

Prevalence of Children Vaccinated against Viral Hepatitis B in Brazzaville

Lucie Charlotte Ollandzobo Ikobo^{1,2*}, Farrèche Colombe Missidi¹,
Hostaud Bienvenu Atipo-Ibara², Arnaud Mongo Onkouo^{1,3}, Clausina Philestine Ahoui Apendi^{1,3},
Jile Florent Mimiesse^{1,3}, Blaise Irénée Atipo Ibara^{1,3}

¹Faculty of Health Sciences, Marien Ngouabi University, Brazzaville, Republic of the Congo

²Infant Paediatrics Department, Brazzaville University Hospital, Brazzaville, Republic of the Congo

³Gastroenterology and Internal Medicine Department, Brazzaville University Hospital, Brazzaville, Republic of the Congo

Email: *lucieatipo@hotmail.fr

How to cite this paper: Ollandzobo Ikobo, L.C., Missidi, F.C., Atipo-Ibara, H.B., Mongo Onkouo, A., Ahoui Apendi, C.P., Mimiesse, J.F. and Atipo Ibara, B.I. (2024) Prevalence of Children Vaccinated against Viral Hepatitis B in Brazzaville. *Open Journal of Pediatrics*, 14, 426-434.

<https://doi.org/10.4236/ojped.2024.142042>

Received: February 5, 2024

Accepted: March 24, 2024

Published: March 27, 2024

Copyright © 2024 by author(s) and Scientific Research Publishing Inc. This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

Abstract

Introduction: Viral hepatitis B (VHL) is a public health problem, particularly in sub-Saharan Africa. The aim of this study was to assess vaccination coverage against HBV in children in Brazzaville. **Patients and Methods:** This was a cross-sectional analytical study conducted in Brazzaville health centres from January to September 2019. It involved children aged between six months and six years who received a vaccination against HBV. Sampling was exhaustive and based on stratified sampling. **Results:** The overall prevalence of children vaccinated against HBV in Brazzaville was 96.2%. It was insufficient in the Talangai health district (79%). The pentavalent vaccine was administered to 97.7% of children, 85% of whom had received all three doses. The reasons for incomplete vaccination were parents' ignorance of HVB (85.6%) and of vaccination (14.3%). **Conclusion:** Although the prevalence of vaccinated children is high in Brazzaville, it is still insufficient in some health districts, particularly Talangai, because parents are unaware of the disease and of vaccination. Pentavalent is the only vaccine available in the national vaccination programme, which is why an effective national vaccination policy needs to be put in place.

Keywords

Prevalence, Vaccination, Viral Hepatitis B, Child, Brazzaville

1. Introduction

Viral hepatitis B (VHB) is an inflammation of the liver parenchyma caused by an attack by the VHB virus present in the physiological fluids of the infected indi-

vidual [1]. It is a major public health problem. The World Health Organisation (WHO) estimates the global prevalence of HBV at 3.5%, and it is responsible for around 88,720 deaths from serious complications such as cirrhosis and liver cancer [2] [3] [4] [5]. Sub-Saharan Africa is a highly endemic region, with a prevalence of over 8%. Vertical transmission is the main mode of contamination [6], and remains a major source of chronic liver disease when infected children reach adulthood, with a high morbidity and mortality rate [7] [8] [9]. In the Congo, the prevalence of hepatitis B in the general population is 12.5%, spread over 7 of the country's 12 departments. According to individual studies, these prevalences vary between 5% and 15% from one population to another [10]; however, the prevalence in children is not known. Management of chronic and complicated forms of the disease is difficult and costly. Eradication through a systematic vaccination policy, adopted in several countries, remains the best option, as vaccines are the main means of protection against the HVB virus [8]. According to the WHO, developing countries have not yet achieved high levels of vaccination coverage, despite systematic, free vaccination and the introduction of the birth dose [11] [12] [13]. In the Congo, the HVB vaccine was introduced into the immunisation schedule by the Expanded Programme on Immunisation (EPI) in 2009 [14], and since the no evaluation has been carried out in the infant population, hence the interests of this first study, the aim of which was to determine the prevalence of children vaccinated against HVB in Brazzaville, to identify the vaccines used for vaccination and to investigate the causes of incomplete vaccination of children (see the **Appendix**).

2. Patients and Methods

This was a cross-sectional, analytical study conducted from January to September 2019 (*i.e.* nine months), in nine health centres selected from the nine health districts of the Brazzaville department. The general population was represented by all children except for vaccination in the health centres where vaccination was carried out on a fixed basis during the study period. The study population consisted of children aged six months to six years except to be vaccinated in the aforementioned health centres during the study period. We included children aged six months to six years who were supposed to have received the primary vaccination and whose parents consented to participate in the study after signing the informed consent form on a voluntary basis. Children who did not have a postnatal follow-up form and/or vaccination record and those whose parents had not consented to the study were not included. We excluded all children who came for their first vaccination. Sampling was simple random using the Random method. We carried out a three-stage survey using the same method: the first stage involved identifying the health districts in the Brazzaville département, the second stage involved selecting the vaccination centres within the health districts to ensure that they were representative; this resulted in the selection of nine representative health centres. At the third level, children were

selecte for each vaccination centre on the basis of registers of appointments for children due to be vaccinated. Data collection was carrier out by the same inter-viewers (a PhD student and a nurse). The interviews were conducted in French and the national languages. A pre-established questionnaire was use to collect information on the vaccination schedule, based on interviews with the mothers, analysis of vaccination records and postnatal follow-up forms. The variables studied were socio-demographic (sex, age, level of education, place of residence, parents' level of education and occupation, parents' marital status), those relating to vaccination (type of vaccine, number of doses, compliance with medical appointments and/or compliance with the interval between doses, booster doses according to age) and variables relating to parents' knowledge of HBV and vaccination. We considered as vaccinated any child who had received a primary vaccination (the 3 recommended doses of vaccine against HBV). A child was correctly vaccinated when he or she had received the primary vaccination with a one-month interval between doses and the booster vaccination(s); otherwise, the vaccination was said to be incomplete. The combined vaccine contains several viral antigens and is administered to infants in combination with other vaccines, such as the pentavalent vaccine (combining the diphtheria, tetanus, pertussis or DTP, Haemophilus influenzae type b and HVB vaccines), which is the recombinant vaccine use in the Congo's EPI. The monovalent vaccine contains only the HBs antigen and is administered alone from birth. Vaccination was said to be mixed when the same child received both the monovalent vaccine at birth and the pentavalent later on. The degree of protection of children against HBV was good when it was greater than 96%. Statistical analysis was performed using Microsoft Excel R.2.10.1. Quantitative variables were expressed as mean and standard deviation, and qualitative variables as frequency and proportion. The Pearson Chi-square test was use to compare the variables. Differences were considered statistically significant when the $P < 0.05$ value was reached. This work carrier out for the thesis with a view to obtaining a doctorate in medicine had been required a favourable opinion from the Health Sciences Research Ethics Committee of the Congo (No. 018/MRST/IRSSA/CERSSA).

3. Results

The overall prevalence of children vaccinated against HBV in Brazzaville was 96.2% (180/187). Vaccination prevalence by health district is shown in **Figure 1**. Of the 187 children included, 106 were boys (56.1%) for 81 girls, giving a sex ratio of 1.3. The mean age of the children was 23.38 months \pm 2.77 (extremes: 6 months to 6 years). The under-24-month age group was the most représenté, with 58.2% ($n = 109$). 83.9% ($n = 157$) of the children did not attend school and were looked after at home by their mothers, 14.9% ($n = 28$) attended pre-school and 1% ($n = 2$) attended primary school. Of these, 55.6% ($n = 104$) were from parents with secondary education, 29.4% ($n = 55$) with higher education, and 14.9% ($n = 28$) with primary education or no education at all. One hundred and fifty children (80.2%) came from married parents and 19.7% ($n = 37$) from sin-

gle mothers. In terms of vaccination practices, 86% (n = 161) of parents had respected medical appointments, and for these children, the free interval between vaccine doses was respected. One hundred and seventy-six children were vaccinated exclusively with the combined vaccine (pentavalent) from the age of 2 months, *i.e.* a prevalence of 97.7%, and 2.2% (n = 4) of children had received the mixed vaccination. The distribution of vaccinated children according to the number of doses of vaccine received is shown in **Figure 2**. 87.7% (n = 158) of children had not received a booster vaccination. The incompletely vaccinated children lived in the Talangai health district in the Mikalou (71%) and Ngamakosso (14.7%) neighbourhoods, and in the Mougali health district in the Plateaux des 15 ans neighbourhood (14.3%). The reasons for incomplete vaccination were related to the parents and are shown in **Table 1**.

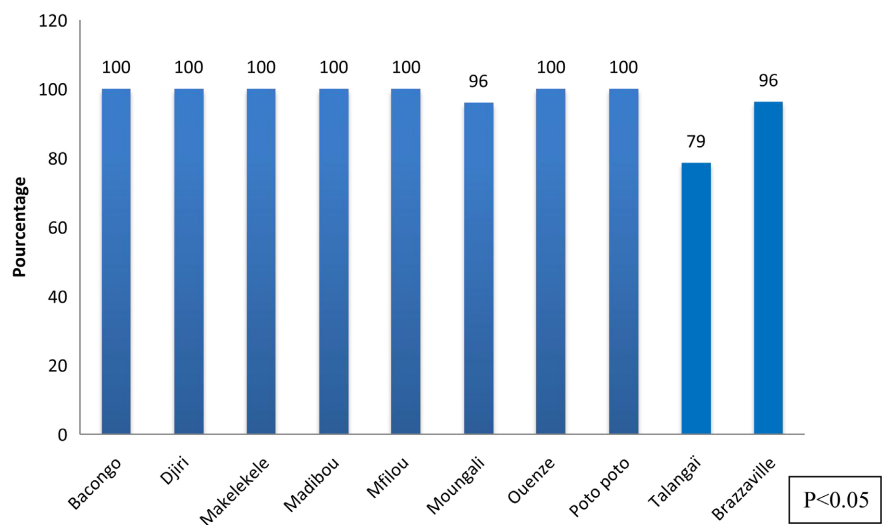


Figure 1. Distribution of the prevalence of children vaccinated against HBV by health district.

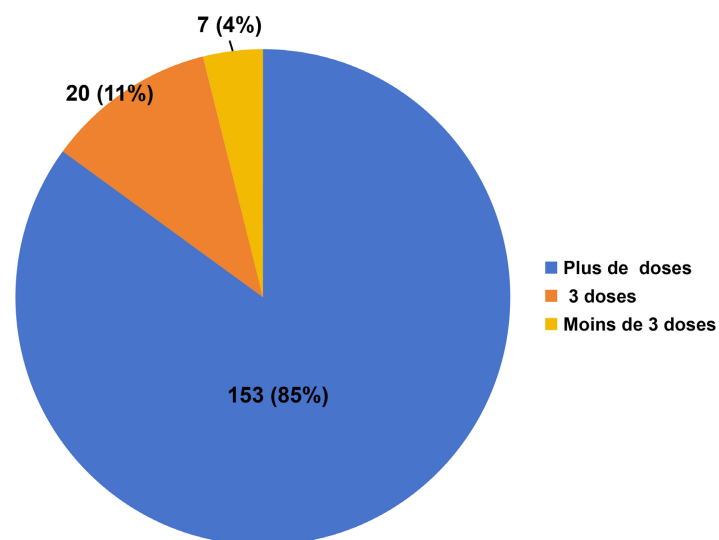


Figure 2. Breakdown of children by number of doses of HBV vaccine received.

Table 1. Reasons for incomplete vaccination linked to parents.

Reason	n	%
Ignorance of disease	135	85.7
Lack of knowledge about vaccination	23	14.3
Total	158	100

4. Discussion

We report the results of a study on the prevalence of children vaccinated against HBV in Brazzaville [15]. The study was self-financed, which meant that it could not be carried out in all 12 of the country's departments because of financial difficulties. The monovalent vaccine is systematically recommended by the WHO from birth within 72 hours of delivery for better efficacy, which justifies modifying the EPI vaccination schedule in line with this recommendation. However, it should be emphasised that in practice this change is not yet effective due to the non-availability of the monovalent vaccine in the Congolese EPI, which reduces the number of children fully vaccinated.

The overall prevalence of children vaccinated in Brazzaville was satisfactory (96.2%). Prevalence varied significantly from one arrondissement to another ($p < 0.05$). Talangai had a lower vaccine prevalence (79%) than the other health districts, because it was one of the most densely populated health districts at the time of the study. However, WHO-CONGO reported in 2018 that HBV vaccination coverage was lower in Madibou (74%) and Makélékélé (50.7%), higher in Moundali (86.9%), Poto-Poto (83.8%), Ouenzé (81.3%) and Talangai (81.6%), and higher in Djiri (99%) and Mfilou (93.3%) [16]. This difference can be explained by the fact that in the present study it was a question of the prevalence of vaccinated children, the denominator not being the same in relation to the immunisation coverage studied by the WHO. Variability in the prevalence of HBV vaccination has also been observed by Personne V *et al.*, in France [17]. The same applies to the predominance of males, although the same author found no statistically significant difference ($p = 0.06$). This is probably a coincidence, perhaps related to the type of sampling. The predominance of children under 24 months of age has also been reported in France (18 to 23 months), probably because of methodological similarities in the choice of the age range of their study population. In our case, it is also due to the fact that EPI vaccination is free (up to 18 months), which increases mothers' acceptance of these infants. In our series, the majority of children were vaccinated with pentavalent vaccine (the only HVB vaccine available in the EPI), and 97.7% received primary vaccination. Monovalent vaccine was used at birth in only 2.23% of children because it was not available in the EPI. The few children who were vaccinated were prescribed by the paediatrician at the parents' expense. The constant use of combined vaccines for children under one year of age in national immunisation programmes is also the case in many African countries, and even in France [14] [18] [19] [20], because of the free and compulsory nature of these vaccines. Vaccination uptake varied

according to place of residence. The majority of children with incomplete vaccination lived in the Talangai (85.7%) and Mounkali (14.3%) health districts. This result can be explained by the fact that the children's parents had no knowledge of the disease itself, or of the existence of preventive measures against it, in particular vaccination against HVB. The national programme to combat the newly-created viral hepatitis centre will need to be operational in order to carry out public awareness campaigns using targeted communication on HVB to change behaviour, and to put in place an effective national vaccination policy to reach all vulnerable populations, particularly pregnant women, newborns, infants and young children.

5. Conclusion

Although the prevalence of children vaccinated against HVB is high in Brazzaville, it is still insufficient in the Talangai and Mounkali health districts, due to parents' ignorance of the disease and vaccination. Almost all children are vaccinated with pentavalent because monovalent is unavailable in the Congolese EPI. Prevention is therefore the most effective weapon, and this involves making the monovalent vaccine available from birth, adhering to the vaccination schedule and educating the population to change their behavior.

Conflicts of Interest

The authors declare that they have no conflict of interest in relation to this publication.

References

- [1] Van Damme, P. (2017) Hepatitis B Vaccines. In: Plotkin, S.A., Orenstein, W.A. and Offit, P.A., Eds., *Vaccines*, 6th Edition, Elsevier Sanders, Philadelphia, 2 p. https://doi.org/10.1007/978-3-319-59952-6_13
- [2] Stanislas, P. (2007) Epidemiology and Natural History of Hepatitis B Virus Infection. *La Revue du Praticien*, **14**, 6-15.
- [3] Kane, M. (1995) Global Programme for Control of Hepatitis B Infection. *Vaccine*, **130**, S47-S49. [https://doi.org/10.1016/0264-410X\(95\)93547-M](https://doi.org/10.1016/0264-410X(95)93547-M)
- [4] World Health Organization (2017) Global Hepatitis Report. Geneva. <https://www.who.int/publications/i/item/9789241565455>
- [5] WHO (2016) Global Health Estimates 2015: Deaths by Cause, Age, Sex, by Country and Region, 2000-2015. http://www.who.int/healthinfo/global_burden_disease/estimates/en/index1.html
- [6] Slowik, M.K. and Jhaveri, R. (2005) Hepatitis B and C Viruses in Infants and Young Children. *Seminars in Pediatric Infectious Diseases*, **16**, 296-305. <https://doi.org/10.1053/j.spid.2005.06.009>
- [7] Baudon, D., Berger, P. and Meynard, J.B. (2001) Grandes Endémies. Encyclopédie Médico-Chirurgicale: Maladies Infectieuses, 6 p.
- [8] Chang, M.H., Chen, C.J., Lai, M.S., *et al.* (1997) Universal Hepatitis B Vaccination in Taiwan Region and the Incidence of Hepatocellular Carcinoma in Children. *New England Journal of Medicine*, **336**, 1855-1859.

<https://doi.org/10.1056/NEJM199706263362602>

- [9] Aubry, P. (2012) Viral Hepatitis in the Tropics. *Médecine Tropicale*, **66**, 3-4.
- [10] Nkodia Loumouamou, M.Y.N., Akiana, J. and Gampouo-Gandza, A.L. (2009) Seroprevalence and Sociodemographic Characteristics of Viral Hepatitis B and C in Pregnant Women in Congo Brazzaville. *Médecine Tropicale*, **69**, 407-410.
- [11] World Health Organization (2009) Hepatitis B Vaccine: WHO Position Paper—2009. *Weekly Epidemiological Record*, **420**, Article 405.
- [12] Institut National de la Statistique (2015) Multiple Indicator Cluster Survey MICSS CONGO 2014-2015. MICSS, 8.
- [13] Sadoh, A.E. and Ofili, A. (2014) Hepatitis B Infection among Nigerian Children Admitted to a Children's Emergency Room. *African Health Sciences*, **14**, 377-383. <https://doi.org/10.4314/ahs.v14i2.13>
- [14] Environmental Performance Index (EPI) Congo (2014) External Review of the EPI Congo Carrier out in October-November 2014. Provisional Report, **138**, 14-15.
- [15] Le Programme élargi de Vaccination (PEV) (2018) Plan Pluriannuel Complet 2018-2022. 17. <https://doi.org/10.3917/apf.181.0017>
- [16] WHO Congo Office. Database, 2018.
- [17] Personne, V., Benainous, O. and Lévy-Bruhl, D. (2015) Hepatitis B Vaccination Coverage of School Children in Paris between 2002 and 2008. *Archives de Pédiatrie*, **22**, 807-815. <https://doi.org/10.1016/j.arcped.2015.05.011>
- [18] World Health Organization (2016) Information Sheet Observed Rate of Vaccine Reaction Hepatitis B Vaccine, June 2012, Geneva. https://cdn.who.int/media/docs/default-source/pyg/global-vaccine-safety/hep-a-vaccine-rates-information-sheet.pdf?sfvrsn=184724d1_4&download=true
- [19] Pichichero, M.E., Bernstein, H., Blatter, M.M., *et al.* (2015) Immunogenicity and Safety of a Combination Diphtheria, Tetanus Toxoid, Acellular Pertussis, Hepatitis B, and Inactivated Poliovirus Vaccine Coadministered with a 7-Valent Pneumococcal Conjugate Vaccine and a Haemophilus influenzae Type B Conjugate Vaccine. *Journal of Pediatrics*, **151**, 43-49. <https://doi.org/10.1016/j.jpeds.2007.02.013>
- [20] Heininger, U., the DTP-HBV-IPV-059 Study Group, Sanger, P., Jacquet, J.-M. and Schuerman, L. (2007) Booster Immunization with a Hexavalent Diphtheria, Tetanus Acellular Pertussis, Hepatitis B, Inactivated Poliovirus Vaccine and *Haemophilus influenzae* Type B Conjugate Combination Vaccine in the Second Year of Life: Safety, Immunogenicity and Persistence of Antibody Responses. *Vaccine*, **25**, 1055-1063. <https://doi.org/10.1016/j.vaccine.2006.09.060>

Appendix: Prevalence of Children Vaccinated against Viral Hepatitis B in Brazzaville

Survey sheet no. ----- survey date: -----/ __ /-----

1) Identification of respondent and epidemiological parameters

Arrondissement -----

Neighbourhood

CSI

Child's number

Sex male // female //

Age (months) -----

Birth rank-----

Number of pre-school children in sibling group-----

Child's guardian -----

How is the child looked after: 1. nursery // 2. nanny // 3. home //

Father's occupation -----

Mother's occupation-----

Parents' level of education :

Mother: 1. primary // 2. secondary // 3. higher // 4. None

Father: 1. primary // 2. secondary // 3. higher // 4. None

Parents' marital status: 1. single // 2. married // 3. living as a couple // 4.

none

Parents' practical knowledge of vaccination against EPI diseases: yes // no//

Particularly hepatitis B: yes // no //

2) Parameters relating to vaccination

Has the child already been vaccinated? If not, why not?

a) Yes // go to 2

b) No

-no reason //

booklet lost // -child never vaccinated //

-child never vaccinated //

Can you show the vaccination record? Has the child been vaccinated against hepatitis B?

a) Yes //

b) No //

Type of vaccine: 1. Combined vaccine (EPI) /___ / or 2. Monovalent vaccine /___ /

a) Monovalent: from birth 1. yes /___ / 2. no /___ / when ?and specify number of doses -----

b) Pentavalent, at least 3 doses: at 2 months /___ / at 3 months /___ / at 4 months /___ /

c) Booster yes // when----- ? No // when----- ?

Post-vaccination reactions: 1. Fever 2. Pain 3. rash 4. None -- /___ / --- 5. other-----

Time between first and second dose -----

Time between second and third vaccination dose-----

3) Parameters relating to parental consent: From a medical point of view, what are the arguments in favour of vaccination against hepatitis B?

a) It is a vaccine that prevents the fatal risk of hepatitis B: 1 = Yes /__ /; 2 = No /__ /

b) This vaccine has been shown to be safe in infants: 1 = Yes /__ /; 2 = No /__ /

c) Vaccination against hepatitis B before the age of 12 provides immunity for several decades: 1 = Yes /__ /; 2 = No /__ /

d) The benefit/risk balance of the hepatitis B vaccine is largely in favour of vaccination: 1 = Yes /__ /; 2 = No /__ /

4) Biological parameters :

HBsAg: 1. positive; 2. negative /__ /

Anti-HBs AC level: 1 = 10 IU/L; 2 = greater than 10 IU/L; 3= 50 IU/L /__ /