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CASE-FINDING AND RELATED ISSUES IN TUBERCULOSIS

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Introduction

Tuberculosis is one of the most widespread infections ever known to man, as one-third of world's population is infected with M.tuberculosis[1]. In India more than a million people die of tuberculosis each year[2] and nearly one-fourth of estimated 12 million tuberculosis patients are infectious[2]. While people of all ages suffer, the heaviest toll is in productive age group leading to adverse, social and economic consequences. Demographic changes and epidemic of human immunodeficiency virus (HIV) are expected to further increase the burden of tuberculosis[3].

Early detection of cases by an efficient case-finding programme followed by optimum treatment constitute the most important control measures. Though, National Tuberculosis Programme (NTP) formulated on the basis of sound epidemiological, sociological and operational studies, is in operation in the country for the past three decades, the disease continues to be a major public health problem.

This paper examines various aspects of case-finding and aims at providing suggestions for improving the efficiency of case-finding activities.

Role of Case-Finding in Tuberculosis Control

Case-finding is defined as a well organised and systematic effort to discover largest possible number of cases in the community on a continuous basis in an acceptable, practicable and cost-effective methodology using simple and standardized tools.

The objective of case-finding is to identify sources of infection in the community and thus for the purpose of tuberculosis control, a case is an individual discharging tubercle bacilli in the sputum (bacteriologically positive on culture). Among them, in about 50%, bacilli can be demonstrated by direct microscopy[4] (smear positive cases) and the rest are smear negative culture positive cases. Under NTP, a case is defined as the one who is smear positive and a patient with radiological evidence of tuberculosis but smear negative is called suspect.

The District Tuberculosis Programme (DTP) has the potential of detecting about 40% of the prevalent bacteriological cases[5]. This is considerably higher than the observed rate of incidence of the disease which is one-third of the prevalence[4].

To make favourable epidemiological impact on the tuberculosis situation, cases equivalent to 85% of case-finding potential of DTP must be cured after detection. Though improving cure rates is important, improvement of case-finding efficiency has been shown to be more crucial[6] in improving the overall efficiency of DTP.

World Health Organization (WHO), in its new global strategy for control of tuberculosis has recommended detection of 70% of all smear positive cases and cure rate of 85% to be achieved every year in developing countries[1].

Priority in Case-Finding

It is well known that smear positive cases are more dangerous as a source of infection of tuberculosis and they are also the ones who have the worst prognosis[7]. Smear negative culture positive patients come next in regard to both the factors. In the developing countries, with resources for tuberculosis control being limited, priority should be given for diagnosing and treating smear positive cases. Emphasis on case-finding is more in rural areas as 75% of cases reside in these areas, the prevalence rate being same as in the urban areas[8].

Reliability and Acceptability of Case-Finding Tools

In a situation where many diagnostic tests are available, the choice of tools for case-finding depends upon their reliability, acceptability, applicability and cost. Tools available for diagnosis of tuberculosis are discussed here under:

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i) **Culture examination** of sputum specimen is considered at present as the gold standard for assessing reliability of other tools since its sensitivity and specificity is close to 100%. However, the technique of processing sputum for culture and its examination requires highly trained staff and sophisticated equipments installed at enormous cost. It takes about four to six weeks to detect tubercle bacilli. This could result in delay in starting treatment and some patients may be lost in the intervening period. The cost of detecting a case by culture alone was found to be several times higher than the cost of detecting a smear positive case by direct microscopy[9]. Additional cost of retrieving the patient when results of culture are available, makes it unavailable to be employed routinely for case-finding activities, even though the reliability of tool is quite high.

ii) **Radiological examination** of chest though highly sensitive, has low specificity and hence patients diagnosed only on the basis of X-ray are called suspects. Interpretation of X-ray films is difficult with high degree of inter and intra-reader variation. Even in a situation when interpretation of X-ray films of those voluntarily reporting to an urban clinic with chest symptoms of more than four weeks duration was made by two independent readers and an umpire reader for disagreed films, X-ray was found to have a predictive value of 62% with 88% sensitivity and 96% specificity[10]. This means that 38% of those diagnosed by X-ray did not have tuberculosis. Moreover, the patient cannot be put on treatment immediately. Higher initial cost and difficulty in maintenance are also other major obstacles for its use in developing countries, especially in rural areas.

ii) **Sputum microscopy** is less sensitive than X-ray but enough to detect the most dangerous sources of infection and is highly specific. The predictive value of 82 to 95% was observed with 80% sensitivity and 99% specificity when chest symptomatics of more than four weeks were subjected to smear examination at an urban clinic[10]. Therefore, fewer false positive cases were put on treatment than by X-ray. The predictive value of a single smear examination among symptomatics at Peripheral Health Institutions (PHIs) varied from 64 to 87%[11]. In actual practice, the efficiency of diagnosis by microscopy depends on skill, aptitude and experience of the staff. With proper training and supervision by an experienced Laboratory Technician from District Tuberculosis Centre (DTC), health workers of general health institutions could become highly proficient in direct sputum microscopy[9]. Operational studies on case-finding have shown that on an average, only one sputum is required to be examined per PHI per day[5]. Moreover, treatment can be started immediately. About 84% of smear positive cases presenting at PHIs can be detected by examination of two sputum specimens[12]. As the additional case yield from more than two specimens is not commensurate with the cost involved, NTP recommends two smear examinations before labeling a patient as smear negative. The cost of detecting a case by smear examination is found to be one-fourth of that by culture examination[9].

iv) **Screening of symptomatics** The 'Awareness Study'[19] revealed that 95% of the bacteriologically positive cases were aware of one or more symptoms and 50% of them seek relief of their symptoms at the nearest general health institutions.

Cough alone or in association with other symptoms has been found to be present in almost all chest symptomatics attending PHIs[5]. Most of the cases could be diagnosed by screening patients self-reporting at PHIs for complaints of cough for more than two weeks duration and subjecting them to direct microscopy[5]. One out of every ten such patients was found to be smear positive.

Use of chest symptoms as a screening tool has been observed to be highly sensitive in an urban centre[10] as 95% of the cases diagnosed were among chest symptomatics.

Since symptomatic screening has a low specificity[10], it cannot be used alone as a case-finding tool.

v) **Newer diagnostic methods** Newer culture methods such as BACTEC allow more rapid detection of growth in about 1-2 weeks. But these methods are more expensive and not widely applicable in our situation. Tests based on Polymerase Chain Reaction (PCR) by amplification of a segment of DNA can detect just a few bacterial cells in a sputum specimen within a few days. These tests are still in the process of standardisation and at best may substitute for

culture and sensitivity testing in national reference laboratories and also it may not be possible to use these as a routine diagnostic tool. Serological tests based on detection of mycobacterial antigens and antibodies have shown mixed results and find little application in a routine mycobacteriological laboratory.

On perusal of merits and demerits of different diagnostic tools, it can be seen that sputum microscopy is the most appropriate tool for case-finding under programme situations in our country.

Case-Finding Strategy

The choice of case-finding strategy has been a contentious issue in the past.

In mass case-finding surveys, the entire community is required to be screened by X-ray and those with shadows suggestive of tuberculosis are subjected to sputum examination. When mass case-finding surveys were repeated either at one year interval or at 3 months interval[13], similar incidence rates were observed. This suggests that cases appear all through the year in the community and mass surveys carried out at intervals fail to pick up all these cases. In an operational study by the National Tuberculosis Institute (NTI), Bangalore, mass surveys in the community resulted in a poor case yield[14]. More cases were discovered among self-reporting chest symptomatics at health institutions than mass surveys conducted at intervals of three years in Czechoslovakia[15] and one year in Japan[16]. High operational cost[9], poor case yield and low predictive value prompted WHO to recommend that case-finding by mass surveys should be abandoned[17].

Examination of contacts cannot be recommended as a case-finding method. Neither epidemiological considerations nor the case yield[18] justify its use. However, WHO[17] recommends examination of contacts only if they have symptoms.

Sputum camps at best can be a periodic effort and not only result in diversion of skilled staff but also dissuade the community from seeking care at regular service centres.

Cases found by any of the active methods of case-finding are unlikely to comply with treatment. The symptoms of tuberculosis develop soon after the onset of disease[10,13] prompting the patients to seek medical advice. About 50% of the cases contacted general health services for relief of their symptoms[19] and this group included most of the smear positive cases[5].

Under NTP, the patients attending PHIs on their own volition are screened for presence of chest symptoms and symptomatics among them are subjected to direct microscopy. Since patients attending DTCs are mostly chest symptomatics, they are screened by mass miniature radiography and those with any X-ray abnormality are examined by smear microscopy. The predictive value of this strategy of case-finding is found to be very high[20] and hence passive case-finding methodology has been adopted under NTP.

Quality Control of Case-Finding Tools

On an average 2.5% of out-patients attending PHIs are chest symptomatics and one out of every 10 sputa examined are positive for AFB on direct microscopy[5]. The case-finding efficiency of individual PHIs can be monitored against this background.

It is very important to control the quality of techniques used in case-finding especially in PHIs. In a study[11] by NTI, the sputum smears prepared from symptomatics at peripheral microscopy centres were re-examined at the Institute. There was an under-diagnosis of 18% and over-diagnosis of 2.8% at centres when compared to results of re-examination. This suggests the need for development of a system of re-examination. Alternatively more intensive training and supervision is recommended to reduce this gap. The microscopes must meet the technical standards for proper smear examination and maintained accordingly. Sufficient number of sputum cups and microscopic slides should be made available and reuse of slides for microscopic examination is to be discontinued.

Since a small number of sputa are examined in PHIs, WHO holds the view that it may be difficult to maintain high quality of smear examination in such institutions[21] and a dedicated sputum microscopy facility should be established for every one lakh population backed up by adequate supervision. Currently, this strategy is being tried as pilot projects.

In the case of X-ray examination, quality of X-ray picture is to be evaluated and independent dual reading of X-ray films is recommended to reduce over and under-reading.

Proper recording and reporting will help in improving quality of case-finding, retrieval of cases and evaluation of case-finding activities.

Delay in Case-Finding

The patient's alertness to the symptoms of tuberculosis leading to proper action combined with readiness of health

services in making a correct diagnosis play an essential role in case-finding. Even if patients are conscious of the symptoms, social stigma, fear of expenses, lack of faith in quality of health services and long distance to the health centres discourage the patients from seeking medical care. In Korea[22], a median delay of 1.8 months by the patients has been observed in visiting a health facility after development of symptoms with 30% of them being diagnosed after 6 months. Many patients with symptoms suggestive of tuberculosis are either overlooked[23] because of inadequately trained staff or missed by poor quality of sputum examination. Diagnostic delay, an important indicator of quality of a tuberculosis programme, of one month has been observed even in the well functioning programme of Japan[24] and is expected to be much longer in developing countries. Transmission of infection continues in the prediagnosis period and epidemiological impact of treatment programme is nullified to a great extent.

Constraints in Case-Finding

While DTP has not yet been introduced in as many as 20% of the districts in the country, a significant proportion of PHIs still remain to be implemented as only 56% of available health institutions have been implemented so far. Though DTCs have achieved a case-finding efficiency of 71%, the same under PHIs has remained low at 36%. The smear positivity rates at PHIs have remained low[27] at less than 5% of the specimens examined against the expectation of 8%. This aspect needs to be examined further whether the expected positivity rates are higher or the quality of sputum microscopy is below par.

The entire central budget is allocated only for drugs and no funds have been earmarked for procurement of diagnostic equipments and maintenance. Non-utilisation of personnel trained by NTI and lack of adequately trained medical and para-medical personnel, especially in PHIs, insufficient supply of basic materials, chemicals and reagents, improper recording and reporting and inadequate supervision from DTC are some of the important constraints in implementation of an efficient case-finding and treatment programme.

Approaches for Improving Case-Finding

Case-finding efficiency today is at a low ebb and on an average, only one-third of the potential is being achieved under DTP. New approaches for reducing the gap between case load and case-detection need to be evolved.

Case-finding activity especially at PHIs is at a low level and utilisation of Multi-Purpose Workers (MPWs), especially for identification of persons with cough of more than two weeks, which is found to be present in 70% of tuberculosis patients[19], during their routine domiciliary visits needs the attention of health administrators.

More than one-third of cases were observed to seek relief outside the government health set up even in a rural area[25]. The patient with chest symptoms undergoes many tests and sputum microscopy is not asked for. The diagnosis of tuberculosis is pronounced on the basis of X-ray results, ESR and mantoux test. Many practitioners are not alert to the possibility of tuberculosis and this results in cases being diagnosed in late stage. Therefore, it is of great importance to bring general practitioners under the ambit of NTP after imparting adequate knowledge about its various aspects.

Non-Governmental Organizations (NGOs) should be involved in mass education activity to create awareness among general public, convincing funding agencies that this is a programme worthy of financial support and influencing government legislators on the need to give due priority to tuberculosis control activities.

Research Issues in Case-Finding

— Patient and community behaviour after development of symptoms and extent cum reasons of delay in case-finding need to be determined.

— Development of more reliable, simple, rapid and inexpensive methods for identifying cases is required.

— Identification of risk factors in tuberculosis will help to determine those most likely to develop active tuberculosis.

— In longitudinal study at Bangalore, 13% of smear negative patients progressed to become smear positive[26]. Moreover, as a result of HIV epidemic, the clinical spectrum of tuberculosis may be altered. Therefore, research is needed to make more reliable diagnosis of smear negative pulmonary tuberculosis.

— Methods of private sector collaboration with NTP need to be demonstrated.

Conclusion

While the strategy of tuberculosis case-finding formulated after sound operational research has a reasonable potential, the case-finding activity under NTP is at a low ebb. For too long, focus has been solely on chemotherapy, the full potential of which can only be realised after reducing the gap between case-finding

potential and current level of case-finding efficiency. Though the need for a more reliable and efficient case-finding tool cannot be denied, for the time being it is essential to continue relying on sputum microscopy which is practical and cost-effective and can be provided in all parts of developing countries.

DTPs should be implemented in all the districts and all health institutions in the country including remotest areas should be covered with tuberculosis case-finding and treatment programmes.

Quality of case-finding has to be upgraded by providing medical personnel and health workers trained in proper selection of chest symptomatics, sputum collection and examination. Standard microscopes with provision of proper maintenance, adequate supply of sputum cups and slides, use of quality reagents, proper recording and reporting aided by adequate supervision of PHIs by DTC personnel will enhance the efficiency of case-finding programme.

Adequate treatment of diagnosed cases by uninterrupted free supply of drugs and case-holding resulting in high cure rates will boost public faith in the community towards the services provided. Mass education campaigns in collaboration with NGOs to convince the public about curability of disease will help to remove social stigma. General public should be made aware of the symptoms of disease and availability of services in order to increase their utilisation. Messages about sputum microscopy being the most reliable means of diagnosing tuberculosis will help to generate demand for the same.

Guiding private practitioners about the techniques of case- finding followed by treatment and their involvement as also that of other health agencies like CGHS, ESI dispensaries and hospitals, railways, defence services and charitable institutions in case notification and submission of reports on treatment results will widen the ambit of case-finding under DTP.

Finally, the programme must be geared to treat effectively all additional cases found by stepped up case-finding activity in order to bring a significant epidemiological impact on the problem of tuberculosis.

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STRENGTHENING.....PRIMARY HEALTH CARE

The district is the frontline unit for planning, organizing and managing primary health care. Programmes have to be devised by governments, the voluntary sector and communities, all planning and working together. While considerable decentralization of authority is called for, overall national guidance and monitoring have to be provided by government. District health systems cannot be strengthened in isolation; the development of the whole system is essential to the functioning of the different parts.

The holistic approach to health care will not work without determination and bold enlightened leadership. Unfortunately, there are increasing pressures to organize resources for health along traditional, vertical lines and to pursue goals and programmes in isolation. The organization of health systems based on the comprehensive objectives of primary health care is difficult, and practical experience in this area remains limited, particularly in international organizations. The sceptics who claim that the district approach is woolly and unmanageable should become more closely acquainted with what is going on in the field and should help to encourage joint action. Those working at government level in developing countries should be aware that the giving of special attention to primary health care in the district is a logical step towards health for all.

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