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Tuberculin Test (Mantoux) Reactions in an Adolescent Population in Lagos

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Summary

Onifade EU, Dosekun EO. Tuberculin Test (Mantoux) Reactions in an Adolescent Population in Lagos. *Nigerian Journal of Paediatrics* **2000; 27: 11.** As a component of secondary school entry medical examination, Mantoux tests were performed on 310 apparently healthy adolescents. Three groups of children were identified: the first group of 132 (42.6 percent) were Mantoux negative and were presumed to be at risk of developing tuberculosis if exposed, the second group of 89 (28.7 percent) had positive Mantoux reactions large enough to arouse suspicion of active disease, while the third group of 89 (28.7 percent) seemed to have adequately sero-converted. The findings suggest that more than two-thirds (71.3 percent) of the study population was at risk of contracting tuberculosis and/or might have established infection. The results indicate that there may be a need to re-evaluate the present national policy on tuberculosis prevention.

Introduction

TUBERCULOSIS, an important communicable disease, remains endemic, particularly in the developing world.[1] Its scourge has been made worse by the advent of the human immuno-deficiency virus (HIV) infection[2] and the emergence of multiple drug resistant strains,[3] while there are reports of increasing incidence of the disease in the industrialized world.[4,5] Despite all control measures, tuberculosis remains highly prevalent in Nigeria.[6]

BCG immunization is universally accepted as protective against tuberculosis and in our environment, tuberculosis control is effected by giving BCG at birth, as well as by active case treatment. Different policies have been adopted by various tiers of the Nigerian government to ensure adequate BCG coverage. In the early seventies, prior to the official launching of the expanded programme on immunization (EPI) in the country, the Lagos State Government encouraged parents to immunize their newborns against tuberculosis by instituting a policy linking BCG immunization to birth registration, and making the latter a precondition for registration into the State's free primary education.[7] Thereafter, EPI and its accompanying health awareness campaign was geared towards improving immunization coverage rates. Given the above scenario, tuberculin sero-conversion rates in Lagos should be high, as most children would have either been in contact with the tubercle bacillus or received BCG vaccine. In the present study, Mantoux tests were performed on a population of apparently healthy adolescent junior secondary school boys in order to assess their tuberculin sero-conversion status, and thus, their level of protection against tuberculosis.

Subjects and Methods

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The survey was conducted among apparently healthy junior secondary school (JSS1) students attending St. Joseph's Boys' Secondary School, an all male secondary school situated in the Mushin Local Government area of Lagos State. The school is one of several serving this area and was chosen for logistic reasons. As part of the admission policy, new entrants are usually subjected to comprehensive medical examination. Parents are aware and approve of this policy. Majority of the students who attend this school lived within a five-kilometre radius of the school. They were all born in Lagos, where they had successfully completed their primary school education. Having passed the Lagos State Common Entrance examination, they had been posted to the school for the junior secondary education by the State's Schools Management Board. Each child had tuberculin test done as part of the comprehensive medical examination. At the time of testing, other information obtained included age, history of previous BCG vaccination, history of any recent immunizations or infectious illnesses, present medications, the presence or absence of a BCG scar, and a record of their present general state of health. Only those children who were adjudged well and not on any medications were included in the study.

Mantoux test was done on each child using standard techniques.[8] After cleaning the ventral surface of the left forearm with sterile water, 0.1ml (5 tuberculin units) of purified protein derivative [(PPD) (*Pasteur Merieux*)] was injected intradermally using a tuberculin syringe fitted with a 26.5G, 10mm needle. A wheal was raised in each case, and the results were read after 48 hours. Each induration at the test site, was measured along its widest diameter with a centimetre ruler, at right angles to the vertical axis of the forearm by one of the investigators (EUO). The results were grouped into four categories depending on the sizes of the induration, as follows:

(a) Negative Mantoux — No induration
(b) Satisfactory Mantoux — Induration <5mm
(c) Borderline positive Mantoux — Induration 5-9mm
(d) Positive Mantoux — Induration =10mm

The parents of the children with indurations =10mm were informed of this result and were referred to the nearest Health Centre for further assessment, while those who had negative Mantoux reactions were sent for BCG vaccination. Statistical analysis where relevant, was by means of the chi square test and significant P value was set at <0.05.

Results

Mantoux test was performed on 328 boys who were medically fit and were aged 10-16 years (mode 12 years), majority being aged 11-13 years. All but 18 of the 328 returned for the test to be read, resulting in a participation rate of 94.5 percent. Those children who did not return had no special characteristics, and were excluded from the analysis of the results.

It was not possible to obtain an immunization history from the children; none had any idea of his immunization status, and on request, none produced documentary evidence of immunization. However, 97 (31.3 percent) of the 310 children had BCG scars over their right and in some cases, left deltoid region (Table I); no such scars were seen in the remaining 68.7 percent.

There was no induration at the test site in 132 (42.6 percent) children who were therefore,

Table I

BCG Scar Distribution at Various Ages in 310 Children

Age (yr)	*BCG Scar seen*	*No BCG Scar*	*Total*
10	1	9	10
11	17	36	53
12	52	83	135
13	22	57	79
14	4	23	27
15	1	4	5
16	0	1	1
Total	97(31.3)	213(68.7)	310(100.0)

Figures in parentheses represent percentages of total

classified as being Mantoux negative; 89 (28.7 percent) had indurations that were less than 5mm, 60 (19.4 percent) had indurations 5mm – 9mm in diameter, while 29 (9.4 percent) had indurations that were 10mm or larger (Table II).

Table II

Mantoux Test Results in 310 apparently Healthy Adolescents

Mantoux Test Results	Number of Children			P value
	With BCG Scar	Without BCG Scar	Total	
No induration	43(44.3)	89(41.8)	132(42.6)	0.67*
<5mm induration	32(33.0)	57(26.8)	89(28.7)	0.27*
5-9mm induration	16(16.5)	44(20.6)	60(19.4)	0.38*
≥10mm	6(6.2)	23(10.8)	29(9.3)	0.19*
Total	97(100.0)	213(100.0)	310(100.0)	

Figures in parentheses represent percentages of total
* Not significant.

Of the ninety-seven children with BCG scars, 43 (44.3 percent) had negative Mantoux, 32 (33 percent) had Mantoux indurations <5mm, 16 (16.5 percent) had indurations 5-9mm and 6 (6.2 percent) had indurations =10mm. Fewer children with BCG scars had negative Mantoux reaction when compared with those without BCG scars, but this difference was not significant (P=0.67). Similarly, with regard to children with positive Mantoux reaction, there was no significant difference between the children with BCG scars and those without (P=0.19). There was also no significant difference between the numbers of children with and without BCG scars who had satisfactory or borderline positive Mantoux reaction (P=0.26 and 0.38, respectively).

Discussion

Despite the policies and measures employed by the various tiers of government, by healthcare workers and the United Nations Agencies involved in the execution of immunization programmes, the children in this study population on questioning, had no information about their immunization status. This raises the issue of the appropriateness of available health education modalities in our environment. Furthermore, the finding that successful BCG immunization as evidenced by the presence of a BCG scar was low (31.3 percent) among the study population, may indicate low BCG coverage. Although ineffective vaccines or faulty immunization techniques may also partly account for the absence of BCG scars, low immunization coverage rate seems universal with immunization programmes in our communities,[9] and is thus, more likely to have been the major reason.

The Mantoux results in this study group clearly identify three groups of children, a large group that was Mantoux negative and therefore, constituted an 'at risk' population for mycobacterial infection, 89 (28.7 percent) children who had Mantoux indurations large enough to arouse suspicion of active disease, and a third group of 89 (28.7 percent) children who seemed to have adequately sero-converted. Although 6.2 percent of the children with BCG scars and 10.8 percent of those without, had positive Mantoux reactions, the difference in these percentages was not significant. If satisfactory Mantoux results indicate adequate protection against tuberculosis, then, this study indicates that only 33.0 percent of the 97 children with BCG scars in this study were adequately protected. Twenty-two of them (22.7 percent) had indurations large

enough to arouse suspicion of active disease, while the remaining 44.3 percent were Mantoux negative and were thus, at risk of contracting tuberculosis. In view of such a large propôrtion of children with BCG scars being at risk of developing tuberculosis if exposed, or having Mantoux reaction suggestive of active infection, this study again raises the issue of the protective effect of neonatal BCG. BCG given at birth does not always achieve the desired seroconversion.[10,11] Indeed, it has been reported that the protection provided by such practice is not absolute,[12] hence the practice of sero-conversion checks followed by repeat BCG immunization if indicated. This practice is at present, not carried out routinely.

Based on the findings in the present study, it may be necessary to include older children in the target audience of immunization campaigns. We suggest that tuberculin sero-conversion be assessed by an "interval" Mantoux test at junior secondary school entry (ages 11-13 inclusive) and that children found to be tuberculin negative at this time, be offered BCG immunization, while those with positive Mantoux reactions be appropriately treated. These measures should help in the control of tuberculosis especially in the light of the increasing pool of active disease consequent on the current HIV/AIDS pandemic.

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