Frequency of BCG vaccination among children with pulmonary tuberculosis at a tertiary care hospital.

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Abstract:

Introduction: There are more instances of tuberculosis in children than the World Health Organization predicts. Most TB cases (95%) are found in low-income nations. Neonate BCG immunization is recommended by the WHO in countries with a "high prevalence" of tuberculosis.

Objective: To determine the frequency of BCG vaccination in children diagnosed with pulmonary Tuberculosis at a tertiary care hospital.

Methodology: From June 2019 to December 2019, researchers examined the prevalence of pulmonary TB in children aged 2-12 using a cross-sectional descriptive research design. Pulmonary TB was diagnosed in 273 people who had a cough and fever for more than 2 weeks and had a PPA score of 7 or above on the Pakistan Pediatric Association (PPA) grading table. Patients were checked for BCG immunization status. The analysis of the data performed using SPSS version 23.

Results: Patients from rural regions contributed 68.86%, while those from metropolitan areas made up 33.14. Contact with tuberculosis patients was reported by 17.22% of patients.74.3% of kids got the BCG shot.

Conclusion: BCG is the sole effective method of preventing tuberculosis in children and young adults. Children who received the BCG vaccine had a 74.36% increased risk of developing TB in the lungs, according to the current study.

Keywords: BCG vaccine, pulmonary tuberculosis, vaccine efficacy

Introduction:

Despite recent advancements in detection and treatment, tuberculosis (TB) remains the second greatest cause of mortality attributable to infectious illnesses worldwide.[1] In 2013, 550,000 children younger than 15 were diagnosed with tuberculosis. The real worldwide burden of paediatric tuberculosis is likely to be substantially greater than the WHO estimates due to underreporting. Eighty percent of the world's TB burden is concentrated in only 22 countries, mostly in Asia and sub-Saharan Africa[2] and about 95 percent of all TB cases occur in low-income nations. Between 2000 and 2016, the annual incidence rate for tuberculosis fell by an average of 2% worldwide. The rise in notification rates after 2013 may be partly attributed to improved case reporting, especially in India. Although TB fatalities decreased by 24% between 2000 and 2016, they still rank in the top ten global causes of death. There was a decline from 1.7 million fatalities in 2000 to 1.3 million deaths in 2016[3, 4] due to tuberculosis. Estimates from 2008 put the number of TB cases in Pakistan at 181 per 100,000 people, or 297 million people, and the number of new sputum smear positive (SS+) cases at 81 per 100,000 people, or 133 million people.[5] Case detection rates for both new SS+ patients and all TB cases are estimated to have improved steadily between 2002 and 2008, from 13% to 84% and from 19% to 84%, respectively. Recent increased estimates of TB incidence, however, have resulted in a lower case detection rate of about 60% for all TB patients and around 58% for new SS+ cases.[6]

District-level public health systems now provide TB services as part of their primary care offerings. However, most private providers are not adhering to National T.B. Control Program (NTP) standards, and the private sector is seen as the entry point into the health care delivery system by most consumers. Less than 3% of general practitioners(GPs) were found to be using national guidelines for diagnosis and therapy of TB in a 2003 study done by the NTP and PTPs in the Lahore and Rawalpindi districts, whereas 90% of GPs relied on chest radiography for diagnosis.[7, 8]

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Since the World Health Organization declared a "global TB emergency" in 1993, there has been a plethora of literature published on various elements of the disease's burden, treatment, and containment. However, most research has focused on illnesses that affect adults. Conversely, paediatric TB has received less attention than it deserves, mostly owing to the difficulty in diagnosing the disease and the fact that young kids have historically been given less of a priority in TB control efforts. Because of this, there has been a dearth of monitoring and research data on TB in children. Paediatric TB is still a public health issue despite the fact that it is anticipated that only one million new cases occur year across the world. [9,10]

The overall relative risk (RR) for tuberculosis in a meta-analysis of prospective studies was 0.49 (95% CI 0.34 to 0.70), indicating a 51% preventive effect. Protective efficacy against meningeal and military TB was 86%, according to another meta-analysis.[11] Gupta et al. found that among children in India who were diagnosed with TB, 77% had received the BCG vaccine. [12]

This result of this study might generate a useful baseline database of our local population and help us figure out the effective role of BCG vaccination in the prevention of tuberculosis among the paediatric population of Southern Punjab, which will be useful in disease control despite the controversy surrounding the vaccine's purported protective effects. The burden on national authorities and medical systems will be reduced, it is also expected that and the number of affected children may also reduce significantly. This review addresses some of the unique features of TB in children; summarizes existing and novel diagnostic, therapeutic and preventative measures; and outlines important areas of future search.

Objective:

To determine the frequency of BCG vaccination in children diagnosed with pulmonary Tuberculosis at a tertiary care hospital.

Methodology:

From June 2019 to December 2019, researchers at Nishtar Hospital's Outpatient Paediatric Medicine Department in Multan, Pakistan, conducted a descriptive cross-sectional study. Institutional review board and the Committee for the Protection of Human Subjects both gave their approval to the project. Children of either gender who had been diagnosed with pulmonary TB before the age of 12 were eligible for participation. Children having a history of TB, tuberculous meningitis, or congenital heart disease were also excluded from the trial, as were parents who refused to provide permission. Using value of p=75%, and z=1.96 and margin of error at 5% and q=100-p, the calculated sample size was 273 by using an n = z2pq d2.[12] The sample was collected using a non-probabilistic, sequential sampling method.

Using Pakistan Paediatric Association (PPA) grading criteria, children having cough and fever for more than 2 weeks with PPA score of 7 or above, scar mark at deltoid were diagnosed as case of tuberculosis and thus included in this study.

Patients were recruited in the trial in the outpatient clinic of the paediatrics department at Nishtar Hospital in Multan. The parents gave written consent after being fully informed. The demographic and study variables were enquire about and notes taken on proforma.

SPSS®23 used to examine the data. Quantitative data were summarised using means and standard deviations. The influence on the final result (BCG vaccination) was analysed using a chi-square test. A significance level of 0.05 was used.

Results:

Overall mean age of all participants was 6.922.8 years, 157 (57.51%) were male and 116 (42.49%) were females. The clear history of contact with tuberculous patients found in only 17.21% (n=47) cases.

Table 1. Stratification of Age to Determine the Association of Age with BCG Vaccination.

Age Group	BCG vaccination		p value
	Yes	No	
02-06 years	97	34	0.909
07-12 years	106	36	

Most of the patients (n=188, 68.86%) were from rural areas while remaining (n=85,33.14%) were urban dwellers. In this series 203 patients (74.36 %) had received the BCG vaccine, whereas 70 patients (25.6 %) had not. Twenty-one patients (7.69%) had mothers who were illiterate, 72 (26.37%) were in the primary level, 77 (28.21%) were in the elementary level, 50 (18.32%) were in the SSC level, 31 (11.36%) were in the HSSC level, 15 (5.49%) were in the graduate level, and 07 (2.56%) were in the postgraduate level. We found no association between age and BCG immunization and pulmonary tuberculosis; 97 cases immunized with BCG vaccination were diagnosed with pulmonary were between age range of 2 to 6 years. While 106 children with age range of 7-12 years with history of BCG vaccination were diagnosed having pulmonary tuberculosis; the p-value for this difference was 0.90, which is statistically insignificant as shown in table no 1. Similarly, we did not find association between BCG vaccination, gender and development of pulmonary tuberculosis. 115 male and 88 female patients immunized with BCG vaccine patients were diagnosed with pulmonary tuberculosis; a statistically insignificant association (p=0.625) as shown in table 2.

Table 2. Stratification of Gender to determine the association of gender with BCG vaccination.

Gender	BCG vaccination		p value
	Yes	No	
Male	115	42	0.625
Female	88	28	

Table 3. Stratification of residential status to determine the association of residential status with BCG vaccination.

Residence	BCG vaccination		p value
	Yes	No	
Rural	142	46	0.509
Urban	61	24	

Table 4. Stratification of maternal literacy to determine the association of maternal literacy with BCG vaccination.

Maternal Literacy	BCG vaccination		p value
	Yes	No	
Illiterate	16	05	0.118
Primary	58	14	
Elementary	58	19	
SSC	39	11	
HSC	17	14	
Graduate	09	06	
Post graduate	06	01	

Table 5. Stratification of history of contact with TB to determine the association of history of contact with TB with BCG vaccination.

History of contact with T. B	BCG vaccination		p value
	Yes	No	
Yes	44	03	0.001
No	159	67	

Reportedly there was no association between socioeconomic status, BCG immunization and pulmonary tuberculosis; 142 immunized patients who lived in rural areas were tested positive; while 61 immunized patients were residing in metropolitan areas. Statistically difference was insignificant (p= 0.509) as shown in table 3.

To know whether education level of mother has any association with development of pulmonary tuberculosis among BCG immunized children we enquire about education status of mother as well. Contact with patient of pulmonary tuberculosis is an important risk factor, we found history of contact in only 44 cases. While the contact history was not found in 159 cases, as shown in table 4 and 5.

Discussion:

Tuberculosis (TB) was declared a worldwide health emergency by the World Health Organization in 1993.[13] Even now, 25 years later, tuberculosis is a serious problem for society. It is responsible for more deaths than any other infectious disease. Mycobacterium TB infects around 25 percent of the world's population, according to some estimates. There were 10 million new cases of tuberculosis in 2017, with 1.6 million fatalities. Around 1 million kids had tuberculosis that year, and 230,000 of them perished.[14] WHO has set the objective of ending the global TB pandemic by 2030 as one of its Sustainable Development Goals (SDG) 3, which focuses on health.[15] No effort should be neglected if it will help bring TB under control, since this would run counter to Pillar 1 of the plan to end TB. Latent infection therapy, when coupled with active illness treatment or preexposure immunization, may significantly reduce TB incidence.[16] With 1.5 million TB sufferers and 250,000 annual new cases, Pakistan ranks sixth in the world in terms of the prevalence of tuberculosis. The disease is responsible for 26% of premature deaths worldwide. About half of all TB cases (181/100,000) are caused by AFB1. TB rates among Pakistani youngsters are difficult to quantify.[17] BCG is the only vaccination available to prevent the most severe types of juvenile TB, with an efficiency of 73% and 77% versus TB meningitis and miliary TB, respectively, however its effectiveness against pulmonary TB is questionable.[18,19] A recent Norwegian research shown that BCG's protection was more cost-effective than anticipated in a long-term setting.[19] According to a second study conducted in Guinea-Bissau, preterm infant mortality may be reduced by 48% if BCG is given at the time of delivery. The closeness of the BCG vaccine to the time of birth and its function as a gateway to an extended programme on immunization (EPI) and other healthcare facilities both contribute to its significance.[20] All babies in Pakistan must be given BCG after birth, with the exception of those with confirmed or suspected HIV infection, according to the government's immunization policy for disease and prevention. Although additional impact variables, such as inadequate control of the cold chain and incorrect injection,

are implicated in the main vaccination failure, the formation of a scar following BCG vaccination is a helpful sign of immunological response.[17,20] Verification of the immunization record and direct examination of the BCG scar are two of the most common procedures used to assess BCG coverage.[21,22] Prior research has shown that a child's likelihood of not being vaccinated increases with her gender, her parents' education level, her awareness of immunization and vaccine-preventable illnesses, her family's wealth index, and the number of siblings she has.[22]

Over the course of many decades, the BCG vaccination has been the subject of countless effectiveness trials and epidemiological research. These studies show that the preventive efficiency of BCG against severe types of childhood TB, especially meningitis, ranges from 60 to 80 percent, whereas the efficacy against pulmonary illnesses varies by region.[23] This regional difference may be explained by the fact that BCG does not appear to protect against illness when administered to patients who are already infected with or sensitized to environmental mycobacteria.[24,25] BCG immunization was reported in 81% of children who reported with pneumonia due to TB in a Greenland investigation on the efficacy of BCG vaccination in limiting tuberculosis (TB)-related infection.[26] A study conducted by Shamaeel et al. on the frequency of BCG vaccination among children presenting with tuberculosis meningitis reported BCG vaccination in 68.78% children.[27] In India, 77% of children with pulmonary TB were vaccinated with BCG, according to a research by Gupta et al.[12]

Children with pulmonary TB were more likely to have been vaccinated against BCG than children without the disease.

The effectiveness of the BCG vaccine in youngsters is now under doubt as a consequence of these findings.

The success or failure of BCG immunization among immunized youngsters in our community requires further research.

Conclusion:

BCG is the sole effective method of preventing tuberculosis in children and young adults. Children who received the BCG vaccine had a 74.36% increased risk of developing TB in the lungs, according to the current study.

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