

CLINICAL NOTE

Clinical measles in an African mine community

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THE COURSE OF MEASLES (morbili) in developing nations and pre-industrial societies differs from measles in modern industrial nations. Measles is a severe and often fatal disease in Africa just as it was in Europe during the nineteenth century when socio-economic factors and the poor nutritional status of the very young were associated with high mortality. African rural populations experience epidemics at longer intervals although urbanization and improved communications may at times influence the incidence and severity of epidemic disease. Extended African families live in 'compounds' or groups of huts where mothers transport infants on their backs, a custom which allows early exposure to disease when families intermingle.

Shabani Mine Hospital serves a large mining community consisting of families living in mine villages where housing, water supplies and sewage are controlled. Emphasis is placed on maintaining these families in units with educational and recreational facilities provided by mine authorities. However, only legally registered wives and their children reside in these villages, although the African custom of maintaining linear families continues. As a result, the legal wife and children live on the mine while another wife (or wives) and children may reside with relations 'at home' in a tribal area, a custom which facilitates the spread of disease.

In 1965 compulsory food rations were discontinued at the request of the mine workers who preferred a salary increase, otherwise social and economic factors in villages changed little between 1962 and 1969.

Hospital records are thought to reflect the incidence of clinical measles at mine villages since all cases which occurred amongst registered dependants had been admitted to hospital for many years (figure I).

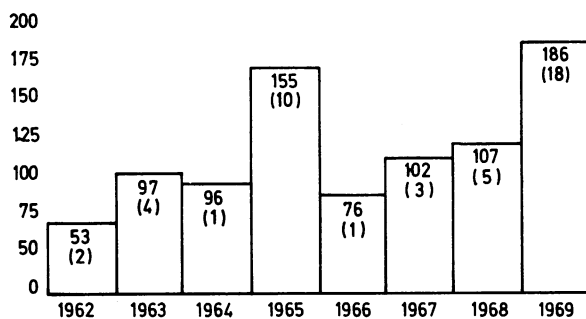


Figure I

MEASLES CASES ADMITTED TO HOSPITAL FROM MINE VILLAGES
1962-69. (Deaths in brackets)

From June to December 1969 there was an increase in clinically diagnosed cases at the Mine Hospital, Shabani, which were thought to be part of an epidemic in nearby tribal and rural areas. As a result measures were taken for: (1) classification of admissions; (2) treatment; (3) prevention and control at mine villages.

TABLE
CLINICALLY CONFIRMED CASES

| Date | Numbers admitted | Cases | 'Complications' | Age | | Deaths | Age | |
|----------------------|------------------|-------|--|--|--|--------|-----------------------|--------------|
| | | | | yrs | mths | | yrs | mths |
| 1969 Jan.— May | 5 | | Nil | | | | | |
| June | 4 | (2) | Tracheobronchitis Laryngotracheobronchitis | 7 2 | 6 | | Nil | |
| July | 8 | (2) | Tracheobronchitis | 1 | 6 | | Nil | |
| Aug. | 16 | (4) | Tracheitis, sore mouth Diarrhoea, PCM, epistaxis, xerophthalmia Respiratory infection, whooping cough Bronchopneumonia | 1 2 1 | 6 9 6 6 | (1) | 1 | 6 |
| Sept. | 22 | (8) | Bronchopneumonia Exfoliative skin lesions, sore mouth, tracheitis Pneumonitis, bronchopneumonia, encephalomyelitis Convulsions, encephalitis Sore mouth, tracheitis PCM, tracheobronchitis, enterocolitis Laryngotracheobronchitis, enterocolitis Bronchopneumonia, whooping cough | 4 6 2 1 1 2 10 | 9 7 | (2) | 10 6 | |
| Oct. | 59 | (16) | PCM, enterocolitis, tracheobronchitis Laryngotracheobronchitis Exfoliative skin lesions, sore mouth, tracheitis, PCM Encephalitis, hyperpyrexia Exfoliative skin lesions, bronchopneumonia, PCM Dehydration, shock, PCM Bronchopneumonia Xerophthalmia, laryngotracheobronchitis Marasmus shock, (moribund on admission) Encephalitis Sore mouth, skin lesions, PCM Laryngotracheobronchitis Exfoliative skin lesions, PCM, bronchopneumonia, whooping cough Exfoliative skin lesions, laryngotracheobronchitis, PCM Exfoliative skin lesions, PCM, laryngotracheobronchitis Exfoliative skin lesions, PCM, tracheitis, enterocolitis | 1 2 1 2 2 4 1 1 1 1 2 9 1 3 1 2 | 7 6 6 6 6 6 | (4) | 2 1 1 1 6 | |
| Nov. | 40 | (16) | Multiple exfoliative skin lesions, cancrum oris, PCM Gastro-enteritis Pneumonitis Acute conjunctivitis, bronchopneumonia, PCM Bronchopneumonia PCM, exfoliative skin lesions, keratitis, bronchopneumonia Laryngotracheobronchitis, PCM, xerophthalmia | 1 3 1 2 5 | 9 11 | (6) | 6 2 1 1 1 | 11 6 9 |

| | | | | | | | |
|--------------|-----|------|--|---|----|------|-----------------|
| | | | Encephalitis, tracheobronchitis, corneal ulceration | 3 | | | |
| | | | PCM, dehydration, shock | | 10 | | |
| | | | Exfoliative skin changes, xerophthalmia, meningismus | 2 | | | |
| | | | Disciform keratitis, bronchitis, encephalitis | 9 | | | |
| | | | Conjunctivitis, laryngotracheobronchitis | 2 | | | |
| | | | Otitis media, acute conjunctivitis | 2 | 6 | | |
| | | | Tracheobronchitis | 5 | | | |
| | | | PCM, gastro-enteritis | 2 | 6 | | |
| | | | Encephalitis hyperpyrexia | 1 | | | |
| Dec. | 32 | (9) | Exfoliative circumoral skin lesions, PCM, bronchopneumonia | 2 | | (5) | 10 |
| | | | Enterocolitis, PCM, encephalitis | 1 | | | 1 |
| | | | Dehydration, shock | | 10 | | 10 |
| | | | Enterocolitis, pneumonitis | 1 | | | 2 |
| | | | PCM, gastroenteritis, bronchopneumonia, whooping cough | | 10 | | 4 |
| | | | Sore mouth, enterocolitis, shock | 1 | | | |
| | | | Acute conjunctivitis, encephalitis | 3 | 6 | | |
| | | | PCM, enterocolitis, bronchopneumonia, shock | 2 | | | |
| | | | PCM, antistaphyloma, xerophthalmia, encephalitis | 4 | | | |
| TOTALS | 186 | (57) | | | | (18) | |
| 1970 Jan. | 4 | (2) | Gastroenteritis | 2 | 4 | (1) | 11 mths 11 only |
| | | | PCM, sore mouth, gastroenteritis, dehydration, shock | | 11 | | |
| Feb. | 3 | | Nil | | | | |
| March | 4 | | Nil | | | | |

Classification of admissions (see table)

1. Contacts who were likely to develop measles.
2. Cases for routine care. These were reassessed daily and those who developed severe symptoms such as 'sore mouth', etc., were placed in group (3) below.
3. Cases for emergency care. This was based on well-known features of severe measles found in Africa:

Dark maculopapular rash with exfoliation of skin; involvement of the face and mucous membranes causing patchy circumoral exfoliation and sores in the mouth.

Protein calorie deficiency syndrome (PCM) with rapid weight loss appearing suddenly during the attack and recurring or seen for the first time during the period of up to two or three months following infection.

Dehydration or diarrhoea and weight loss.

Bronchopneumonia and severe laryngotracheobronchitis.

Meningismus, encephalitis, encephalomyelitis.

Eye and ear complications, xerophthalmia, acute conjunctivitis, etc.

Treatment

Medical care at the mine hospital, which is situated away from specialized medical centres, is, in effect, a community general-practitioner service to mine villages.

All cases were routinely 'isolated' on admission although African custom makes this most difficult. Mothers admitted with children are likely to collect and consume their food on a communal basis and it is usually impossible to regulate visiting.

Vitamin A, C, and B complex were administered routinely. Vitamin deficiencies are aggravated so that in addition to immediate effects on the gastro-intestinal tract there are long-term complications to be expected such as retarded growth, night blindness, follicular hyperkeratosis and involvement of the lateral skin surfaces of the arms and extensor surfaces of the thigh.

Mild cases required observation for detection of complications which sometimes appeared as the rash faded. In more severe cases the rash persisted with exfoliation. One case developed haemorrhagic lesions. Sore mouth, total inability to breast feed and respiratory or gastro-intestinal tract complications occurred with clinical evidence of protein calorie malnutrition. Severely-ill patients received routine broad spectrum antibiotic cover. In bronchopneumonia large doses of crystalline penicillin G were more effective. Oxygen and the 'steam room' were used in emergency treatment of respiratory complications. Corticosteroids appeared to help in post-infectious encephalitis. With complications there is a known susceptibility to infections due to streptococci, pneumococci, staphylococci, *haemophilus influenzae* and *mycobacterium tuberculosis*. Many infants, some in shock, required emergency treatment when admitted to hospital. Maintenance of fluid and electrolyte balance also proved to be difficult in treatment of dehydration with gastrointestinal tract involvement.

Intramuscular vitamin A, antibiotic eye ointment or steroids were given according to indication in conjunctivitis, superficial keratitis and xerophthalmia. Corneal ulceration and a deeper disciform keratitis required emergency treatment.

Some patients believed to be suffering from protein calorie malnutrition (PCM) died. Clinical features of kwashiorkor and marasmus were seen in infants. Changes in the small intestine which occur in these conditions probably lead to malabsorption, and coexisting inadequacies of digestive enzymes may also aggravate the situation and give rise to protein malnutrition. It is known that the synergism between malnutrition and infectious disease may also result in fatal diarrhoea. Treatment to reverse this process through administration of diets which contain complete protein supplement whether given orally or by tube feeding were ineffective until the pyrexial phase subsided. Most fatalities were associated with irreversible weight loss in the acute phase of illness or during convalescence.

Prevention and control at mine villages

1. Vaccination programme

Morley (1967) suggested that in West Africa vaccination against measles must be practised throughout the year in order to prove effective, since mass vaccination at yearly intervals protected only a proportion of children. The age groups to be protected are 6 to 7 months and 9 to 10 months, to be followed by attendance at 'under fives' clinics along with regular charting of children's weights during the first five years. A protective level of placentally transferred antibodies is not present in large numbers of infants over the age of six months.

Morley also records the early work and satisfactory results of Rey and his colleagues (1965) in Chad using the less expensive method of a hand operated 'dermojet' with a much reduced dosage of measles vaccine. Measles vaccination commenced at Shabani among registered mine dependants when vaccine became available in February 1970, by which time many children had been exposed to measles. From 1-28 February 1970, 847 infants and children under five years of age were vaccinated, and a further 120 aged six months to one year by 30 September 1970.

Up to 1,770 children under five years old may be in residence at the villages at one time. Movements of families, workers and children between mine villages, rural areas and other parts of Rhodesia is unrestricted and many workers accompanied by their families proceed on leave to nearby African countries. Changes in the child population which occur cannot be fully known.

So far no recorded cases of measles occurred among vaccinated children during 1970. No adverse reactions have been recorded at the clinics although the vaccine (freeze-dried Beckenham 31 strain) had been restricted because of adverse reactions in 1969 (Westwater).

Mine hospital records from 1962 to 1969 show epidemics and higher mortality in 1965 and 1969. This together with the 1969 series of 186 cases, 120 under two years and 50 under five years, confirmed that full protection is unlikely without year round clinics for infants under two years with follow up in the pre-school years. As a result, continuous clinics have been set up for mine dependants using half the full dose.

2. *The prevention of malnutrition*

There appears to be an underlying state of protein calorie malnutrition in the age groups affected by measles and it is thought that a relatively inexpensive feeding programme would reduce admission to hospital, the length of stay in hospital and deaths per 1,000 patients. Under somewhat similar conditions in the Gatooma-Hartley area of Rhodesia it was shown (Rhodesian Medical Congress 1968) that the greatest pressure on hospital bed space was exerted by pre-school children and that the pattern of admissions had been changing from 'predominantly adult male injury or sickness to predominantly diseases of women and children'.

South African studies in 1937 and the later history of 'Pronutro', the first of the protein rich supplements, suggest that mass programmes meet with varied success. Infants, expectant mothers and to a lesser extent young children are first in line for any concentrated attack on malnutrition. However, the effectiveness of educational programmes and supplementary feeding are hampered by customs, taboos and sheer ignorance. When one considers that a mixture of two parts of maize meal flour and one of pea flour yields a product of biological value near that of meat (Bender 1969), modern food technology must be close to supplying means to combat protein calorie deficiencies within the economy of rural and tribal Africa which in turn could result in a saving of time, money and the utilization of hospital bed space with a corresponding reduction in the tragic loss of life among infants and young children.

Since popular support for family planning is lacking repeated child bearing is commonly found among tribalized Africans. In large families, especially where marriages are polygamous, there is not enough protein food for all members. This is complicated by the fact that protein demands are higher in mothers during pregnancy and lactation and in infants at the time of weaning.

Measures taken at mine villages include provision of free milk for children provided it is consumed under the supervision of welfare workers. African social workers are also employed to promote infant and child care through instruction at villages. Unfortunately families most in need of this service show the least interest.

Conclusion

During 1969, 186 cases of clinically diagnosed measles were admitted to hospital from mine villages. Fifty-seven (30.7 per cent) of the cases had dangerous complications and 18 (9.6 per cent) died in hospital. In the age groups affected, 120 cases (64 per cent) occurred in infants who were less than 2 years old, 50 (27.7 per cent) were under 5 years and 16 were aged 6 to 10 years.

Protein calorie malnutrition and malabsorption which may occur during measles infections are believed to underly many complications and deaths in the series.

A conservative estimate of the immediate cost of treating measles at the mine hospital during the years 1962 to 1969, is \$15,696 Rhodesian based on treating cases at \$2 per patient day for an average stay of nine days. This does not include costs of outpatient treatment and after care of infants suffering from permanent disabilities such as loss of vision as a result of complications.

During 1969, 277 infants were born to mine dependants at the hospital. At least as many are thought to have been born to dependant wives residing in tribal areas. Pending social and economic advances through community development with improved nutritional standards, measles vaccination remains the only practical, although expensive, control measure to reduce morbidity and mortality among infants and young children likely to be afflicted at mine villages.

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