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Full Immunization Coverage and Related Socio-Demographics Factors in Children Aged 12-23 Months Received in Albert Royer Hospital in Dakar, Senegal

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Abstract: *Introduction*: Vaccination is one of the most effective and least costly public health interventions in the world. *Methods*: This is a cross-sectional, descriptive and analytical study of children aged 12-23 months received in consultation at the Albert Royer Children's Hospital during the period from November 20, 2019 to January 20, 2020. Results: Boys accounted for 61.8% of children and 70.8% were at least 15 months of age. The average age of mothers was 29.2 years. They were not educated in 22% of cases. Almost all (95.2%) had received vaccination information. Just over half (51%) of mothers did not know how many vaccine contacts their child needs to make. Vaccination records were available in 88.7% of cases. Immunization coverage was complete in 62.9% of children. In multivariate analysis with step-down logistic regression, the only factor significantly associated with complete immunization coverage was the child's rank in siblings (OR =1; p=0,04). *Conclusion*: Full immunization coverage for children aged 12-23 months received in pediatric emergency department consultations is low. The vaccination rate according to the specific vaccine is important with good retention for almost all multiple-dose vaccines between the first and third doses.

Keywords: Child, Immunization, Senegal

1. Introduction

Vaccination is a key component of primary health care and an undeniable human right. It is one of the best investments in health and one of the most effective and least costly public health interventions for the prevention of disabling infectious diseases, disabilities and mortality from vaccine-preventable diseases. with the best cost-effectiveness. It saves between 3.5 and 5 million children per year [1, 2]. The Global Action Plan for Vaccines 2011-2020, aimed for national coverage of at least 90% and at least 80% for all vaccines included in national immunization program [3]. Vaccination coverage of T2D is a key indicator of vaccination programs. During the 2010-2019 period, it is estimated that the global vaccine coverage for the third dose of diphtheria, tetanus, polio, pertussis, and the first dose of measles vaccines was between 84% and 86%. [4]. In the African region, vaccination coverage was 77% with 90% national immunization coverage in 18 countries. However, it has stagnated at 72% in sub-Saharan Africa over the past five years, exposing populations to vaccine-preventable diseases and epidemics [5].

Senegal developed its EPI in 1979 for the control of target diseases to which yellow fever was added. Since its creation, the EPI has remained efficient and dynamic despite some

constraints. For example, seven diseases were added in 2004 and 2005, the hepatitis B vaccine and the vaccine against Hemophilis influenzae B (Hib) infections with a combination in the form of Pentavalent (DTC-Hib-HeB). Between 2013 and 2015, 13-valent pneumococcal conjugate vaccine (PCV13), measles combined rubella vaccine (RR), rotavirus monovalent diarrhea vaccine, inactivated polio vaccine (IPV) and hepatitis B monovalent vaccine at birth (Hep B) have been introduced into the ENP. Survey data show a steady progression in vaccine coverage over time. The 2018 Demographic and Health-Continuity Survey (DHS-C) showed complete vaccination coverage in 77% of children aged 12-23 months [6]. In view of the significant number of children who remain unvaccinated, we undertook this study to determine the complete vaccination coverage and associated factors of children aged 12 to 23 months received in consultation.

2. Methods

2.1. Study Design

Descriptive and analytical cross-sectional, study, conducted from 20 November 2019 to 20 January 2020 at the Albert Royer Children's Hospital (HEAR) in Dakar.

2.2. Population

The study population consisted of mothers of children aged 12 months to 23 months. Included in this study were all mothers of children aged 12-23 months received in HEAR emergency department consultations. Not all mothers of children who met the criteria but refused to take part in the survey were included, as the carers did not bring the child's follow-up diary and did not know the child's background and the children in life distress. The sample size was calculated using the Schwartz formula.

2.3. Data Collection

All children aged 12-23 months were included exhaustively. The data collection questionnaire was pre-tested and filled in in direct interview with the child's mother. A child was fully vaccinated if they received one dose of BCG TB vaccine, three doses of DTC-Hep B-Hib for diphtheria, tetanus, pertussis, Hemophilus influenzae type B (Hib) and hepatitis B, four doses of polio vaccine, three doses of pneumococcal vaccine, two doses of rotavirus vaccine, one dose of maril vaccine and two doses of measles and rubella vaccine.

2.4. Data Analysis

Qualitative variables are described according to frequencies, proportions and confidence intervals. Quantitative variables are described by mean and standard deviation when distributions were normal, median and quartile if not. The estimation of the Odds Ratio (OR) and their 95% confidence interval (95% CI) obtained from the multivariable logistic regression model was used to characterize the association between the characteristics of children and the achievement of different vaccines. Effective vaccination is the event to be explained. A uni-variable logistic regression was first performed to select the variables (with a p-value < 15%) potentially associated with vaccination. These selected variables were then introduced into a multi-variable model. A step-down regression strategy was used to determine the factors associated with complete immunization coverage with a p-value < 5%. All analyses were re-adjusted with version 9.4 of the SAS software.

3. Results

3.1. Socio-Demographics Caracteristics

Two hundred and fifty-seven children were included. Boys represented 61.9% with a sex ratio was 1.6. More than two-thirds of children (70.82%) were at least 15 months of age. The average age of mothers was 29.2 years with extremes of 17 and 46 years. The average sibling size was 2.2 children (extremes 1 and 9 children). The socio-demographic characteristics of children and mothers are shown in Table 1 and Table 2.

Table 1. Socio-demographics caracteristics of children.

settings	workforce (n)	(%)
Sex		
Male	159	61,9
Female	98	38,1
Age (months)		
12-14	75	29,18
15-17	69	26,85
18-24	113	43,97
Sibling position		
First	110	42,8
Second	66	25,7
Third or more	81	31,5
Child's place delivery		
Health institution	254	
Home	3	1,18
Immunization place		
Health post	146	57,8
Health center	111	43,2

Table 2. Socio-demographics caracteristics of mothers.

Settings	Workforce(n)	(%)
Educational status		
Illiterate	62	24,1
Primary	45	17,5
Secondary and above	150	58,4
Area of residence		
Urban	157	61,1
Suburban	78	30,4
Rural	22	8,5
Marital status		
Monogamous married	204	79,3
Polygamous married	49	19,1
Unmarried	2	0,8
Divorced/widoved	2	0,8
Occupation		
Government employee	55	21,4

Settings	Workforce(n)	(%)
Income generating activity	40	15,6
House wife	134	52,1
Student	28	10,9
Ethnicity		
Wolof	104	40,5
Pular	72	28,0
Serere	37	14,4
Others	44	17,1

3.2. Knowledge of Mothers About Vaccination and Information Source on Vaccination

More than half of mothers (76.2%) received information about vaccination, health workers (68.3%) and the media (64.78%). For almost all mothers (99.19%), vaccination was important because it protects children from diseases for 88.66% of them. For 63.16% of mothers, vaccination must start at birth. Just over half (51.01%) of mothers did not know the number of vaccine contacts.

The child's vaccination centre was identical to the monitoring structure for pregnancy (45%) and childbirth in 30.52% of cases. Vaccination records were available at the time of the investigation in 88.72% of cases. The proportion of children over 15 months of age who were fully vaccinated was 62.90%. The EPI immunization coverage of children is shown in Table 3. Non-HEV vaccines (anti-hepatitis A, anti-meningococcal, anti-typhic, anti-influenza) were very poorly performed with frequencies ranging from 1.77% to 2.23%. Table 3.

Table 3. *Immunization coverage.*

Vaccine	Workforce(n)	Percent (%)
BCG	224	87,2
OPV 0+ B Hepatitis	229	89,1
Penta1+OPV1+ PCV1 +Rota1	224	87,2
Penta2+ OPV2+PCV2+Rota2	225	87,5
Penta3+ OPV3+ Injectable Polio + PCV3	223	86,7
Yellow fever+ Measles -Rubella1	219	85,2
Measles -Rubella 2	107	41,6

3.3. Related Factor

In univariate analysis, the factors associated with RR2 vaccination are represented in the table In multivariate analysis, the child's rank in the siblings was the only determining factor for RR2 vaccination. Children from the third-ranked siblings are less vaccinated than the first-ranked sibling with a 1st-ranked odds ratio of 0.5, a 95% confidence interval (0.29-0.99) and a p-value of 0.04.

Table 4. *Factor associated with RR2 vaccination.*

Univariate logistic regression	OR	IC95%OR		p-value
Educational status				
Illiterate	1	--	-	0,2
Primary	1,333	0,588	3,022	
Secondary	0,929	0,440	1,960	
Suprior	1,497	0,728	3,081	
Occupation				
Governement employee	1	--	-	0,2
House wife	0,966	0,502	1,861	
Income generatting activity	1,235	0,524	2,914	
Student	1,697	0,662	4,351	
Birth weight				
Normal	1	--	-	0,4
Hypotrophy	1,410	0,631	3,150	
Macrosomia	0,529	0,215	1,298	
Child Birth order				
First	1	--	-	0,04
Second	0,713	0,372	1,364	
Third or more	0,539	0,292	0,994	
Sexe of the child (male / female)	1,061	0,623	1,808	0,8
Number of children of the mother (>2 / ≥2)	0,597	0,340	1,047	0,07
Age of mother (≥30years/<30 years)	0,844	0,496	1,435	0,5
Child's place delivery (health institutions / home)	0,967	0,575	1,625	0,9
Area of residence (Urban, suburban/ rural)	0,864	0,504	1,480	0,6
Pregnancy care (Gynecologist /midwife)	0,896	0,525	1,530	0,7
Post-natale Consultations after delivery (yes/ no)	0,639	0,280	1,459	0,3
Mother's awareness of vaccination (yes/ no)	1,632	0,858	3,103	0,1
Immunization centre in the same structure where you consult if the child is sick (yes/ no)	0,833	0,486	1,430	0,5

4. Discussion

Full immunization coverage for children aged 12-23 months was 62.90%. This rate is lower than that reported nationally in 2018 which was 77% with disparities. The western region had the highest rates of immunization coverage (81%) compared to the northern region where it was lower (70%). Children in households with the highest quintile had better basic immunization coverage (84%) than those in the lowest quintile (72%) [6]. A 2016 study in central Kaolack reported higher vaccination coverage of 87.9%

[7]. Higher vaccination coverage rate (66%) reported in Gambia [5] and Cameroon (84,5%) [8]. Lower rates reported in Kenya (31,1%) [9] and in the state of Osun, Nigeria (58%) [10]. In the Kazungu study of crude vaccine coverage compiled from DHS in 13 West African countries, complete childhood immunization coverage ranged from 24.1% in Nigeria to 81.2% in Burkina Faso. [11]. The vaccination rate according to the specific vaccine shows that more than 85% of children had received all vaccines except for the second dose of RR vaccine with good retention for almost all multiple-dose vaccines between the first and third doses. These results are similar to those reported at national level [6]. In contrast, in the Touré study in the Gambia, a very slight loss between the first and third dose of penta was reported [5]. In Kenya, Calhoun reported greater loss between first and third doses of polio and penta [9]. Rank in siblings was the factor that was significantly associated with complete vaccination coverage. A study in Kenya had found in addition to rank in siblings, the number of children in the family, the place of birth, advice for the next growth monitoring appointment, the existence of awareness services [12]. In the Kazungu study, rank in siblings was a factor associated with full immunization coverage in Liberia, Nigeria and Togo. Other factors such as childbirth in a health structure, the existence of the vaccination record and postnatal consultation within 2 months after birth, were associated factors in other countries [11]. In the 2016 study in Kaolack in the centre of the country, the place of residence, instruction in French and the practice of an income-generating activity of the mother were the determining factors in the vaccination coverage of children aged 12-23 months [7]. In the Ambo Woreda area of Central Ethiopia, prenatal consultations, birth in a health structure, knowledge of mothers of vaccination were the factors statistically associated with complete vaccination coverage [13-15].

5. Conclusion

Full immunization coverage of children aged 12-23 months received in pediatric emergency department consultations is below WHO targets. The vaccination rate according to the specific vaccine is important with good retention for almost all multiple-dose vaccines between the first and third doses. Given the effectiveness of vaccination in reducing child morbidity and mortality, there is a need to strengthen vaccination strategies and parent awareness.

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