Appendix 3. Reported genes associated with syndromic high myopia.

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| --- | --- | --- | --- | --- | --- | --- |
| **Phenotype** | **Phenotype** | **Inheritance** | **Location** | **Gene** | **Gene** | **Reference#** |
|   | **MIM number** |   |   |   | **MIM number** |
| Marshall syndrome | 154,780 | AD | 1p21.1 | COL11A1 | 120,280 | (Griffith et al., 1998) |
| Stickler syndrome, type II | 604,841 | AD | 1p21.1 | COL11A1 | 120,280 | (Richards et al., 1996) |
| Muscular dystrophy-dystroglycanopathy (congenital with mental retardation), type B, 3 | 613,151 | AR | 1p34.1 | POMGNT1 | 606,822 | (Clement et al., 2008) |
| Muscular dystrophy-dystroglycanopathy (limb-girdle), type C, 3 | 613,157 | AR | 1p34.1 | POMGNT1 | 606,822 | (Clement et al., 2008) |
| Muscular dystrophy-dystroglycanopathy (congenital with brain and eye anomalies), type A, 3 | 253,280 | AR | 1p34.1 | POMGNT1 | 606,822 | (Raitta et al., 1978; Yoshida et al., 2001) |
| ?Stickler syndrome, type V | 614,284 | AR | 1p34.2 | COL9A2 | 120,260 | (Baker et al., 2011) |
| Hypomagnesemia 5, renal, with ocular involvement | 248,190 | AR | 1p34.2 | CLDN19 | 610,036 | (Meier et al., 1979; Konrad et al., 2006) |
| Schwartz-Jampel syndrome, type 1 | 255,800 | AR | 1p36.12 | HSPG2 | 142,461 | (Aberfeld et al., 1965; Nicole et al., 2000) |
| Ehlers-Danlos syndrome, type VI | 225,400 | AR | 1p36.22 | PLOD1 | 153,454 | (Wenstrup et al., 1989; Hautala et al.,1993) |
| Harel-Yoon syndrome | 617,183 | AD, AR | 1p36.33 | ATAD3A | 612,316 | (Harel et al., 2016) |
| Shprintzen-Goldberg syndrome | 182,212 | AD | 1p36.33-p36.32 | SKI | 164,780 | (Stoll, 2002; Doyle et al., 2012) |
| Ectopia lentis et pupillae | 225,200 | AR | 1q21.2 | ADAMTSL4 | 610,113 | (Goldberg et al.,1988; Christensen et al., 2010) |
| CATARACT 1, POSTERIOR SUBCAPSULAR, WITH MICROCORNEA | 116,200 | AD | 1q21.2 | GJA8 | 600,897 | (Devi and Vijayalakshmi, 2006) |
| White-Sutton syndrome | 616,364 | AD | 1q21.3 | POGZ | 614,787 | (White et al.,2016) |
| Gaucher disease, type III | 231,000 | AR | 1q22 | GBA | 606,463 | (Erikson and Wahlberg, 1985; Dahl et al., 1990) |
| Retinitis pigmentosa-12, autosomal recessive | 600,105 | AR | 1q31.3 | CRB1 | 604,210 | (Leutelt et al., 1995; Den Hollander et al., 1999) |
| Muscular dystrophy-dystroglycanopathy (congenital with brain and eye anomalies, type A, 11 | 615,181 | AR | 1q42.3 | B3GALNT2 | 610,194 | (Stevens et al.et al., 2013) |
| Stickler syndrome | NA | AR | 2p13.1 | LOXL3 | 607,163 | (Alzahrani et al., 2015) |
| Donnai-Barrow syndrome | 222,448 | AR | 2q31.1 | LRP2 | 600,073 | (Donnai and Barrow, 1993; Kantarci et al., 2007) |
| Nephrotic syndrome, type 5, with or without ocular abnormalities | 614,199 | IC | 3p21.31 | LAMB2 | 150,325 | (Hasselbacher et al., 2006) |
| Muscular dystrophy-dystroglycanopathy (congenital with brain and eye anomalies), type A, 14 | 615,350 | AR | 3p21.31 | GMPPB | 615,320 | (Carss et al., 2013) |
| Muscular dystrophy-dystroglycanopathy (congenital with brain and eye anomalies), type A, 9 | 616,538 | AR | 3p21.31 | DAG1 | 128,239 | (Geis et al., 2013) |
| ?Night blindness, congenital stationary, type 1G | 616,389 | AR | 3p21.31 | GNAT1 | 139,330 | (Naeem et al., 2012) |
| Muscular dystrophy-dystroglycanopathy (congenital with brain and eye anomalies, type A, 8 | 614,830 | AR | 3p22.1 | POMGNT2 | 614,828 | (Manzini et al., 2012) |
| Biotinidase deficiency | 253,260 | AR | 3p25.1 | BTD | 609,019 | (Taitz et al., 1983; Pomponio et al., 1995) |
| Retinitis pigmentosa 56 | 613,581 | AR | 3q12.3 | IMPG2 | 607,056 | (Bandah-Rozenfeld et al., 2010) |
| Cataract 12, multiple types | 611,597 | AD | 3q22.1 | BFSP2 | 603,212 | (Zhang et al., 2004) |
| Myopia, high, with cataract and vitreoretinal degeneration | 614,292 | AR | 3q28 | P3H2 | 610,341 | (Mordechai et al., 2011) |
| Hypomagnesemia 3, renal | 248,250 | AR | 3q28 | CLDN16 | 603,959 | Manz et al., 1978; Weber et al. 2000) |
| Optic atrophy 1 | 165,500 | AD | 3q29 | OPA1 | 605,290 | (Chen et al., 2007) |
| Cone-rod dystrophy 12 | 612,657 | AR | 4p15.32 | PROM1 | 604,365 | (Beryozkin et al., 2014) |
| Cone-rod dystrophy 18 | 615,374 | AR | 4p15.33 | RAB28 | 612,994 | (Roosing et al.) |
| Night blindness, congenital stationary, autosomal dominant 2 | 163,500 | AD | 4p16.3 | PDE6B | 180,072 | (Tsang et al., 2007) |
| Night blindness, congenital stationary (complete), 1F, autosomal recessive | 615,058 | AR | 4q25 | LRIT3 | 615,004 | (Zeitz et al., 2013) |
| Brittle cornea syndrome 2 | 614,170 | AR | 4q27 | PRDM5 | 614,161 | (Burkitt Wright et al., 2011) |
| Bietti crystalline corneoretinal dystrophy | 210,370 | AR | 4q35.1-q35.2 | CYP4V2 | 608,614 | (Li et al., 2004; Wang et al. 2012) |
| Cornelia de Lange syndrome 1 | 122,470 | AD | 5p13.2 | NIPBL | 608,667 | (Levin et al., 1990; Tonkin et al., 2004) |
| Wagner syndrome 1 | 143,200 | AD | 5q14.2-q14.3 | VCAN | 118,661 | (Kloeckener-Gruissem et al., 2006) |
| Contractural arachnodactyly, congenital | 121,050 | AD | 5q23.3 | FBN2 | 612,570 | (Babcock et al., 1998) |
| Night blindness, congenital stationary (complete), 1B, autosomal recessive | 257,270 | AR | 5q35.3 | GRM6 | 604,096 | (Barnes et al., 2002; Dryja et al., 2005) |
| Leukodystrophy, hypomyelinating, 11 | 616,494 | AR | 6p21.1 | POLR1C | 610,060 | (Thiffault et al.) |
| Leber congenital amaurosis 15 | 613,843 | AR | 6p21.31 | TULP1 | 602,280 | (Mataftsi et al., 2007) |
| Weissenbacher-Zweymuller syndrome | 277,610 | AD | 6p21.32 | COL11A2 | 120,290 | (Ramer et al., 1993; Pihlajamaa et al. 1998) |
| Fibrochondrogenesis 2 | 614,524 | AD, AR | 6p21.32 | COL11A2 | 120,290 | (Tompson et al., 2012) |
| Stickler syndrome, type III | 184,840 | AD | 6p21.32 | COL11A2 | 120,290 | (Brunner et al., 1994) |
| Anterior segment dysgenesis 3, multiple subtypes | 601,631 | AD | 6p25.3 | FOXC1 | 601,090 | (Martin and Zorab, 1974; Nishimura et al., 1998) |
| Stickler syndrome, type IV | 614,134 | AR | 6q13 | COL9A1 | 120,210 | (Van Camp et al., 2006) |
| Ichthyosis, spastic quadriplegia, and mental retardation | 614,457 | AR | 6q14.1 | ELOVL4 | 605,512 | (Aldahmesh et al., 2011) |
| Spastic paraplegia and psychomotor retardation with or without seizures | 616,756 | AR | 6q16.3 | HACE1 | 610,876 | (Hollstein et al., 2015) |
| Muscular dystrophy, congenital merosin-deficient | 607,855 | AR | 6q22.33 | LAMA2 | 156,225 | (Tome et al.,1994; Helbling-Leclerc et al., 1995) |
| Coffin-Siris syndrome 1 | 135,900 | AD | 6q25.3 | ARID1B | 614,556 | (Hoyer et al., 2012) |
| Ehlers-Danlos syndrome with progressive kyphoscoliosis, myopathy, and hearing loss | 614,557 | AR | 7p14.3 | FKBP14 | 614,505 | (Baumann et al., 2012) |
| Muscular dystrophy-dystroglycanopathy (congenital with brain and eye anomalies), type A, 7 | 614,643 | AR | 7p21.2 | ISPD | 614,631 | (Chitayat et al.,1995; Willer et al., 2012) |
| Exudative vitreoretinopathy 5 | 613,310 | AD | 7q31.31 | TSPAN12 | 613,138 | (Poulter et al., 2012) |
| Muscular dystrophy-dystroglycanopathy (congenital with brain and eye anomalies), type A, 12 | 615,249 | AR | 8p11.21 | POMK | 615,247 | (Jae et al.; 2013) |
| Retinitis pigmentosa 1 | 180,100 | AD, AR | 8q11.2-q12.1 | RP1 | 603,937 | (Chassine et al., 2015) |
| Achromatopsia 3 | 262,300 | AR | 8q21.3 | CNGB3 | 605,080 | (Brody et al., 1970; Sundin et al., 2000) |
| Cohen syndrome | 216,550 | AR | 8q22.2 | VPS13B | 607,817 | (Norio, 2003;Kolehmainen et al., 2003) |
| Hypomagnesemia 1, intestinal | 602,014 | AR | 9q21.13 | TRPM6 | 607,009 | (Vainsel et al., 1970; Schlingmann et al., 2002) |
| Retinal cone dystrophy 3B | 610,356 | AR | 9p24.2 | KCNV2 | 607,604 | (Michaelides et al., 2005; Wissinger et al.,2008) |
| Muscular dystrophy-dystroglycanopathy (congenital with brain and eye anomalies), type A, 4 | 253,800 | AR | 9q31.2 | FKTN | 60,744 | (Fukuyama et al.,19681; Kobayashi et al.,1998) |
| Muscular dystrophy-dystroglycanopathy (congenital with mental retardation), type B, 1 | 613,155 | AR | 9q34.13 | POMT1 | 607,423 | (Villanova et al., 2000; van Reeuwijk et al.,2006) |
| Muscular dystrophy-dystroglycanopathy (congenital with brain and eye anomalies), type A, 1 | 236,670 | AR | 9q34.13 | POMT1 | 607,423 | (Godfrey et al., 2007) |
| ?Retinitis pigmentosa 66 | 615,233 | AR | 10q11.22 | RBP3 | 180,290 | (Arno G et al., 2015) |
| Leukodystrophy, hypomyelinating, 7, with or without oligodontia and/or hypogonadotropic hypogonadism | 607,694 | AR | 10q22.3 | POLR3A | 614,258 | (Saitsu et al., 2011) |
| Papillorenal syndrome | 120,330 | AD | 10q24.31 | PAX2 | 167,409 | (Schimmenti et al., 1995; Sanyanusin et al., 1995) |
| Schuurs-Hoeijmakers syndrome | 615,009 | AD | 11q13.1-q13.2 | PACS1 | 607,492 | (Schuurs-Hoeijmakers et al., 2012) |
| Muscular dystrophy-dystroglycanopathy (congenital with brain and eye anomalies), type A, 13 | 615,287 | AR | 11q13.2 | B3GNT1 | 605,517 | (Buysse et al., 2013) |
| Temtamy syndrome | 218,340 | AR | 12p13.31 | C12orf57 | 615,140 | (Temtamy et al., 1996; Zahrani et al., 2013) |
| Night blindness, congenital stationary, type 1H | 617,024 | AR | 12p13.31 | GNB3 | 139,130 | (Vincent et al., 2016) |
| Epiphyseal dysplasia, multiple, with myopia and deafness | 132,450 | AD | 12q13.11 | COL2A1 | 120,140 | (Ballo,1998; Beighton et al., 1978) |
| Stickler syndrome, type I | 108,300 | AD | 12q13.11 | COL2A1 | 120,140 | (Ahmad et al., 1990) |
| Kniest dysplasia | 156,550 | AD | 12q13.11 | COL2A1 | 120,140 | (Siggers et al.,1974; Winterpacht et al.,1993) |
| SED congenita | 183,900 | AD | 12q13.11 | COL2A1 | 120,140 | (Bach et al., 1967; Lee et al., 1989) |
| Spondyloperipheral dysplasia | 271,700 | AD | 12q13.11 | COL2A1 | 120,140 | (Zankl et al., 2004; Terhal et al., 2015) |
| Lethal congenital contractural syndrome 2 | 607,598 | AR | 12q13.2 | ERBB3 | 190,151 | (Landau et al., 2003; Narkis et al., 2007) |
| Muscular dystrophy-dystroglycanopathy (congenital with brain and eye anomalies), type A, 10 | 615,041 | AR | 12q14.2 | TMEM5 | 605,862 | (Vuillaumier-Barrot et al., 2012) |
| Leukodystrophy, hypomyelinating, 8, with or without oligodontia and/or hypogonadotropic hypogonadism | 614,381 | AR | 12q23.3 | POLR3B | 614,366 | (Saitsu et al., 2011) |
| Noonan syndrome 1 | 163,950 | AD | 12q24.13 | PTPN11 | 176,876 | (Van et al., 2016) |
| Cutis laxa, autosomal recessive, type IIA | 219,200 | AR | 12q24.31 | ATP6V0A2 | 611,716 | (Morava et al., 2005; Kornak et al., 2008) |
| Deafness and myopia | 221,200 | AR | 13q31.1 | SLITRK6 | 609,681 | (Ohlsson, 1963; Tekin, 2013) |
| Brain small vessel disease with or without ocular anomalies | 607,595 | AD | 13q34 | COL4A1 | 120,130 | (Coupry et al., 2010) |
| Microphthalmia, syndromic 6 | 607,932 | AD | 14q22.2 | BMP4 | 112,262 | (Bakrania et al., 2008) |
| Retinal dystrophy, early-onset, with or without pituitary dysfunction | 610,125 | AD | 14q22.3 | OTX2 | 600,037 | (Vincent et al., 2014) |
| Weill-Marchesani syndrome 3, recessive | 614,819 | AR | 14q24.3 | LTBP2 | 602,091 | (Haji-Seyed-Javadi et al.,2012) |
| Microspherophakia and/or megalocornea, with ectopia lentis and with or without secondary glaucoma | 251,750 | AR | 14q24.3 | LTBP2 | 602,091 | (Desir et al., 2010; Kumar et al., 2010) |
| Muscular dystrophy-dystroglycanopathy (congenital with brain and eye anomalies), type A, 2 | 613,150 | AR | 14q24.3 | POMT2 | 607,439 | (Godfrey et al., 2007) |
| Muscular dystrophy-dystroglycanopathy (congenital with mental retardation), type B, 2 | 613,156 | AR | 14q24.3 | POMT2 | 607,439 | (Mercuri et al., 2009) |
| Loeys-Dietz syndrome 5 | 615,582 | AD | 14q24.3 | TGFB3 | 190,230 | (Bertoli-Avella et al., 2015) |
| ?Retinitis pigmentosa 51 | 613,464 | AR | 14q31.3 | TTC8 | 608,132 | (Goyal et al., 2016) |
| Night blindness, congenital stationary (complete), 1C, autosomal recessive | 613,216 | AR | 15q13.3 | TRPM1 | 603,576 | (Li et al., 2009) |
| Ehlers-Danlos syndrome, musculocontractural type 1 | 601,776 | AR | 15q15.1 | CHST14 | 608,429 | (Malfait et al., 2010) |
| Weill-Marchesani syndrome 2, dominant | 608,328 | AD | 15q21.1 | FBN1 | 134,797 | (Faivre et al., 2003) |
| Marfan lipodystrophy syndrome | 616,914 | AD | 15q21.1 | FBN1 | 134,797 | (Graul-Neumann et al., 2010; Jacquinet et al., 2014) |
| Marfan syndrome | 154,700 | AD | 15q21.1 | FBN1 | 134,797 | (Pyeritz and McKusick, 1979) |
| Night blindness, congenital stationary (complete), 1D, autosomal recessive | 613,830 | AR | 15q22.31 | SLC24A1 | 603,617 | (Riazuddin et al., 2010) |
| Weill-Marchesani-like syndrome | 613,195 | AR | 15q26.3 | ADAMTS17 | 607,511 | (Morales et al., 2009) |
| Mucolipidosis III gamma | 252,605 | AR | 16p13.3 | GNPTAG | 607,838 | (Pohl et al., 2010) |
| DOOR syndrome | 220,500 | AR | 16p13.3 | TBC1D24 | 613,577 | (James et al., 2007; Campeau et al.,2014) |
| Hamamy syndrome | 611,174 | AR | 16q12.2 | IRX5 | 606,195 | (Hamamy et al., 2007) |
| Microcornea, myopic chorioretinal atrophy, and telecanthus | 615,458 | AR | 16q23.1 | ADAMTS18 | 607,512 | (Aldahmesh et al., 2011) |
| Foveal hypoplasia 2, with or without optic nerve misrouting and/or anterior segment dysgenesis | 609,218 | AR | 16q23.3 | SLC38A8 | 615,585 | (Perez et al., 2014) |
| Lymphedema-distichiasis syndrome | 153,400 | AD | 16q24.1 | FOXC2 | 602,402 | (Bahuau et al., 2002) |
| Brittle cornea syndrome 1 | 229,200 | AR | 16q24.2 | ZNF469 | 612,078 | (Bertelsen et al., 1968; Christensen et al., 2010) |
| Pontocerebellar hypoplasia, type 8 | 614,961 | AR | 16q24.3 | CHMP1A | 164,010 | (Mochida et al., 2012) |
| Smith-Magenis syndrome | 182,290 | IC, AD | 17p11.2 | RAI1 | 607,642 | (Girirajan et al., 2005) |
| Cone-rod dystrophy 6 | 601,777 | AD | 17p13.1 | GUCY2D | 600,179 | (Gregory-Evans et al., 2000) |
| Macrocephaly, macrosomia, facial dysmorphism syndrome | 614,192 | AD | 17q11.2 | RNF135 | 611,358 | (Douglas et al., 2007) |
| Neurofibromatosis, type 1 | 162,200 | AD | 17q11.2 | NF1 | 613,113 | (Thiel et al., 2009) |
| Poretti-Boltshauser syndrome | 615,960 | AR | 18p11.31 | LAMA1 | 150,320 | (Aldinger et al.) |
| Pitt-Hopkins syndrome | 610,954 | AD | 18q21.2 | TCF4 | 602,272 | (Whalen et al.,2012) |
| Muscular dystrophy-dystroglycanopathy (congenital with brain and eye anomalies), type A, 5 | 613,153 | AR | 19q13.32 | FKRP | 606,596 | (Beltran-Valero de Bernabe et al., 2004) |
| Bohring-Opitz syndrome | 605,039 | AD | 20q11.21 | ASXL1 | 612,990 | (Hoischen et al., 2011) |
| Stickler syndrome | NA | AR | 20q13.33 | COL9A3 | 120,270 | (Faletra et al., 2014) |
| Knobloch syndrome, type 1 | 267,750 | AR | 21q22.3 | COL18A1 | 120,328 | (Passos-Bueno et al., 1994) |
| Homocystinuria, B6-responsive and nonresponsive types | 236,200 | AR | 21q22.3 | CBS | 613,381 | (Reish et al., 1995; Kruger et al.,1995) |
| Muscular dystrophy-dystroglycanopathy (congenital with brain and eye anomalies), type A, 6 | 613,154 | AR | 22q12.3 | LARGE | 603,590 | (Clement et al., 2008) |
| Rubinstein-Taybi syndrome 2 | 613,684 | AD | 22q13.2 | EP300 | 602,700 | (Bartsch et al., 2010) |
| Aland Island eye disease | 300,600 | XL | Xp11.23 | CACNA1F | 300,110 | (Wutz et al., 2002; Forsius et al., 1964) |
| Cone-rod dystrophy, X-linked, 3 | 300,476 | XLR | Xp11.23 | CACNA1F | 300,110 | (Hauke et al., 2013) |
| Night blindness, congenital stationary (incomplete), 2A, X-linked | 300,071 | XL | Xp11.23 | CACNA1F | 300,110 | (Bergen et al., 1995; Strom et al., 1998) |
| Linear skin defects with multiple congenital anomalies 3 | 300,952 | XLD | Xp11.3 | NDUFB11 | 300,403 | (Van Rahden et al., 2015) |
| Retinitis pigmentosa 2 | 312,600 | XL | Xp11.3 | RP2 | 300,757 | (Kaplan et al., 1990; Schwahn et al.,1998) |
| Night blindness, congenital stationary (complete), 1A, X-linked | 310,500 | XLR | Xp11.4 | NYX | 300,278 | (Bech-Hansen et al., 2000) |
| Cone-rod dystrophy, X-linked, 1 | 304,020 | XL | Xp11.4 | RPGR | 312,610 | (Demirci et al.,2002) |
| Retinitis pigmentosa 3 | 300,029 | XL | Xp11.4 | RPGR | 312,610 | (McGuire et al., 1995; Meindl et al., 1996) |
| Ocular albinism, type I, Nettleship-Falls type | 300,500 | XL | Xp22.2 | GPR143 | 300,808 | (Xiao and Zhang, 2009) |
| Alport syndrome | 301,050 | XLD | Xq22.3 | COL4A5 | 303,630 | (Ohlsson et al., 1963; Barker et al., 1990) |
| Danon disease | 300,257 | XLD | Xq24 | LAMP2 | 309,060 | (Bergia et al., 1986; Nishino et al., 2000) |
| Bornholm eye disease | 300,843 | XLR | Xq28 | OPN1LW | 300,822 | (Haim et al., 1988; McClements et al., 2013) |
| Blue cone monochromacy | 303,700 | XLR | Xq28 | OPN1LW/OPN1MW | 300,822 | (Gardner et al., 2009 |

Note: IC, isolated cases; AR, autosomal recessive; AD, autosomal domiant; NA, non-available; #, References only included the first published paper for clinical features report and genetic analysis.