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Determination of Anti-Hib Type B Antibodies Level and Vaccination Coverage in Children Aged 6-7 Months, 18 Months After the Introduction of the Hib Vaccine in the District of Bamako-Mali

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Abstract **Original Research Article**

The Center for Vaccine Development – Mali as part of its hospital-based on surveillance of invasive bacterial infections in pediatrics at the Gabriel TOURE University Hospital, Hib was isolated in 10% of these children. It was in view of this opportunity to introduce the vaccine into the expanded vaccination program in 2005 that the Center for Vaccine Development – Mali decided to carry out studies. The objective of our study was to determine the level of anti-Hib Ab and vaccination coverage. This was a descriptive and cross-sectional study focusing on the measurement of anti-Hib antibodies and vaccination coverage in children aged 6-7 months to 18 months after introduction of the Hib vaccine in the Bamako district. The following results were obtained: 91.8% of participants' vaccination cards were presented, according to the mother's declaration or vaccination card. A gradual decrease in the percentage from the first to the third dose of DPT, OPV, hepatitis B and Hib was noted. Among our participants, 81.4% were correctly vaccinated and therefore had received all the antigens (BCG, OPV, Pentavalent). The obstacle was the reason most cited by mothers for not vaccinating their children in both surveys. 70% of participants had an antibody level greater than or equal to the value considered as the protection threshold which is 1.0mcg/ml 18 months after introduction of the Hib vaccine.

Keywords: Immune Status, Children 6-7 Months, Hib Antibodies, Hib Vaccine.

INTRODUCTION

The overall success of vaccination programs no longer needs to be demonstrated. The development of scientific knowledge in immunology, microbiology and epidemiology has considerably advanced the field of vaccinations in recent years. Despite this success, 25,000 children die each year from conditions that we have long known how to prevent or cure inexpensively [1]. Before the introduction of vaccination, the incidence of invasive Hib infections in the United States and Europe was 50 to 100 cases per 100,000 children per year (including 30 to 60 cases of meningitis per 100,000 children per year) [2, 3]. According to the results of the 2002-2003 annual report, the number of deaths was 100,000 to 160,000 cases among children aged 0 to 15 years in Sub-Saharan Africa [4]. The Center for Vaccine Development – Mali (its acronyms in English CVD-Mali) CVD-Mali as part of its hospital-based surveillance of invasive bacterial infections in pediatrics at the Gabriel TOURE University Hospital, Hib was isolated in 10 % of these children with a high incidence of 161 per 100,000 in children < 1 year and a case fatality rate of 11%. The peak incidence was observed in children aged 6-7 months, i.e. 406 per 100,000 [5]. It was in view of this opportunity to introduce the vaccine into the expanded vaccination program (EPI) in 2005 that the CVD-Mali decided to carry out studies to describe immunity against Hib in the population before and 18, 30 and 42 months after introduction and demonstrate the need for sustainability of the new vaccine. This was carried out 18 months after introduction to see the evolution of immunity against Hib in the population, finally to be able to judge the effectiveness of the vaccine.

MATERIALS AND METHOD

This was a descriptive and cross-sectional study from July 2005 to January 2007 on vaccination coverage and seroprevalence, i.e. 18 months after the introduction of the Hib vaccine in the routine EPI of Mali in 4 different districts of Bamako including Djicoroni-para, Sébénikoro, Banconi, and Kalabankoro. A total of 200 healthy children aged 6 to 7 months were recruited, including 100 in Djicoroni Para –Sébénikoro and 50 children in each of the two other districts Banconi and Kalabankoro. All healthy children aged 6 to 7 months residing in the neighborhoods concerned at least 1 month before the study were included in the study. All children aged 6 to 7 months presenting with a febrile illness, having received a transfusion of blood or blood products in the previous month and those whose parents did not give consent were not included. The study was approved by the corresponding ethics committee. Confidentiality was respected during this study. The children's identities were coded and all materials relating to the child carried these codes as well as blood samples for analysis and storage. Informed consent was sought and obtained from the children's parents or guardians for both the investigation vaccination coverage and for the seroprevalence survey. All aseptic measures were used to collect the children in good health and ethical conditions.

The data collected was entered and analyzed using the following software: SPSS version 12.0, Epi info 6.0 and Excel. We used the Chi2 test was used for the comparison of proportions. The value of $p < 0.05$ was considered statistically significant. The results were presented in tables for their better understanding and then compared to those in the national and international literature.

RESULTS

During the study, 1784 households were surveyed, which made it possible to identify 220 eligible children and all participated in the vaccination coverage survey, 20 did not participate in the Sero-surveillance survey due to parental refusal, 157 out of 220 (71.4%) children (participants) were correctly vaccinated, 140 out of 200 (70%) had an antibody level in serum greater than or equal to the value considered as the protection threshold which is 1.0 mcg/ml.

The female gender was predominant with a male to female ratio less than 1, or 0.88%.

The majority of participants' vaccination cards were examined (91.1%), which contributes to the reliability of the result of the coverage survey. 71.4% of participants were correctly vaccinated.

In Africa in general and in Mali in particular, it very often happens that people miss vaccinations for various reasons. Some of these reasons found in our study are shown in Table 1.

Table 1: Distribution of participants according to reasons for missed vaccination opportunities:

Reasons	Effective	Percentage
Obstacles	14	22,2%
Lack of motivation	16	25,4%
Lack of information	33	52,4%
Total	63	100 %

The most mentioned reason was the obstacle with 52.4% among all the others mentioned.

The production of a minimum level of antibodies is very necessary, to give a good immune response allowing a certain acceptable protection and without which this protection would be insufficient. The protection threshold would be reached at an antibody level greater than or equal to 1.0 mcg/ml in serum. Table 2 shows the distribution of participants according to the protection threshold.

Table 2: Distribution of participants according to the protection threshold

Participants	Effective	Percentage
Unprotected (Ac level < 1.0mcg/ml)	60	30%
Protected (Ac level ≥ 1.0mcg/ml)	140	70%
Total	200	100%

As it is possible to note, 70% of participants were protected at 18 months after the introduction of Pentavalent in the EPI in Mali. Even if this should be improved, this rate would seem to be important in our context.

Knowledge of the vaccination status of the population is very important from an epidemiological point of view and in making curative decisions at crucial times. Table 3 shows us the distribution of participants according to vaccination status / protection threshold.

Table 3: Participants according to vaccination status (without cases of refusal)/protection threshold

		Protection threshold (Ac level ≥1.0mcg/ml in serum)		Total
		Unprotected	Protected	
Vaccination status	Incorrect	39(73,6%)	14(26,4%)	53
	Correct	21(14,3%)	126(85,7%)	147
Total		60	140	200

Khi^2= 7,29 p=0,007

In this study it should be noted that protection is strongly linked to correct vaccination status with a value of p=0.007.

The pentavalent vaccine has contributed very favorably to the protection of children since its introduction into the vaccination program of different countries. Table 4 shows us the relationship of the participants according to the protection threshold and said vaccine.

Table 4: Participants according to protection threshold/Pentavalent

Protection threshold (Ac level ≥1.0mcg/ml in serum)	Penta		
	Not received	Received according to the card	Received according to mother
Unprotected	16(80%)	38(22,9%)	6(42,9%)
Protected	4(20%)	128(77,1%)	8(57,1%)
Total	20	166	14

The protection threshold is considered to be an antibody level greater than or equal to 1.0 mcg/ml in serum. According to official information on the vaccination card, 77.1% of participants were protected.

DISCUSSION

In our study, the sample size planned at 200 for the two surveys was slightly increased for the vaccination coverage survey (220) because of 20 cases of refusal for the Sero-surveillance survey, 18 months later. The introduction of the vaccine. Few studies have been done on vaccination coverage and it was only in April 2005 that the first study was carried out to determine the level of anti-Hib antibodies in serum. Which will considerably reduce our framework for discussions.

The female gender was the most dominant with a male to female ratio of less than 1. During the survey, 91.8% of vaccination cards were presented. This result is a significant improvement compared to that obtained by Diarra S.S. in 2005, which was 86.4% [6]. Kalabankoro has a low coverage rate of 60% compared to Djicoroni-Para, Sébénikoro (69%) and Banconi (87%). This difference could be due to a lack of awareness of the dangers of target diseases preventable by vaccination, the mothers' occupations, the time of the vaccination session which does not suit them and the geographical location of some of these neighborhoods in relation to the CSCOMs.

Contrary to the results obtained by DIARRA S.S. in 2005, these results are decreasing in Djicoroni-Para/Sébénikoro, and Kalabankoro; Banconi observed a clear improvement, i.e. 61%, Djicoroni-Para, Sébénikoro (75%) and Kalabankoro (77.1%). At 18 months after the introduction of penta into the routine EPI in Mali, 70% of children had an antibody level greater than or equal to the protection threshold. This result is significantly higher than that obtained by DIARRA S.S. which was only 1.5% of children protected before the introduction of penta [6].

85.7% of children were protected, compared to only 14.3% who were not protected. This could be explained by non-compliance with the vaccine cold chain, incomplete doses at the time of vaccine administration or the failure to produce sufficient antibody levels to provide a good immune response.

73.6% of children were not protected compared to 26.4% who were protected; which could be explained by natural immunity, the impact of vaccination which could optimize strategies to combat epidemics thanks to a protective power acquired earlier in early childhood [7-10].

CONCLUSION

At the end of this study we were able to notice that the more correct the vaccination status of children, the higher the protection threshold. Everything must be done to make vaccination services accessible in order to protect children against vaccine-preventable diseases. The protection threshold is strongly linked to the correct vaccination status of the child with more than 85% of children protected, hence the need for the sustainability of the Hib vaccine in the expanded routine vaccination program in Mali.

Author Contribution: All authors contributed to the collection, analysis and interpretation or reading and final correction of the manuscript.

Conflict of Interest: The authors declare no conflict of interest.

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