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Short Communication

Adherence To Correct BCG Immunisation Technique: A Clinical Audit

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I N F O

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A B S T R A C T

Introduction: Bacillus Calmette-Guerin (BCG) vaccination plays a pivotal role in preventing tuberculosis and mycobacterial infections. This clinical audit explores the historical significance, diverse protective mechanisms, and the critical role of accurate administration techniques for optimising BCG's global health benefits.

Methodology: Conducted at Sharda Hospital, the audit aimed to evaluate and enhance adherence to the correct BCG vaccination technique in neonates. Pre-training audits revealed inconsistency, prompting a one-day training program emphasising intradermal administration. Post-training audits demonstrated a significant increase in adherence from 27.7% to 87.0%. Ethical considerations were strictly adhered to, with informed consent obtained for documentation.

Results: Pre-training, wheal formation occurred in only 27.7% of cases. Post-training, the rate rose to 87%, reflecting improved adherence. Newborn demographics showed term and pre-term distribution, with timely vaccinations improved in post-training assessment.

Conclusion: This clinical audit highlights the success of educational interventions in improving adherence to correct BCG vaccination techniques, emphasising the need for periodic staff training and sustained monitoring. As tuberculosis cases rise, maintaining the correct vaccination practices is imperative for better healthcare outcomes.

Keywords: Clinical Audit, BCG, Vaccination, Tuberculosis

Introduction

Tuberculosis (TB) remains a significant global health crisis, claiming the lives of over a million individuals each year. Compounded by prolonged treatment courses and inadequate adherence to medications, the rise of drug-resistant TB strains has further complicated efforts to combat this pandemic.[1]

Live attenuated Bacillus Calmette-Guérin (BCG) vaccine, derived from Mycobacterium bovis, has been utilised since 1921 and remains the only approved vaccine for TB. Since then, BCG has stood as the sole defence against tuberculosis and has become integral to routine newborn immunisation schedules globally.

BCG has been a cornerstone in tuberculosis control efforts

for over four decades, especially in developing countries. Its recommendation for use in these regions underscores its crucial role in public health. Remarkably safe, the BCG vaccine boasts a favourable safety profile, with no severe complications commonly associated with its administration.

The protection Against Tuberculosis extends beyond mere vaccination, encompassing acquired or vaccine-induced immunity against mycobacterial infections, including tuberculosis. Natural protection against tuberculosis infection is conferred through prior exposure to nontuberculous mycobacteria and Mycobacterium tuberculosis. The immune response to mycobacterial antigens plays a pivotal role in safeguarding against tuberculosis, with prior latent infection offering substantial protection upon subsequent exposure.[2]

However, a nuanced risk emerges in individuals with a history of active tuberculosis. Both HIV-uninfected and HIV-infected patients face an elevated risk of recurrent active tuberculosis due to distinct strains, highlighting the complexity of tuberculosis management in these populations.[3]

An aspect of BCG's impact extends beyond its primary role in preventing tuberculosis. BCG has been linked to a reduction in childhood mortality, a phenomenon not solely attributed to its anti-tuberculosis properties. This reduction may partly result from the epigenetic reprogramming of the nucleotide-binding oligomerisation domain (NOD2) receptor, highlighting the vaccine's multifaceted influence.

BCG vaccination can be administered via two routes—subcutaneously or intradermally—both deemed equivalent in efficacy. Nevertheless, the intradermal route is preferred, presenting a unique set of challenges owing to the technical nature of the injection and the delicate size of newborn arms.[4]

The correct technique of BCG vaccination assumes paramount importance in realising the vaccine's benefits. Administered by trained healthcare workers, the vaccine is ideally injected in the lateral aspect of the left upper arm intradermally. The standard dosage consists of 0.05 mL until 1 month and 0.1 mL beyond age 1 month till 1 year of age, ensuring optimal efficacy and safety.

The intricacies of intradermal injection, executed with a short narrow needle (15 mm, 26 G), demand precision. The needle is introduced just under the skin over the left deltoid area at a 5–15-degree angle. It is placed almost flat against the patient's skin, with the bevel side facing upwards. A successful injection is signalled by the appearance of a small wheal or bleb (> 5 mm), indicative of fluid residing in the dermis.[5]

Acknowledging the technical challenges involved, especially for inexperienced staff, underscores the imperative need for comprehensive training to mitigate potential failures in the intradermal vaccination technique. Subcutaneous administration, while an alternative, bears the risk of inducing local infections, potentially spreading to regional lymph nodes and causing either suppurative or non-suppurative lymphadenitis.

In essence, this comprehensive overview serves to illuminate the multifaceted landscape of BCG vaccination, emphasising its historical significance, diverse protective mechanisms, and the critical role of accurate administration techniques in maximising its benefits for global health.

Methodology

In the conducted clinical audit at the Department of Paediatrics, Sharda Hospital, the primary objective was to evaluate and enhance adherence to the correct technique of BCG vaccination in neonates born at the hospital. A pre-training assessment involved a retrospective review of BCG vaccination records, revealing a notable inconsistency in the administration technique, particularly the absence of wheal formation.

Subsequently, a one-day training program was organised and facilitated by the Chief Medical Officer (CMO), Gautam Buddha Nagar. The training focused on imparting proper administration techniques, emphasising the use of a small, thin needle (15mm, 26G) at a 5–15-degree angle, with the needle placed almost flat against the skin, with the bevel side facing upwards. Practical demonstrations and hands-on training were incorporated to address the nuances of the intradermal technique.

Following the training, a post-training clinical audit was conducted, involving the verification of the correct technique by a paediatrician. BCG vaccine administration was carried out, and photographic documentation of the wheal was performed after obtaining informed consent from parents. In cases where an unsatisfactory technique was identified, immediate discussions were initiated with the Chief Nursing Officer (CNO) and nursing staff, and corrective measures were implemented, including additional training sessions and resources. Sustained monitoring strategies were put in place, including the incorporation of a BCG vaccination technique module in the orientation program for new Postgraduate students and nursing staff involved in immunisation.

Ethical considerations, such as obtaining informed consent for photography and maintaining confidentiality, were meticulously adhered to throughout the audit process, with approval sought from the hospital's ethics committee.

This comprehensive methodology aims to systematically address deficiencies, improve healthcare worker adherence to proper BCG vaccination techniques, and establish a robust monitoring framework for sustained quality enhancement at Sharda Hospital.

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The minimum sample size for a clinical audit is 30, however, as we realised that 13 out of 18 babies in the pre-training assessment had been administered vaccine in incorrect technique, it was terminated at the number 18 due to ethical reasons (i.e., it would have been unethical for more babies to receive BCG vaccination by incorrect technique) and hence the difference in pre- and post-training sample size.

Result

In the pre-training audit, 18 newborns were given BCG vaccination, out of which in 13 (72.20%) newborns the wheal was not formed whereas it was formed only in 5(27.70%) newborns, wheal formation was seen only in 5 newborns (Figure 1).

In the post-training audit, 70 newborns were given vaccination and a wheal was formed in 61 newborns which was verified by a postgraduate student (Figure 2).

Post training, adherence to the correct vaccination technique increased from 27.7% to 87.0%.

(the blue colour denoting Wheal not formed and orange colour denoting that wheal formed). In 9 (12.80%) newborns the wheal was not formed whereas it was formed in 61(87%) newborns.

In the pre-training audit, it was seen that out of a total of 18 newborns, 13 were term, and 5 were pre-term. The newborns who received BCG vaccination in less than 24 hours was 0, 24–48 hours was 4, 48–72 hours was 8 and more than 72 hours was 6 respectively (Figure 3).

In the post-training audit, it was seen that out of a total of 70 newborns, 50 were term, and 20 were pre-term. The newborns who received BCG vaccination in less than 24 hours was 16, 24–48 hours was 39, 48–72 hours was 2, and more than 72 hours was 13, respectively.

The BCG vaccination was primarily carried out by nursing staff at the postnatal ward and vaccination centre in the Paediatrics OPD and neonatal intensive care unit i.e., a total of 5 nursing staff.

After the training was done, 71 babies out of 80 were found to have been administered the vaccine in the correct method which had been given by those 5-nursing staff only hence all had improved in their technique.

A 5 mm wheal was raised i.e., end point of good BCG vaccine administration, and was seen in 71 babies out of 80 babies in the post-training audit.

As far as late response is concerned, blister and scar formation is variable from 6 weeks to 3 months which has to be seen on follow-up.

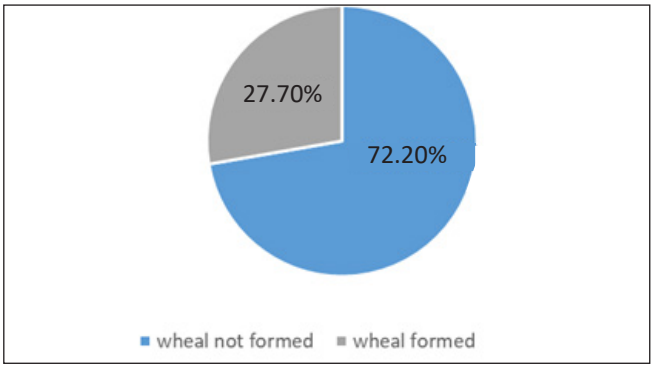

Figure 1.Pre-Training Audit Results (the blue colour denoting Wheal not formed and grey colour denoting that wheal formed)

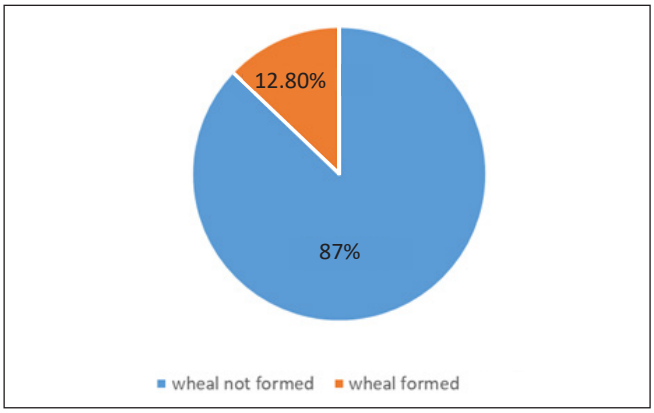

Figure 2.Post-Training Audit Results

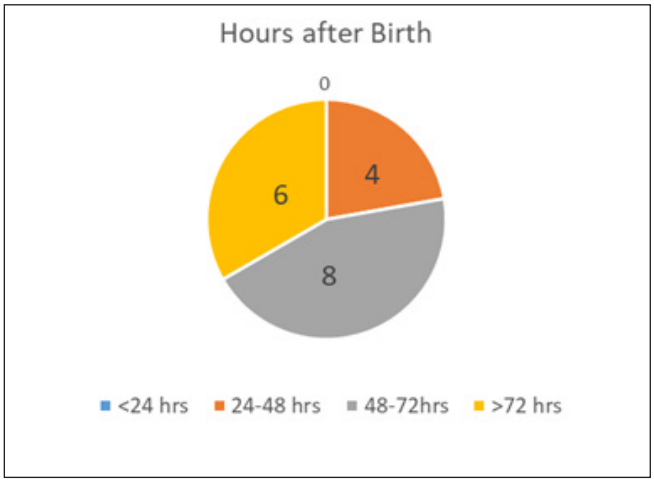

Figure 3. Pre-Timing of BCG vaccination (in hours)

Discussion

In the initial audit conducted before the training schedule, findings revealed a lack of adherence to the correct technique for neonatal BCG vaccination. However, the second audit done post-training showed an increase in the rate of adherence to the correct technique of vaccination from 27.7% to 87.0%.

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As tuberculosis cases continue to rise in our country, correct vaccination technique is of utmost importance, hence this clinical audit was done to keep a check on the correct technique of administration. This audit underscores that simple interventions, such as surveillance and education, can lead to significant improvements in practice without requiring extensive additional resources.

Engaging in widespread clinical audits is expected to increase documentation of clinical practices through explicit standards or policies. Utilising existing clinical policies serves as a suitable starting point for the audit process. Effective implementation and meaningful change through audits necessitate distributing explicit standards or policies to all responsible parties involved in their implementation and ensuring compliance with agreed-upon standards.

In a study by Ahmed et al., audits of the Avon Neonatal BCG Immunisation Policy revealed gaps in compliance, with only a small percentage of eligible infants receiving the vaccine initially. However, after interventions were implemented and the audit cycle completed, there was a significant improvement in compliance rates, highlighting the effectiveness of completing the audit cycle in improving clinical practice.[1]

Similarly, in an audit by Deshpande on ethnic differences in BCG vaccination rates, disparities were observed, with infants of Indian subcontinental origin more likely to receive the vaccine compared to non-Indian subcontinental infants. This emphasises the need for greater awareness and simplification of eligibility criteria to improve vaccination rates among all eligible infants.[2]

Sustained efforts need to be taken in order to implement correct techniques for vaccination and from time to time such audits can help in improving the vaccination practices. The staff should be trained at regular intervals for proper compliance with the techniques.

Figure 4.Wheal was not formed in the pre-training audit

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Figure 5.Wheal was formed in the post-training audit

Conclusion

This clinical audit highlights the success of educational interventions in improving adherence to correct BCG vaccination techniques, emphasizing the need for periodic staff training and sustained monitoring. As tuberculosis cases rise, maintaining correct vaccination practices is imperative for better healthcare outcomes.

Conflict of Interest: None

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