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PROGRAMME OF ACUTE RESPIRATORY INFECTIONS

WHO TECHNICAL ADVISORY GROUP ON
ACUTE RESPIRATORY INFECTIONS

Report of the Third Meeting
Geneva, 9-13 March 1987

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PREFACE

The programme on ARI was officially established in 1982 upon adoption by the World Health Assembly of the Seventh General Programme of Work. A Technical Advisory Group (TAG) met in 1983 and again in 1985. The first meeting endorsed the adoption of intervention strategies, intended to reduce mortality, which were then developed and evaluated during 1984 and 1985 (1). The second TAG meeting decided that the time had come to shift the emphasis from health systems research to the implementation of programmes (2). The task for the third meeting, which took place in Geneva from 9 to 13 March 1987 (the List of Participants is attached as an Annex), was to review the present phase of formulation of national control programmes and results of recent relevant research in order to advise on the best ways to achieve the short-term targets of the programme.

RECOMMENDATIONS

After a thorough review of the aims, objectives and priorities set for the programme at its previous meetings, the TAG considers that these were wholly appropriate to the needs of the ARI problem and that they continue to provide a sound foundation on which to build future activities.

1. General strategy

1.1 Considering the global magnitude of the ARI problem, the high numbers of preventable deaths, especially among children in developing countries, and the heavy burden of morbidity in all countries of the world, the ARI programme should continue to be accorded high priority by WHO.

1.2 With increasing experience of programme implementation, evidence continues to accumulate which demonstrates the impact of case management in reducing ARI mortality in children. It is now time to develop and implement national programmes.

1.3 The ARI Programme aims to reach the greatest possible number of children at risk in the shortest possible time. First priority for support, therefore, should be given to countries and regions within countries where infant mortality remains above the Health for All target of 50 per 1000 live births. There are 85 of such countries which account for 56% of all children under 5 years of age and 84% of ARI-related deaths in children.

1.4 In other countries and areas where death rates are already lower, ARI control programmes should be firmly encouraged. Effective programmes will reduce morbidity and make more rational use of human and drug resources. In particular, case-management for ARI should be implemented through the entire existing health care network together with high immunization coverage with EPI vaccines as essential components of the PHC.

1.5 Since ARI is ubiquitous and in moderate and severe cases requires antimicrobial treatment early in the course of illness, access to effective management must be assured at even the most peripheral level. PHC workers, including community health workers, should be given the authority to provide the antimicrobials as specified in the programme.

1.6 The successful implementation of the programme will depend heavily on the cooperation and support by non-governmental organizations, the health professions and members of the public. Advocacy of the ARI programme is, therefore, an essential part of the control programme strategy.

1.7 The expansion of the programme will require greatly increased financial support and this must be solicited from every available source, including both budgetary and extra budgetary funds. To this end it is important to identify clearly why funds are required and the amounts needed for specific purposes in order to present a well justified case to interested parties.

1.8 Interagency contacts and collaboration at national and international levels should be actively promoted, for example by further meetings of all parties with an interest in or commitment to the ARI programme.

2. Programme priorities

2.1 Managerial, technical and financial support by WHO should be readily available to countries which are in the process of formulating and implementing ARI Control programmes.

2.2 National training centres and courses for mid-level supervisors should be given high priority because the PHC worker must be trained, supplied and supervised to apply the principles of case management effectively.

2.3 The development and testing of locally relevant health educational material for use by PHC should be given high priority as parents must be able to recognize when their children need lifesaving care for ARI.

2.4 During the implementation phase of the ARI programme, an active research programme should be undertaken to validate and implement the technical policy under local conditions, to find innovative methods to improve the efficiency of the programme, and to test new techniques for prevention, diagnosis and treatment.

2.5 Efficient programme implementation calls for close collaboration at all organizational levels, including within WHO, between the ARI programme and all related programmes, in particular those directed at the same target population such as the EPI, CDD, MCH, Essential Drugs, and Nutrition.

The importance of AIDS and its potential role in acute lower respiratory tract infections in children, especially in the first few months of life will require attention. Insufficient data on this problem preclude any recommendation at present. The ARI programme should establish links with the Special Programme on AIDS to monitor the incidence of AIDS in children and make appropriate recommendations.

2.6 Integration at the country level with other programmes such as the diarrhoeal disease programme in such activities as joint training, common instructional material and evaluation protocols would have the advantages of economy and maximum impact.

2.7 Indoor air pollution, such as that caused by biomass fuel combustion inside rural houses in developing countries, is likely to predispose to or aggravate ARI in children. It is recommended therefore that efforts by environmental control programmes to introduce appropriate technological and behavioural changes be intensified without delay.

2.8 Intensified efforts are urgently required to secure the interest and commitment of leading paediatricians, primary care physicians and other PHC workers, as well as politicians, health service and population planners and members of the public to the principles and practice of the ARI programme.

3. Health services

3.1 National ARI programmes

3.1.1 Urgent steps are needed to develop plans and implement ARI Control Programmes at national level. If funds are restricted, phased development may be necessary according to priority within countries. It is essential to ensure that, once intervention activities are started, resources are available and firmly committed in order that the programme can be sustained and extended rapidly to other areas.

3.1.2 Assistance should be extended to Member States in the major aspects of programme planning, including determination of national strategies, setting of realistic targets based on available local resources (including personnel, drugs, hospital beds), adaptation of technical and educational material, elaboration of the detailed plan of operations, and organization of programme monitoring, evaluation and surveillance system.

3.1.3 At the central level, a nucleus of staff fully committed to the ARI programme is necessary, but at the peripheral levels the aim should be integration of activities with related programmes such as CDD, EPI, MCH, Essential Drugs and Nutrition.

3.1.4 National programme planners should be made aware of the availability of low cost drugs through international programmes such as UNICEF. To improve the supplies and contain costs, production of essential antibiotics and other antimicrobial drugs on a regional basis should be explored.

3.2. Staff training and continuing education

3.2.1 At the country level it is necessary first to ensure the managerial capability required to implement the programme and build up the skills to apply it. Regional and National workshops should be organized to ensure that the managerial capability needed to develop and implement the programme is fostered.

3.2.2 Training for medium-level supervisors, notably district programme managers should be supported so that they can train PHC workers to enhance their skills in programme implementation.

3.2.3 Prototype training material for use in training PHC workers should be produced, adapted according to local needs and integrated with material for other programmes. The material should include explanations of the reasons for recommended regimens. Training material should be tested before its introduction and evaluated after use.

3.2.4 As a part of national programmes, ARI modules, including guidelines for programme development and ARI case management, should be introduced into the curricula of health staff training institutions.

3.3 Health education and community behaviour

3.3.1 Prototype health education material for use by PHC workers should be produced and evaluated as soon as possible. These will need to be adapted by local programmes.

3.3.2 The ability of mothers to recognize critical signs to discriminate between the forms of ARI and her behaviour in taking action is an important indicator in the evaluation of health education.

3.3.3 Steps should be taken to increase community awareness of the problem of ARI and of the action which the community and individuals can take to reduce the risks of developing severe lower respiratory tract infections, especially in infants. This will include explanation of the importance of such risk factors as poor nutrition, low birth weight, tobacco smoking and smoke pollution in the home.

3.4 Monitoring and surveillance

3.4.1 The monitoring and surveillance system should be adequate at least to monitor changes in mortality and to assess availability and use of services. Health information systems may need to be revised to take full account of ARI. Specific surveys to collect data for ARI control should be carried out in situations where this system is not satisfactory.

3.4.2 Rapid surveys of mortality and morbidity should be encouraged. These can economically combine the collection of information on ARI with CDD, EPI and MCH programmes. Further evaluation and refinement of this technique in several areas is indicated.

3.4.3 The laboratory network should be strengthened to allow surveillance to be undertaken of the sensitivity to the antimicrobials used in the programme.

3.5 Professional and public awareness

3.5.1 Conferences and workshops should be organized, journal articles and formal and informal discussion should be generated, to secure the commitment of politicians, administrators and professional leaders, especially paediatricians and primary care physicians.

3.5.2 Widespread use of available information channels to convey the nature of ARI problems and the value of mass media (radio, television and press) for public educational purposes need to be more widely recognized and exploited. It must be complemented by personal education to bring about behavioural changes.

3.6 Collaboration with other organizations

3.6.1 Collaboration with UNICEF should be intensified in the spirit of the joint WHO/UNICEF Statement on "Basic principles for control of acute respiratory infections in children in developing countries".

3.6.2 Collaboration with the International Union against Tuberculosis and Lung Disease and similar organizations active in promoting ARI Control programmes in service and research should be continued and further developed.

4. Programme development and research

The knowledge and expertise exist to implement the ARI programme as it stands. Research and technical development will have a vital role to play in strengthening the scientific basis of the Programme and improving its effectiveness and efficiency.

There are areas where research is needed immediately in support of the programme (for example, behavioural research or research on training and educational materials), areas where research will refine and evaluate existing interventions (for example, controlled trials of antimicrobials or the development of better bacterial antigen assays), areas where research is needed to quantify risk-factors and disease determinants and thus provide the basis for public health decision-making, and areas where alternative and complementary interventions need to be developed and evaluated (for example, new vaccines). The resources to carry out all needed research are not immediately available, and to wait for them would impede the implementation. Therefore, a detailed plan should be developed by WHO which identifies priority areas, and specifies approaches and activities in order that such research services as are available are used in the most effective way in support of the programme. A mechanism, such as a Scientific Working Group, should be established for the review of the technical and practical aspects of the research plan.

4.1 Health systems research

4.1.1 Support should be given to continuing to validate the existing technical policy and to test its feasibility. This research should include:

- (a) Behavioural research directed towards finding the best methods of improving the family's ability to recognize the severity of ARI and to respond appropriately;
- (b) studies on the sensitivity and specificity of signs and symptoms used for discriminating between mild, moderate and severe ARI by local health workers in different settings;
- (c) studies on the effectiveness of antimicrobial treatments for severe ARI under field conditions where referral facilities are not available with particular emphasis on management of neonatal pneumonia in the small hospitals.

4.1.2 The scientific basis of training and of health education needs to be strengthened by research into their content and their method of communication.

4.1.3 A range of model protocols should be developed for the investigation of ARI problems in countries with limited research resources and expertise, e.g.

- incidence of ARI classified by severity and age groups
- prevalence of bacterial agents and antibiotic sensitivity
- local risk factors
- evaluation of the efficacy of treatment regimes
- evaluation of programme effectiveness and efficiency.

4.1.4 Major health systems research and demonstration projects should be supported in a limited number of areas and confined to situations where the expertise and resources

are adequate to ensure high quality research and reliable results with wide applicability. Taken together such projects need to be representative of areas (countries) where ARI mortality is a major health problem.

4.2 Epidemiology, pathogenesis and disease prevention

4.2.1 Epidemiological research in developing countries should be carried out to provide a sound basis for planning and programming. This research should include:

- (a) Studies to determine the incidence of pneumonia and other respiratory syndromes and of risk factors for ARI such as low birth weight, malnutrition, indoor air pollution and passive smoking;
- (b) studies to identify the agents responsible for the predominant ARI syndromes in the community;
- (c) studies on the impact on mortality of the programme introduced, in different areas.

4.2.2a A protocol should be prepared setting out procedures for the collection of verbal autopsy data, standardization of the information to be collected and methods for the analysis and interpretation of the data, based on the experience gained in Chandigarh (India), Goroka (PNG), Bohol (Philippines) and Jumla (Nepal).

4.2.2b A unified approach to the criteria for diagnostic classification of ARI is required which will allow assignment of cause of death according to:

- Underlying cause
- Contributory cause
- Unrelated or associated conditions

In cases with multiple causes, agreement should be reached on priorities for assignment of cause of death.

4.2.3 Studies are needed to clarify the interaction of viruses and bacteria in the pathogenesis of severe and fatal pneumonia.

4.2.4 Field trials should be carried out to determine the efficacy of pneumococcal and Haemophilus influenzae vaccines.

4.2.5 Research should be undertaken to measure the impact of the modification by specific intervention of risk factors in the host (for example, vitamin A deficiency) or in the environment (for example, indoor air pollution).

4.3 Clinical research

4.3.1 Clinical research that should be carried out in developing countries includes:

- (a) comparisons of the efficacy, toxicity and acceptability of first line antimicrobials for treatment of pneumonia and otitis media.
- (b) Study on etiology, clinical manifestations, and management guidelines for pneumonia in very young infants (0-3 months).
- (c) Evaluation of commonly used and possible alternative supportive measures to be applied at home.
- (d) Assessment of oxygen delivery systems for use in small hospitals.
- (e) Investigation of the efficacy of case management plans for areas where incidence of bacterial pneumonia and mortality are low.

4.3.2(a) Support should be given to the development of a technology for concentrating oxygen from the atmosphere that can be used in rural hospitals without electricity.

4.3.2(b) An appropriate technology should be developed for the diagnosis of otitis media that can be used by non-doctors in rural areas.

4.4 Laboratory research

4.4.1. A major problem in evaluating the role of bacterial agents in the etiology of lower respiratory infections is that the currently available diagnostic techniques lack sensitivity and specificity. Research should include:

- (a) Development of effective and simple diagnostic techniques to detect bacterial antigens;
- (b) Studies to evaluate the relationship of the presence of bacterial antigens to illness in different settings.

4.4.2 Rapid diagnostic techniques for viral respiratory infections should be further simplified and rendered appropriate for use under the conditions of the least developed countries.

4.5. WHO Collaborating Centres

The global network of WHO Collaborating Centres for ARI should be expanded to cover a wide variety of epidemiological and socio-economic conditions. The existing centres should be strengthened where required to support programme development, training and research.

1. INTRODUCTION

Acute respiratory infections (ARI) are responsible for at least 4 million child deaths annually - approximately 27% of all child deaths world-wide (3). Eighty-four per cent of ARI-related deaths occur in countries where infant mortality is greater than 50 per 1000 per annum.

It is estimated that one fourth of all ARI-related deaths could be prevented with the vaccines used in the Expanded Programme on Immunization (EPI): diphtheria, pertussis, measles and BCG vaccines. The ARI Programme is concerned, therefore, with the prevention of the remaining three-fourths of all ARI-related deaths and gives highest priority to those countries with the highest mortality.

Primary Health Care (PHC) infrastructures have developed with little specific attention to the problem of ARI. There is no generally accepted approach, at the point of primary care or in the home, to the management of the child with cough in either developed or developing countries.

Deaths from ARI are predominantly due to bacterial pneumonia caused by Streptococcus pneumoniae (pneumococcus) and Haemophilus influenzae. In an intervention programme parents and PHC workers need to identify those children at risk of dying and treat them appropriately. It is necessary therefore to know how to discriminate reliably between mild and moderate-severe ARI, and also to provide supportive care and to prevent progression from mild to severe disease.

Important risk factors are low birth weight, failure of breastfeeding and poor nutrition. Indoor air pollution may be a contributing factor.

The feasibility and impact of case management to the control of ARI in low birth weight infants was demonstrated in 21 villages of Haryana, near Chandigarh in India. ARI specific mortality was 30/1000 live births in intervention villages as compared to 71/1000 live births in control villages (4).

In Kathmandu valley in a pilot project, the strategy of discrimination of severity of ARI by community health workers and use of ampicillin as the first line antibiotic in the treatment of moderate/severe ARI led to reduction of ARI mortality from 52.6 to 20.1/1000 in infancy and from 10.5 to 5.3/1000 in 1-5 years old children (5).

The findings of the pilot studies carried out in Bagamoyo, Tanzania, add weight to the growing body of evidence that ARI mortality can be reduced by the use of management approach within PHC (6).

To move to the next stage - the actual implementation of national programmes - will require the development of manpower expertise and implies a vast expansion of activities and resources.

2. REVIEW OF THE WHO ARI PROGRAMME

2.1 Review of the global ARI Programme

There are three major components of the programme: health services, research, and promotion and information. These are important at all levels.

2.1.1 Health services component

From the outset, WHO faced the need to produce the supporting documentation needed by managers and other health workers. The first step was to produce technical guidelines for peripheral health workers (7). These give details of simple supportive care and propose indications for the use of antibiotics and the referral of patients. A second set of guidelines provide scientific background for doctors and outline case management in small hospitals (8).

Two training modules were then produced: Management of the Child with Cough (9) and Management of the Child with Ear, Nose and Throat Infection (10). They are addressed to mid-level supervisors and are similar in format to modules developed for EPI and Control of Diarrhoeal Diseases (CDD) programmes. Separate guidelines have been printed for course facilitators even though the basic documents can be used for self-learning.

Audiovisual aids, also suitable for adaptation, have been produced. These include two sets of 24 slides each on the Management of Cough in Children, one for Asia and one for Africa with an accompanying audio cassette, which includes the commentary for the slides, and important respiratory noises (11); two flip-charts, one with 20 drawings, for use in the training of health workers, and one with 12 drawings, for the health education of families, and a video cassette.

The first two inter-country workshops on programme development were held in 1986 for the South-East Asia and the Western Pacific Regions. An operational manual, together with a set of exercises, has been written for programme managers (12). This provides a framework that can be adapted to the needs of individual countries. Five more workshops are planned for 1987. The workshop approach stresses the need for the integration of ARI control activities with other PHC services and specially those of EPI, CDD, MCH and Essential Drugs. National plans for the control of ARI need to be written for a 3-5 year period. They should describe and analyse the existing situation, set objectives and targets for reducing mortality, establish monitoring and evaluation mechanisms, and indicate budget allocations. They need then to be incorporated into national health plans.

Progress can be measured in terms of the increase of cases managed according to guidelines (coverage) and the reduction of ARI-related mortality (impact). Because routine information systems do not always supply the necessary information, special surveys may be necessary. The rapid survey method developed by the EPI and diarrhoeal diseases programmes has been applied to ARI in Mongolia and Chandigarh, India.

The Bacterial and Virus Diseases programmes, under the Microbiology and Immunology Support Services, are responsible for the global surveillance of respiratory bacteria and viruses. Both programmes have issued guidelines on rapid diagnostic techniques (13) and cooperate with the distribution and quality control of reagents. World-wide information on the distribution of pneumococcal types has been collected through the services of two Collaborating Centres. Similarly, surveillance for drug resistance in pneumococcus and H. influenzae in ten countries has also been established.

The ARI Programme has established cooperation linkages with the Board on Science and Technology for International Development (BOSTID) of the US National Research Council, Washington, which has supported a series of studies in developing countries to determine causative agents and risk factors of ARI.

A Working Group met in 1985 to draft proposals on the classification of respiratory infections for the Tenth Revision of the International Classification of Diseases (14). In the past an inappropriate classification of ARI has hindered understanding of the problem. It is important that a classification addresses the needs of health professionals and decision makers. The Group recommended that ARI be a main heading, that upper and lower respiratory infections be then separated, and that lower respiratory infections be primarily divided into the three major categories of bronchitis, bronchiolitis and pneumonia.

WHO and UNICEF have agreed on the need to utilize the available appropriate technology at the community level to reduce the death toll from ARI in children in developing countries (15). UNICEF-WHO cooperation would be principally at the country level and would support the preparation and printing of technical guidelines and training materials, the production of health education material and the development of programmes, the training of PHC workers, the provision of clinical equipment and drugs, and programme evaluation. At the global level, a joint working group would work on educational, promotional and information components.

2.1.2 Research component

Initial support by WHO was for research on the role of specific agents in respiratory mortality (16) and on risk factors. Studies were also started to measure impact on mortality and to determine the feasibility of programmes. These have continued over the last two years, and clinical trials and studies of indoor air pollution have also been included in the research activities.

The quality of case-management needs to be improved world-wide as this offers an immediate visible solution to the problem. As a part of primary prevention, vaccine development deserves due attention. Within WHO, grants for research on vaccines are administered through a group of steering committees under the supervision of the Scientific Group of Experts (SAGE). SAGE has created a steering committee on acute respiratory viral infections which has currently limited its activities to respiratory syncytial virus (RSV) and parainfluenza vaccines. Another committee, concerned with the encapsulated bacteria, has concentrated on meningococcal vaccines. World-wide coordination by the WHO ARI programme of development and field testing of other relevant vaccines not covered by SAGE, particularly pneumococcus and H. influenzae vaccines, would be of value.

2.1.3 Promotion and information component.

Despite growing awareness of the problem of ARI, resources were too limited to permit the promotion and information component of the programme to expand as rapidly as was needed. The objectives are firstly, to inform policy makers and others of the existing situation and of the programme and secondly, to disseminate information on projects and technical developments to health workers involved in ARI Programmes in developing countries.

ARI News is the main vehicle for the dissemination of practical information among health workers at health centres and small hospitals. It was first published in 1985 by the Appropriate Health Resources and Technologies Action Group (AHRTAG) and sponsored by WHO and other agencies. It will be translated into Spanish (by the WHO Regional Office for the Americas and UNICEF) and French (by the IUATLD). A special series of publications is produced and distributed by the programme. A Bibliography of Respiratory Infections in children is published in English by the WHO Regional Office for the Americas in collaboration with the US National Library of Medicine.

WHO recognizes the existence of attitudes which may hinder the development of the programme. These include:

- resistance of the medical profession to the idea of allowing health auxiliaries to prescribe antimicrobials;
- questions on the part of public administrators about the ability of health auxiliaries to recognize key signs and symptoms and to prescribe antimicrobials responsibly;
- expectations of parents that antimicrobials will be given for every episode of cough and fever in their children;
- doubt and ignorance on the part of parents that lead to delay in bringing seriously ill children to the health worker.

A comprehensive Information Dossier in English and French has been prepared. From this, information kits can be prepared for various target groups such as policy makers, opinion makers, the medical profession and public health administrators.

2.1.4 Resources

The total resources of the programme increased from \$844 950 in 1982-1983 to \$2 571 090 in 1986-1987.

2.2 Regional ARI programmes

2.2.1 African Region

In the African region, ARI control efforts are implemented by the three WHO subregions. Acute respiratory infections are among the leading causes of death both among children and adults, being responsible for 20-50% of all deaths in children (total 1.5 million per year). The high mortality related to post-measles pneumonia may be connected with low birth weights and malnutrition.

A meeting to review the ARI situation was organized in Malawi (1986) and training courses on ARI case management organized with WHO's support in Gambia and Tanzania.

To date only one country has a specific budget line for an ARI Control Programme in the 1986-1987 biennium. The feasibility and impact of ARI control measures was demonstrated in the coastal district of Bagamoyo (Tanzania). The effect of the programme when introduced through regular health care system is being evaluated in the rural area of Maragua (Kenya). Studies on indoor air quality were initiated in Kenya and Gambia.

Three intercountry workshops in 1987 (two in English and one in French) for 22 countries will introduce ARI technical guidelines, training modules and guidelines for planning, implementing and evaluating the national programmes to the potential country managers. Intercountry courses are proposed in Burundi, Gambia and Mauritius. Morbidity and mortality surveys are planned in Mali and Kenya. The focus of ARI control efforts will be on the 10 most populous countries with 70% of the region's population.

2.2.2 Region of the Americas.

Fourteen countries introduced ARI control guidelines, prepared national plans of activities in 1985, and started implementation programmes in 1986. Others are developing the plans. Progress was evaluated in a joint document of WHO and UNICEF in February 1987.

The Region has continued the publication of the bibliography on Respiratory Infections in Children in collaboration with US Academy of Medical Sciences; the translation of WHO modules, manuals and guidelines into Spanish, and the translation of ARI News into Spanish was completed. The training modules have been tested. Support was provided for national CDD/ARI courses for supervisors in Latin America and the Caribbean. Several countries have developed educational material in the form of flip charts in collaboration with UNICEF.

Thirteen countries received advisory visits by the Regional Adviser and consultants in 1985 and ten during 1986. A regional workshop was organized in Belem, Brazil, in October 1985 and a Subregional meeting on ARI and CDD in Quito, Ecuador, in May 1986. These meetings were held through joint collaboration of WHO, UNICEF, USAID, the Kellogg Foundation and the national governments.

The Region has maintained a close liaison with etiological and epidemiological studies supported by BOSTID; appropriate technology efforts by PATH/DIATECH and the development and testing of pneumococcal vaccines initiated by NIH and CDC.

It is proposed to continue the translation of training material, and the distribution of training, educational and promotional material during 1987. A simplified version of a supervisory skills course incorporating within it the components of MCH is in preparation in Rio de Janeiro. Advisory services will be extended in the form of programme evaluation to countries which have already implemented the programme activities: to Argentina, Ecuador, Nicaragua, Peru, Uruguay and the Dominican Republic. Six Subregional workshops for managers are also planned (Argentina, Bolivia, Brazil, Caribbean, Guatemala and Barbados).

2.2.3 Eastern Mediterranean Region.

The acute respiratory infections programmes is a part of the communicable diseases control programme in the Region. Of the 23 member states, 16 have infant mortality rates of more than 50 per 1000 and ARI is the second most common cause (after diarrhoea) of death in children 0-5 years of age.

National ARI control programmes have been developed for Tunisia and Sudan. Oman has expressed interest in the preparation of a control programme plan.

A pilot project to test the feasibility of ARI control through case management has made considerable progress in Abbottabad, Pakistan, with indications of a fall in mortality. The project in Tunisia has demonstrated the feasibility of control efforts and in Somalia the census for obtaining the baseline data in the project area is completed.

It is proposed to organize an intercountry workshop in Alexandria in October 1987 for national managers from 7 countries and to support a national workshop in Iraq.

2.2.4 European Region.

Most of the 32 member countries in the Region are considered to belong to the industrial and developed world. Despite gross under reporting, ARI is responsible for considerable morbidity. Even though high mortality related to ARI may not be an issue of major concern, the discomfort caused by ARI and the large scale absenteeism from work and school are deserving of attention. In this Region, 90% of both upper and lower respiratory tract infections are considered to be caused by viruses; it is estimated that 12 million pneumonia cases occur annually. The adoption of simplified standard clinical care and management by member countries will help in the rationalization of current practices.

2.2.5 South East Asia Region.

The resolution adopted at the SEARC conference on South East Asian children in October 1986 provided endorsement to the policy of ARI control at the highest official level.

Seven countries have established national task forces for ARI control, four have prepared documents for implementation of the programme and six have specific budget lines for the ARI Control Programme in the 1988-1989 biennium.

Consultation was provided to Burma, Nepal, Bhutan and Indonesia, to help the countries develop national ARI control capabilities.

Operational pilot projects are being carried out in India, Nepal, Sri Lanka and Indonesia. Etiology and epidemiology studies are in progress in India, Burma, Mongolia and Bangladesh. Combined morbidity and mortality surveys were carried out in India and Mongolia.

An intercountry consultative meeting was held in New Delhi in October 1985 (17) and a regional workshop for national ARI Programme managers was held in New Delhi in October 1986 to introduce the newly developed training, educational and promotional material.

The ARI training modules were field tested in Sri Lanka and India as a part of national integrated supervisory skill courses.

A WHO collaborative centre on research and training was established in Chandigarh, India. It is proposed that ARI, EPI, CDD and Essential Drugs be included as an integrated component of UNDP health projects in the Region. Increased cooperation with UNICEF and other agencies will enable expansion of control activities.

2.2.6 Western Pacific Region.

A total of 450 000 deaths per year are ascribed to ARI in children under 5 years of age.

Five countries (China, Malaysia, Papua New Guinea, the Philippines and Viet Nam) have implemented programmes of clinical, etiological or epidemiological research. In most of these countries, laboratories were strengthened by providing supplies and equipment and by training technical staff in Australia, Japan and the USA. Sendai National Hospital, Japan, was designated, in 1985, as a WHO Collaborating Centre for respiratory viruses reference and research.

Two national workshops on laboratory diagnostic method were held in Beijing and Manila in 1985 and 1986 respectively, and a workshop on epidemiology and bacteriology was held in Beijing in 1986.

Community studies to monitor the impact of the control programme and to test ARI case management strategies are in progress in China, Papua New Guinea, the Philippines and Viet Nam. The reduction of mortality from ARI by pneumococcal vaccines was demonstrated in field trials in Papua New Guinea.

Following the 1986 Manila Regional workshop 10 countries have planned pilot control programmes with health systems research and training of health workers to initiate or expand national ARI control programmes in 1987 and five additional countries will initiate ARI control programmes by the end of 1988.

To promote programme implementation, an integrated approach with EPI, CDD, and MCH through primary health care, is emphasized. Combined training courses and surveys will be organized in several countries during 1987. An integrated control programme will be funded by UNDP in China, Laos, Viet Nam and the Philippines. Integrated training courses and surveys will be organized in several countries during 1987.

It is proposed that the Capital Institute of Paediatrics, China, be designated as a WHO Collaborating Centre for epidemiology and health systems research on ARI.

3. COUNTRY REPORTS

3.1 Indonesia

The ARI Control Programme in Indonesia was initiated in 1985 with the establishment of a subdirectorate at national level. The programme started in the form of a number of feasibility demonstration projects in East Java, Sumatra, Bengkulu, West Java, Kalimantan and Kediri Sub-district of West Nusa Tenggara.

In Kediri, the collection of baseline information on mortality was begun in May 1986. Up until December 1986, a total of 347 deaths was registered. ARI accounted for 30.5% of deaths and measles for 21.9%. No treatment was provided in 12.9%, and traditional treatment in 55.9% of children before death. Government facilities were used in only 10% of instances. A Knowledge, Attitudes and Practices (KAP) survey revealed the irrational, widespread use of antibiotics for treatment of mild ARI.

Health education is considered crucial to the success of the ARI Control Programme. In Kediri 79% of the mothers are illiterate. Therefore, the three booklets on ARI that were available at that time had limited usefulness. This is expected to improve with recently produced material. The outreach of television is limited. Material presented for radio will be reproduced in the form of audio cassettes for widespread distribution in the villages. Puppet shows - "Wayang" - are very popular and will be used to complement other material.

The intervention programme in the form of case management will be initiated in Kediri Subdistrict in May 1987.

3.2 Kenya

A field project covering 13 000 households in Maragua (Muranga district) 80 Km north of Nairobi was initiated to assess mortality among children below 5 to determine the cause of death by verbal autopsy, undertake KAP studies and introduce the ARI Control Programme as an intervention. There are three health facilities in the study area and a district hospital located 7 Km from Maragua. The estimated infant mortality rate (IMR) is 56 per 1000 as compared to the national figures 92 per 1000 live births.

During the prospective study period, 2407 babies were born and 169 deaths were registered (95 in 1985 and 74 in 1986). The IMR during the first year was 53.8 and in the second year 35.9 per 1000 live births. Sixty three per cent of all deaths were during infancy. ARI is the most common cause of death. Death was attributed to ARI in 49 (47.1%) and to measles in 17 (16.3%) children. Considering the substantial mortality associated with measles, immunization against measles deserves a high priority.

3.3 Nepal

In Nepal, ARI control efforts were initiated first in Kathmandu valley. A project to test the feasibility and impact of ARI case management on mortality amongst children, and to determine the programme management requirements, was initiated in Jumla district. The area was selected because of its remoteness and inaccessibility. The villages are located at an elevation of 12 000 - 17 000 feet above sea level. The total population is 75 000; people are poor and health services undeveloped. Wood burning for warmth in the houses is common; indoor smoke pollution is intense.

The estimated infant mortality is 184 per 1000 live births and under five mortality 97 per 1000. Standard case management for ARI was initiated by selecting and training workers within the community, one for every 1000 population. One supervisor is provided for six ARI workers. Thirty-second sand-glass timers were used for counting the respiratory rate. Co-trimoxazole syrup was selected as the first line antimicrobial and chloramphenicol as the second line antibiotic. The current estimated pneumonia (moderate to severe ARI) treatment rate is 1200 per 1000 children. It is not known whether this high incidence is a consequence of local environment or an artefact due to over-diagnosis.

Prospective investigation shows that diarrhoea is the most common cause of death being responsible for 36% of all deaths investigated. ARI accounted for 26% of all deaths (ARI only, 17%; ARI and diarrhoea 5%; ARI and others 4%).

Initial findings show that people selected from within the community can competently treat ARI provided that they are properly trained and supervised. The case management programme is beginning to show its impact on ARI mortality. In this particular case, the introduction of the ARI programme will provide the impetus for the introduction of comprehensive PHC services.

4. CURRENT STATUS OF TECHNOLOGY

4.1 Field diagnosis: Rapid surveys of morbidity and mortality

Available health service records and information systems are of limited value in studying the problem of ARI in developing countries because of problems in defining the population at risk, of a lack of agreement about disease definitions and often of the general quality of the data itself. Rapid surveys using cluster sampling techniques have been used in the CDD and EPI programmes but there is relatively little experience of their use in studying ARI. Costs would be reduced if multi-purpose surveys could be designed.

In a survey carried out in Chandigarh, India, morbidity and mortality from ARI and diarrhoea, and a history of any treatment of ARI or diarrhoea were studied in a sample of 15 000 children drawn in clusters of 100 children each from a total population of one million people. Morbidity was studied for two weeks and mortality for one year before

the survey by means of retrospective questioning. Questions about ARI covered the presence or absence of key symptoms (cough, rapid breathing, difficult breathing, noisy breathing, and pain or discharge from the ears) and the use of health care services. Detailed questions about symptoms before death involved the use of a number of different forms and of decision tree so as to arrive at a final diagnosis about the cause of death.

The levels of morbidity and mortality estimated in this way were consistent with results obtained by other methods, although difficulty was noted in distinguishing between moderate and severe ARI by means of the mothers account only. The results of questions about the use of health services showed a clear trend in favour of the increased use of co-trimoxazole.

Rapid surveys are a potentially useful tool in the epidemiological assessment of the problem of ARI and in determining the acceptance and effect of interventions. The method needs to be evaluated in other social and cultural environments.

Retrospective studies of mortality using the "verbal autopsy" technique have been made in a number of other countries. A summary document will be produced which combines the features of the different methods now in use.

4.2 Bacterial and viral etiology

In the last two years, two further reviews of the etiology of pneumonia in developing countries have been published (18,19). The weight of the evidence continues to confirm the role of bacteria in severe disease. Detailed results of etiology are expected from the BOSTID-sponsored series of investigations in developing countries.

There is persisting concern about the adequacy of available techniques for the diagnosis of respiratory bacterial disease. A manual of bacteriological procedures in ARI has been published by WPRO (20) in an attempt to improve laboratory standards. Blood culture, the only generally accepted investigation based on conventional techniques, is agreed to be insensitive and of little or no use in field situations.

The best available antigen detection systems appear to be a latex agglutination assay for H. influenzae type b infections and a staphylococcal coagglutination assay for pneumococcus infections. There are doubts about the sensitivity and specificity of these procedures however. A meeting on antigen detection in bacterial respiratory infections sponsored by the Finnish Public Health Institute in collaboration with WHO will be held in March 1987.

4.3 Clinical problems

4.3.1 Neonatal pneumonia

Neonatal pneumonia by definition occurs during the first month of life although the upper age limit is not, in practice, precisely defined. It is distinguished from pneumonia in older infants by the modes of transmission, the nature of the causative organisms and the somewhat non-specific manifestations of disease.

Infection of the foetus may either be a consequence of trans-placental spread or of the aspiration of infected amniotic fluid. The neonate may be infected at birth during passage through the genital tract or, after birth, by older infants or adults.

Often the nature of the causative organism will reflect the mode of transmission. Cytomegalovirus pneumonia is a consequence of maternal viraemia. Herpes simplex, Chlamydia trachomatis or Ureaplasma urealyticum infections are consequent to maternal genital tract infection. Obviously in such cases the same organism can be isolated from mother and infant.

The risk of neonatal pneumonia is increased by prolonged or difficult labour and/or by early rupture of the membranes. Transmission of infection after birth reflects environmental factors and may be increased if, for example, an infant is placed in a day care nursery.

The bacteria most frequently isolated are Staphylococcus and Escherichia coli but others of importance include Streptococcus agalactiae (Group B), S. pneumoniae, Pseudomonas and Klebsiella pneumoniae. In developed countries respiratory viruses are held to be responsible for 40 to 50% of infections. It should be noted that Pneumocystis carinii can cause pneumonia in the immuno-incompetent neonate. Chlamydial infection, acquired during birth, manifests itself beginning seven to 10 days and then up to several weeks afterwards.

Signs of toxæmia and respiratory distress predominate in neonates and there is less direct evidence of pulmonary involvement than in older infants. There may be no cough. In large hospitals diagnosis can be confirmed by radiology. In small hospitals without X-ray facilities, current WHO recommendations are that the diagnosis should be made if two of the following three signs are present: respiratory rate more than 60 per minute, chest indrawing, or grunting (8).

In large hospitals quite sophisticated support care may be required. Small hospitals without the necessary facilities should aim to provide broad spectrum antibiotic cover, and oxygen if the patient is cyanosed. Chloramphenicol is contraindicated. Treatment with benzyl penicillin and an aminoglycoside is recommended (8). Infants under the age of 2 months should be so treated.

Knowledge about neonatal pneumonias is largely dependent upon reports from developed countries. In developing countries which now have relatively low levels of infant mortality, neonatal pneumonia has become more prominent as a cause of death. In China, a fall in infant mortality from 48 per 1000 live births to 30 per 1000 has been associated with a fall in pneumonia specific infant mortality from 13 to 5 per 1000. Pneumonia mortality remained at this level for some years. A study of six countries reflected this pattern. In those countries where infant mortality was above 40 per 1000, pneumonia mortality was high and MCH services were underdeveloped or absent. Where infant mortality was less than 30 per 1000, the WHO programme of case management for pneumonia had been implemented and MCH services were well developed. In these latter, one half of pneumonia deaths in children were in infants less than four months of age and one half of these were in infants who were low weight-for-age. In a related hospital study, 84% of pneumonia deaths occurred in infants under the age of four months.

The Chinese data suggest that the initial decline in ARI specific infant mortality is predominantly due to a decline in the post-neonatal period. As this process continues, neonatal pneumonia becomes more prominent as a cause of death. Its causes are complex and as a disease problem it is more resistant to direct attack through the health services than is pneumonia in older children.

In Jumla, Nepal, the incidence of neonatal pneumonia falls during the second week of life but rises again during the third and fourth weeks, suggesting the importance of transmission of organisms from older persons. In Goroka, Papua New Guinea, the presence of organisms associated with perinatal transmission (C. trachomatis, P. carinii, and cytomegalovirus) has been confirmed (18) but an examination of the results of blood culture has not revealed a pattern specific to neonates.

These data, together with data from carriage studies, suggest that if neonates are exposed to an environment where high transmission rates of bacterial pathogens already occur, neonatal bacterial disease, particularly in the third and fourth weeks of life, will tend to reflect that pattern and not a specifically neonatal one.

Neonatal pneumonia provides a clear example of one type of problem facing the WHO ARI Programme. Where infant mortality is high (over 50 per 1000), the appropriate response is comparatively straightforward: provide treatment for bacterial pneumonia in older infants and children and the best possible management of pregnancy and labour through MCH services. Once infant mortality has fallen much below this level the nature of the residual problem is more complex and the efforts required will be more costly.

4.3.2 Acute otitis media.

Acute otitis media is one of the commoner diseases of late infancy and early childhood. Etiological factors are broadly similar to acute lower respiratory infections (ALRI) although the pathogenesis of disease is undoubtedly more complex. Peak age incidence is from 6 to 11 months; acute otitis media is more common in males, in the lower social classes, and in bottle fed infants; it is a condition characterized by recurrence. *Pneumococcus* and *H. influenzae* are frequently isolated (50-70% of all cases), but respiratory viruses probably play a more important role in pathogenesis than isolation rates suggest. *E. coli* and *S. aureus* are commonly isolated in neonates with acute otitis media. Mixed infection with both anaerobes and aerobes including *Pseudomonas* is commonly found in chronic otitis media. The consequences of acute otitis media include serous and mucoid otitis, which are usually associated with Eustachian tube dysfunction, chronic otitis, and deafness. It is because of deafness and the likelihood of associated cognitive disabilities that otitis media is considered to be of such importance.

Acute otitis media is best diagnosed by otoscopy. The standard of use of this instrument by physicians needs to be upgraded generally. Where the otoscope is not available the health worker should diagnose an ear infection if there is acute onset of ear discharge, or sudden ear pain in an older child (7). External otitis, foreign bodies, and referred pain from tonsillitis or traditional uvulectomy are other causes of ear pain.

Current recommendations are that children with acute otitis media (sudden ear pain, or inflamed, bulging drum, or ear discharge for less than two weeks) be treated at home with antimicrobials (7). Neither long-term antibiotics nor pneumococcal vaccine have proved to be of value in preventing recurrence. A chronically discharging ear will only heal if dry. Antibiotics should not be given. The ear should be dried with an absorbent wick (10).

4.3.3 Streptococcal pharyngitis.

The problem of streptococcal pharyngitis had not, hitherto, been considered by the ARI programme. Treatment recommendations as they stand are that antimicrobials be given at home for purulent pharyngitis with large and tender lymph nodes in the neck (7).

Group A streptococcal infection always precedes rheumatic fever, but throat culture is usually negative by the time rheumatic fever is diagnosed. Streptococcal antibodies are more useful and provide reliable evidence of recent group A streptococcal infection. Group A streptococcal infection is not the only factor in the pathogenesis of rheumatic fever; there are also contributory host factors but these are poorly understood. Whereas the prevalence of rheumatic heart disease varies between 1.0 and 20 per 1000 children, beta hemolytic streptococcus can be detected in the throats of up to 50% of asymptomatic, healthy children.

The ARI programme should continue to cooperate with the WHO Intensified Programme for the Prevention of Cardiovascular Diseases/Action for the Prevention of Rheumatic Fever/Rheumatic Heart Disease in Developing Countries, the principal strategy of which is secondary prevention.

4.4 Vaccines

4.4.1 Pertussis vaccine

Pertussis vaccine has been in use for over 30 years in developed countries. During the last decade, concern has been generated regarding its safety and apparent failures in its efficacy: it seems that it may not prevent asymptomatic carriage or always offer lasting protection. These anxieties led to a decline in vaccination rates in some countries (due to non-acceptance by parents (UK) or Japan) or even withdrawals (Sweden). An increased incidence of pertussis because of diminished individual and population immunity followed in these countries.

Acellular vaccines containing selected components of the pertussis whole cell are now being developed, with the aim of reducing reaction rates and improving the immune response. Candidate components include filamentous haemagglutinin (FHA), lymphocytosis promoting factor (LPF) and agglutinogens. An acellular vaccine containing LPF detoxified by formaldehyde and FHA adsorbed onto aluminium hydroxide was introduced in Japan to immunize children at the age of 2 years. The protection appears to be satisfactory and local and systemic reactions are reported less frequently than after whole cell vaccine.

In Sweden a two dose schedule with Japanese acellular vaccine is under trial in infants aged 6 to 12 months. In the UK, trials are planned to assess other component vaccines by a three dose schedule at 3, 5 and 10 months.

It will not be possible to assess the risk of neurological reactions of new vaccines until they have been administered to many millions of children over a considerable period of time. However, in Japan where 20 million doses have been administered, fewer such reactions have been reported than after whole cell vaccine.

While the development of these vaccines offers promising results in early trials, current whole cell vaccine should continue to be recommended as providing safe and effective protection.

4.4.2 Haemophilus influenzae vaccine.

Haemophilus influenzae B (Hib) capsular polysaccharide vaccine is safe and effective when administered to 2-year old children for protection against Hib meningitis and some invasive systemic infections (including pneumonia) caused by this organism. The vaccine is less effective at younger age because of low antibody responses. The conjugated vaccine in which Hib capsular polysaccharide is conjugated to a protein carrier does elicit adequate antibody in younger infants and thus offer the opportunity of preventing infection in these age groups.

Even if a new generation of vaccine does protect infants under the age of two, the occurrence of disease despite immunization and the high cost (US\$7 per dose) of the presently available vaccine are matters for concern. A further problem is the incidence of disease due to non-B capsulated strains and non typable strains of H. influenzae.

In view of the importance of H. influenzae infection as a frequent cause of pneumonia and death in infants, despite doubts about the efficacy and relevance of available type B vaccine, trials should be carried out in areas of high risk.

4.4.3 Pneumococcal vaccine.

Three double blind placebo controlled trials of pneumococcal capsular polysaccharide vaccines containing 14 and 23 capsular serotypes were carried out in children between 6 months and 5 years of age. These trials were carried out in two separate areas, Asaro valley and Tari basin of highland provinces in Papua New Guinea. The infant mortality estimates were 70 per 1000 live births which correspond to the national figures. Efficacy of the vaccine in reducing deaths solely caused by acute lower respiratory tract infection (ALRI) in children below 5-years of age was 59%; it was 50% in those below 2 years and 39% in babies less than 6 months old (21).

There was no observed effect of the vaccine when ALRI was the underlying cause of death associated with other causes. This may be because in such cases pneumonia was caused by organisms other than pneumococcus. The use of vaccine was followed by a 19% decline in mortality from all causes which could be related directly to a fall in ALRI mortality caused by pneumococcus.

The pneumococcal vaccine should be tried in carefully selected different ecological settings with varying prevalence of low birth weight or protein energy malnutrition and in endemic areas of malaria. The pattern of death related to age will be an important consideration in site selection.

4.4.4 Respiratory viruses vaccines.

Influenza vaccines are available in the form of inactivated and live attenuated forms. Inactivated vaccine has low reactogenicity and prevents 70% of illness when the virus causing the disease is closely related to the vaccine virus. It is recommended that the vaccine be given annually to high risk groups because of a fall in antibody titre and change in antigenic nature of the circulating viruses. In Japan, school age children are given this vaccine, in USSR, adults are routinely immunized; while in other countries, its use is restricted to high risk groups. The degree of protection by live attenuated influenza virus vaccine is variable.

Research on paramyxoviruses (RS virus and parainfluenza III) is now in an exponential phase of growth. A good animal model is the cotton rat. The advances in technology using the technique of DNA recombinants; development of subunit vaccines; identification of role of T cells in recovery from infections; cloning of individual genes of A-2 strain of RS virus and identification of viral envelope glycoproteins (which are immunologically important) offer the prospects for early development of vaccines in the control of ARI in children.

5. ENVIRONMENTAL DETERMINANTS AND RESPIRATORY INFECTIONS: THE EFFECT OF BIOMASS FUELS

It has been estimated that more than 500 million persons in developing countries, mostly women and children, are exposed to the effects of indoor air pollution from biomass fuels such as wood and animal dung. Indoor air pollution surveys are being carried out in a number of countries where ARI studies are also in progress.

The indoor air quality was studied in a sample of houses in rural Kenya. There, the standard method of cooking was over an open fire with three stones. Houses with iron or thatched roofs and with internal or detached kitchen arrangements were included in the study. The high levels of respirable suspended particle (RSP) concentrations were directly related to the presence of a lit fire. Average levels approximated minimal recommended occupational levels but exceeded by 20-fold the recommended levels for a general population. Exposure did not vary by housing type, ventilation or location of the kitchen. The levels of polycyclic aromatic hydrocarbons (PAHs) were similar to those found in a heavily cigarette-smoke polluted environment. The 24-hour average nitrogen dioxide concentration (NO₂) (90ppb) was estimated to be sufficient to produce non-specific chronic symptoms as well as minor effects on lung function. Levels of carbon monoxide, formaldehyde and carbon dioxide were lower than have been found in similar situations in other developing countries; this was probably due to the good ventilation of the houses. The average number of ARI episodes per child (0-4 years) was 7.7. Incidence could not be correlated with house type or smoke level as exposures to the pollutants were very homogeneously distributed among the population.

There appears to be little doubt that children are being exposed to indoor pollutants that will damage respiratory defences and interfere with lung function and increase the incidence of respiratory infection (22,23). It is feasible to measure smoke pollution in existing ARI studies and to relate variability in the characteristics of indoor smoke to variability in the ARI disease pattern. The difficulty lies in determining the contribution made by these agents to total morbidity and mortality. Within populations, exposure to smoke is relatively homogeneous and the use of improved cooking methods are strongly correlated with social and economic variables that are themselves strongly correlated with the incidence of ARI.

Procedures, involving biological markers currently being developed, are required that will allow for an assessment of individual risk. Another more indirect approach may be through intervention studies. In such studies attention will need to be paid to the definition of outcome variables and of control groups.

In the meantime, the design of stoves more efficient in terms of lower fuel consumption and less pollution should be encouraged. It remains to be determined whether the effects of pollutants on lung defences are dose-related and whether threshold levels exist.

6. TRAINING, EDUCATION AND INFORMATION SERVICES

6.1. Training

The ARI programme is concerned with the rationalization of the use of antimicrobials. A fundamental problem is that children with mild ARI are frequently treated with the antimicrobial they do not need and many die without ever receiving the antimicrobial they do need. Families obtain antimicrobials from a variety of sources; they can place considerable pressure on health workers to prescribe them; they can make false economies and errors of judgement in seeking help. Lacking clear guidelines, health workers make arbitrary decisions.

The training modules which include role play and other exercises are principally for use when teaching the skills needed at the first level health care facility. Courses take about two days. The slide sets and video have been produced to supplement the modules in the courses and are helpful if used as a starting point for discussion and comment. In other circumstances they may be used alone. Their use will naturally be limited by resources available in a particular setting.

Clinical sessions are a crucial part of training. Although they may seem less relevant to the needs of senior staff, it is important that senior staff be exposed to the full training process. Participants should assess normal children and children with abnormal breathing - a busy outpatients department is often the best place to find suitable cases.

Staff need to learn to talk to families when children are healthy as well as when children are sick. It is important that families appreciate that new knowledge is available as well as understand the place of traditional remedies.

Flip charts, and other printed material, will lend authority to what is being taught. The ARI Programme has produced prototype material that can be adapted for local use when desired or can be used as it stands. One chart is for training community health workers and the other for working with families.

All these materials will continue to be tested and will be revised accordingly. It is hoped that the labour of making locally appropriate training materials will be lessened by the availability of the prototypes.

6.2. Health-seeking behaviour - programme implications

Behavioural studies on the perception of mothers regarding management of ARI in children were carried out in Metro Manila and Bohol Islands in the Philippines. Private physicians were preferred in urban areas and traditional healers in the rural community. Cost considerations, accessibility of health care providers and faith are important in the decision making. Accessibility was a major factor which influenced decision making in similar studies carried out in rural Haryana, India. These findings make a strong case for improving the accessibility through PHC approach.

Cough mixtures were used in about one third of the cases. Antibiotics were self administered by the urban mothers more frequently than in rural settings. The treatment of acute upper and lower respiratory infections was inappropriate in more than 75% of cases. This is a reflection of the poor ability of mothers to discriminate the severity of ARI. These findings were consistent with results from other studies. Mothers in rural Haryana, India, recognized moderate/severe cases correctly but could not differentiate moderate from severe cases.

Based on the above findings in the Philippines, five simple health education messages were identified and health education material was conceptualized in comic book format. This has since been tested and introduced as a part of information, education and communication efforts to influence decision making by the mothers.

6.3 Professional attitudes

Professional endorsement is essential to the success of the ARI Control Programme. The opinion of health professionals prevails in the making of government policies especially with regard to access to antibiotic therapy. Pharmaceutical manufacturers also exert considerable influence on decision-making.

Physicians as professionals are constantly concerned about the side effects of drugs. They maintain a healthy respect for the diagnostic processes and in many countries are worried about the possible litigation resulting from inappropriate use of drugs or investigative procedures.

In recent years, editors of leading international journals have begun to acknowledge the serious nature of the problem of ARI. However, it has not been fully accepted that WHO's programme involving the widespread use of antimicrobials in the treatment of pneumonia is an appropriate solution to the problem. It will be necessary to expose all elements of the programme to scientific scrutiny to obtain its wider acceptance.

A start has been made by inclusion of ARI symposia in a number of international congresses but this process needs to be expanded. For this, the pool of ARI consultants who can hold their own in debates on antibiotics, oxygen or epidemiologic surveillance must be enlarged rapidly.

Ways by which the essential programme elements can reach public visibility, and thus influence medical opinion should be identified.

ARI News is a vehicle for meeting the needs of people operating at the interface between medical professionals and the community. It should also be used to influence the opinion of the medical professionals.

7. NATIONAL PROGRAMME DEVELOPMENT

Since the inception of ARI control efforts by WHO, 40 developing countries have implemented the programme in selected areas or on a limited scale as feasibility studies. WHO's guide for the planning, implementation and evaluation of control programmes within Primary Health Care will help the member states to prepare national control programmes (12).

The control programme objective is to reduce the ARI mortality in 85 countries with an IMR of more than 50 per 1000 and which account for 84% of the total ARI mortality. The target is to achieve adequate access to primary health care and referral facilities, to extend relevant health education and improve the quality of case management in all children with ALRI.

It is important to enlist the national commitment as indicated by allocation of a specific budget for ARI control, appointment of a national programme manager, and formation of a multidisciplinary advisory committee. A document specifying the magnitude of the problem, the objectives and targets of the programme, the proposed control strategy, methods for training of personnel, plans for monitoring, evaluation and supervision is necessary. The specific plan of operations for programme implementation must be written.

In many countries resource constraints may dictate initiation of a programme in selected areas and subsequent phased stepping up of the programme to prevent over-commitment of resources. This strategy would permit institution of mid term corrections based upon previous experiences.

REFERENCES

1. World Health Organization (1984). A programme for controlling acute respiratory infections in children: Memorandum from a WHO meeting: Bulletin of the World Health Organization, 62: 47-58.
2. World Health Organization (1985). Programme of acute respiratory infections: WHO Technical Advisory Group on acute respiratory infections - Report of the second meeting - Geneva, 25-29 March 1985 (Document WHO/RSD/85.18).
3. Leowski, J. (1986). Mortality from acute respiratory infections in children under 5 years of age: Global estimates. World Health Statistics Quarterly, vol. 39: 138-144.
4. Datta, N. et al. (1987). Application of case management to the control of acute respiratory infections in low birth weight infants: a feasibility study. Bulletin of the World Health Organization, 65(1): 77-82.
5. Pandey M.R., Sharma P.R., Shakya, G.M. (1986) Nepal: impact of a pilot ARI control programme. ARI News, 6:4.
6. Mtango F.D.E, Neuvians, D. (1986). Acute Respiratory Infections in Children under five years. Control project in Bagamoyo District, Tanzania. Trans.Roy.Soc.Trop.Med.Hyg., 80: 851-858.
7. World Health Organization (1985). Case management of ARI in children in developing countries. Report of a working group meeting. Geneva, 3-6 April 1984 (Document WHO/RSD/85.15).
8. World Health Organization (1986). Respiratory infections in children - management at small hospital. Background notes and a manual for doctors (Document WHO/RSD/86.26).
9. Supervisory skills. Management of the child with cough. World Health Organization. Programme of Acute Respiratory Infections 1986.
10. Supervisory skills. Management of the child with an ear, nose and throat infection. World Health Organization Programme of Acute Respiratory Infections 1986.
11. Savage King, F., Shann, F. (1986). Management of cough in children (2 sets of slides: one Asian, one African with optional audio cassette). Teaching Aids at Low Cost, P.O. Box 49, St. Albans, Herts AL1 4AK, United Kingdom.
12. World Health Organization (1986). Acute Respiratory Infections: a guide for the planning, implementation and evaluation of control programmes within Primary Health Care (Document WHO/RSD/86.29).
13. World Health Organization (1981). Rapid laboratory techniques for the diagnosis of viral infections. Report of a WHO Scientific Group. Geneva, 29 September - 3 October 1980. World Health Organization Technical Report Series, 661.

14. Proposal for the classification of acute respiratory infections and tuberculosis for the tenth revision of the International Classification of Diseases. Report of an ad hoc working group meeting: WHO Collaborating Centre for Research on ARI, Academic Department of Community Medicine, St Mary's Hospital, London and the International Union against Tuberculosis (Document WHO/RSD/85.25).
15. WHO/UNICEF Joint Statement (1986). Basic principles for control of acute respiratory infections in children in developing countries. WHO Geneva.
16. Shann, F. (1985). Pneumonia in children: a neglected cause of death. World Health Forum, 6, (2): 143.
17. WHO Regional Office for South East Asia (1986). Acute respiratory infections in South East Asia - Report of an intercountry meeting New Delhi, 8-11 October 1985 (SEARO Technical Publications No.8).
18. Shann, F. (1986). Etiology of severe pneumonia in children in developing countries. Pediatric Infectious Disease, 5:(2), 247.
19. Berman S, McIntosh, K. (1985). Selective Primary Health Care strategies for control of disease in the developing world. XXI Acute Respiratory Infections. Review of Infectious Diseases 7, 674-91.
20. WHO Regional Office for the Western Pacific (1986). Acute respiratory infections: Laboratory manual of bacteriological procedures: Western Pacific Education in Action Series No.1.
21. Riley, I.D. et al. (1986). Pneumococcal vaccine prevents deaths from Acute Lower Respiratory Tract Infections in Papua New Guinean Children. Lancet 4; 877-861.
22. Lindvall, T. (1985). Health effects of nitrogen dioxide and its oxidases. Scand. Jr. Work Environment and Health, 11;(3): 10-23.
23. U.S. Environmental Protection Agency (1982). Air quality criteria for particulate matter and sulfur oxides. Research Triangle Park, N.C.: Environmental Criteria and Assessment Office: EPA report nos. EPA-600/8-82-029aF-cF.

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