

more general use of preventive measures against ophthalmia neonatorum in cities than by the country practitioners.

That there are RACE PECULIARITIES is shown by the fact that out of 10,000 Christians there are only 9.4 blind, while the same number of Jews furnishes 13.3 blind. One reason for this large percentage of blindness in Jews is the great frequency with which they suffer from glaucoma. It is said that the sclera is more dense and less elastic in people of this race than in others, and that this condition favors the development of glaucoma. It has been further claimed that dark eyes are more prone to amaurotic affections than light ones, and that Jews, who usually have dark eyes, are therefore more liable to suffer from blindness. This, however, is not borne out by facts, for dark races are usually possessed of deeply pigmented eyes, yet the percentage of blindness is not great with them. It should be remembered, however, that the so-called amaurotic affections constitute but a small proportion of the causes of blindness; and the fact should not be overlooked that overcrowding and bad ventilation are often found in the class to which the majority of Jews belong—and such surroundings are prolific sources of external inflammations of the eye. Consanguinity in marriage is another cause which renders the Jewish race more prone to blindness than others. They, too, almost invariably live in cities, where the percentage of blindness has heretofore been higher than in rural districts. The number of blind negroes in the United States in 1890 was 7,160 out of a population of 7,470,040; or 9.5 to 10,000. Lack of care for diseases and injuries is the probable cause of much blindness with them, rather than any other racial difference.

INFLUENCE OF SEX.—The United States has a population of 32,067,880 males and 30,554,370 females, which gives a preponderance of 1,513,510 in favor of males. The number of blind males is 27,983, and of females 23,428, which gives a preponderance of 5,555 in favor of the male blind. The number of blind in 10,000 males is 8.7 and in the same number of females 7.3. This difference is a slight one, and can be easily accounted for by the accidents arising from exposure of the eyes to the injurious influences of the trades followed by men. An interesting fact bearing upon this point is the comparative diminution in the percentage of blindness in males after they reach an age which recalls them from pursuits that endanger the eyes to surroundings more nearly like those of females. Table V., prepared by Magnus from the Prussian census, illustrates this condition most aptly.

TABLE V.

Table with 4 columns: Age, Males (1871), Females (1871), Males (1880), Females (1880). Rows represent age groups from under 10 years to over 50 years.

See in this connection Table X. for the causes which produce blindness at different ages.

TABLE VI.

Table with 4 columns: Age, Percentage of blind between the ages given, Percentage of population, Number of blind in 10,000. Rows represent age groups from 1 to 10 years to 90 to 100 years.

Table VI. gives the percentage of blind of different ages in column 2, and the percentage of population at different ages in column 3 (Katz), while column 4, which has been adapted from Meyr's table, shows the number of blind in 10,000 at different ages.

This table, which is a very interesting and instructive one, deserves attention for its own merits; yet it becomes more instructive when considered in connection with Table X., which gives the causes that produce blindness at different ages.

The following table from Eulenburg's Real-Encyclopædie, p. 505 (1894), shows the percentage of blindness at different ages in the countries referred to, as follows:

TABLE VII.

Table with 7 columns: Ages, Thirteen German States, England, Wales, and Ireland, Finland, Nether-lands, Belgium, United States. Rows represent age groups from 1 to 5 to over 50.

INFLUENCE OF OCCUPATION.—The causes of blindness incidental to occupation may be divided into two classes, viz., traumatic and non-traumatic.

Traumatic.—Under this head are included such occupations as necessitate exposure of the eyes to the direct influence of injurious agents from without, which result from the work performed—as machinists, who are constantly exposed to flying bits of metal, which often produce injury of the eye and blindness; and the same is true of blacksmiths, locksmiths, stone-cutters, and miners. The last named are also exposed to the dangers of premature or careless explosions. Cases of monocular blindness almost invariably arise from the causes just considered.

Cohn found 535 men with 554 blind eyes, and 241 women with 446 blind eyes. Preference is shown for neither eye. The United States census reports for 1890 show 93,988 cases of monocular blindness—or 15.1 to 10,000. The males show 21.7 to 10,000; females, 8.3 to 10,000. The greater frequency of binocular blindness in females is another argument in favor of the accidental occurrence of blindness from the injurious trades followed by men.

Non-traumatic.—Under this head are included such occupations as produce blindness indirectly—as myopia, from over-use of the eyes. Professional men, whose duties necessitate much study; and others, who, from necessity or preference, do much reading, or much fine work, which requires close and long-continued use of the eyes, are liable to suffer from myopia and the train of symptoms which in this disease lead to blindness. Workers in lead are liable to suffer from neuro-retinitis or atrophy of the optic nerves; and workers in India rubber are exposed to the same dangers, from sulphide of carbon. It is claimed that optic-nerve atrophy sometimes occurs in workers who are exposed to the fumes of tobacco or of alcohol. Soldiers in crowded barracks are apt to suffer from conjunctival diseases, and the exposure to wind, dust, glare, and inclemencies of weather, when marching, may also cause the same trouble. Sailors who are constantly exposed to the vicissitudes of weather are liable to suffer from conjunctival and other forms of eye disease, and their crowded quarters and often meagre fare are also conducive to eye affections.

CAUSES OF BLINDNESS.—Table VIII. gives an anatomical grouping of the causes of blindness, compiled by Magnus from 770 cases.

TABLE VIII.

Table with 2 columns: Cause of blindness, Per cent. Rows include Conjunctiva, Cornea, Uveal nerve, Retina, Optic nerve, Glaucoma, Congenital deformities of the eye, Unclassifiable.

Table IX., compiled by the same author from a study of 2,528 cases reported by various writers, gives the causes of blindness, arranged in pathological groups, and the percentage of each individual cause.

TABLE IX.

Table with 2 columns: Cause of blindness, Per cent. Divided into A. Congenital blindness, B. Acquired blindness (a) From idiopathic diseases of the eye, C. Acquired blindness (b) Injuries, D. Acquired blindness (c) The eye disease being in consequence of disease of the body.

Congenital anomalies constitute nearly four per cent. of the causes of blindness. The majority of instances occur as a result of consanguineous marriages, or where there is an hereditary tendency toward defects of the eye, or as a result of syphilitic manifestations in intra-uterine life. They are usually hopeless—cataract being the only cause in this category which is amenable to treatment. Among 34 children, the offspring of 14 marriages in which one or both parties were blind from birth or childhood, Magnus found 8 cases, i. e., 23.5 per cent., of blindness or bad sight.

The various ages at which other causes of blindness arise are well shown in Table X. from Magnus, which gives the percentage of causes at the ages when they are developed.

TABLE X.

Table with 11 columns: Cause of blindness, 1 to 5 years, 6 to 10 years, 11 to 15 years, 16 to 20 years, 21 to 25 years, 26 to 30 years, 31 to 40 years, 41 to 50 years, 51 to 60 years, 61 to 70 years, 71 to 80 years. Rows include Ophthalmia neonatorum, Trachoma, Injuries, Optic-nerve atrophy, Uveal tract with choroido-retinitis, Detachment of retina, Glaucoma, Operations, Cornelial diseases, Variola, Measles, Scarlatina, Typhus.

The various causes of blindness, as given in Table IX., will now be considered individually, with such remarks and deductions as are of general interest.

(1) Ophthalmia neonatorum furnishes 10.876 per cent. of the blind, a larger proportion than any other single cause—which in itself invests it with grave importance; and this importance is greatly enhanced when it is considered that blindness from this cause means an entire life of blindness; that this disease can be practically prevented by proper prophylactic measures; and further, that even after it is developed, prompt, energetic, and appropriate treatment will usually bring it to a successful termination without impairment of sight. The simple measure of washing the eyes of all infants with warm water as soon as they are born, and instilling a few drops of a two-per-cent. solution of silver nitrate into the conjunctival sac, and subsequent attention to cleanliness, would almost banish this disease from our lists, as has been lately proven in the Maternity Hospital in Vienna and other similar institutions. Ophthalmia neonatorum is almost always caused by the irritating discharges from the vagina, which gain access to the eye either during birth, or, later, by the careless handling of the infant with unwashed hands which have been about the vulva. And it should be borne in mind that these discharges may produce inflammation in any conjunctiva with which they come in contact. Furthermore, the contagiousness of conjunctival discharges should never be overlooked, and this action should always be explained to those who have to deal with any form of conjunctivitis. As a rule, the contagious material from a mild form of conjunctivitis will produce a slight attack in another eye, and vice versa for virulent forms. Yet this is not always the case.

(2) Trachoma and blennorrhœa of adults, with a percentage of 9.492, come next in order of importance. Trachoma occurs chiefly in the lower walks of life, where, from necessity or indifference, there are overcrowding, bad ventilation, lack of cleanliness, and a general disregard of the laws of hygiene. It is often seen in the poor and neglected of our city population, in the crowded barracks of military camps, and in the confined quarters of northern latitudes. Its development is favored by low and damp localities on the one hand, and by dry and sandy districts on the other. The contagiousness of the secretion is also an important element in the spread of the disease in crowded quarters. The presence of trachoma, even in a mild form, renders an eye very prone to take on an active form of inflammation (blennorrhœa), which will assume epidemic character if conditions favor its spread, as is seen in Egyptian or military ophthalmia. Once developed, trachoma becomes always an obstinate, and often a serious, disease; hence prophylactic measures

against it are of the utmost importance, and they are to be found in a correction of the sanitary conditions referred to. Its local treatment should be prompt, energetic, and persistent.

Blennorrhœa of adults may arise from the same conditions that produce trachoma, and it is often an outgrowth of the latter. It is frequently—in fact usually—the result of contagion. The discharge from any form of conjunctivitis, as also leucorrhœal or other irritative discharges, gaining access to the eye may produce the disease. The observance of care and cleanliness, with proper regard to hygiene, would cause both of these diseases to disappear, and appropriate treatment would cure most cases, even after the disease has developed.

(3) *Diphtheritic Conjunctivitis*.—Diphtheritic and membranous ophthalmia are sometimes caused by direct infection of the conjunctiva by diphtheritic material from the throat of another person, while in other cases the diphtheritic process creeps up the nasal duct from the nose, and thus reaches the lining membrane of the eye. But in the majority of cases of diphtheritic ophthalmia the disease is a local one, in which the inflammation takes on this special form. No doubt there is often something peculiar in the patient's health, or in the state of his eye tissues, which gives a proclivity to this particular pathological process. These cases are, for instance, seen with particular frequency after measles, and less commonly during or after scarlet fever, and are more likely to occur in children than in adults. The existence of old, granular disease of the conjunctiva also gives a strong tendency to a diphtheritic type of inflammation, and the same tendency is seen sometimes in a well-marked degree in ophthalmia neonatorum, and in gonorrhœal ophthalmia.

(4) *Diseases of the Cornea*.—This furnishes rather a large contingent of blind, and it is not to be wondered at when we consider that transparency and regularity of curve of this membrane are essential to good vision. Keratitis, in its various forms, may leave opacity sufficient to cause blindness; and the same is true of superficial ulceration; while deeper ulceration may lead to prolapse of the iris, displacement or obliteration of the pupil, etc., and all are at times liable to be followed by softening of the cornea, with development of staphyloma, etc. Hypopyon keratitis furnishes a larger number of blind than all other corneal affections put together. Kerato-conus and kerato-globus are sometimes causes of blindness.

(5) *Irido-choroiditis, Cyclitis, Iritis*.—The different diseases enumerated under this heading are placed together, first, because they often combine; and, second, because the structure involved—the uveal tract—is common to each of the several anatomical parts designated. The term *uveitis* is often and advantageously employed to describe, collectively, inflammations in these parts. *Iritis*, uncomplicated, rarely causes blindness; yet it may do so if the pupil becomes glued down to the lens and the pupillary space becomes blocked with exudation (*occlusion of pupil*). Both this condition and that of *exclusion of pupil* (complete posterior synechia) are very apt to be followed by *secondary glaucoma*. More frequently synechia from previous inflammation cause recurrent attacks of iritis; and the inflammatory process, extending to the choroid, or to the ciliary body, or to both, gives rise to opacities in the vitreous, and later to detachment of the retina, cataract, etc. The trouble may begin in the choroid, or, less frequently, in the ciliary body, and, extending to other parts or remaining in either locality, may cause blindness in the same way.

(6) *Choroiditis myopica* (6) and *detachment of the retina* (11) will be treated of together under the head of the latter, both being considered as effects of myopia.

(7) *Choroiditis, Retino-choroiditis*.—The choroid and retina are so intimately associated that it is difficult to have an affection of one of these structures without involvement of the other. Syphilis, acquired or inherited, is the usual cause; and blindness is produced by the

formation of opacities in the vitreous and disturbance or destruction of the retinal elements.

(8) *Retinitis Pigmentosa, Acquired*.—Though this affection may be developed at almost any period of life, it cannot be considered an acquired disease, for it occurs in particular groups of individuals who, from hereditary tendencies or from consanguineous marriages, show congenital deficiencies in this and in other ways. Such cases are hopeless; and even when the disease is recognized in an early stage little or nothing can be accomplished in the way of treatment.

(9) *Retinitis Apoptotica*.—The chief significance of this disease is the index which it furnishes of the condition of the blood-vessels in the brain; for it is usually but a precursor of similar trouble within the cranium.

(10) *Neuro-retinitis*, as an idiopathic affection, is almost unknown. It usually occurs as an accompaniment of some other disease—as syphilis, Bright's disease, intracranial disease, pregnancy, cardiac disease, etc.; but as these diseases are specially considered as sources of blindness further on, we are reduced to very narrow limits. It must be admitted that cases of neuro-retinitis are occasionally seen without apparent cause. And it is probable that such vague causes as prolonged exposure of the eyes to very bright light, with great heat, as the glare of a furnace, or to the reflection of the sun from the waters of the tropics, or from excessive use of the eyes by strong, artificial light, may produce the disease and thus lead to blindness.

(11) *Detachment of the Retina and (6) Choroiditis Myopica*.—Myopia, the cause common to each of these conditions, is of great importance, and merits careful consideration. It may be said to be an outgrowth of civilization and education, and it may be taken as an index of the studious habits and of the close eyework of a people. In this present busy age of progress and competition, which calls for work at high pressure, and necessitates the forcing process as soon as school days are begun, there are many causes at work which serve to swell the ranks of myopes, and to lay the foundation for its future increase. The long hours of confinement in the schoolroom, and the lack of proper out-of-door exercise and fresh air, tend to cultivate sedentary habits and to lessen the resisting power of the tissues of the body. The close application of the eyes at near work, with badly constructed desks and insufficient illumination, which necessitate stooping over the pages and straining the eyes, brings on congestion of the fundus of the eye, with thinning and bulging of the sclera at the point of least resistance—the posterior pole; and the development of myopia is the consequence. This condition, once produced, is increased by a continuation of the causes which induced it; and, in unpromising subjects, even the removal of these causes does not put a stop to its progress.

The development and increase of myopia during school life are nowhere better shown than in the following table, taken from Fuchs and prepared by Cohn. The village school corresponds to our lowest grade, and then follow in regular sequence the higher grades, until the last or university course is reached:

TABLE XI.

	Percentage of myopia.	Degree of myopia.
Village school.....	1.4	1/24.4
Elementary school.....	6.7	1/22.7
Intermediate school.....	10.3	1/21.0
High school.....	19.7	1/19.6
Gymnasium (college).....	26.2	1/18.7
University.....	59.0	1/12.2

It was furthermore noted that the percentage of myopia increased in each school from class to class. Among theological and medical students, whose term of study is prolonged beyond the ordinary university course, the percentage of myopia is still further increased, reach-

ing in the case of theological students seventy-eight per cent. And in reference to confinement and indoor life on the one hand, and out-of-door life and exercise on the other, Erisman found the percentage of myopia in resident scholars to be forty-two per cent., and in day scholars to be thirty-five per cent. Dor found even a greater difference—thirty-three per cent. against eighteen per cent.

Myopia abounds among studious people, and is almost unknown among the ignorant and illiterate. It is not congenital, yet the tendency to its development is certainly transmitted from parent to child. The prophylactic measures against myopia are of the utmost importance. First and foremost are: A proper amount of out-of-door exercise during school life; well-ventilated schoolrooms, with good illumination, properly constructed desks, so that the light will fall to best advantage upon the page, and avoidance of the habits of stooping or bending the head over the work, and of holding objects close to the eyes. After the development of myopia, much can be done for its relief by the use of atropine and the wearing of properly selected glasses. It should be remembered that myopia fosters sedentary and studious habits; and it at times becomes advisable to discontinue the use of the eyes for near work altogether; and it not infrequently falls within the province of the physician to decide upon the child's future mode of life and employment.

A few cases of myopia with choroiditis occur independently of the causes here ascribed to it; yet they are so infrequent that they may be left out of consideration. And, too, detachment of the retina is sometimes seen in eyes that are not myopic; but it rarely occurs in such as a primary affection, and when secondary to some other pathological lesion, that, and not the detachment, is the cause of blindness.

(12) *Glaucoma*.—The importance of this disease, as indicated by its quota of blind, is forcibly increased, when its usual amenability to treatment is considered. While a well-marked case of glaucoma presents unmistakable symptoms of the disease, which it would be unpardonable to overlook, there are other cases which are obscure and misleading. The very fact of this uncertainty should, however, put us upon our guard; and there are few cases indeed which would run the gauntlet of careful examination and close observation. Once recognized, prompt and energetic treatment is indicated; and there is no operation in the whole range of surgery that affords more brilliant results than does iridectomy in cases of acute glaucoma. Sclerotomy and eserine have their spheres of usefulness; and stretching the external nasal nerve has recently been much lauded in the treatment of certain obstinate forms of glaucoma. Unfortunately the more obscure cases attract but little attention until the disease is far advanced, and medical advice is sought only after serious and permanent impairment of sight comes on. A more thorough knowledge of the disease and greater familiarity with its symptoms by the general practitioner will not only insure its more prompt recognition, but will lead the laity to a better understanding of the affection, and cause greater care in the observance of eye symptoms. A few cases of glaucoma are strongly allied to optic-nerve atrophy, and these are very unfavorable.

(13) *Idiopathic optic-nerve atrophy* occurs most frequently in subjects who have inherited a tendency to nervous disorders. It is often a precursor of spinal cord or of cerebral disease; and as the length of time which may intervene between the development of optic atrophy and central changes is often considerable, the diagnosis is usually difficult and uncertain. The disease is one of the most obscure that we have to deal with, and the prognosis is unfavorable. It is much more frequent in men than in women.

(14) *Tumors of the Eye and its Surroundings*.—*Malignant diseases*, as glioma of the retina, sarcoma of the choroid, of the ciliary body, and of the iris, and epithelioma or lupus of the conjunctiva, or of the cornea, may

produce blindness through destruction of the globe by their own growth; yet their chief importance is in their danger to life. Cysts of the iris, if they are not removed, may cause blindness by increase in size.

Gummata of the ciliary body and of the sclera may also produce blindness in the same way. Other tumors of the eye rarely cause blindness. Tumors arising from parts adjacent to the eye may produce blindness, directly by extension of the disease to the globe, or indirectly by pressure effects upon the globe or optic nerve, as is seen in vascular and cystic tumors of the orbit, and in tumor or distention of the frontal, ethmoidal, nasal, or maxillary sinuses.

(15) *Unclassifiable*.—The percentage here given may be taken as a fair example of the proportion of the blind which present such complicated conditions as to preclude classification.

(16) *Direct Injury of the Eyes*.—The more important proportion of these cases occur in individuals whose labor necessitates exposure of the eyes to flying bits of metal or stone, as machinists, workers in stone, miners, etc., and in those who have to deal with explosives, as in blasting, the manufacture of explosive materials, etc. The use of protective glasses, preferably of mica, which combines perfect transparency with considerable strength, is a measure that would afford much protection to the eyes, though it has been but little adopted by workmen exposed to these dangers.

A certain number of cases occur from unavoidable and unforeseen accidents, and of these it is unnecessary to treat.

Injuries of the eye in the German army during the Franco-German war (1870-71) were met with in 786 cases—being 0.79 per cent. of the whole number of injuries, and 7.8 per cent. of head injuries; and affections of vision after head injuries were met with in 74 cases—or 0.7 per cent. of head injuries.

(17) *Unsuccessful Operations*.—The percentage here furnished certainly appears small, when it is considered that many eye operations are attended with considerable risk to the eye, even in the hands of the most accomplished operators. Cataract extraction—the most important operation in ocular surgery, and at the same time the most formidable—is accountable for most cases of blindness from operative measures. As it is performed late in life, when the process of repair is impaired by age and often by disease, it is to be wondered that the proportion of unfavorable results is not larger.

(18) *Injuries of the head* produce blindness through lesions of the optic nerve, at or about the optic foramen. It is known that blows upon the head may cause fracture of the bones about the apex of the orbit, or at the optic foramen; and blindness ensues from injury to the optic nerve—immediately if the injury be severe, and more slowly if dependent upon secondary degenerative changes (atrophy). Meningitis following injuries of the head may cause optic neuritis or atrophy and blindness. And injuries of the angular gyrus may produce blindness.

(19) *Traumatic Sympathetic Ophthalmia*.—This is one of the most important of eye diseases, and, because of its insidious character and its intractable and uncertain course, merits the utmost care in its consideration at the hands of ophthalmologists, and general practitioners as well. Resulting, as it does, from previous mechanical injury which has greatly impaired or entirely destroyed the fellow eye, its treatment involves great responsibility. And as it not infrequently happens that the sympathizing eye is ultimately left in a worse condition than the exciting one, advice should be well and intelligently considered. The disease may appear within a few weeks, or it may not develop for years; and while its prodromes may extend over periods varying from weeks to months, it sometimes comes on unannounced, and quickly leads to blindness. Arising at times from wounds, apparently trivial, in the ciliary region, it occasionally fails to appear after extensive injury to this, the vulnerable zone. Treatment of the disease after it has developed is of course important, and while it is sometimes unsatisfactory, it is