes; 431 eyes were phakic; 125 were pseudophakic; and 12 were aphakic. The 12 aphakic patients were included in the pseudophakic group for analysis. There was no difference in the proportion of patients who had previous cataract surgery (table 4).

Myopia

Among phakic patients, there was no difference in the prevalence of significant myopia (at least $-3D$) (table 5). In 60 patients, the refraction prior to RRD was unknown.

DISCUSSION

In this study, the overall incidence of RRD was comparable with that from other reports.^{2-5 14} We found no association

between SIMD quartile and either the number of quadrants involved or the proportion of macula-off detachments. This implies that delayed presentation is not linked to socio-economic deprivation.

Socio-economic status is known to be an important determinant of the risk of blindness and visual impairment.^{8 9} However, the inverse association between deprivation and retinal detachment was unexpected and has not been previously reported.

We used a postcode-based methodology to assess deprivation, and this is necessarily an approximation, as there may be deprived households in affluent areas, and some households in deprived areas may be affluent. However, these anomalies are unlikely to lead to systemic bias on the scale reported in this study.

Only patients resident in Scotland were included in the study. Scotland is known to have highly significant disparities in life expectancy and other health indicators according to socio-economic factors.¹⁵ Our findings may not be applicable to other countries, and it would be interesting to replicate the study elsewhere.

Nineteen patients refused to participate in the study, but even if they were all from the most deprived quartile, this would not alter the results.

This finding has implications for research into the epidemiology of RRD. The reported annual incidence varies from 4¹⁶ to 17.9² per 100 000 population. One cause of this variation may be differing levels of social deprivation. Observed differences in incidence between ethnic groups may also be partly caused by socio-economic factors.³ There are implications for service planning, as there is likely to be a greater need for vitreoretinal services in areas with less deprivation.

We have considered a number of possible explanations. On a global scale, cataract surgery is associated with affluence—the cataract surgery rate is much higher in wealthy industrialised

Table 2 Macula status and deprivation quartile

Quartile	Macula on	Macula off	Total
1	41 46.1%	48 53.9%	89
2	49 42.2%	67 57.8%	116
3	63 37.3%	106 62.7%	169
4	90 45.9%	106 54.1%	196
Total	243 42.6%	327 57.4%	570

$\chi^2 = 3.28$; $df = 3$; $p = 0.35$.

Table 3 Number of quadrants detached and deprivation quartile

Quartile	One quadrant		Two quadrants		Three quadrants		Four quadrants		Total
1	21	24.4%	40	46.5%	20	23.3%	5	5.8%	86
2	35	31.0%	54	47.8%	19	16.8%	5	4.4%	113
3	29	17.3%	87	51.8%	40	23.8%	12	7.1%	168
4	56	29.3%	90	47.1%	33	17.3%	12	6.3%	191
Total	141	25.3%	271	48.6%	112	20.1%	34	6.1%	558

$\chi^2 = 11.30$; df = 9; p = 0.26.

Table 4 Distribution of the patients with pseudophakia in the quartiles

Quartile	Phakic		Pseudophakic/aphakic		Total
1	73	82.0%	16	18.0%	89
2	86	74.8%	29	25.2%	115
3	120	71.0%	49	29.0%	169
4	152	78.0%	43	22.0%	195
Total	431	75.9%	137	24.1%	568

$\chi^2 = 4.56$; df = 3; p = 0.21.

countries than in poor countries.¹⁷ Within developing countries, poverty and low socio-economic status reduce access to cataract surgery.^{18, 19} Even in the UK, with universal provision of free healthcare, there is evidence to suggest that access to cataract surgery is influenced by social deprivation.²⁰ If more affluent zones have more cataract surgery, they might be expected to be at greater risk of RRD. If this was the main reason for the association of RRD with affluence, we would expect to see more pseudophakic detachments in the least deprived group. However, aphakic and pseudophakic detachments were evenly distributed between the four quartiles.

Myopia has been associated with IQ, and thus higher income and socio-economic status.^{21, 22} As myopia is a risk factor for RRD, a higher prevalence of myopia in the most affluent quartile could explain the increased incidence of RRD. However, there was little difference between the quartiles in the proportion of RRD associated with 3 dioptres or more of myopia.

Deprived areas in Scotland have higher standard mortality ratios.¹⁵ RRD is associated with age¹⁴ and is most common in the seventh decade. High mortalities mean that fewer people will live long enough to be at greatest risk of retinal detachment. However, data from the Scottish Census show that the percentage of the population aged over 60 shows little variation—21.5% in the most deprived group, 22.8% in the second quartile, 21.4% in the third and 18.7% in the most affluent. It appears that the higher risk of RRD in the least deprived cannot be explained by greater life expectancy.

The Scottish RRD survey only records patients on presentation to hospital, and it is possible that patients from areas of greater deprivation do not attend hospital and are excluded from the study. However, sudden loss of vision is a dramatic symptom which is unlikely to be ignored. Second, if there were large numbers of untreated RRD in Scotland, we would expect to encounter them when patients attend their optometrist, or an eye clinic, for some other reason. In fact, it is rare to detect untreated RRD in primary care. Finally, there is no evidence of delayed presentation in the more deprived patients, which suggests they are no more likely to ignore a detached retina than the most affluent.

We have not found any satisfactory explanation for the greater incidence of RRD in less deprived patients. It is possible that a combination of small differences in known risk factors, such as myopia and previous cataract surgery, account for the difference. However, we cannot exclude the possibility that

Table 5 Significant myopia (at least -3D) in phakic eyes

Quartile	Myopic		Not myopic		Total
1	27	41.5%	38	58.5%	65
2	35	45.5%	42	54.6%	77
3	39	36.8%	67	63.2%	106
4	64	48.1%	69	51.9%	133
Total	165	43.3%	216	56.7%	381

$\chi^2 = 3.31$; df = 3; p = 0.35.

affluence is associated with some other, hitherto unknown, risk factor for RRD. The Scottish RRD survey will continue until November 2009, and we hope that additional data may provide an explanation for this unexpected finding.

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