

SOME ASPECTS OF PREVENTIVE PAEDIATRICS *

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In England throughout this century preventive medicine in its broadest sense has been the responsibility of doctors known as Medical Officers of Health, who are employed either by the Central Government in London, or more locally by the County, City or Town Councils. They are not concerned with the care of individual patients, but deal with such broad problems as the inspection of food, drainage and sanitation, and the control of epidemic diseases, and are responsible for the organisation of such services as the antenatal clinics, infant welfare centres, and the medical inspection of school children.

If we turn now to all those branches of medicine that are concerned with the health of individual patients and the detection of disease, it is true to say that the scope for preventive medicine is greatest during the years of infancy and childhood, and paediatricians can fairly claim to have played a large part in the prevention of disease at this particular age period. Lest however we should allow ourselves to indulge in any sense of self-praise, let me add at once that there remains much to accomplish. Nevertheless it is possible to gather some idea of what has been achieved by a contemplation of mortality rates in childhood, and such a study may be equally applied to any country that maintains a central register of births and deaths. Thus in England at the beginning of this century, of every 1000 children born alive, 120 died within their first year. Fifty years later, the figure of 120 had steadily dropped to 45. This decline had in the main been due to prevention of illnesses after the neonatal period, that is in children between 1 and 12 months of age. It has proved much more difficult to lower the death rate in infants under one month of age, i. e. the neonatal mortality rate, and this is not surprising for such disorders as severe congenital deformities and the extreme degrees of prematurity will always carry a high mortality and account for an irreducible minimum of deaths in the early days of life, but even so at the beginning of the century of every 1000 infants born alive 40 died within the first month, and now fifty years later that figure of 40 has dropped to 20.

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Let us now consider some of the factors that play a part in the prevention of disease in children. Premature infants, and infants during their first month, present such special problems that attention must first be directed to them.

Prematurity. If the cause of premature birth were more completely understood, prevention of prematurity might be more hopefully undertaken with a consequent reduction in the neonatal mortality rate. Maternal toxæmia of pregnancy, twins, placenta prævia and congenital malformations account for some, but the cause in at least half the cases is not properly understood. It has however been shown that the rate of premature births increases as the social scale declines. It is probable that a wider knowledge of birth control with consequently better spacing of pregnancies would do something to lessen the chance of prematurity, but probably much importance is to be attached to raising the standard of living coupled with a better knowledge of how to live; any steps that will improve the health of women, better dwelling houses with less overcrowding, and, probably of greatest importance, a well constituted diet before as well as during pregnancy are targets to be aimed at, but towards which any country can move but slowly.

Then when the premature infant is born, little is likely to be achieved unless the doctor and the midwife have a sound knowledge of the special needs of premature infants, and this at once takes us back to the medical and nursing schools where the teachers themselves must be well versed in these matters and the medical student and the nurse in training must be given the opportunity of seeing for themselves how the requirements of the premature infant should be met. The three main essentials for the premature infant are: first, the maintenance of warmth; second, care of the diet; third, the prevention of infection to which prematures are so very prone. There is no space in this lecture to develop these aspects, but I think it is now widely accepted that early feeding of a premature infant increases the risk of choking and consequent inhalation pneumonia, and it is better to defer the first feed for a day or two until the infant begins to exhibit evidence of hunger. There is also no doubt that a supply of breast milk is invaluable and in many countries the establishment at maternity hospitals of breast-milk banks has proved of great value. Here the mother who can produce more milk than her own infant needs is encouraged to do so, the milk is stored often by being frozen, and is then available at small cost for those delicate and premature infants who might otherwise have to be reared on some less suitable substitute. It is essential

that all who have handling of premature infants should be trained in aseptic methods, themselves be healthy without skin disorders or respiratory infections, and should be encouraged to wear gown and mask when actually dealing with the infant.

Before leaving the premature infant a word must be said about retrolental fibroplasia. This disorder mainly affects premature infants, the first changes consisting of tortuosity of the retinal vessels and retinal oedema, and in severe cases progressing to retinal detachment, the formation of an opaque retrolental mass, and eventual blindness. Although only recognised during the last six or seven years, it has naturally created a great deal of concern. There is increasing support for the view that it is attributable to the use of high oxygen tensions in the care of prematures, coupled with a too rapid removal from high to normal oxygen atmospheres. It has certainly come to the fore since paediatricians have interested themselves so closely in the care of premature infants, and there is regrettable ground for regarding it as a paediatrician-induced disorder. In centres and countries where oxygen is not used for the care of these infants, retrolental fibroplasia does not occur. We understand that it can be prevented by using oxygen only when strictly indicated, and then maintaining the oxygen tension not above 40%, and, when the time comes to discontinue oxygen, to do so very gradually.

Let us now briefly consider measures that may prevent disease in the full term newborn infant.

We have become well aware that certain infections of the mother during pregnancy may cross the placenta and damage the developing foetus. German measles - or rubella - is one such infection. Infection of the mother in the second and third month of pregnancy may present her later on with a child suffering from congenital cataract, congenital cardiac disease, or mental defect. Although there is no direct means of preventing this calamity, clearly there is every advantage in girls having German measles during their childhood, and perhaps therefore we should not be too zealous in attempting to prevent the spread of this infection among school children. The only other method of prevention at present available would be to empty the uterus, and hope that another and more successful pregnancy will later ensue. In my country, however, to do this would be to contravene the law, and as I am ignorant of the laws in Turkey that govern the artificial termination of pregnancy, I must not recommend this procedure to you. All I can say is that the law, after a suitable lag period, should conform to modern discoveries, and it may be that at some future date the law in this respect may be modernised.

Syphilis is of course another and very important neonatal infection which is preventable. Fortunately the spirochaete of syphilis is susceptible to penicillin, and a routine Wassermann Reaction in pregnant women will bring this infection to light, and energetic treatment with penicillin will protect the foetus. It is considered advisable to give the mother another course of treatment in each successive pregnancy.

Then there is the condition of Rhesus incompatibility, which accounts for the three clinical entities known as hydrops foetalis (usually fatal), icterus gravis neonatorum, and congenital haemolytic anaemia. We must all be concerned over these infants who, suffering from icterus gravis neonatorum, eventually survive, but produce such evidence of cerebral damage as mental defect or spastic paralysis, deafness or convulsions, due to injury to the nuclear masses in the brain, and spoken of as kernicterus. We now know enough of this disease to realise that prompt diagnosis literally at the time of birth by such means as the Coombs test on the infant's blood and an estimate of the severity of the condition by determination of the haemoglobin level in the blood from the umbilical cord is required if immediate and efficient treatment by means of an exchange-transfusion through the umbilical vein is to be carried out. This will save many of these infants from cerebral damage. We also have the means of warning ourselves that this emergency may arise at the time of birth and this consists of determining the presence or absence of the rhesus factor in all pregnant women; and those who are rhesus negative should have their blood examined from the 32nd week of pregnancy onwards for the presence of an increasing titre of rhesus agglutinins. It does of course become necessary that when such warnings is obtained, whatever previous arrangements the mother may have made for her confinement, she should be delivered in an obstetric centre where the necessary equipment and skilled personnel are available to carry out the technique of exchange-transfusion on the newborn infant. This is preventive paediatrics of a high order, and is by no means sufficiently carried out in my own country, although steps are being taken to arrange this on a nation-wide basis.

Rhesus incompatibility occurs in about 1 in 200 pregnancies, and it is therefore a simple matter for health authorities to gauge how efficient the medical profession is in recognising this condition, and in taking steps to prevent it.

Septic infections in the newborn account for far too many deaths in the first month of life, and, just as in premature infants, it is a preventable state of affairs, if those who have charge of the newborn observe correct personal hygiene, and are without skin or respiratory

infection. It is usual in England for the nursing staff of a maternity ward or babies ward to wear face masks and gowns when dealing with these small patients. One difficulty about neonatal sepsis is the failure on the part of doctors to realise how easily simple infections such as a discharging umbilicus or sticky eyes may be the starting point for a fatal septicaemia, because the clinical picture of septicaemia in the neonate is so different from that seen in adults. The infant with a positive blood culture may show at first simply a reluctance to feed and some looseness of the motions, becoming increasingly apathetic, grey in colour, and later showing a haemorrhagic tendency. The temperature throughout may be subnormal. Unless one keeps this clinical picture in mind it is easy to overlook a dangerous septic infection in the newborn. As a rule the infecting organism is the staphylococcus, susceptible to penicillin or aureomycin, the next most common organism at that age being the *Bacillus coli*, susceptible to streptomycin.

For many years particular steps have been taken to protect the newborn against ophthalmia, especially gonococcal ophthalmia, this being an important cause of blindness. The gonococcus is very susceptible to penicillin, and this discovery has led, at any rate in England, to abandoning Credé's method of prevention which was effected by the instillation into the eyes of the newborn child of one or two drops of either a silver nitrate solution or the silver preparation called Protargol. Such treatment is now omitted, and nothing is done unless, and until, evidence of conjunctival infection arises. This is then promptly treated by the instillation of a drop of penicillin every five minutes until the discharge has ceased - this may take from six to thirty instillations. Instillations continue at half hourly intervals for six hours, and then hourly intervals for twenty-four hours.

So much for the premature and the newborn infant. We may now consider further aspects of prevention under the headings of Diet, Immunisation, Drugs and Early Diagnosis.

Diet. One reason that is always advanced in support of breast feeding is that the breast fed infant shows a lower morbidity and a lower mortality than the artificially reared infant. In these days when the subject of artificial feeding has undergone such intense study, and when the sulphonamides and antibiotics are at hand to counter infection, it is increasingly difficult to obtain figures in support of my statement about breast feeding - indeed I understand that in New York City few women undertake breast feeding for much more than a week, and yet the neonatal mortality there is not noticeably high.

Even so I believe that breast feeding has the advantage indicated above and traditionally given to it, although to prove it at the present day might well require statistical enquiry in some primitive land such as among the negro African tribes. I hope you will allow me to include the encouragement of breast feeding as one of the paediatrician's weapons on behalf of preventive medicine

Of the three main components of food, namely fat, carbohydrate and protein, there is ample evidence that certain amino acids obtained of course only from protein are necessary for the growing child, and this has recently received remarkable corroboration from studies of kwashiorkor - a nutritional disorder of young children widespread throughout the tropics. These children after weaning begin to waste, develop gross abdominal distension with enlargement of the liver, may become depigmented, and if they live long enough become the subjects of cirrhosis of the liver. There is ample evidence that this disorder is due to protein deprivation, and is corrected by supplying protein, usually in the form of skimmed milk. We may, therefore, conclude that for the growing child we must ensure an adequate supply of protein, and by doing so we shall prevent malnutrition and failure to thrive.

We are all aware that disease is easily conveyed through infected milk, particularly bovine tuberculosis, but also such other infections as the haemolytic streptococcus, diphtheria and abortus infection or Malta Fever. Insistence on a sterile milk supply, and the education of mothers in the sterilisation of milk in the home offers another important field for preventive paediatrics. At last in England bovine tuberculosis has virtually disappeared because of such measures. I am glad to tell you that it is no longer permissible to sell raw unsterilised milk in England unless it is derived from tuberculosis free herds of cattle.

Lastly under the heading of diet we may include the prevention of those diseases that are due to a lack of vitamins. Both rickets and scurvy in England have become rare diseases. Rickets we prevent by giving to each child, from a month old, a supplement of 800 international units of vitamin D daily in the form of Cod Liver Oil, or one of the vitamin D concentrates, while all the dried cows milk sold in England for the artificial feeding of infants is also fortified by the addition of vitamin D. The public have also been educated to the need for preventing scurvy by giving to all young children from a month old upwards, a daily dose of vitamin C usually in the form of fresh orange juice, beginning with a teaspoonful and increasing to the juice

of a whole orange at 6 months of age, or if this is not tolerated, by giving the pure vitamin, i. e. ascorbic acid, in tablet form daily. Other vitamin deficiency diseases such as xerophthalmia due to lack of vitamin A, and beri-beri and pellagra both due to lack of different components of the vitamin B complex are in any case rarities in England and no particular steps are taken to prevent them, but in countries where they are more common they should be as easily preventable as rickets and scurvy have proved to be in England. It is, I hope, clear that the subject of diet in childhood offers plenty of scope for preventive paediatrics.

Immunisation. I am sure I do not need to elaborate on the value of vaccination with cowpox in order to prevent smallpox, for since its efficiency was first demonstrated by Jenner in England, it has become a world wide practice. For many years vaccination against smallpox was compulsory in England, although parents could refuse to have their children vaccinated on conscientious grounds. Since the war it is no longer compulsory, with the interesting result that the numbers vaccinated have shown a slight rise—a good demonstration of the value we put upon the freedom of the individual.

I am also sure that I need not dwell for long on the great success of immunising injections with Diphtheria toxoid in the prevention of that horrible disease. In all countries where immunisation against diphtheria is widely practised that disease has virtually disappeared. It is generally considered that the best age for the first immunisation is between six and nine months, with a boosting dose given at about 5 years when schooling begins.

For many years attempts have been made to protect children against whooping cough, for this is one of the more serious of the infectious illnesses of childhood, and recently the Medical Research Council in England have reported favourably on the use of whooping cough vaccine. The vaccine has to be prepared from *Haemophilus pertussis* in its smooth cultural phase, and large doses of the order of 20,000 million organisms per ml. have to be used. Even so the vaccine does not confer such reliable immunity as does immunisation against diphtheria but the disease if it occurs is sufficiently modified as to render it relatively harmless. Immunity takes about two months to develop and therefore the vaccine is of little use for children who have already been exposed to infection, and it is valueless as a means of treating the disease once it has started. Unlike diphtheria, which is rare under 9 months of age, whooping cough can affect quite young infants, and

the ideal time to start the vaccine is therefore about a month after birth.

In some countries, notably America, it is also customary to protect children against Tetanus by injections of Tetanus Toxoid, and the value of this was well demonstrated when given to the troops in the last war. At present in England immunisation of children against tetanus is carried out only on a very small scale, but a triple vaccine which combines immunisation against diphtheria, whooping cough and tetanus is now available, and is gaining popularity. There is some difference of opinion as to what is precisely the best age to give this triple vaccine, but at about 3 months is probably the right answer. Perhaps I should remind you that tetanus toxoid, unlike tetanus anti-toxin which is used in the treatment of tetanus, is not prepared from animal serum, and therefore its use does not entail the risk of anaphylaxis at a later date.

I do not propose to dwell on immunisation against typhoid fever, yellow fever and other tropical infections as these concern adults as much as children, but my lecture would be incomplete if I omitted mention of B. C. G. vaccination against tuberculosis. The value of this vaccine in affording some degree of immunity is now generally recognised, although it offers by no means such a complete immunity as for instance that conferred against diphtheria. The vaccine has to be most carefully prepared as the organisms in it are alive although their virulence is much reduced. When originally introduced by the Frenchman Calmette it was given to newborn infants by mouth, but it is now usually given either by multiple skin puncture through the vaccine, or by intracutaneous injection. A primary tuberculous focus develops at the site of inoculation, and the regional lymphatic glands draining the area become enlarged and may break down into a tuberculous abscess. A small circular scar remains as a legacy at the point of inoculation.

During infancy and childhood B. C. G. vaccine is usually reserved for those who are at risk of exposure to infection. Before they receive the vaccine they must be shown to be negative to tuberculin skin tests, and ideally they should be removed at once from any further risk of infection, and inoculation with vaccine should be delayed for six weeks, and at the end of that time the skin test should still be negative. If it has changed to positive, the child has already been infected, and the vaccine would, therefore, be contraindicated. Six weeks after the inoculation, the child should again be skin tested, a positive test indicating that the inoculation has resulted in a primary infection. It must be made clear that B. C. G. vaccine is no substitute for unremitt-

ting attention to hygiene and the general measures taken to prevent tuberculosis. England has been very tardy in employing B. C. G.; it is given to all children known to be at risk of infection; also to children who at school leaving age are found to be tuberculin negative (this applies to London); and to adults who being skin test negative are known to run special risks, such as nurses and medicals students. In Norway, France and Yugoslavia vaccination of tuberculin negative persons is now compulsory.

Drugs. Drugs play but a small part in preventive paediatrics, but mention must be made of the use of either sulphonamides or oral penicillin in the prevention of acute rheumatic infection. The use of these preparations is based on the knowledge that acute rheumatic arthritis and more important, rheumatic carditis follows as a complication in susceptible individuals after an acute haemolytic streptococcal infection, which is usually situated in the throat. If haemolytic streptococcal infection could be prevented, the risk of an ensuing attack of rheumatic infection would be removed. Yet only a small proportion of children who have this streptococcal infection go on to a rheumatic attack, and therefore the prevention of streptococcal infection in all children by means of drug-taking is not a practical or desirable policy. But once a child has had an attack of acute rheumatism, further attacks may be prevented by this means. One gram daily of sulphonamide, or 150,000 units of penicillin by mouth appears to be sufficient, but protection is only afforded so long as these preparations are in use - within a few days of their cessation the child is at risk again. It is a matter of opinion whether these preparations should be given to a rheumatic child year in and year out or whether they should only be used in the winter months when streptococcal infection is more likely. My personal opinion is that if they are to be used at all, they should be employed throughout the year, and should continue throughout childhood until the age of puberty, when in any case the likelihood of further attacks of acute rheumatism sharply declines.

Early Diagnosis. To the paediatrician engaged in clinical work, early diagnosis, although not actually preventing disease, may, by enabling the child to have treatment promptly, lead to the avoidance of much crippling and invalidism. In this respect early diagnosis may fairly be regarded to some extent as a preventive measure. For instance congenital dislocation of the hip, if diagnosed in the newborn and treated at that age, gives much better and quicker results than when the diagnosis is delayed until the child shows by his defective gait that something is amiss. This deformity is all too often forgotten in the examination of the newborn, but that is the very age when

the diagnosis ought to be made. The same is also true of the various types of talipes, which again should come under treatment during the neonatal period. Congenital scoliosis is yet another such condition. The prognosis of cretinism also depends very much on early diagnosis as well as on efficient and sustained treatment. Diagnosis of this condition should ideally be made not later than the third or fourth month. These few examples lend support to the contention that early diagnosis may be regarded as one facet of preventive paediatrics.

Prevention of Maladjustment. So far in this lecture I have dealt with physical disease, but there is an awakening conscience in civilised countries as to the need for safeguarding a child's emotional balance. The maladjusted child is one who is mentally normal, but whose emotional life is so disturbed that he is unable to behave like a normal child. Some may be aggressive, cruel or spiteful; others may be unnaturally tranquil or gravely handicapped in their education. This is much too large a subject to develop in this lecture, but it is one that comes well within the province of the paediatrician. Occasionally the source of the disturbance may be in the child's school or in his relations with his young friends, but in the great majority the fault lies in the child's own home and the lack of wise parenthood. Methods of prevention cover a very wide range, but they are mainly concerned with the improvement of home life. Thus talks on mothercraft and parentcraft can start in the top classes of schools, and be continued through such agencies as boy's and girl's clubs, boy scouts and girl guides. Young parents often ask their doctor for advice about the upbringing and training of the children, and I fear that all too often the doctor has no very clear ideas on the subject, and is often too busy to be able to give the parents the help they need and are asking for, and this is a great pity, and means the missing of a great opportunity. No paediatrician should ever allow himself to be too busy to advise young parents, and must also allow himself enough time to think before he speaks.

Other agencies are often blamed for maladjustment in children, such as unsuitable books and childrens' papers and the cinema also comes in for a lot of blame, but although these may certainly exert an adverse influence, they will create little harm in the child who has a happy home life—it is the child's home on which preventive measures must mainly concentrate.

There are many other aspects of preventive paediatrics that time forbids me from discussing. For instance surely there is much to be done in the wide fields of education of adults as well as children if we wish to reduce the truly appalling risk that children have to face

from street accidents, and from burns, scalds and swallowing poisons in their home. Nor have I been able to mention the part that a greater knowledge of eugenics might play in the control of such diseases as diabetes and epilepsy, but at all events I think we can all agree that childhood offers the best opportunity for preventing a great deal of physical and psychological illness, and it is a challenge to paediatricians, because they are in the position of front line troops in this magnificent cause.