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Cost-Benefit of Contact-Tracing in a Tuberculosis Programme

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Summary

Akenzua GI and Oviawe O. Cost Benefit of Contact-Tracing in a Tuberculosis Programme. *Nigerian Journal of Paediatrics* **1984; 11:81.** In order to assess the cost-benefit of contact examination in a tuberculosis programme, we analysed the results of examinations carried out on household contacts of cases of tuberculosis treated at the University of Benin Teaching Hospital (UBTH) during a two-year period. There were eight children with active disease among 332 persons, aged less than 15 years, found in households of 66 cases of tuberculosis containing 509 members. These constituted 7.8% of 103 children under 15 years old treated for tuberculosis in the hospital during the period. The estimated time spent by public health nurses to carry out contact-tracing was 396 hours valued at ₦1,061.28 and the distance travelled was 6,552 km at a cost of ₦655.20. Thus, an extra sum of ₦1,716.48 was spent by the hospital to detect 7.8% of children treated for tuberculosis. It is suggested that in a country with limited resources, the extra sum of money spent to find less than 10% of the children treated for tuberculosis could be more judiciously used for case detection in out-patient clinics. Alternatively, additional services such as administration of INH to children under 4 years of age with positive tuberculin test should be done during home visits in order to increase cost effectiveness of contact-tracing.

Introduction

TUBERCULOSIS is a major problem in Nigeria. The exact incidence of the disease in children is unknown, but reports indicate that it constitutes a high proportion of children treated annually in various hospitals.[1–3] It has been suggested that the large number of children with tuberculosis in Nigeria reflects widespread infection in the adult population.[4] Although there is no national programme for the control of the disease in Nigeria, a considerable degree of anti-tuberculosis activity is embarked upon by different health institutions in the country.[5] Hence, some portion of our health resources is currently expended on tuberculosis.

In most centres, examination of household contacts of tuberculosis cases is routinely carried out, in the hope that contact tracing may lead to

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the detection of additional cases, those in early stages of the disease and others who may be at risk of infection from the index case. However, some studies have shown that other cases are not necessarily concentrated in the households of known cases and that 98% of asymptomatic cases in the community may be undetected even after examination of household contacts of symptomatic cases.[6 7] Also, because potent chemotherapeutic agents are now available, additional cost for early case detection may no longer be justified since all cases are treated for at least, one year no matter the stage of the disease at the time of detection. Furthermore, persons at risk of infection from an index case are not necessarily confined to household members since the "zone of influence" of a case may extend beyond close family contacts to reach up to the tenth neighbourhood.[8]

In view of the above observations, it seemed necessary to examine the cost-benefit of contact tracing undertaken at the University of Benin Teaching Hospital (UBTH), in order to make recommendations either for increasing its cost-effectiveness or for a more judicious allocation of scarce resources.

Materials and Methods

Data for the present study were derived from information obtained on patients treated for tuberculosis at the UBTH, during a two-year period. The UBTH has 400 beds of which 70 are paediatric cots and beds; it draws patients mainly from Benin City (population–300,000). As the main referral hospital, it provides tertiary medical care for the entire State population of about 4.2 million (projection from 1963 census).

Home visits are routinely carried out on all patients diagnosed as having active tuberculosis irrespective of bacteriological confirmation of the diagnosis. Household contacts are screened with Mantoux test (10 TU) and those with negative reactions are vaccinated with BCG, while positive reactors are further screened with chest radiograph.

The records of the Health Visiting Unit of the UBTH were examined in order to obtain information on home visits done on patients treated for tuberculosis in the hospital from 1st July, 1980 to 30th June, 1982. Information obtained included the number of persons in each household, home address of index cases, number of visits per household and results of tuberculin test, chest radiograph and other investigations carried out as part of the screening procedure. The number of children between birth and 15 years found to have active tuberculosis was obtained.

From various other sources in the hospital, all children aged between birth and 15 years treated for tuberculosis during the period, were identified. The proportion of the total number of children with tuberculosis contributed by cases obtained from contact tracing was determined.

In order to compute the average distance covered by health visitors carrying out contact tracing, the homes were again visited, using the most direct motor route from the UBTH and the distance of each home from the hospital was determined using the odontometer of a Toyota Land Cruiser vehicle. Two health visitors who carried out the contact tracing on all the cases were interviewed and information obtained on their salaries, conditions of service and the number of hours spent on each home visit. Their official diaries were examined to supplement the information obtained and these were used to compute the cost of contact tracing to the hospital. This information was used to assess the cost-benefit of contact-tracing. Only data on child contacts were used for the analysis.

Results

There were 66 persons treated for tuberculosis on whom home visits were carried out during the 24-month period. Five hundred and nine persons were found in their households and 332 (65%)

of these 509 were children, aged between birth and 15 years. From the various screening procedures, eight of these children (2.4%) had "active" disease. When these were added to the children from other sources, there were 103 children treated for TB in hospital during the two-year period. Thus, the yield of childhood tuberculosis cases from contact tracing was 24 per 1,000 and contact examination contributed 78 per 1,000 (7.8%) of the total cases.

Children were considered to have "active" disease if they had chest radiographs reported by a competent radiologist to indicate active tuberculosis and/or if acid-fast bacilli could be demonstrated in their gastric washings. The result of tuberculin testing and the distribution of children with active disease by tuberculin reaction is shown in Table I. It should be noted that 32 (9.6%) of the 332 tuberculin tests could not be read as the children were not available on the day of reading. Only 5 (7.6%) of the 66 children with positive tuberculin reaction had active disease.

TABLE I

Tuberculin Reaction in Household Contacts and Proportion of Children in each Reaction Category with Active Disease

Tuberculin Reaction	*No. of Children*	*No. with Active Disease*	*% of Total*
Negative (0–4mm)	193	1	0.5
Doubtful (5–9 mm)	41	2	4.9
Postive (10mm and above)	66	5	7.6
Not read	32	–	–
Total	332	8	2.4

On the basis of Mantoux reaction and/or general assessment, 44 children were requested to undergo further radiographic examination of the chest. Thirty-three had the examination and 8 of them (24.2%) had active disease. The distribution of chest radiographic examination according to tuberculin reaction is shown in Table II. Thirty-three (9.9%) of all child contacts were further examined by chest radiography after initial Mantoux test and in 19 (57.6%) of them, chest radiographs were required irrespective of their tuberculin reaction status.

TABLE II

Distribution of Chest Radiographic Examination according to Tuberculin Reaction in 332 Children

Tuberculin Reaction	*No. of Children*	*No. X-rayed*	*% X-Rayed*
Positive	66	14	21.2
Doubtful	41	5	12.2
Negative	193	13	6.7
Not Read	32	1	3.1
Total	332	33	9.9

Computation of financial implication of contact tracing to hospital is shown in Table III. Three hundred and ninety six hours of nursing time, valued at ₦1,061.28, were spent in contact tracing work. A total of 6,552km travelled in official vehicle by the nurses was valued at ₦655.20 at the rate of 10k per km. Thus, an additional sum of ₦1,716.48 was expended by the hospital to find 7.8% of children treated for tuberculosis since there was no new case registered for treatment from among the 177 adults examined in these households.

Discussion

The case yield of 24 per 1,000 found in the present study is higher than 4-9 per 1,000 in household contacts and 2–8 per 1,000 for general population reported in an Indian study.[9] However, it is muhc less than 20.6%–54% found among symptomatci

TABLE III

Financial Implications of Contact-Tracing in UBTH

			₦	K
1. *Value of Nurses' Time:*				
Health Visitors' salary per annum	₦5,136.00			
Working hours per annum at 40 hr/wk	2080 hrs			
Less leave period	160			
Total	1920 hrs			
Monetary value of nurses' time	= ₦5136 / 1920 hrs			
	= ₦2.68 per hr			
2. *Nurses' Time on Home Visits:*				
Average no of hrs per nurse per household	= 3 hrs.			
Time spent by 2 nurses on 66 households (2 x 66 x 3)	= 396 hrs			
3. *Cost of Home Visits:*				
Cost of 396 hrs nurses' time	= 396 x N2.68	=	1,061	28
Cost of travelling 6552km at 10k per km	= 6552 x 10	=	655	20
Total Cost of Home Visits			1,716	48

persons attending various health institutions.[10] The high rate in the present study may be due to our more liberal definition of an active case. WHO Expert Committee on TB in 1964, defined a case as a person suffering from bacteriologically confirmed disease.[11] In the present study, we considered children with radiologically confirmed disease as active cases irrespective of their bacteriologic status.

Nair and Gothi[7] in 1973, examined the data from many tuberculosis centres in India and concluded that the contribution of contact examination did not justify the resources required to carry it out. They, however, gave no indication of the financial implications of contact-tracing. The present study supports this conclusion. As it is presently carried out in UBTH, contact-tracing brings only limited advantage of adding about 7.8% new cases to those obtained from other sources; it offers BCG vaccination to persons who are not at a significantly higher risk of infection than the general population.

Therefore, we think that the tuberculosis programme would be more cost-effective if the additional sum of over ₦1,700 in nurses' time and travels were utilized for case-finding among children attending out-patients clinics of the hospital. At present, the diagnostic potentials for detecting tuberculosis is not fully realised since children reporting in these clinics have no routine Mantoux test and chest radiographic examination. Alternatively, if home-visiting must remain part of the tuberculosis programme, its cost-benefit can be enhanced by including additional services. It is recommended that such additional services should include supervision of home administration of INH to children under 4 years of age with positive tuberculin tests.

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References

1. Aderele WI. Pulmonary tuberculosis in childhood. *Trop Geogr Med* 1979; **31:** 41–51.
2. Taqi AM, Abdurrahman MB and Ango SS. Childhood tuberculosis as seen at the Ahmadu Bello University Teaching Hospital, Zaira. *Nig J Paediat* 1982; **9:** 99–103.
3. Alakija W. A study of cases of tuberculosis in Bendel, Nigeria. *Nig Med Practitioner* 1983; **5:** 95–8.
4. Okeahialam TC. Childhood tuberculosis in Enugu, Nigeria. *Nig J Paediat* 1980; **7:** 1–6.
5. Epidemiology and Statistical Bulletin, Ministry of Health, Bendel State, 1975–1978.
6. Anderson S and Geser A. The distribution of tuberculosis infection among households in African communities. *Bull Wld Hlth Org* 1960; **22;** 39–60.
7. Raj N, Nair SS, Ramanatha Rao G and Chandrashekhar P. Distribution of tuberculosis infection and disease among households in a rural community. *Bull Wld Hlth Org* 1966; **34:** 639–54.
8. Nair SS, Ramanatha Rao G and Chandrashekhar P. Distribution of tuberculosis infection and disease in cluster of rural households. *Ind J Tubercul* 1971; **18:** 3–9.
9. Indian Council for Medical Research (ICMR). Tuberculosis in India—A sample survey, 1955–58. Special Rep Ser **34**, New Delhi, 1959.
10. Nair SS and Gothi GD. Place of contact examination in a tuberculosis programme. *Ind J Tubercul* 1973; **20:** 164–72.
11. World Health Organization. Expert Committee on tuberculosis. *WHO Tech Rep Ser* **290,** 1964.

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