



## BCG SCAR; FACTORS AFFECTING ITS FORMATION IN INFANTS ATTENDING IMMUNIZATION CENTRE AT A DISTRICT HOSPITAL

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**ABSTRACT:** BCG vaccination may cause scar formation but it does not occur in 100% children. **Objectives:** To know the frequency of BCG scar in the infants 9-11 months of age and its relation with sex, gestational age, weight at birth, the timing of vaccination and the pattern of feeding in the first month of life. **Setting:** Immunization Center of Department of Pediatrics, Civil Hospital Bahawalpur. **Period:** 1<sup>st</sup> June 2015 to 15<sup>th</sup> August 2015. **Subjects and Material:** The infants 9 to 11 months of age coming for measles vaccination and having record of BCG immunization by the single vaccinator done at the same centre were included for the study. The scar on the right arm was observed at the time of measles vaccination. **Result:** There were 500 infants included in the study. The BCG scar was absent in 55 cases giving absent scar rate of 11%. There was no statistically significant difference among different sexes, birth weights, gestational ages, timings of BCG vaccination and patterns of feeding in the first month of life. **Conclusion:** Absent BCG scar is not an uncommon feature and is independent of sex, birth weight, gestational age, and timing of BCG vaccination and pattern of feeding in the first month of life.

**Key words:** BCG scar; BCG vaccination; Gestational age; Birth weight

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### INTRODUCTION

Tuberculosis (TB) is a global health issue. In Pakistan approximately 5.7 million people suffer from TB, with 260,000 new cases occurring every year.<sup>2</sup> The exact population of children with TB in Pakistan is unknown.<sup>3</sup> Bacille Calmette-Guerin (BCG) vaccine is recommended for all neonates in countries with a high prevalence of tuberculosis and has been shown to prevent severe forms of tuberculosis but not primary infection and reactivation of latent pulmonary infection.<sup>4,5,6,7</sup> It has been the main stay of tuberculosis control in Pakistan since 1952. It is given intradermally on right deltoid as 0.05ml at birth in Pakistan. Correct intradermal BCG vaccination almost invariably results in minor local reactions (erythema, induration, tenderness) often followed by a small ulceration at the site of the injection and then a scar.<sup>6</sup>

The presence or absence of a BCG scar is often taken as an indicator of previous vaccination.<sup>8</sup> But, its sensitivity as an index of vaccination

status is still controversial as absent BCG scar may be a common occurrence.<sup>9</sup> Moreover, BCG scar is a marker of better survival among children in countries with high child mortality.<sup>10</sup> The BCG vaccination scar was found as low as 48 % in the study done by Storgaard L et al 2015<sup>11</sup> and as high as 99% in the study done by Santiago EM et al 2003.<sup>12</sup> The study done in Pakistan by Rahman M et al 2013<sup>13</sup> showed positive scar in 88% children.

The failure to form a scar may be related to factors such as lack of maturation of the immune system<sup>14</sup>, faulty technique, or use of a nonpotent vaccine.<sup>15</sup> The other factors may include the sex, gestational age, weight at birth, timing of vaccination given and the pattern of feeding in the first month of life as well as the strain and dose of the BCG vaccine.<sup>6</sup>

The objectives of the study were to know the frequency of BCG scar in the infant's 9-11 months of age and its relation with sex, gestational age, and weight at birth, the timing of vaccination and the pattern of feeding in the first month of life.

## SUBJECTS AND METHODS

This cross sectional study was conducted in the Immunization Center of Department of Pediatrics, Civil Hospital (District Hospital), Bahawalpur from 1st June 2015 to 15<sup>th</sup> August 2015. The infants 9 to 11 months of age coming for measles vaccination who had record of BCG immunization (given as 0.05 ml intradermally on right deltoid) by the single trained and skilled vaccinator at the same centre (Immunization Center of Department of Pediatrics, Civil Hospital) were included for the study. Informed oral consent was obtained from parents/guardian.

The infants with unknown gestational age or gestational age less than 28 weeks or more than 42 weeks, infants sick enough to be admitted in the hospital at birth during first month of life, infants receiving BCG vaccination at other Immunization Center or receiving by the other vaccinator than the one who gave vaccination to the study group, BCG vaccination given after 7 day of life, infants having no or incomplete record. The scar on the right arm was seen at the time of measles vaccination by the same examined. Any visible scar was taken as positive BCG scar.

Information about age, sex, birth weight, gestational age, and timing of BCG vaccination

and pattern of feeding in the first month of life were obtained.

Data was entered and analyzed using SPSS 13. The qualitative data was compared by Chi square test and p value less than 0.5 was taken as significant.

## RESULTS

There were 500 infants included in the study. The BCG scar was absent in 55 cases giving absent scar rate of 11%. The BCG scar was absent in 10.3% males and 12.06% female infants but the difference was insignificant (0.5378). It was absent in 11.36% preterm and 10.1% full term delivered infants but the difference was insignificant (0.9357). It was absent in 12.5% infants having birth weight <2.5 Kg and 10.81% infants having birth weight  $\geq$ 2.5 Kg infants but the difference was insignificant (0.7034). It was absent in 10.23% infants where BCG vaccination was given within 3 days and 11.86% infants where the vaccination was given within 3-7 days of life but the difference was insignificant (0.5592). It was absent in 7.32% infants with exclusive breast feeding in first month of life and 12.8% infants where feeding was non-exclusive breast feeding or formula feeding but the difference was insignificant (0.0659). The details are given in Table-I.

Feature	Total cases	Cases with positive scar		Cases with absent scar		P value
		Total cases	Positive scar rate	Total cases	Negative scar rate	
Sex						
Male	301	270	89.7%	31	10.3%	0.5378
Female	199	175	87.94%	24	12.06%	
Gestational age						
Preterm (<37 weeks)	44	39	88.64%	5	11.36%	0.9357
Full term(37-42 weeks)	456	406	89.9%	50	10.1%	
Birth Weight						
<2.5 Kg	56	49	87.5%	7	12.5%	0.7034
$\geq$ 2.5Kg	444	396	89.19%	48	10.81%	
Vaccination given within						
3 days	264	237	89.77%	27	10.23%	0.5592
3-7 days	236	208	88.14%	28	11.86%	
Feeding in the first month						
Exclusive breast fed	164	152	92.68%	12	7.32%	0.0659
Non exclusive breast fed	336	293	87.2%	43	12.8%	

Table-I: BCG SCAR AND FACTORS

## DISCUSSION

There is usually scar formation after BCG vaccination but failure to scar formation may vary from study to study. So failure to BCG scar formation cannot be taken as the child was not given BCG vaccine. There are many factors which may be responsible for the failure of formation of BCG scar. This study was done to know the frequency BCG BCG scar and its relation with sex, gestational age, and weight at birth, timing of vaccination given and the pattern of feeding in the first month of life.

The absent scar rate was 11% in this study. The other study conducted in Pakistan by Rahman M et al<sup>13</sup> showed absent BCG scar in 12% cases while another national study done by Sherjil A et al<sup>16</sup> 2006 showed absence of BCG scar in 19.6%. The international study done by Srisaravanapavananthan N et al 2008<sup>17</sup> gave the same results. Santiago EM et al<sup>12</sup> 2015 showed that BCG scar was absent in 1.4%, Atimati AO et al<sup>18</sup> 2014 showed absent BCG scar in 3.7%, Dhanawade SS et al<sup>19</sup> 2015 showed a scar failure rate of 8.6% while Rani SH et al<sup>20</sup> 1998 showed absent BCG scar in 10% cases. Sivarajah N et al<sup>1990</sup><sup>21</sup> showed absent BCG scar in 13.9% while Storgaard L et al 2015<sup>11</sup> showed BCG scar was absent 48% cases.

The BCG scar was absent in 10.3% males and 12.06% female infants but the difference was insignificant (0.5378) in this study. Santiago EM et al<sup>12</sup> 2003, Srisaravanapavananthan N et al<sup>17</sup> 2008, Atimati AO et al<sup>18</sup> 2014 and Dhanawade SS et al<sup>19</sup> 2015 also showed that BCG scar did not differ by sex.

The BCG scar was absent in 11.36% preterm and 10.1% full term delivered infants but the difference was insignificant (0.9357) in my study. Atimati AO et al<sup>18</sup> 2014 and Kaur S et al<sup>22</sup> 2002 also showed no significant difference was seen in the scar formation in infants studied with varying gestation.

The BCG scar was absent in 12.5% cases having birth weight <2.5 Kg and 0.81% infants having birth weight ≥2.5 Kg infants but the difference

was insignificant (0.7034). Santiago EM et al<sup>12</sup> 2003 showed that BCG scar did not differ by birth weight. Atimati AO et al<sup>18</sup> 2014 and Kaur S et al<sup>22</sup> 2002 also showed no significant difference was seen in the scar formation in infants studied with birth weights.

The BCG scar was absent in 10.23% infants where BCG vaccination was given within 3 days and 11.86% infants where the vaccination was given within 3-7days of life but the difference was insignificant (0.5592) in this study . Santiago EM et al<sup>12</sup> 2003 and Dhanawade SS et al<sup>19</sup> 2015 also showed that BCG scar did not differ by age of vaccination.

The BCG scar was absent in 7.32% infants with exclusive breast feeding in first month of life and 12.8% infants where feeding was non-exclusive breast feeding or formula feeding but the difference was insignificant (0.0659) in this study. Pabst HF et al<sup>23</sup> 1989 showed that breast-feeding significantly enhanced cell-mediated immune response to BCG vaccine given at birth but it did not affect of this on BCG scar formation.

The difference in frequency of absent BCG scar in various studies could be accounted for by variability in the study designs and differences in the demographic characteristics of subjects. Development of BCG scar depends on the strain, injected dose and technique of administration.<sup>24</sup> Other factors like quality of vaccine, proper transport, storage and undiagnosed underlying immune disorder in infants are also responsible for the absence of scar formation.<sup>25</sup>

## CONCLUSION

Absent BCG scar is not a uncommon feature and is independent of sexe, birth weight, gestational age, timing of BCG vaccination and pattern of feeding in the first month of life.

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