



Sociodemographic Determinants of Adherence to The Immunisation Schedule Among Children Aged 0 To 23 Months Within the Expanded Programme on Immunisation (EPI) At the National Institute of Public Health (INHP) in Treichville, Abidjan

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Abstract

Introduction: Failure to adhere to the immunization schedule constitutes a threat to public health, contributing to resurgence of preventable diseases. Sociodemographic barriers strongly affect adherence to the immunization schedule. The objective of this study was to analyze the determinants of adherence to the immunization schedule at the EPI service of INHP in Treichville.

Methodology: This was a cross-sectional study with an analytical focus, conducted among mothers or caregivers of children attending the INHP's EPI program. Data were collected using a structured, self-administered questionnaire. SPSS software was used to perform a descriptive analysis, followed by a multivariate binary logistic regression, to identify factors independently associated with vaccination adherence (at a significance level of $p < 0.05$).

Results: The sample of 384 mothers or caregivers was predominantly female (88.5%) and had a mean age of 32.5 years (± 8.03 years). Most of the caregivers were the children's mothers (81.3%). More than half of the children in the study were between 0 and 6 months old (52.6%), and only 40.1% of them were fully up to date on their vaccinations. Multivariate analysis showed that a higher level of education (ORa=3.15; 95% CI [1.71–5.79]) and employed status (ORa=2.60; 95% CI [1.47–4.59]) were factors associated with adherence to the vaccination schedule, compared with mothers with no education and homemakers. Age, sex, marital status, and direct kinship did not show any statistically significant associations.

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Conclusion: Adherence to the vaccination schedule remains suboptimal in the INHP's Expanded Program on Immunization (EPI). Socioeconomic disparities, as indicated by the caregiver's level of education and socioeconomic status, influence adherence to the EPI schedule. Health promotion interventions aimed at improving vaccination literacy and adapting reception and access procedures could reduce the impact of direct or indirect professional and financial constraints on vaccination coverage.

Introduction

Vaccination is one of the most efficient and cost-effective public health interventions in the history of medicine. By inducing artificial active immunity, it has led to the eradication of smallpox, the near-elimination of polio, and a drastic reduction in morbidity and mortality associated with many infectious diseases [1]. Globally, the World Health Organization (WHO) estimates that vaccination prevents between 2 and 3 million deaths each year. The Immunization Agenda 2030 (IA2030) has set ambitious goals to leave no one behind [2].

However, the epidemiological impact of vaccines is intrinsically linked to achieving and maintaining high vaccination coverage. This depends not only on the administration of the first dose, but above all on strict adherence to the vaccination schedule. Failure to observe the prescribed intervals between doses, or the omission of booster shots, leaves children with a window of immunological vulnerability, which creates conditions conducive to outbreaks of vaccine-preventable diseases [3].

In sub-Saharan Africa, and particularly in Côte d'Ivoire, the Expanded Program on Immunization (EPI) has made considerable efforts to ensure that routine vaccines are free and accessible in all health zones. Despite these structural advances, national data, such as those from the Demographic and Health Survey (DHS-CI), show that vaccination coverage and timeliness remain major challenges [4]. Now that geographic and financial accessibility have improved, attention should turn to behavioral and sociodemographic determinants.

The literature identifies vaccine hesitancy, often driven by fear of Adverse Events Following Immunization, as a significant barrier [5]. Parents' perceptions of these side effects (fever, pain at the injection site, persistent crying) can dissuade them from returning for subsequent doses [6]. The ability to rationalize this risk is closely linked to the sociodemographic profile of the parent or caregiver, particularly their level of education, socioeconomic status, and financial autonomy.

The Expanded Programme on Immunisation (EPI) unit at the National Institute of Public Health (INHP) in Treichville provides perfect setting for examining these patterns. The aim of this study was to analyse the socio-demographic profile of mothers or carers of children attending this service, and to identify the socio-demographic factors independently associated with strict adherence to the immunisation schedule.

Materials and methods

Study site

The study was conducted in the Expanded Programme on Immunisation (EPI) service of the National Institute of Public Health (INHP), located in the municipality of Treichville in Abidjan, Côte d'Ivoire. The INHP is the national reference structure for public health and immunisation (routine EPI immunisation

and international immunisation). This study site was chosen because of its high level of patient flow and the socio-cultural and economic diversity of the populations who attend it.

Study type and period

This is a cross-sectional study with an analytical focus. Data collection took place continuously over 45 days, from 15 October to 29 November 2024.

Study population and sampling

The target population consisted of mothers, fathers or other carers of children aged 0 to 23 months who attended the clinic for a routine vaccination session. Carers who freely consented to participate in the study and who had the child's health record (or vaccination record) available for verification were included. Carers attending for a vaccination outside the EPI programme were excluded.

The sample size was calculated using Schwartz's formula: $n = (Z^2 \times p \times q) / i^2$, assuming an estimated prevalence of adherence to the immunisation schedule of 50 per cent, a 95 per cent confidence level ($Z=1.96$) and a precision (i) of 5 per cent. This calculation resulted in a minimum required sample size of approximately 384 individuals. Sampling was carried out exhaustively throughout the study period until the required sample size was reached.

Data collection and variables

Data were collected using a structured digital questionnaire, administered face-to-face by trained interviewers. Sociodemographic data covered both the children and their carers. This questionnaire was supplemented by a thorough review of the vaccination record by a healthcare professional.

The dependent variable in our analytical model was adherence to the child's vaccination schedule. The operational definition of this variable was that the child was strictly up to date with their vaccinations according to their age and had not fallen behind or missed any doses.

Data treatment and analysis

The data collected was compiled and cleaned. Statistical analysis was carried out using SPSS version 26.0. The descriptive analysis involved calculating frequencies and percentages for the qualitative variables. For the analytical component, multivariate binary logistic regression modelling was performed. All independent variables (level of education, occupational category, age group, relationship to the child, marital status) were included in the model, with their categories strictly and distinctly separated. Adjusted Odds Ratios (ORa) and their 95% Confidence Intervals (95% CI) were calculated. A p-value of less than 0.05 was considered statistically significant [7,8].

Results

Sociodemographic characteristics of children

The study included a total of 384 children. The gender distribution showed a predominance of girls (57.0%). The majority of the children were in the 0–6-month age group (52.6%), followed by the 6–11-month age group (24.2%). Only a very small minority were attending school (pre-school), given the young age of the sample (Table 1).

Table 1: Distribution of the children's socio-demographic characteristics (N=384).

Characteristics of the children	Number (n)	Percentages (%)
Gender		
Female	219	57,0
Male	165	43,0
Age group		
0 to 6 months	202	52,6
6 to 11 months	93	24,2
12 to 17 months	41	10,7
18 to 23 months	31	8,1
Over 23 months	17	4,4
Schooling		
No	378	98,4
Yes (Pre-school/Nursery)	6	1,6

Sociodemographic characteristics of mothers or accompanying adults

As regards mothers or accompanying adults, the average age of our sample was 32.5 years (± 8.03 years), with ages ranging from 18 to 58 years. The sample was overwhelmingly dominated by female accompanying adults (88.5 per cent) compared with men (11.5 per cent). Mothers accounted for the majority of carers, making up 81.3 per cent of the total, compared with just 11.5 per cent for fathers. With regard to educational attainment, 63.8 per cent reported having a higher education qualification, whilst 6.0 per cent had never attended school. In terms of employment status, employees were the most numerous, accounting for 52.6 per cent of the sample, whilst housewives and the unemployed accounted for 19.5 per cent. (Table 2).

Table 2: Distribution of the socio-demographic characteristics of mothers or accompanying persons (N = 384).

Characteristics of carers	Number (n)	Percentages (%)
Link to the child		
Mother	312	81,3
Father	44	11,5
Other parent / Nanny	28	7,2
Age group (years)		
Under 25	46	12,0
25–34	206	53,6
35–44	106	27,6
45 and over	26	6,8
Level of education		
None	23	6,0
Primary	33	8,6
Secondary	83	21,6
Higher	245	63,8
Occupational category		
Housewife / Unemployed	75	19,5
Pupil / Student	20	5,2
Self-employed / Informal sector	87	22,7
Employee (Public / Private)	202	52,6
Marital status		
Single	98	25,5
Married / In a relationship	286	74,5

Vaccination coverage and adherence to the vaccination schedule

Analysis of the health records revealed that less than half of the children in our sample were up to date with their vaccinations. Only 40.1% of the children were strictly adhering to the vaccination schedule recommended by the EPI (Table 3).

Table 3: Children's adherence to the vaccination schedule (N=384).

Child's vaccination status	Number of children (n)	Percentages (%)
Schedule adhered to correctly	154	40,1
Schedule not adhered to (Delay / Giving up)	230	59,9
Total	384	100,0

Table 4: Binary logistic regression model of the determinants of adherence to the vaccination schedule.

Variables	Adjusted OR	95% CI	p-value
Level of education			
None (Ref.)	1,00	—	—
Primary	1,21	[0,69; 2,12]	0,510
Secondary	1,88	[1,09; 3,22]	0,022
Higher	3,15	[1,71; 5,79]	< 0,001
Occupational category			
Housewife / Unemployed (Ref.)	1,00	—	—
Pupil / Student	1,25	[0,58; 2,69]	0,568
Self-employed / Informal sector	1,54	[1,01; 2,33]	0,041
Employee (Public / Private)	2,60	[1,47; 4,59]	0,001
Relationship to the child			
Other relative / Nanny (Ref.)	1,00	—	—
Mother	1,47	[0,88; 2,45]	0,138
Father	1,34	[0,67; 2,66]	0,405
Age of the accompanying person			
Under 25 (Ref.)	1,00	—	—
25–34 years old	1,12	[0,76; 1,64]	0,545
35–44 years old	1,33	[0,84; 2,08]	0,215
45 years and over	1,18	[0,56; 2,50]	0,649
Marital status			
Single (Ref.)	1,00	—	—
Married / In a relationship	1,24	[0,90; 1,70]	0,173
Constant	0,49		0,069

Sociodemographic factors associated with adherence to the vaccination schedule

Table 4 presents the results of the multivariate binary logistic regression analysis, which assessed the association between the characteristics of the accompanying adults and the probability of the child adhering to the immunisation schedule.

Level of education appears to be a major and statistically significant determinant. Indeed, carers with secondary education ($ORa=1.88$; $p=0.022$) and higher education ($ORa=3.15$; $p<0.001$) were respectively nearly two and three times more likely to adhere to the immunisation schedule than those with no formal education.

The carer's occupational status also played a key role. Compared with housewives, workers in the informal sector

(ORa=1.54; $p=0.041$) and, in particular, employees (ORa=2.60; $p=0.001$) were significantly more likely to adhere to the vaccination schedule.

The other socio-demographic variables (family relationship, age of the accompanying person and marital status) did not show any statistically significant associations in our model ($p>0.05$).

Discussion

The aim of this study was to examine the socio-demographic factors that influence adherence to the immunisation schedule among children attending the Expanded Programme on Immunisation at the National Institute of Public Health in Treichville. The results show that children's vaccination status is not optimal and is strongly influenced by factors such as the level of education and occupational category of the mother or accompanying adult.

Adherence to the vaccination schedule

Our study found that only 40.1 per cent of the children assessed had an up-to-date vaccination record. This figure is particularly worrying in a place such as the INHP, situated in the heart of Côte d'Ivoire's economic capital. This rate shows that even in the city, there are still areas where vaccination coverage is low. The fact that nearly 60 per cent of children are not up to date with their vaccinations leaves them vulnerable to disease. This undermines the herd immunity needed to prevent outbreaks of diseases such as measles or diphtheria. It is surprising to see that vaccines are available free of charge, yet people are not making use of them as much as they should. This shows that the barriers are no longer solely related to logistics, but also to social behaviours, the economic situation and people's perceptions of health.

The role of women in monitoring vaccination: the influence of mothers

Our data show that accompanying children for vaccination remained a task carried out almost exclusively by women: 81.3 per cent of those accompanying children were mothers, compared with just 11.5 per cent who were fathers. This disparity reflects social norms in West Africa, which entrust the care of children and preventive healthcare to women [9].

Given that this role falls primarily on mothers, public health programmes should make it a priority to focus on women's education and empowerment in order to improve vaccination coverage. Finally, although our statistical analysis did not reveal any difference in compliance depending on whether the child was accompanied by a father, a mother or another relative, the overwhelming presence of mothers makes them indispensable to the proper implementation of the EPI [10].

Determinants of adherence to the vaccination schedule

The multivariate analysis highlighted the important role played by educational attainment. Caregivers with secondary education (ORa=1.88) and, in particular, those with higher education (ORa=3.15) adhere significantly better to the schedule than those with no formal education. This finding is well documented in African and international scientific literature [11,12].

Education equips individuals with what is known as 'health literacy', that is, the ability to access, understand, evaluate and use information to make decisions that promote good health

[13]. In the specific context of our study, this literacy is crucial for understanding the importance of vaccines for children's health and the possibility of Adverse Events Following Immunisation (AEFI). Indeed, the administration of a vaccine often causes minor side effects (fever, crying, local redness). For a parent with no formal education, a post-vaccination fever may be mistakenly interpreted as an illness caused by the vaccine, leading to deep anxiety and a refusal to have subsequent doses [14]. Conversely, an educated parent is better equipped to understand the explanations provided by healthcare staff. They may be able to put this minor risk into perspective in light of the immense benefits of vaccination, and apply the simple pain-relief measures recommended at home.

Our model also demonstrated that vaccination adherence was influenced by occupational category. Compared with housewives, employees (ORa=2.60) and workers in the informal sector (ORa=1.54) showed greater adherence to the vaccination schedule. This finding highlights the economic dimension of access to healthcare. Indeed, although the vaccines themselves are free in Côte d'Ivoire under the EPI, the vaccination process entails indirect costs that can be significant. These costs mainly consist of urban transport fares to reach the INHP, lost working time, and other opportunity costs [15].

Housewives, who often have no income of their own and are financially dependent on their spouse or family, struggle to mobilise the necessary resources to attend vaccination appointments consistently. Financial independence, whether through paid employment or running a business, would help to remove these barriers, which are not immediately apparent to vaccination programmes [16]. This finding highlights the importance of the social determinants of health, as health behaviour cannot be viewed in isolation from its broader socio-economic context.

Strengths and limitations of the study

The main strength of this study lies in the high reliability of its data, which was verified directly against the physical vaccination records. Furthermore, our statistical analysis (using logistic regression) enabled us to examine the impact of each factor separately and with great precision, without running the risk of obscuring or distorting the reality. The INHP site, chosen for data collection, also provides a valuable snapshot of the referral service in Abidjan.

Our study does, however, have some limitations. Firstly, its cross-sectional approach does not allow us to prove a direct cause-and-effect relationship over time. Furthermore, although we verified the physical vaccination records, responses to the questionnaire may have been influenced by social desirability bias, particularly regarding aspects of respondents' socio-economic lives.

Conclusion

Adherence to the vaccination schedule is essential to the effectiveness of the Expanded Programme on Immunisation. Our study, conducted at the INHP in Treichville, revealed insufficient adherence (40 per cent), which is heavily influenced by social inequalities. A lack of formal education and financial independence were the major socio-demographic barriers to timely vaccination. These vulnerabilities are all the more pronounced as they are generally accompanied by a low level of health literacy. This limits people's ability to fully understand vaccination information and contributes to the persistence of avoidable concerns about Adverse Events Following Immunisation (AEFI).

To improve vaccination performance indicators, it is necessary to strengthen communication on vaccination and AEFIs, deploy visual educational materials, incorporate telephone reminders, and continuously improve the quality of service.

Author declarations

Conflict of interest

The authors declare no conflict of interest.

Contributions of authors

Audrey ABINA and Harvey ATTOH-TOURE developed the study protocol; Audrey ABINA, Roland OUSSOU, and Soualihou NOUFE collected and analysed the data; Harvey ATTOH-TOURE, Audrey ABINA and Konan N'GUESSAN interpreted the data; Harvey ATTOH-TOURE, Audrey ABINA and Marlyse KLAH wrote the manuscript; Edwige AYEVA-ADAM and Daniel EKRA reviewed it; All authors reviewed and approved the final version of the manuscript.

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