eries No.04

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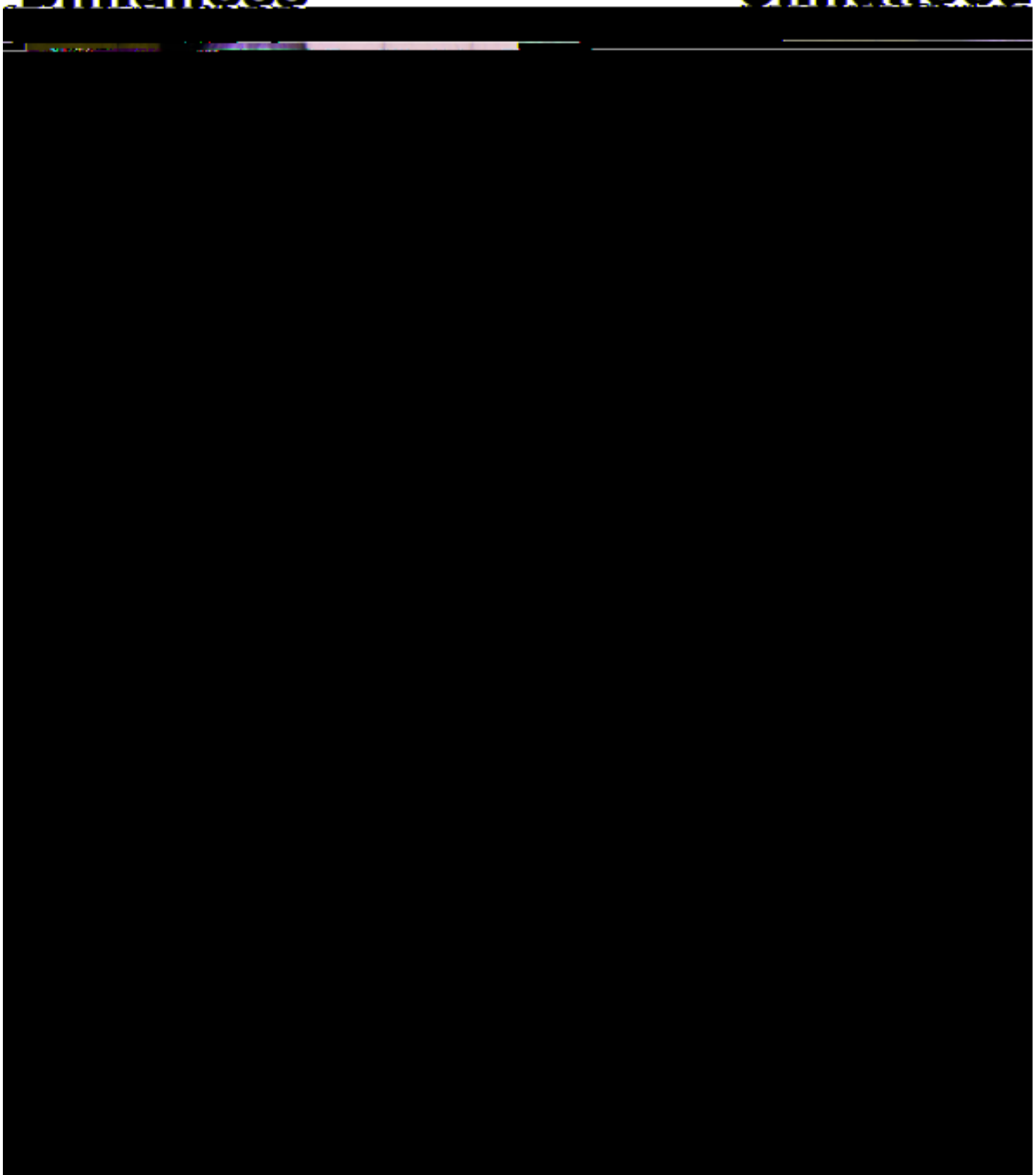
Teaching S

Preven Childhood



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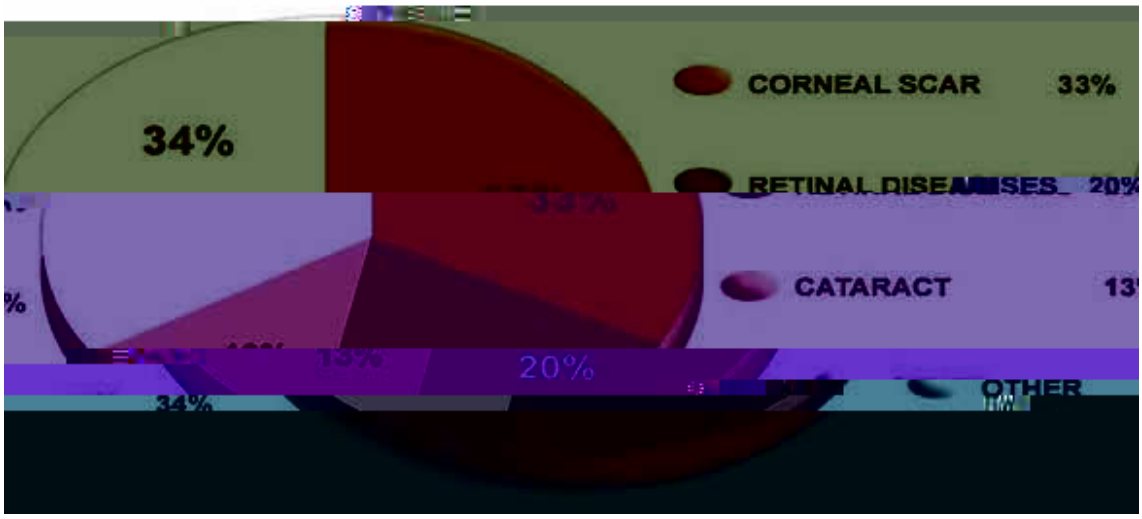

Over a million children in Asia and Africa are blind and by far the most common

For the purpose of this study we recognise that a child is aged 0-15 years.

A simple classification divides the causes of childhood blindness into four groups:

1. Hereditary factors present from conception
2. Factors influencing the unborn child during pregnancy
3. Factors operating around the time of birth
4. Factors acting during childhood

Hereditary factors which contribute to childhood blindness may cause, for example, familial cataract or retinal dystrophies. Damaging influences to the unborn child during pregnancy include maternal infection with rubella and toxoplasmosis. Examples of factors affecting sight around the time of birth are the effect of too much oxygen given to the premature child (retinopathy of prematurity) and infection (newborn conjunctivitis). Blindness occurring in childhood includes conditions due to vitamin A deficiency, measles, external eye infections, harmful traditional eye medicines and eye injuries.

Worldwide, vitamin A deficiency is the commonest single cause of childhood blindness, accounting for an estimated 350,000 new cases each year. Vitamin A deficiency is also very important as it is associated with higher infant and childhood mortality rates, particularly associated with measles. It is estimated that 60% to 80% of children who become blind from vitamin A deficiency die within a few years because of increased susceptibility to disease and sometimes lack of care.

Recognition by health workers that vitamin A deficiency is causing blindness in children for whom they care, should also make them aware that children in these communities will be dying unnecessarily from a preventable cause. Health education for parents and communities is very important in preventing this nutritional disease.

Xerophthalmia is the term commonly used to describe an eye showing the clinical features of vitamin A deficiency. Literally, the term means ‘dry eye’ and one sign of xerophthalmia is the dry appearance of both the conjunctiva and the cornea, described as conjunctival and corneal xerosis. Vitamin A deficiency also causes poor night vision due to lack of visual purple in the retina.

Vitamin A deficiency can occur for three major reasons:

because of reduced intake of foods rich in vitamin A

because the vitamins are not absorbed, usually because of diarrhoea

- because of increased need for vitamin A, as occurs during infections, particularly measles.

Blinding malnutrition is found in the developing countries of the world. This is by far

While vitamin A deficiency can occur at any age, the group which is at risk of blindness is the group of pre-school children, 6 months to 6 years of age.

A typical child at risk of corneal blindness is a child who is one to 3 years old, no longer breast fed, who receives a poor diet and is malnourished, and who has developed measles (or another infection) or is suffering from diarrhoea. The child shown in the slide is malnourished and makes an unhappy picture - she is underweight, with obviously thin arms and legs. She has bilateral corneal ulceration due to vitamin A deficiency.

Measles is a particular risk factor in many countries and we shall look further at this important subject.

The following are the ocular symptoms and signs of vitamin A deficiency (xerophthalmia). The World Health Organization clinical codes are given in brackets.

Night blindness (XN): Vitamin A is needed to replace the rhodopsin (visual purple) of the retina at the back of the eye and this is necessary for night vision. An adult or older child, on questioning, will describe the problem of night blindness but a very small child will not be able to offer this information. Ask the mother if the child bumps into objects in the evening.

Conjunctival xerosis (XIA): Vitamin A is required for the production of secretions on the surface of the eye. This dry appearance together with xerosis of the corneal epithelium gives the condition its name, xerophthalmia. There is damage to the cells that produce secretions which moisten the surface of the eye.

Bitot's spots (XIB): A Bitot's spot has a typical foamy appearance and is localised on the surface of the conjunctiva. Bitot's spots may be found in both eyes, most often on the temporal conjunctiva. The picture shown top left is one example of a Bitot's spot. These may appear in children under 5 years but also can persist in older children. The appearance indicates changes in the squamous epithelium of the conjunctiva with underlying xerosis.

Corneal xerosis (X2): The surface of the cornea can have a typical dry appearance, and this can be seen in the picture shown top right.

Corneal ulceration with xerosis (X3A): The eye pictured top right has an inferior corneal ulcer which has been stained green with fluorescein dye. This area of ulceration places this eye in the category, corneal ulceration with xerosis (X3A).

Corneal ulceration/keratomalacia (X3B): This is the consequence of severe vitamin A deficiency. The onset is often sudden, and the cornea may melt very quickly, even over a few hours (keratomalacia). This development is most often seen in young children. The child shown bottom left has deep corneal ulceration progressing towards keratomalacia.

Corneal scarring (XS): The significant end stage of malnutrition causing eye damage, in a child who survives, is corneal scarring (bottom right). Corneal scarring often has a marked effect on vision. The anterior part of the eye may bulge forward (anterior staphyloma) or the opposite may occur and the eye shrinks (phthisis).

It is important to realise that not every child who is vitamin A deficient and at risk of blindness will have obvious eye signs. Finding evidence of xerophthalmia in one child will indicate that other children in the same family and community are also vitamin A deficient, even if they have no obvious signs. A child may have just enough vitamin A but have very little reserve in the liver. If a child becomes ill with measles, for example, vitamin A stores in the liver are rapidly used up resulting in acute deficiency. It is this situation that characteristically causes very rapid and severe corneal melting (keratomalacia) which results in blindness.

Learn to recognise the symptoms and signs of xerophthalmia. Not only will you save a child’s sight but you may also save a life.

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† If there is vomiting, an intramuscular injection of 100,000 IU of water soluble vitamin A (not an oil-based preparation) may be used instead of the first oral dose.

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contra-indicated in pregnancy. If a woman has night blindness or Bitot's spot she should have a daily dose of 10,000 IU of vitamin A orally for 2 weeks.

Immediately after the birth of her child a woman may be given 3 doses of vitamin A 200,000 IU, on Day 1, Day 2, and Day 8, to ensure a good supply of vitamin A in her breast milk for the newborn baby.

doses should be given on Day 1, Day 2 and after 4 weeks.

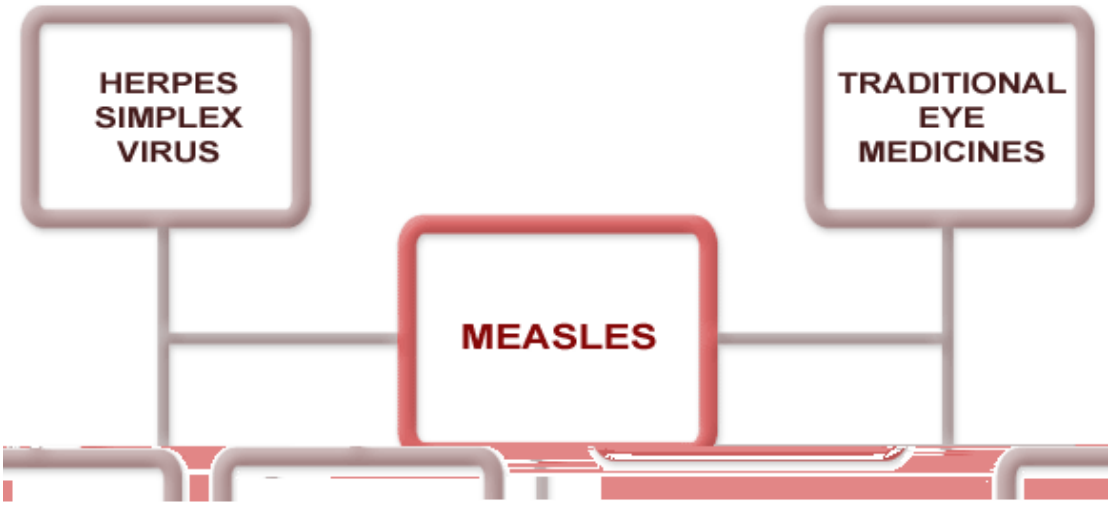
A programme of measles immunisation should be planned and carried out. We shall be discussing measles in more detail with the next slide.
Immediately after her child is born a mother may be given 3 doses of 200,000 IU vitamin

A orally on Day 1, Day 2, and Day 8 after delivery. This will help protect the breast-fed infant.

3. Foods may be fortified with vitamin A, for example, by fortifying a widely used food such as sugar. In the picture (bottom right) these refugee children are collecting milk which has been prepared from powdered milk fortified with vitamin A and vitamin D.

   Remember the importance of public knowledge of the eye condition. Posters may be placed in hospitals, schools and other meeting places. Women and schoolgirls (the mothers of the next generation) especially need education. Teach other health workers. Use radio programmes, if available.

   School children provide a ‘captive’ audience. Why not arrange a school drawing competition on the subject of eye health? Ask a well known person to come and give prizes to the winners of the competition.



Measles is a serious condition, not only because it can cause blindness, but also because it is an important cause of mortality. Both blindness and the death of a child can be prevented by recognising the condition quickly and treating the child with high doses of vitamin A.

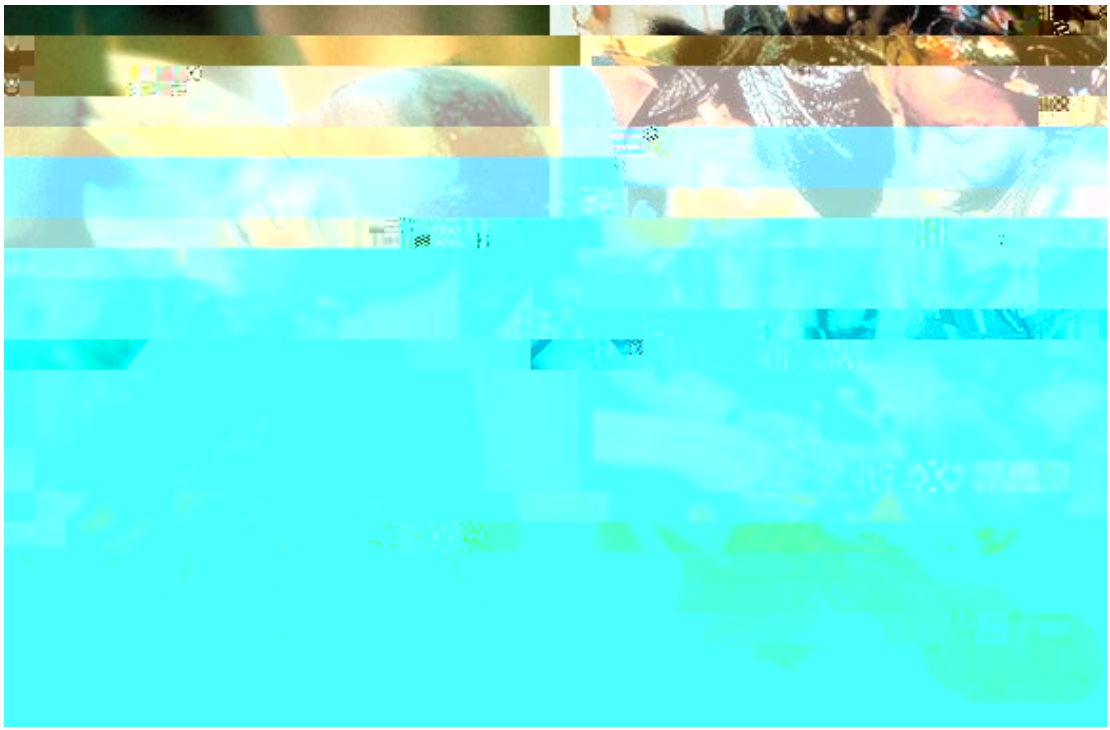
If a child has measles there is usually photophobia, watering, red eyes, and closer examination may show a superficial punctate keratitis. A few children with measles develop true corneal ulceration and in half of these children both eyes are affected.

It has been found that many children in blind schools have a history of measles infection before they become blind.

1. The reserves of vitamin A may be low in the child and measles causes increased use of the remaining vitamin A. The sick child will have loss of appetite, often with gastro-enteritis. Intake of vitamin A will be reduced, together with the protein required for transport of vitamin A in the body. Thus, acute corneal ulceration and keratomalacia may rapidly occur and blindness result.

2. The fever associated with measles and depression of the activity of the immune system may allow secondary infection by the herpes simplex virus. We shall look at this complication with section 11.

3. Because the child's eyes are inflamed and red, the mother may turn to a traditional healer and try a local remedy. These traditional eye medicines (TEM) can be harmful and make the condition worse and even cause blindness. We shall discuss TEM with section 12.



It is estimated that at least half of the childhood blindness in Africa is related to measles infection. If immunisation programmes are carried out on children at nine

* If there is vomiting, give intramuscular water soluble vitamin A 100,000 IU instead of the first oral dose.

Children under one year or less than 8 kg weight should be given half doses of the above regimen.

5. Admission to hospital may be necessary. Many children are very ill with this disease.

As with any corneal ulceration, healing may occur with scarring which can cause significant loss of vision.

Traditional eye medicines (TEM) are used for a great variety of eye diseases. The result of their use is often a more complicated clinical picture because the local remedy may cause further harm to an already abnormal eye.

Measles is one example of a common infective condition causing a red eye where TEM may so worsen the clinical picture that corneal ulceration and blindness may follow.

In deciding whether the appearance of a child's eye or eyes has been influenced by TEM, the history is important. Keep in mind the fact that the mother may be very reluctant to admit that TEM has been used. She will realise that the community health worker will generally not approve the use of TEM.

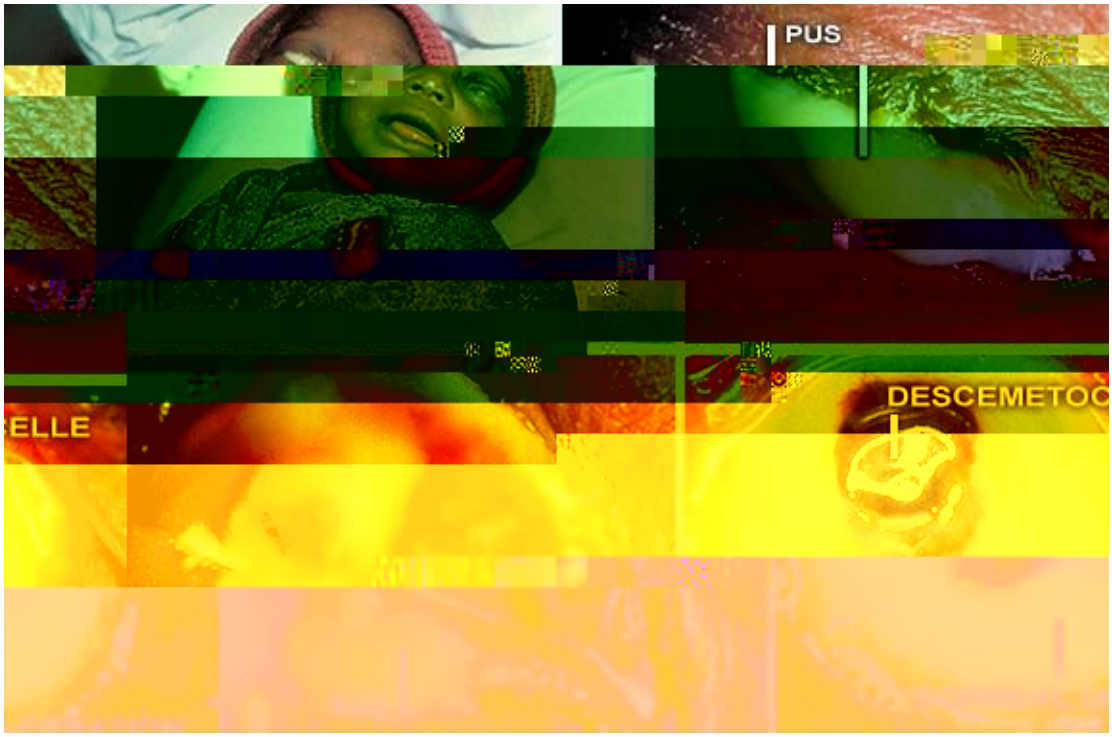
Traditional healers use a variety of substances in treating the eyes. They may use herbal medicines, the juice of squeezed plant leaves, lime juice, kerosene, toothpaste, breast milk and urine (either animal or human). Not all substances are harmful, but some may cause a chemical or caustic keratoconjunctivitis, others may introduce infection, such as bacterial infection with *Neisseria gonorrhoeae* from human urine, or fungi from plant materials.

An unusual appearance of an eye which does not seem to have a typical clinical appearance, together with an accurate history, if this is given or admitted, will help make the diagnosis.

The little boy photographed top left has been treated with a red staining substance, which is made from ground down red rock (stone). Traditional eye medicines have caused dramatic chemosis (inflammatory swelling of the conjunctiva) of each eye in

the child shown top right and one fears for the state of the cornea in each eye. The picture bottom left shows a cornea which is thinned and Descemet's membrane, the inner layer of the cornea, is bulging forward (Descemetocele) - there is a real danger of perforation. In the picture bottom right traditional eye medicines have contributed to the corneal scarring which may have been present before a traditional form of treatment was used.

Treatment is not easy and depends on the findings. Give topical medication with an antibiotic. A child with an eye condition made worse by TEM should be referred immediately to the eye specialist.



Conjunctivitis of the newborn (ophthalmia neonatorum) is a very serious problem in many parts of the developing world. Infection of the child's eye in the mother's birth canal at the time of birth will present first as a conjunctivitis. The great danger to sight is infection which involves the cornea. As the condition usually affects both eyes, the tragedy of an otherwise healthy child becoming blind must be avoided.

By definition, conjunctivitis of the newborn occurs in a child within the first 30 days of life. Two organisms commonly cause conjunctivitis of the newborn.

Neisseria gonorrhoeae causes bilateral purulent conjunctivitis with considerable discharge which may accumulate behind tense and swollen eyelids. This condition usually presents in the early days of life and corneal involvement can progress to ulceration and perforation. Severe corneal scarring may cause blindness. The picture top left shows a newborn child with purulent gonococcal conjunctivitis affecting both eyes. A close-up view of one eye in the same child (top right) shows pus squeezing between tense eyelids. The picture bottom left reveals inflamed conjunctivae with purulent discharge. This is an eye emergency and treatment must begin immediately. Failure to prevent this condition or treat the infection quickly can result in the tragedy of the eye shown bottom right, where the cornea is severely infected and will later be grossly scarred. When examining a child with this infection be careful when opening the tense eyelids as pus may spurt into your own eye! However, it is necessary to see the condition of the cornea and, also, to instil antibiotics so that they come into direct contact with the cornea and conjunctiva. Wash your hands thoroughly afterwards.

Chlamydia trachomatis is the other organism which may commonly affect the eyes of a newborn child. In a similar way infection occurs in the mother's birth canal. In these children the infection has a less dramatic presentation, causing irritable, red eyes but without purulent discharge, unless secondary bacterial infection has complicated the picture. Usually the infection presents later than gonococcal infection and some of these children may not be brought to the clinic.

The clinical picture of newborn conjunctivitis may be confused if a child is given traditional eye medicines (TEM) by a local healer.

Infection with these organisms is not confined only to the eyes but can involve the other systems of the body, so treatment requires systemic therapy as well as topical eye medication.

Other bacteria which may cause newborn conjunctivitis are *Haemophilus, Streptococcus pneumoniae, Staphylococcus* and *Pseudomonas.*

We have already discussed treatment of different types of corneal ulcers. But we should consider our general approach to examination and treatment of a child presenting with a corneal ulcer.

general appearance.
Is the child malnourished?
Does the child have measles?
Is there any evidence of respiratory infection or gastro-enteritis?
Examine the eyes carefully using a focal light and magnification. Note the appearance of the ulcer or ulcers and of any discharge.
Is the condition affecting one or both eyes?
Corneal ulceration in children:
Is there dryness of the eyes - or Bitot's spots?
Is there discharge of pus? (This will indicate bacterial or fungal infection)
Is there pus in the anterior chamber of the eye (hypopyon)?
Is there watering only? (This occurs with viral infection and after injury).
Is there a typical dendritic figure of herpes simplex keratitis or a possible herpetic

traditional eye medicine, and the whole eye is beginning to become smaller in size (phthisis). We must try to prevent this development of a blind, shrunken eye, by early diagnosis and early referral to the specialist for prompt and expert treatment.

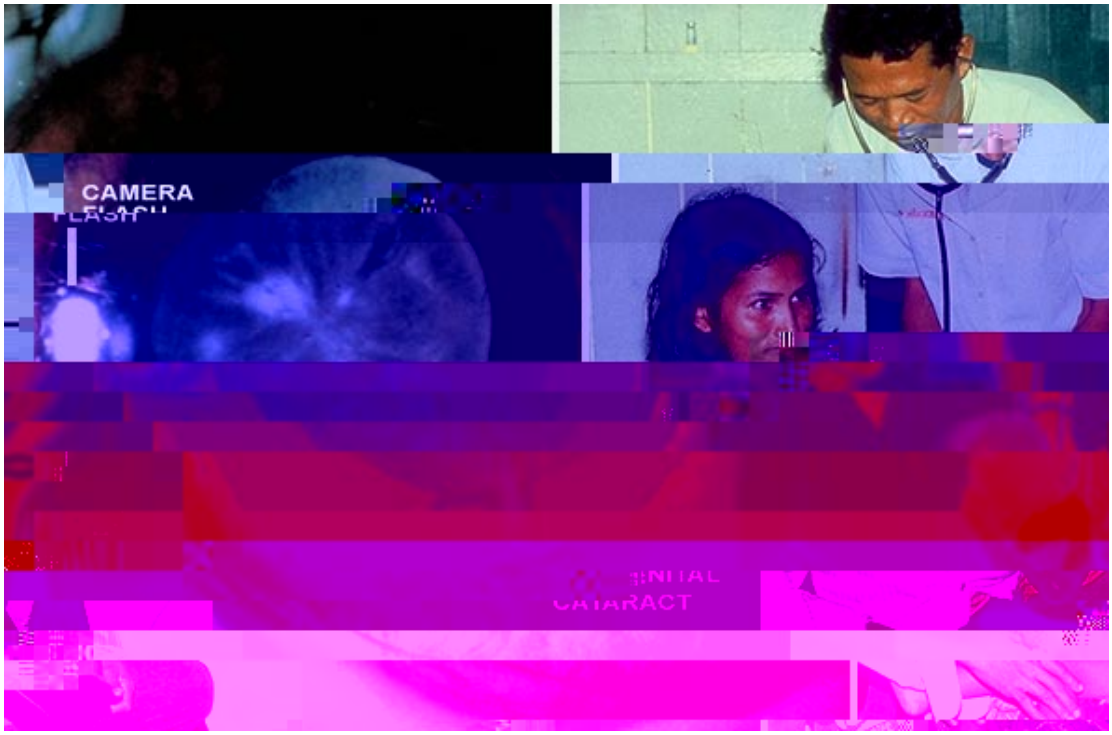

CORNEAL SCAR

All the conditions dealt with so far cause loss of vision due to corneal scarring, and we have seen that many of them are preventable, or can be treated, to limit the amount of corneal damage.

The conditions that will be described in the following slides are usually not preventable, but it is important that they are recognised, as treatment given at the right time can help restore or maintain vision. These conditions include congenital cataract, glaucoma, retinoblastoma, retinopathy of prematurity and eye injuries.

A cataract is an opacity of the lens of the eye. A child born with lens opacity has congenital cataract. Look at the photograph of the child on the left. The centre of each eye, the pupil, is dark. This is the normal appearance. Now compare with the child on the right. The pupil area in each eye is densely white and opaque. These are cataracts and since both eyes are involved and the cataracts are dense, vision will be affected.

Cataract is the commonest cause of blindness in the world amongst adults. Cataracts in babies and small children differ in two major respects from those in adults; firstly, in why they develop and, secondly, in how they are managed.



There are a number of different causes of cataract presenting in newborn children. Genetic factors we have mentioned previously. Since the condition is an inherited one, brothers and sisters may also be born with cataract. If there is a family history of cataracts, the parents need to be told of the risks of future children being affected, so that they can make the decision whether or not to have any more children.

We have also referred to infections affecting the mother in the early months of pregnancy resulting in her child having cataract. Rubella is the most common cause. Chickenpox and toxoplasmosis (infection with *Toxoplasma gondii*) in the mother may also cause cataract in the unborn child. Other causes include metabolic disorders, where certain substances, necessary for normal biochemical functions, are deficient. Down's syndrome, also known as mongolism, may be associated with congenital cataract.

The mother of the child, whose congenital cataract is shown in the picture on the left, had rubella during the first 4 months of pregnancy. Notice that this cataract is dense and centrally placed. Children with the Congenital Rubella Syndrome may also have other congenital defects such as small eyes (microphthalmos), glaucoma, deafness, heart abnormalities, and defective growth and mental development.

Cataracts caused by congenital rubella can be prevented by immunisation. At present there are two different approaches to this problem; vaccination of all babies in infancy at the time of immunisation against measles (MMR - mumps, measles and rubella), and vaccination of young girls at puberty. The aim of both programmes is to prevent women from contracting rubella when they are pregnant, so preventing congenital cataract from this cause.

8. Remember that the mother and father will be distressed that their new baby is not entirely healthy. Gently explain the reasons for your enquiries and that you want to provide the best possible care for the infant.
9. The treatment of congenital cataract is surgical.

focused again as quickly as possible so that normal vision can develop. (Aphakia is the situation where the lens has been removed from the eye).

Three methods have been used to provide optical correction after congenital cataract surgery.

Aphakic spectacles should be prescribed for the child who has had surgery for cataract in both eyes. A young child will often accept the spectacles quite well. The picture (bottom left) shows a child wearing aphakic spectacles.

It is necessary to carry out a refraction every 6 months and keep the child in the best spectacles possible. It is advisable to overcorrect distance refraction by one to 2 dioptres to encourage the use of near vision in the child. Often high plus dioptre lenses are needed in a small baby.

Other methods used to correct aphakia are:

Contact lenses - these are difficult to fit, expensive and are often lost. (They may have a place in uniocular aphakia).

Intraocular lens implants - intraocular lenses, which are being increasingly used for adults, are also being used in more advanced centres for the care of children with cataract. For technical and optical reasons their use is not recommended for small babies.

Glaucoma is a condition which affects adults much more often than children. In glaucoma there is damage to the optic nerve of the eye, which leads to gradual loss of the peripheral field of vision and sometimes blindness. The damage is usually associated with an abnormally high pressure inside the eye.

In children glaucoma can either be present at birth, or it can develop during childhood. It can affect one or both eyes. A child's eyes are formed by tissues that are more elastic, when compared with an adult's eye, and so they can stretch. This is what happens in childhood glaucoma. As the pressure inside the eye rises, the tissues stretch, and the eye enlarges. This is why the condition is known as buphthalmos or ox eye.

The condition may be painful, and the child can be distressed. Loss of vision may be obvious. Light often makes the eyes more uncomfortable, and the child will try to avoid bright light (photophobia). The eyes may be watery, but there is no discharge

Surgery is required to control the intraocular pressure and is effective by allowing aqueous fluid to drain more freely from the eye. This child had a surgical drainage procedure to control the intraocular pressure in the left eye.

The Glaucomas are discussed in a separate Teaching Set in this series (No. 5).

The most significant influence on successful treatment is recognition of the tumour while it is still contained within the eye, followed by immediate referral to a specialist.

In most eye centres in developing countries the correct treatment is surgical removal of the eye (enucleation) taking as much of the attached optic nerve as possible.

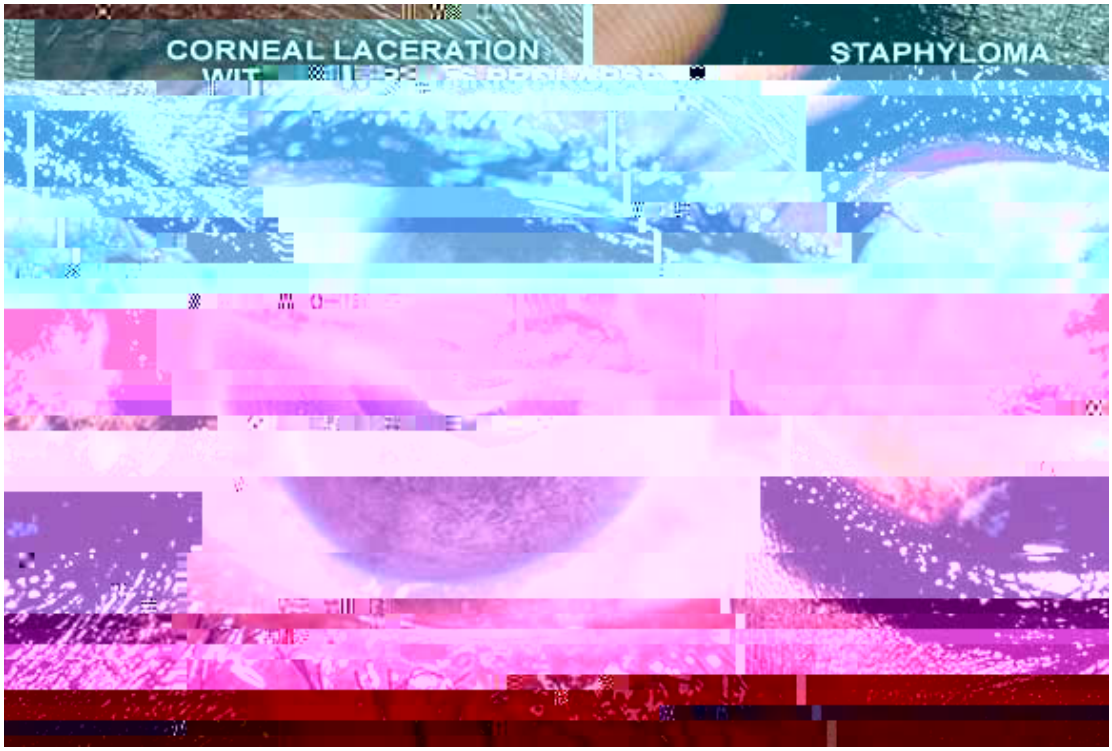
Some centres have the facilities to provide radiotherapy and chemotherapy for these children, as well as the necessary surgical expertise. Early recognition and referral to an advanced specialist centre, which has the equipment and drugs available to give appropriate treatment, may allow up to 90% of children to survive.

Retinopathy of prematurity (ROP) is a potentially blinding disease which primarily

To identify babies with ROP needing treatment, the first examination should be 6-7 weeks after birth. All babies weighing less than 1,500 gms, or born before 32 weeks gestation, should be included in the screening programme, which is probably best organised by the neonatologist or nurse in charge of the unit. The pupils need to be dilated with phenylephrine 1% and tropicamide 0.5%, and the retina examined using an indirect ophthalmoscope, with scleral depression so that the retinal periphery can be adequately examined.

Eyes with Stage 3 disease (fibrovascular proliferation) with ‘plus’ disease (dilation of the retinal and iris blood vessels, with vitreous haze) should be treated straight away with either gentle cryotherapy or laser to the avascular, retinal periphery. The picture bottom left shows Stage 3 ‘plus’ disease with extensive fibrovascular proliferation (new vessels), and dilated, tortuous retinal blood vessels. A baby with Stage 3 ‘plus’ disease (bottom right) is being given gentle cryotherapy to the avascular retinal periphery under general anaesthetic.

The infants need to be followed up to ensure that the disease is regressing, and to see whether they are developing refractive errors, or strabismus, which are more common in premature babies.



Injuries to the eye can be caused in many ways and by a variety of objects.

Superficial injuries may heal without loss of sight. If a wound of the cornea is no deeper than the corneal epithelium healing will usually take place without scarring.

A general subdivision of ocular injury is:

1. Penetrating injury
2. Blunt injury

Penetrating injury. Injury with a sharp object, for example, a thorn, a knife, a needle, or a foreign body travelling at speed, may cause considerable damage to the eye. Damage in the line of the visual axis will have some effect on vision. Examples of injuries which may result in loss of vision are: a central laceration of the cornea, the development of traumatic cataract, haemorrhage into the vitreous and disturbance of the central retina. There is also the danger of infection being introduced into the eye by a penetrating injury. The picture on the left shows a horizontal laceration of the cornea with prolapse of iris through the wound.

Foreign bodies may be superficial (on the surface of the eye) or deep (in the cornea, or inside the eye). Superficial foreign bodies can often be removed under local anaesthesia, and then treatedenetratTc 0bteerIoeer5(ss 786 unlocal)]TJ0c17 the duceIi(.279 Tedw.00r

previous injury to this eye has caused severe damage to the eye with areas of scleral thinning and bulging, showing the dark choroid beneath (scleral staphylomata).

In the case of acute injury to the eye, take an accurate history, record the vision in each eye, examine carefully and make exact notes. Give a topical antibiotic and then apply an eye pad making sure that the eyelids are closed under the eye pad. With a penetrating eye injury an eye shield should be placed over the eye, for example, a Cartella shield. If a commercially made shield is not available then old x-ray film, or card, cut and shaped to make a cone, can temporarily shield the eye and orbit.

An eye injury where vision is reduced requires referral to the eye specialist. Any uncertainty in diagnosis, or prognosis, should also mean referral of the patient for expert advice and treatment.