Summary table 50 — corticosteroids and cataracts

Paper no.	Reference	Type of study	Population/study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
1123	Uboweja et al 2006	Systematic review with meta-analysis (2 case–control, 1 cross-sectional and 1 cohort with nested case–control analysis)	NA	Inhaled corticosteroids	No corticosteroids	Meta-analysis of about 20,000 cases and 50,000 controls	IV (Acceptable)	Inhaled corticosteroids (ICS) may be associated with systemic side effects such as cataracts. Pooled OR was 1.48. Further evaluation required to assess impact of dosage and duration of drug use.	The risk of increased cataract needs to be weighed against the benefits of ICS

Summary	Group
Inhaled corticosteroids may be associated with cataracts.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 53 — corticosteroids and glaucoma

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
2049	Lipworth 1999	Systematic review (2 case reports and 1 case–control study of glaucoma)	NA	Inhaled corticosteroids	No corticosteroids	NA	III-3	The case–control study found that there was no association between current use of inhaled glucocorticosteroids and increased risk of glaucoma and intraocular hypertension, but patients using high doses on a regular basis were at an increased risk (OR 1.44; 95%CI 1.01 to 2.06).	Systematic review of adverse effects of corticosteroids
1067	Gartlehner et al 2006	Systematic review (1 cross-sectional and 1 case–control)	NA	Inhaled corticosteroids	No corticosteroids	NA	IV	In a cross-sectional study based in Australia, a dose-related increase in the risk of open-angle glaucoma was found in patients using inhaled corticosteroids with a family history of glaucoma (OR 2.8; 95%CI 1.2 to 6.8). Authors note that the risk–benefit ratio appears to favour inhaled corticosteroid treatment in patients with moderate to severe chronic obstructive pulmonary disease.	Systematic review of efficacy of corticosteroid use
1634	Garbe et al 1997	Case–control	People with ocular hypertension or POAG	Oral glucocortoids	No glucocorticoids	9793 cases, 38,325 controls	III-3	Current users of oral glucocortoids were more likely to develop ocular hypertension or primary open-angle glaucoma (POAG) than nonusers (OR 1.41; 95%CI 1.22 to 1.63). There was a dose-related increase in the odds ratios for current users, increasing from 1.26 for those on less than 40 mg/day hydrocortisone to 1.88 for those on more than 80 mg/day. The odds ratios also increased with the duration of treatment over the first 11 months of exposure.	

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
2058	Sahni et al 2004	Case report	29-year-old woman	Topical steroids used near the eyes	NA	1	–	Sahni et al describe a case involving a 29-year-old woman who used large quantities of topical steroids to treat severe eczema, including a potent formulation near the eyes. She developed bilateral glaucoma and irreversible visual loss. Although there have been few case reports of glaucoma from topical steroid application, the authors recommend regular glaucoma screening during prolonged periorbital topical steroid use. Long-term use of strong formulations should be avoided.	

Summary	Group
Inhaled Inhaled corticosteroid use may present an increased risk of glaucoma and ocular hypertension for people who are on high doses for long periods of time, or for those with a family history of glaucoma. Oral The use of oral glucocortoids increases the risk of ocular hypertension or open-angle glaucoma in older people. Topical The long-term use of potent formulations of topical corticosteroids near the eyes may increase the risk of glaucoma. General Monitoring of intraocular pressure may be advisable in patients who require long-term treatment with high doses of corticosteroids.	*Group 1* — Clear association/causality **(inhaled/oral)** *Group 2* — Possible association/causality (more research needed) **(topical)** *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 54 — corticosteroids and age-related macular degeneration

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
3059	Wang et al 2003	Prospective cohort	Blue Mountains Eye Study	Anti-inflammatory medications (both steroids and nonsteroids)	No anti-inflammatory medications	3654	II (LPS)	It has been postulated that inflammatory processes may play a role in the pathogenesis of AMD. This study explored whether systemic use of anti-inflammatory medication, including steroidal and nonsteroidal types, influenced the development of AMD. However, no protective effect was found.	

Summary	Group
No association was found between the use of systemic anti-inflammatory medications and the cross-sectional incidence or prevalence of age-related macular degeneration.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 57 — high myopia and cataract

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
1786	Saw et al 2005	General review (includes population-based cohort studies, cross sectional studies and case–control studies)	Beaver Dam Eye Study (USA), Blue Mountains Eye Study (Australia) and Barbados Eye Study	High myopia	NA	NA	II (LPS)	There is a large body of evidence from population and clinic-based studies to suggest that cataract (including posterior subcapsular, nuclear and cortical cataract) is associated with myopia. Care should be taken when assessing cross-sectional studies, however, as the possibility that myopic shifts occurred as a consequence of cataract cannot be excluded.	
507	McCarty 2002	General review of Australian data	Melbourne Visual Impairment Project and Blue Mountains Eye Study	High myopia	NA	NA	II (LPS)	Both studies identify myopia as a significant risk factor for cortical, nuclear and posterior subcapsular cataracts (PSC). The Melbourne Visual Impairment Project found that myopia increased the risk of cortical (OR 1.76), nuclear (OR 2.73) and PSC (OR 3.59). The Blue Mountain Eye study also showed that myopia was a risk for cortical (OR 2.9) nuclear (OR 2.3) and PSC (OR 4.9). The author predicts that the absolute and relative amount of cataract in the Australian population will increase dramatically due to population ageing.	
580	Mukesh et al 2006	Prospective cohort study	Melbourne Visual Impairment Project	Myopia	NA	3721	II (LPS)	This recent study further demonstrated that myopia is an independent risk factor for development of cortical cataract.	

Summary	Group
Myopia, particularly high myopia, is a risk factor for cortical, nuclear and posterior subcapsular cataract, although the causal mechanism remains unknown.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 58 — high myopia and ambylopia

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
1814	Robaei et al 2006	Cross-sectional	The Sydney Myopia Study (6-year-old Australian children)	High myopia	NA	1741	IV	This study reports an association between ambylopia and both high hyperopia and anisometropia but not myopia.	
1801	Fitzgerald et al 2005	Cross-sectional	Children less than 10 years of age with high myopia	High myopia	NA	178	IV	In a study of 178 children with high myopia, 75.8% had ambylopia or reduced corrected visual acuity. The study concluded that children under 10 years with high myopia were at high risk of developing ambylopia.	
1810	Marr et al 2001	Cross-sectional	Children between 3 and 10 years of age with high myopia	High myopia	NA	112	IV	The study found that children with high myopia rarely had 'simple' high myopia, 54% had an underlying systemic condition (such as Marfan syndrome), while 38% had associated ocular problems such as ambylopia. This suggests that children with high myopia should be referred for further examination.	

Summary	Group
It is not clear whether children with high myopia are at increased risk of amblyopia.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 59 — high myopia and diabetic retinopathy

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
1820	McKay et al 2000	Cross-sectional	Victorian residents aged 40 years and over	Myopia	NA	4744	IV	Retinopathy was not significantly associated with myopia ($P < 0.05$).	
1818	Dogru et al 1998	Case series	Patients from the Kobe University Department of Ophthalmology, Diabetes Outpatient Clinic with asymmetric proliferative diabetic retinopathy	High myopia	NA	19	–	The authors state that high myopia has previously been suggested to induce asymmetric diabetic retinopathy. This study found that there were trends towards high myopia being a protective influence, although statistical significance was not achieved, due to the small study size.	

Summary	Group
The relationship between high myopia and diabetic retinopathy remains unclear.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 60 — high myopia and glaucoma

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
1825	Coleman and Wilson 2000	General review (including relevant prospective cohort study)	Blue Mountains Eye Study	High myopia	NA	NA	II (LPS)	The Blue Mountains Eye Study found a strong association between low myopia and primary open-angle glaucoma (POAG) and a stronger association between moderate-to-high myopia and POAG (OR 3.3). A survey in Japan, however, found increasing POAG prevalence and decreasing myopia prevalence with age, a relationship possibly specific to that population. There are numerous reports of a relationship between myopia and ocular hypertension, the most important risk factor for POAG, although the Blue Mountains Eye Study found that the relationship between POAG and myopia is independent of intraocular pressure. Myopia was not a risk factor for POAG.	Myopia as risk factor for glaucoma
1638	Georgopoulos et al 1997	Prospective cohort	Untreated glaucoma suspects	High myopia	Nonmyopic patients	345	II	Axial myopia was more common in patients who progressed from ocular hypertension (OHT) to glaucoma (χ^2 0.45; $P < 0.01$).	Myopia as a risk factor for progression from OHT to glaucoma

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
1832	Ko et al 2002	Case series (retrospective review patients who presented for juvenile open-angle glaucoma [JOAG] and chronic open-angle glaucoma [COAG])	Clinical data from patients with JOAG and COAG	Myopia	Patients with JOAG compared to those with COAG	JOAG – 27 COAG – 30	NA	The JOAG patients were more likely to have a myopic refractive state than COAG patients ($P < 0.001$).	Risk of early-onset glaucoma
1833	Landers et al 2002	Case–control (random selection of patients attending clinic for POAG and ocular hypertension (OHT) — data collected on family history, myopia, migraine, etc)	A sample of patients with POAG and OHT selected from a glaucoma practice	Myopia	Patients with POAG compared with patients with OHT	POAG – 438 OHT– 301	III-2	Myopia is more prevalent among patients with POAG than with OHT (OR 1.5; 95%CI 1.0 to 2.2), suggesting that myopic patients with OHT may be more susceptible to POAG.	Myopia as a risk factor for progression from OHT to glaucoma
1838	Nomura et al 2004	Cross-sectional	Randomly selected subjects aged 40–82 years from Japan	Myopia	Development of ocular hypertension	1855	IV	Intraocular pressure increased with advancing degrees of myopia, even after adjustment for related factors such as age and central corneal thickness ($P = 0.011$). This finding supports the hypothesis that the relationship between glaucoma and myopia might be pressure mediated.	

Summary	Group
There in an increased risk of POAG in myopic eyes. In studies of patients with ocular hypertension, myopic patients appear more susceptible to developing POAG than nonmyopic patients. Myopic patients may also be more likely to develop glaucoma early in life.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 61 — high myopia and age-related macular degeneration

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
1861	Wang et al 1998	Cross-sectional	Blue Mountains Eye Study	Myopia	NA	3654	IV	No significant associations were found between myopia and any AMD stage. The authors warn that this result should be interpreted cautiously due to the potential for symptoms of myopic retinopathy to cause misclassification.	

Summary	Group
Myopia does not appear to be a risk factor for age-related macular degeneration.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 64 — intraocular pressure and cataract

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
1604	Mori et al 1997	Cross-sectional	Patients who had developed cataracts before the age of 2.5 years and had been monitored until they were age 5 without operative correction	Ocular hypertension (OHT)	NA	41 patients (58 eyes)	IV	Open-angle glaucoma and OHT did not develop in any patients. Closed-angle glaucoma developed in 2 eyes. Intraocular pressure was not linked to cataract.	
1602	Leske et al 2002	Prospective cohort	Participants in the Barbados Eye Study with no nuclear opacities at baseline were followed over 4 years and underwent regular ophthalmic examinations	OHT	Less pressure	2609	II (LPS)	Risk factors for developing cataracts included age, myopia, diabetes and being on treatment for ocular hypertension (RR 2.7). Treated patients had a threefold increased risk of cataracts (RR 3.2; 95%CI 1.6 to 6.5). Participants with IOP $\geq$21 mmHg and receiving treatment had a fivefold increased risk (RR 5.0; 95%CI 1.7 to 15.1) versus those who were untreated.	

Summary	Group
There are conflicting results from studies of possible links between ocular hypertension and development of cataract.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 67 — intraocular pressure and glaucoma

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
1613	Ontoso et al 1997	Systematic review (18 randomised controlled trials)	People receiving treatment with timolol for ocular hypertension (OHT)	Ocular hypertension (OHT)	Less pressure	NA	I (Adequate)	People who did not receive treatment for mild or moderate OHT may be more likely to develop glaucoma. Meta-analysis (using weighted and adding zetas) suggested that treatment of even mild and moderate OHT may help to prevent the onset of glaucoma.	
2593	Friedman et al 2004	Systematic review (6 randomised controlled trials, 3 prospective cohorts)	People receiving treatment with timolol for OHT and participants in cohort trials	OHT	Less pressure	NA	I (Good)	Some people with OHT will develop glaucoma. Risk factor for OHT was: (OR 1.11; 95%CI 1.04 to 1.18).	
1633	Flammer et al 2002	General review (experimental and clinical intervention studies)	NA	OHT	Less pressure	NA	III-2	Several studies have shown that reducing intraocular pressure (IOP) can relieve glaucoma, but not for all patients. Pressure reduction does not avoid damage in all patients. Women are more likely to develop glaucoma, despite having similar IOPs to men. Other risk factors also contribute to glaucoma: myopia, genetics, sex and race.	
1636	Gasser 1999	General review (clinical and experimental evidence)	NA	OHT	Less pressure	NA	III-2	Systemic hypotension is a more significant risk factor for glaucoma than systemic hypertension.	

Summary	Group
Ocular hypertension (OHT) can lead to glaucoma; treatment of even mild and moderate OHT may help to prevent the onset of glaucoma.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 71 — poor living conditions (lower socioeconomic status) and cataract

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
592	Klein et al 2003	Prospective cohort	Beaver Dam Eye Study (persons aged 43–86 years)	Level of income	Income	4926	II (LPS)	A direct association was found between low income and nuclear cataract (but not for cortical or posterior subcapsular cataract). For nuclear cataract, cumulative incidence rates were 23.6% for income < $10,000, falling to 19.5% at income > $44,000 (*P* <0.001).	Cataract surgery
2542	Younan et al 2002	Prospective cohort	Blue Mountains Eye Study	Occupation	Occupation	3654 in 1992–94; 2334 in 1997–99	II (LPS)	Information on participants' principle occupation was analysed using Australian Bureau of Statistics categories (stratified into 4 groups) and the Daniel Occupational Prestige Scale. There were no statistically significant associations for any of the occupational categories with the 5-year incidence of cataract surgery. The authors suggest that this study supports the view that cataract surgery is largely patient driven, according to patient benefit.	Cataract surgery
3395	Meddings et al 1998	Case–control	Residents of British Columbia aged 50–65 years	Socioeconomic decile and cataract surgery	Controls	2323 cases and 243,045 controls	III-3	Residents aged 50–65 living in the 4 lowest socioeconomic deciles were significantly more likely than those living in the highest socioeconomic areas to undergo cataract surgery (RR for males of 2.3–1.4 and for females of 2.7–1.4 over the age range 50–65 years). Results were similar in presence or absence of diabetes.	

Summary	Group
It is not clear whether or not poor living conditions are linked to cataracts. Two studies found an association between low socioeconomic status and cataract (confined to nuclear cataract in one study and type not specified in the other) and a third study did not. Possible reasons for the discrepancy are the lack of a standard classification system for socioeconomic status, and the use of cataract surgery as a surrogate for cataract.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 73 — poor living conditions (lower socioeconomic status) and diabetic retinopathy

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
2511	Bachmann et al 2003	Cross-sectional	People with diabetes among general practices in Avon and Somerset, UK	Level of income and education	NA	567 of 770	IV	Low income and level of education are associated with diabetic retinopathy (DR). The lowest earning and least educated patients were about 4 times more likely than the highest earning and most educated to have DR (adjusted OR 4.1; 95%CI 1.0 to 16.0).	
2512	Bihan et al 2005	Cross-sectional	Consecutive diabetic patients admitted to the hospitalisation unit of a French endocrine department	Deprivation status	NA	123 of 135	IV	Deprivation was assessed using 42 socioeconomic questions on education, income, occupation, family structure, housing conditions, employment, social benefits, financial difficulties, leisure activities, social support, life events, self-perceived health and use of health care. The more deprived patients were more likely to have DR than those less deprived (OR 3.66; 95%CI 1.39 to 9.64; *P* = 0.009).	

Summary	Group
Lower socioeconomic status may be linked to a higher incidence of diabetic retinopathy.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 74— poor living conditions (lower socioeconomic status) and glaucoma

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
2518	Ho et al 1997	Cross-sectional	Poor individuals receiving vision-screening examinations in Los Angeles	Low income	NA	925	IV	Higher rates of glaucoma were observed in both homeless and poor nonhomeless populations than in the general population. For all ethnic groups combined, the 52–64-year-old individuals in this study had crude glaucoma rates of 5.4% (homeless) and 9.8% (nonhomeless); this compares to a rate of 1.4% prevalence among the same age groups in the Framingham Eye Study.	

Summary	Group
Low income may be associated with glaucoma.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 75 — poor living conditions (lower socioeconomic status) and age-related macular degeneration

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
2503	Chew et al 2005	Comparative study (not randomised)	Patients undergoing therapy for condition secondary to AMD, in Canada in 2000–01	Unable or unwilling to fund surgery for AMD	Willing to self-fund surgery for AMD	115	NA	Patients divided according to whether or not willing to self-fund therapy for complication of AMD, or preferred a government-funded alternative. Those not willing to pay had significantly worse macular disease (P = < 0.001 to 0.032, depending on feature measured) before treatment and a significantly lower mean income (P = 0.05) than those willing to pay. However, there was no significant difference in percentage with postsecondary education between the 2 groups.	
2508	Reidy et al 1998	Cross-sectional study	Random sample of people aged 65 years or older from general practices in north London	Socioeconomic status	Higher levels of socio-economic status	1547 of 1840	IV	Possible association between low socioeconomic status and AMD, but not statistically significant.	
756	DeAngelis et al 2004	Case–control	Sibling pairs in which 1 of pair had AMD and other did not	Low level of education	Higher levels of education	73 of 81 pairs	III-3	No link found between AMD and education for high school graduation (OR 0.44; 95%CI 0.13 to 1.45) or < high school graduation (OR 0.32; 95%CI 0.06 to 1.79).	
2506	Klein et al 2001	Prospective cohort	Individuals aged 43–86 years participating in Beaver Dam Eye Study, USA	Low level of education and service-related occupation	Higher levels of education	3681	II (LPS)	Less education and being in a service-related occupation (rather than a white-collar one) was associated (P < 0.5) with the incidence of early AMD. The link with occupation may reflect higher level of passive smoking. No significant association was found between income and AMD.	

Summary	Group
It is not clear whether or not poor living conditions are associated with AMD. Two studies found an association between socioeconomic factors (income, education and occupation) and AMD; two did not. Possible reasons for the discrepancy are the lack of a standard classification system for socioeconomic status and the different factors measured in the different studies.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 78 — diabetes and cataract

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
507	McCarty 2002	Systematic review (2 prospective cohorts)	Melbourne Visual Impairment Project, Blue Mountains Eye Study	Diabetes	NA	NA	I (Adequate)	Melbourne study: diabetes duration > 5 years significantly associated with cortical (OR = 2.57) and nuclear (OR = 2.04) cataract. Blue Mountains Study: posterior subcapsular cataract was significantly associated with diabetes (OR = 1.8).	
449	Abraham et al 2006	General review (prospective cohorts)	Beaver Dam Eye Study, Blue Mountains Eye Study, Barbados Eye Study	Diabetes	NA	NA	II (LPS)	High fatty acid levels, associated with type 2 diabetes, have been linked to cataract development.	
462	Robman and Taylor 2005	General review (clinical studies, cross-sectional and prospective cohort)	Beaver Dam Eye Study, Blue Mountains Eye Study, Barbados Eye Study	Diabetes	NA	NA	II (LPS)	Biochemical and experimental studies have shown that diabetes mellitus and galactosaemia are associated with some types of cataract. Higher prevalence and early onset of cortical cataract and posterior subcapsular opacities in diabetic patients was confirmed by clinical studies. A cross-sectional study attributed around 4% of all cataracts to diabetes. The author notes that diabetes as a risk factor for cataract fitted all epidemiological tests for causality except for reversibility.	
2245	Altan 2003	General review (discusses biochemical studies of potential mechanisms for diabetes-induced cataract)	People with cataract	Diabetes	NA	NA	NA	Diabetes is linked with high sorbitol concentrations, which in turn are associated with cataract. Oxidative stress during hyperglycaemia in diabetes has also been cited as a factor in cataract formation.	
634	Negahban and Chem 2002	General review (prospective cohort, retrospective cohort, case studies, case–control)	Blue Mountains Eye Study	Diabetes	NA	NA	II (LPS)	Case studies have reported patients with diabetes developing cataracts when their symptoms are uncontrolled. Once symptoms were controlled, the cataracts resolved. Patients with type 1 diabetes had a higher rate of	

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
								cataract than age-matched control subjects.	

Summary	Group
Type 1 and type 2 diabetes are both significantly associated with cataract formation (all three types). If diagnosed early, diabetic cataract can be reversed with a change in diet and medication.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 81 — diabetes and glaucoma

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
2227	Bonovas et al 2004	Systematic review (5 case–controls and 7 cross-sectional)	People with diabetes	Diabetes	NA	NA	III-3 (Adequate)	Eleven studies reported a positive association (OR > 1) between diabetes and glaucoma. One reported a negative association (OR < 1). Only 5 of the positive studies had ORs that were statistically significant and the study reporting negative association was not significant. Meta-analysis indicated that diabetes was a positive indicator for POAG (OR 1.55; 95%CI 1.13 to 12.13).	
2233	Krueger and Ramos-Esteban 2007	Systematic review (population cohort studies)	People with diabetes	Diabetes	NA	NA	I (Poor)	In several studies diabetes was shown to have a protective effect against glaucoma progression. Large epidemiological studies have shown varied results, with some showing diabetes as a risk factor for open-angle glaucoma (OAG) and others not finding it a significant risk factor.	Poor quality review but included studies were good quality (LPS)
2236	Nakamura et al 2005	General review (population-based frequency and rate studies, laboratory testing)	People with diabetes	Diabetes	NA	NA	NA	Population studies found mixed results, with some linking diabetes and OAG and others not. Diabetes does cause retinal nerve damage that could make the eye more susceptible to OAG.	Extracted from abstract. Frequency and rate studies

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
2243	Wu et al 2006	Prospective cohort	People of African descent without glaucoma or on IOP-lowering treatments studied over 9 years	Diabetes	NA	2298	II	The mean change in IOP (intraocular pressure) was small over the 9-year period and had a relatively large dispersion (mean ± SD, 0.4 ± 4.0 mmHg). Mean IOP increases were greatest in people aged 50–59 at the start of the study (mean ± SD, 0.9 ± 4.3 mmHg) and decreased in the over 70s (mean ± SD, –0.6 ± 4.2 mmHg). IOP changes were positively associated with males, hypertension, diabetes and increases in blood pressure over the 9 years ($P < 0.05$).	
2240	Pasquale et al 2006	Prospective cohort	Nurses' Health Study (females aged ≥ 40 with no POAG at baseline, 20-year follow-up)	Diabetes	NA	76,318	II (LPS)	Type 2 diabetes was positively associated with POAG (RR 1.82; 95%CI 1.23 to 2.70). It did not strengthen with longer duration of diabetes; RR 2.24; 95%CI 1.31 to 3.84 for duration < 5 years versus RR 1.54; 95%CI 0.92 to 2.62 for duration > 5 years.	
2230	De Voogd et al 2006	Prospective cohort	Rotterdam Eye Study, Netherlands (participants age ≥ 55 years without OAG at baseline, 7-year follow-up)	Diabetes	NA	3837	II (LPS)	OAG developed in 87 of the cohort. The relative risk of OAG associated with baseline diabetes was 0.82; 95%CI 0.33 to 2.05. After adjustment for age, sex, body mass index and hypertension, the relative risk was 0.65; 95%CI 0.25 to 1.64	

Summary	Group
A systematic review with meta-analysis indicates that diabetes is a risk factor for open-angle glaucoma; however, some prospective cohort studies suggest the opposite.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 82 — diabetes and macular degeneration

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
725	Clemons et al 2005	Prospective cohort	Patients from 11 retinal specialty clinics enrolled from 1992 through 1998. Aged 55 to 80 years old at enrolment and had best corrected visual acuity of 20/32 or better in at least 1 eye.	Diabetes	NA	4757	II	Diabetes was not linked to macular degeneration.	
2224	Voutilainen-Kaunisto et al 2000	Prospective cohort	Newly diagnosed type 2 diabetic patients diagnosed between 1979 and 1981	Diabetes	Nondiabetic controls from the general population	133 diabetics, 144 controls	II	The rate of macular degeneration was similar in both diabetic and control populations.	

Summary	Group
Diabetes appears not to be a risk factor for macular degeneration.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 84 — diabetes and trachoma

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
1448	Durkin et al 2006	Cross-sectional	Aboriginal patients in remote South Australia seen between 1999 and 2004.	Diabetes	NA	1651	IV	1.2% of people had active trachoma and 15.7% had symptoms associated with having had trachoma. 46.7% had diabetes. 22% of the patients with diabetes had diabetic retinopathy and of these patients 77 had background diabetic retinopathy (46%) and 92 (54%) had either proliferative diabetic retinopathy or maculopathy. Prevalence of clinically significant macula oedema among those with maculopathy (14 of 50 patients) was 28%.	

Summary	Group
There are high rates of diabetes in patients with trachoma, but causality is not clear. Both diseases are poverty-related and this single study looked at a very poor population. Diabetic retinopathy appears to make people more susceptible to poor visual acuity after trachoma.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 85 — heredity and cataract

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
462	Robman and Taylor, 2005	Review (including 4 studies of the heritability of cataract)	Patients with cataracts	Heredity	NA	NA	111-3 /IV	Based on a number of family studies, twin studies and case studies (levels III-3 and IV), heredity is a major determinant for the development of cataract, with the heredity component being responsible for at least 50% of cases (age and environmental factors being the other major determinants). The high level of relatedness suggests the action of dominant genes.	

Summary	Group
Heredity is a major factor in determining cataract development.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 86 — heredity and amblyopia

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
2354	Abrahamsson et al 1999	Prospective cohort	Six-year follow-up of Swedish children with a family history of strabismus, plus controls without a family history of strabismus	Heredity	Children without a family history of strabismus	1571 (632 cases and 939 controls)	II	A family history of squint combined with high hyperopia was an effective screen for children with an increased risk of 4 to 6 times for developing strabismus.	

Summary	Group
Heredity strabismus appears to be linked with amblyopia.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 88 — heredity and glaucoma

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
2356	Budde 2000	General review (including 2 population and 2 clinic-based studies of the effect if genes on rates of POAG)	Patients with glaucoma	Heredity	NA	NA	II–III (based on ind studies)	Several loci in the human genome have been linked to primary open-angle glaucoma (POAG). Studies of twins have shown a clear link between genetics and POAG. A prospective cohort study of an entire twin cohort in Iceland compared heterozygous twins with other twin and spouse, Hereditary factors were more important than environmental factors for development of POAG. Confirmed by population study in Rotterdam of lifetime risk of POAG (22% in relatives of POAG vs 2.3% in relatives of controls). Clinic based studies of family history showed higher rates of family history of POAG but this may have been because people with glaucoma are more likely to report a family history of glaucoma than people without glaucoma. As glaucoma has different phenotypes (sometimes due to corneal thickness, sometimes due to increased intraocular pressure, etc) it more difficult to associate a particular case with heredity than for cataract (see Summary table 85).	
2360	Wadhwa and Higginbotham 2005	General review (including retrospective cohort and cross-sectional studies)	Patients with glaucoma from African American, Hispanic and Asian backgrounds	Heredity	NA	NA	III	African Americans have a disproportionately high rate of glaucoma (in the Baltimore Study of people age 40–49 years, a prevalence of 1.23% compared with 0.92% in the white population). Barbados Eye Study reported similar findings. Studies have shown that African Americans and whites have the same rate of mutation of genes associated with POAG. Other studies have found rates of POAG in Hispanics to be higher than in the white population.	

								Central corneal thickness varies across ethnic groups. Thin central corneas are linked to POAG; Hispanics and African Americans have been found to have thinner central corneas than whites.	
2357	Budde 1999	Cross-sectional	Patients with chronic open-angle glaucoma	Heredity	NA	1176	IV	24.5% of patients with primary open-angle glaucoma had a family history of glaucoma. This correlation decreased with age (35.8% in patients younger than 50, 25% in patients between 51 and 70 years and 11.7% in patients older than 70 years). Family history did not have a correlation with secondary open-angle glaucoma.	

Summary	Group
Development of primary open-angle glaucoma appears to be strongly linked to heredity factors in some cases. Secondary open-angle glaucoma may not be as strongly linked to heredity factors. Ethnic variations in physiology also account for differences in rates of glaucoma across different ethnic groups.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 92 — hypertension and cataract

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
626	Durant et al 2006	Nested case–control	The Somerset and Avon Eye Study (age and gender stratified random sample of subjects aged over 55 years registered at general practices)	Hypertension	Patients without hypertension	197 watercleft cases and 199 retrodot cases	III-3	A self-reported history of hypertension was not found to be a significant risk factor for either waterclefts or retrodots (cataract subtypes).	
2678	Schaumberg et al 2001	Prospective cohort	Physician's Health Study (male US physicians aged 40–84 years)	Hypertension	Patients without hypertension	17,762	II (LPS)	No significant relationship was found between hypertension and incident cataract. A modest, but statistically significant, association was found between high systolic blood pressure and cataract.	
2604	Klein et al 2004	Prospective cohort	Beaver Dam Eye Study	Hypertension	Patients without hypertension	4926	II	This study showed that retinal vascular characteristics associated with hypertension, such as focal and generalised arteriolar narrowing, are related to the incidence of nuclear cataract. Relationships, however, were weak and inconsistent.	
613	Delcourt et al 2000	Cross-sectional	POLA study (residents of Sète, southern France aged 60–95 years)	Hypertension	NA	2468	IV	Hypertension was associated with a decreased risk of cataract surgery (OR 0.57). The authors note that these results conflict with previous studies, 4 of which found no significant association between hypertension and cataract, while 2 studies found an increased risk of cataract with hypertension.	

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
2018	Leske et al 1999	Cross-sectional	Barbados Eye Study (random sample aged 40–84 years)	Hypertension	NA	4314	NA	Systolic blood pressure was not associated with lens opacities but diastolic blood pressure greater than 95 mmHg was related to an increase in cortical opacities. This was especially significant for those aged less than 60 years (OR 1.49; 95%CI 1.00 to 2.23).	Rate/frequency study
2670	Goodrich et al 1999	Cross-sectional	Blue Mountains Eye Study (people aged 49–97 years living in the Blue Mountains)	Hypertension	NA	3654	IV	Hypertension was associated with a lower incidence of nuclear cataract (adjusted OR 0.8; 95%CI 0.6 to 0.9).	

Summary	Group
There are conflicting results on the relationship between hypertension and cataract. Further studies are required, and should distinguish between different types of cataract in their analysis.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 94 — hypertension and diabetic retinopathy

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
2566	Leske et al 2005	Prospective cohort	Barbados Eye Study: African population (40–84 years, 9-year follow-up). Diabetes at baseline and at risk of developing diabetes during follow-up.	High blood pressure	No treatment for high blood pressure	324	II	Antihypertensive treatment halved the risk of diabetic retinopathy (DR) vs no treatment (RR 0.5; 95%CI 0.3 to 0.9). DR risk increased by 30% for every 10 mm Hg of higher systolic blood pressure at baseline (RR 1.3; 95%CI 1.1 to 1.4). Overall, incidence of DR among hypertensive participants varied with hypertensive treatment, with a trend towards decreased risk with treatment.	
2002	van Leiden et al 2003	Prospective cohort	People aged 50–74 years, selected from the larger cohort used in the Hoorn Study (1995). Examined at baseline and followed up after 10 years	Hypertension	Those in the cohort who did not develop hypertension	233	II	Hypertension was a significant determinant of retinopathy in a general population: adjusted odds ratio for retinopathy was 2.36 (95%CI 1.02 to 5.49) for hypertension. Estimated risk for developing retinopathy after the 10-year period in people with hypertension was twice as high as in people without hypertension, even after adjusting for age, sex and glucose metabolism. At the end of the 10-year period, 51.9% of the 27 people who developed retinopathy had hypertension ($P = 0.02$).	

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
2582	Matthews et al 2004 [UKPDS 69]	Prospective cohort	UK Prospective Diabetes Study: people with hypertension and type II diabetes mellitus (DM) in 19 hospital-based clinics in the UK; mean age and blood pressure: 56 years, 160/94. 758 people were allocated to tight blood pressure control group; 390 allocated to less-tight blood pressure control group	Hypertension	Less tight blood pressure control	1148	II (LPS)	Measured various aspects of DR and compared results between tightly controlled group and less-tightly controlled group. Highly significant difference in microaneurysm count (≥5 microaneurysms), with 23.3% in tight group cf 33.5% in less tight at 4.5 years (RR 0.70; $P = 0.003$); same at 7.5 years (RR 0.66; $P<0.001$) Fewer hard exudates in tight group (RR 0.53, $P<0.01$ (although increased in both groups). Fewer cotton wool spots in tight group (RR, 0.53; $P<0.01$). Fewer people in tight group progressed ≥2 steps deterioration on ETDRS scale (RR 0.75; $P = 0.02$). Less likely in tight blood pressure-controlled group to undergo photocoagulation (RR 0.65; $P = 0.03$). Overall, high blood pressure worsens each aspect of DR. Tightly controlling blood pressure decreases risks of diabetic eye disease. Describes other studies with similar findings.	Caveats to study: few nonwhite participants, oldest participant was 65 years.

Summary	Group
Hypertension is a risk factor for retinopathy in both people with diabetes and people without diabetes.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 95 — hypertension and glaucoma

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
2610	Maier 2005	Systematic review (5 randomised controlled trials)	Meta-analysis of randomised controlled trials with a concurrent untreated control group and information on time-to-glaucomatous changes to visual field and optic disc.	Ocular hypertension	No treatment	NA	I (Good)	Trials showed significant preventative effect of reducing intraocular pressure on the progression of glaucoma (hazard ratio 0.56, 95%CI 0.39 to 0.81; *P* = 0.01; NNT = 12) [Note: this was only in patients with ocular hypertension ≥ 24 mm Hg] Pooled data of studies in manifest glaucoma showed significant delay of visual field deterioration (0.65, 0.49 to 0.87, *P* = 0.003; NNT = 7) Combining the results of the trials in a meta-analysis showed beneficial treatment effects of lowering ocular pressure.	

Summary	Group
Ocular hypertension is a risk factor for glaucoma in the general population.	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies

Summary table 96 — hypertension and age-related macular degeneration

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
2643	Klein et al 2003	Prospective cohort	Population (69–97 years) of 1998 whites and 363 blacks in the US (studied between 1997–98)	Hypertension	NA	2361	II	Early ARM was present in 15.5% and late ARM in 1.3 % at follow-up. There was no association between hypertension and blood pressure with AMD. After controlling for age, sex, race, there was no association of mean arterial, average systolic and diastolic blood pressure over the 10-year period, and hypertension status with prevalent early ARM.	A range of cardiovascular risk factors was studied
1536	Klein et al 2003	Prospective cohort	Beaver Dam Eye Study (people aged 43–86 years, 10-year follow-up period)	High blood pressure	NA	2764	II	After controlling for age, sex, drinking and smoking histories, and vitamin use, higher systolic pressure at baseline was associated with the 10-year incidence of retinal pigment epithelial depigmentation (RR per 10-mm Hg systolic blood pressure, 1.1; 095%CI 1.01 to 1.18, $P = 0.02$) and exudative AMD (RR 1.22; 95%CI 1.06 to 1.41; $P = 0.006$). Higher pulse pressure at baseline was associated with incidence of retinal pigment epithelial depigmentation, exudative AMD, progression of ARM. Study showed association between higher pulse pressure and systolic blood pressure with an increase in the 10-year incidence of some lesions characteristic of early ARM and exudative AMD. In summary, when other factors were controlled for, people with controlled hypertension were twice as likely, and	Included other risk factors

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
								people with uncontrolled hypertension were thrice as likely, to develop exudative AMD compared with people without hypertension. Mentions other studies with similar findings, as well as studies with conflicting findings.	
2659	van Leeuwen 2003	Prospective cohort	Part of the Rotterdam Study. Population from Netherlands (55+ years), follow-up at approximately 2 and 6.5 years. Free from ARM at baseline	Hypertension/high blood pressure	NA	4822	II (LPS)	Increased systolic blood pressure/pulse pressure was associated with a higher risk of ARM. After adjusting for age, sex, smoking, cholesterol, body mass index (BMI), AMD, the odds ratio per 10-mm Hg increase were 1.08 (95%CI 1.3 to 1.14) and 1.11 (95%CI 1.04 to 1.18). After adjusting for age and sex, elevated systolic blood pressure was associated with increased risk ARM (OR per 10-mm Hg increase: 1.06; 95%CI 1.01 to 1.12). Lists other studies that *did find* an association between blood pressure/hypertension and AMD (these were case–control studies). Also lists other studies that *did not find* an association between blood pressure and prevalence of ARM (these were population-based studies). Notes that the only prospective population-based study (the Beaver Dam Eye Study) found that both systolic blood pressure and hypertension were significantly related to the incidence of retinal pigment epithelial depigmentation but not of drusen. However, this study only had about half the number of	

Paper no.	Reference	Type of study	Population/ study information	Risk factor	Comparator	*N*	Level (quality)	Results	Other notes
								incident cases of early ARM compared with this study.	

Summary	Group
There may be an association between hypertension/blood pressure and age-related macular degeneration (AMD). One study showed no association between hypertension and ARM; others showed that hypertension/high blood pressure were risk factors for ARM/AMD. Beaver Dam Eye study had a smaller number of incident cases of ARM than Klein et al 2003 (see results column). Van Leeuwen study had a much larger study sample than other two studies (other two were of comparable size).	*Group 1* — Clear association/causality *Group 2* — Possible association/causality (more research needed) *Group 3* — Lack of association/causality *Group 4* — Possible lack of association/causality (more research needed) *Group 5* — Conflicting results *Group 6* — Possible protection *Group 7* — No studies