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Factors Associated with Drop-Out between Tuberculosis and Measles Immunization among Infants in Parakou (Benin) in 2012

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Abstract

Introduction: In Benin, the epidemiological profile is dominated by endemic and epidemic diseases preventable through immunization. This study had been carried out to determine the factors associated with the rate of drop-out between tuberculosis and measles immunization among infants aged 12-23 months in the District of Parakou.

Methods: A descriptive cross-sectional and analytical study had been carried out from July to August 2013 on 510 couples of children- mothers of children aged 12 to 23 months in the District of Parakou. Pearson's Chi-square test was used for comparisons with a significance threshold $p<0.05$.

Results: The ratio of children completely and properly immunized was 68.82% and the rate of drop-out between BCG and measles immunization in the District was 31.18%. In 57.45% of the cases, child mothers said they know the target diseases of the Expanded Programme on Immunization (EPI), but no one of them was able to mention at least 8 target diseases. Among those mothers, 17.45% knew the EPI immunization schedule. Drop-out between BCG and measles immunization was significantly associated with certain factors, the main ones being: place of delivery, number of under 5-year siblings, educational background and quality of information received after child immunization.

Conclusion: This study suggests that communication aiming to enhance the level of information and child mothers and communities' knowledge of immunization should be improved.

Keywords: Drop-out; Tuberculosis immunization; Measles immunization; Children; Benin

Introduction

The economic and human advances in which so many societies take pride largely depend on the improvement of public health, a pillar of which is immunization [1]. According to the World Health Organization (WHO) and epidemiological data, each year immunization helps to avoid 2 to 3 million child deaths in the world [2]. According to estimates, the global coverage with an initial dose of measles vaccine increased from 72% in 2000 to 84% in 2011 [3]. In spite of this progress at global level, some populations are still not protected against measles. It is estimated that 20 million children in the world did not receive that initial dose of vaccine in 2011 and 158, 000 deaths due to measles were counted globally, i.e. approximately 420 deaths per day [4].

In Benin, one child under one year out of 10 did not receive any vaccine from the Expanded Programme of Immunization (EPI) in June 2012 [5]. According to the 2009 self-evaluation report of the National Directorate of Expanded Programme on Immunization and Primary Health Care (DNPEV-SSP), the immunization coverages administered with tuberculosis and measles vaccines respectively increased from 114% and 95% in 2009 to 111.6% and 97.5% in 2010 [5,6]. The rate of drop-out between BCG and measles immunization was 12.63% in 2010 and remains high in 79% of the country's districts [7] while WHO standard was less than 10% [8]. The immunization system in Benin in general and in the district of Parakou in particular, despite the fact that it is free of charge, has not yet succeeded in covering all the social strata on a fair basis. The children who have access to it do not complete the whole normal process.

In the District of Parakou, the rate of drop-out between BCG and measles immunization was 37% in 2012 [9]. A review of two previous years statistics indicate, for the district of Parakou, a rate of drop-out between BCG and measles immunization estimated at 21% in 2010 [10] and 39% in 2011 [9]. However, no research work has explored this drop-out issue and its causes in the district of Parakou. It is the reason why we decided to carry out this study in order to determine the factors associated with the high rate of drop-out between BCG and measles immunization in children aged 12-23 months in the District of Parakou in 2012.

Setting, Subjects and Methods

Setting

The District of Parakou is located in the centre of the Republic of Benin at 407 km from Cotonou the economic capital. In 2012, the District of Parakou counted a population estimated at 207 240 inhabitants distributed in 41 administrative areas. It covers an area of 441 km^2 with a density of 455 inhabitants per km^2. Three quarters of its population live in the really urbanized area. The town hosts the Regional Hospital of Borgou (CHD-B), and the Army Teaching Hospital (HIA). There are also 6 public health facilities which carry out primary healthcare activities including immunization. There are several private practices and clinics the number of which is around 109. The health situation of the District is still characterized by the persistence of diseases such as malaria, Acute Respiratory Infections (ARIs) and diarrheal diseases. This situation has deteriorated since HIV/AIDS emerged. In addition to the diseases mentioned above, cases of meningitis, measles, tuberculosis, yellow fever and sexually transmitted

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infections are noted. The population of children aged 12-23 months was estimated at 3% of the overall population (6217 infants). The Expanded Programme on Immunization, through the implementation of primary health care, started in the 90s in Benin with six antigens (tuberculosis, diphtheria, tetanus, pertussis or whooping cough, poliomyelitis and measles). Tuberculosis antigen is administered at birth and measles immunization is done at nine months of age in the EPI program accepted in Benin. These days and gradually, the coverage of antigen availability went up to 8 in 2003 with vaccine against hepatitis B and yellow fever, then to 10 with the conjugate vaccine against haemophilus influenzae type b (Hib) in 2005 and the pneumococcal conjugate vaccine (PCV 13) in 2010. Since 1996, a regular annual oral polio immunization takes place all over the country.

Method

Type of study: It is a cross-sectional, descriptive and analytical study which was based on a survey.

Period of study: It was conducted from July to August 2013.

Study population: Our study had been conducted on children aged 12-23 months and their mothers or child minders in the district of Parakou in 2013.

Inclusion criteria: All the children aged 12-23 months at the time of the survey, living in the district of Parakou since at least 12 months, who have received at least BCG or with a vaccine scar on the left arm, having an immunization card and present during the survey period.

Exclusion criteria: All the children whose mothers or minders had refused to be interviewed or who were unreachable after three appointments had been excluded.

Sampling and sample size

The sampling applied to children aged 12-23 months and their mothers and minders in the district of Parakou in 2013, based on inclusion and exclusion criteria. The sample size was 510 couples of children-mothers or child minders calculated according to Schwartz formula on the basis of frequency p=37% which is the rate of drop-out between BCG and measles immunization in the district of Parakou in 2012 according to the unpublished statistical data of the Parakou/N'Dali Health Zone.

The study was carried out through cluster sampling technique. The survey base consisted of the list of all the villages/areas of all the district's boroughs with their respective target populations (3% of the overall population for the children aged 12 to 23 months). According to the reliability standards set by WHO within the framework of immunization coverage survey [11], 30 clusters of 17 children were selected instead of 7 children, consistent with the sample size. The 30 clusters were selected as follows: creation of cumulative target population table; determination of sampling interval. We picked or drawn a number between 1 and the sampling interval (212) by means of 6.04 French version of Epi 6 software (we found 74); this drawn number helped to determine the first cluster; we got the second cluster by adding the sampling interval to the drawn number and to each new result, we added the sampling interval till getting the 30 clusters. In each study cluster, 50% of the eligible households were drawn by simple random sampling and in each selected household, only one eligible child was randomly picked and his mother or minder interviewed. The second compound visited was the one immediately located on the right, when leaving the first one. So, progress was made step by step till getting the size required for each cluster.

Study variables

The dependent variable was drop-out between tuberculosis and measles immunization, that is to say having received BCG vaccine at birth and not having received measles vaccine dose at 9 months of age. The independent variables of the study were demographic data of mothers or child minders (age, educational background, civil status, nationality) and those on the child (age, sex, place of delivery, rank among siblings, number of under 5-year children among siblings); socio-cultural data (ethnic group, religion, decision-making power, family relationship with the child, occupation); mothers or child minder's knowledge about immunization (immunization advantages, adverse events following immunization (AEFI), EPI target diseases, immunization schedule, vaccine side effects, child immunization status at the time of survey); organizational data related to immunization sites (welcome, reception in order of arrival, seat while waiting, waiting time, missed opportunities, quality of information received after immunization, distance between health centre and domicile).

Techniques and tools of data collection

As regards collection, the data concerning children were collected from immunization cards, by means of data processing sheets. Survey data were collected through a questionnaire given to mothers and child minders. The survey had been conducted by a team of 10 interviewers divided into 5 pairs overseen by a supervisor. Each team consisted of one epidemiologist and one health worker.

Data processing and analysis

The collected data were captured with software Epi Data 3.1 (French version) and analyzed with Epi Info version 3.5.2. Central tendency and dispersion parameters were used for the quantitative variables and ratios for qualitative variables. The measure of association used was prevalence ratio (PR). Frequency comparison was done through Pearson's Chi-square test with a significance threshold at 0.05 accompanied by its p-value. The difference was statistically significant for a p-value below 0.05. A multivariate analysis has been made to sort out independent factors associated with the drop-out.

Results

Overall, 510 couples of children-mothers or child minders caring for a child aged 12-23 months participated in the survey. No mother or child minder had refused to participate in the survey.

Characteristics of the children

The 510 children included in the study were divided into 266 male children and 244 female children, (sex-ratio value is 1.09). The mean age of the children was 17 months ± 4 months. The median birth rank of the children included in the study was 2 (extremes 1 and 8). The children who were the elders of their mother represented 33.73 %. The number of under 5-year children among siblings varied from 1 to 3 children with an average number estimated at 1.40 child ± 0.51 child. The (Table 1) describes the characteristics of the children included in the study.

Socio-demographic and socio-cultural characteristics of mothers or child minders

Surveyed mothers or child minders were aged 15-45 years with an average of 27 years ± 6 years. Most investigated mothers or child minders had an age comprised between 21 and 35 years i.e. 77.06%. In 67.84 % of the cases, they were muslims. According to mothers or child minders, 69.41% were not obliged to get a permission of the head of

Variables	Number (n)	Frequency (%)
Sex		
Male	266	52.16
Female	244	47.84
Age (in months)		
12-15	167	32.75
16-19	186	36.47
20-23	157	30.78
Place of birth		
At home	17	3.33
Maternity(public/private)	493	96.67
Rank among siblings		
1st	172	33.73
2nd	119	23.33
3rd	108	21.18
4th and more	111	21.76
Mothers or childminders characteristics		
Mothers'age (years)		
15-20	68	13.33
21-35	393	77.06
36-55	49	9.61
Mother's religion		
Muslims	346	67.84
Christians	158	30.58
Traditional	6	1.18
Mother'snationality		
Foreign	52	10.20
Benin national	458	89.80
Mother's matrimonial status		
Not married	21	4.12
Monogamic marriage	363	61.37
Polygamic marriage	114	22.35
Divorced /widow	12	2.35
Mother's occupations		
Peasant /shepherd	11	2.15
Students/Pupils	27	5.30
Civil servants	32	6.30
Handcraft workers	103	20.20
Retailers	141	27.64
Hoseholders	196	38.43
Person responsible for decision making in the household		
Mothers	354	69.41
Others	156	30.59
Mother'seducational background		
Any	238	46.70
Primary	104	20.4
Secondary	155	30.4
Higher	8	1.5
Literacy	5	0.9
Mother's caring for one versus two or more children under 5 years		
1	307	60.20
≥ 2	203	39.80

Table 1: Distribution of children included and mothers or chilminders in the study based on their characteristics, District of Parakou in 2013 (N=510).

household or of the father of the child before attending immunization appointment. The distribution of interviewed mothers or child minders based on their educational background showed that in 46.7% (238) of the cases, surveyed mothers or child minders had no educational background. In 20.4% (104) of the cases, they had primary school level; in 30.4% (155) they had secondary school level. In 1.6% of the cases (8), the educational background was higher education and in 0.9% (5) of the cases mothers were illiterate (Table 1).

Rate of drop-out between tuberculosis and measles immunization

Out of the 510 children who were administered BCG (tuberculosis antigen), 376 were immunized against measles. The ratio of fully immunized children was 73.73%. Taking into account the age at which measles vaccine was administered, 25 children out of the 376 were immunized after 1 year of age. Hence, the ratio of children properly immunized at 1 year was 68.82%. The rate of drop-out between BCG and measles immunization was 31.18%, according to the data collected on immunization cards/records during this survey.

Surveyed mothers or child minder's knowledge about immunization

Among the six areas of knowledge covered by this study, the adverse events following immunization (AEFI) were the best known (90.20%) and among the latter 44.35% feared them. Out of the 510 mothers or child minders, 88.38% knew that immunization was a means for child protection against EPI target diseases. More than half (57.45%) claimed that they know about the EPI target diseases, but no one was able to mention at least 8 diseases out of the 10, while 82.55% had a low level of knowledge about the immunization schedule. Child immunization status, on the day of survey, was known by 60.20% of the respondents (Table 2).

Mothers or child minder's perceptions on immunization services organization

87.84% of the surveyed mothers or child minders stated that they were warmly welcomed. In 86.47% of the cases, they were not informed about the date of next appointment for immunization, the diseases against which child is immunized and the possible AEFI that could occur after child immunization. The ratio of surveyed mothers or child minders who had missed at least one opportunity to have their child vaccinated represented 44.51% and the waiting time was perceived as long in 61.37% of the respondents (Table 2).

Factors associated with the rate of drop-out between BCG and measles immunization

The difference between the two frequency measures noted in children whose mothers or minders cared for an under 5-year child (27.36%) and in those whose mothers or minders cared for two children under 5 years or more (36.95%), was statistically significant (p= 0.0222).

There was a statistically significant association between the main occupations of interviewed mothers or minders and the drop-out between tuberculosis and measles immunization (p=0.0050).

Mothers or minders who feared the AEFI ran a risk 1.10 time higher of abandoning their children immunization than the other mothers or child minders (p=0.0134).

Reception did not influenced the immunization status of surveyed children (p=0.2830). However, the waiting time was significantly associated with immunization drop-out (p=0.0003). The mothers or child minders who missed opportunities to have their child vaccinated ran a risk 1.51 time higher of abandoning their children immunization than the other mothers or child minders (p=0.0018).

The association between distance from health centre and

Variables	Numbers (n)	Frequency (%)
Age of BCG immunization		
At birth	445	87.25
Don't know	65	12.75
Age of Measles immunization		
At 9 months of age	256	50.20
Don't know	254	49.80
Knowledge of mothers on their children's immunization status		
Yes	307	60.20
No	203	39.80
Level of mother's knowledge on EPI schedule		
Low	421	82.55
Acceptable	89	17.45
Mothers or chilminders'perception of the health facilities organization of immunization episode		
Healthworkers attitud towards patients at their arrival		
Welcoming patients	448	87.84
No welcoming	62	12.16
Waiting time		
Long	313	61.37
Acceptable	197	38.63
Quality of informations received after immunization		
Insufficient	441	86.47
Good	69	13.53
Missed opportunities		
Yes	227	44.51
No	283	55.49
Distance from home to health facilities		
Long	179	35.10
Acceptable	331	64.90
Information on AEFI given to mothers		
Yes	223	43.73
No	287	56.27
Information given on target diseases in EPI program		
Yes	104	20.39
No	406	79.61
Fear of AEFI (n=460)		
Yes	204	44.34
No	256	55.65
Immunization date post sponing (510)		
Yes	184	36.1
No	326	63.9

Table 2: Distribution of mothers or chilminders on the basis of their knowledge of immunization and EPI, immunization advantages and their perception about EPI services organization in Parakou District in 2013 (n=510).

respondents' residences and drop-out between tuberculosis and measles immunization was not statistically significant (p=0.1496).

The relations existing between mothers or child minders socio-demographic characteristics and drop-out between BCG and measles immunization and those between the knowledge levels of mothers or child minders interviewed on immunization and drop-out between tuberculosis and measles immunization, are shown in (Table 3 and 4).

The children of the women who did not know the immunization status of their child had a risk 10.51 times higher of not being fully immunized on their 1th birthday than those of the women who knew the immunization status of their child (p<0.0001) (Table 3).

To summarize, many were the factors associated with drop-out between tuberculosis and measles immunization among children in Parakou district in 2013. From the most important to the least significant we can associated factors were: the place of birth of the child (p<0.0001), knowledge of the child immunization status (p<0.0001), immunization date post-sponing (0.0001), waiting time(0.0003), missed opportunities (0.0018), mother's occupation (p= 0.005), knowledge of the immunization schedule (0.0068), quality of information given to the mothers after immunization (p=0.0079), educational background (p=0.0082), fear of AEFI (p=0.0134), knowledge of the immunization advantages (p=0.0140) and mothers caring for one versus two or more children under 5 years (p=0.0222) (Table 4).

Reasons for non-compliance with EPI immunization schedule

According to investigated mothers and child minders, the main reasons for non-compliance with the immunization schedule associated with populations: carelessness (33.26%), misunderstanding of key information about immunization (29.37%), the fact of forgetting immunization appointments (26.57%) and those related to immunization services were: too long waiting time (23.33%), missed opportunities (22.03%), lack of communication (14.90%).

In Table 5 are summarized different factors which were associated to the drop-out between tuberculosis and measles immunization among children in Parakou district.

Discussion

Ratio of children properly immunized at 1 year of age

While conducting the survey, the ratio of children aged 12-23 months properly immunized at 1 year of age was 68.82%. This ratio is much lower than the national objective of immunization coverage with measles vaccine in Benin which was estimated at 95% [8]. This result is similar to the one found in the research works performed by Diédhiou et al. in Senegal in 2005, which was 67.40% [12]. It was different from the 94.98% found in the district of Parakou in 2012 according to the administrative data of the Parakou/ N'Dali Health Zone and the 87.60% found in the EPI review in Burkina Faso in 2009 [13]. In the French schools, taking into account first rubella immunization, immunization coverage was high enough (93.9%), but it was from 52 to 56% when taking into account the second dose of rubella immunization [14]. Immunization drop-out was also noted in a study carried out in Congo in 2002 and it was 24% [15].

Indeed, these figures were higher than the ones found again in this research work; an explanation of this would be the seasonal migrations of Parakou district's populations to peripheral areas, or an under-estimation of the initial target population, thus giving the impression of an administrative coverage that gives reassurance. As well, the fact that most children are most often immunized through forward strategy by nurse aides left on their own, could be sources of double scoring which inflate the administrative data. The immunization of off-area targets and off-target children may also explain this difference between the administrative data and the community-based survey data. From another point of view, the fact that the survey was carried out in couples of mothers-children having health booklet, could explain the weakness of this coverage compared with the administrative coverages, in our context where mothers often lose their immunization cards whereas this work was conducted through recruitment based upon presentation of immunization card.

Birth place of the children

At the end of this study, 96.67% of the deliveries were performed in a public or private maternity and 3.33% performed at home. This result

Variables	Total (N)	Drop-out between BCG and measles immunization		PR [IC at 95%]	p-value
		Number (n)	Frequency(%)		
Child sex					
Male	266	83	31.20	1	0.9892
Female	244	76	31.15	1.00 [0.77-1.29]	
Birth rank of the child					
≥ 3rd	219	75	34.25	1	0.1941
< 3rd	291	84	28.87	1.19 [0.92-1.53]	
Place of birth of the child					
At home	17	15	88.24	1	**< 0.0001**
Public/private maternity	493	144	29.21	3.02 [2.42-3.77]	
Mother's age (in years)					
15-20	68	15	22.06	2.94 [1.79-4.84]	0.4161
21-35	393	127	32.32	2.19 [1.84-2.61]	
36-55	49	17	34.69	2.08 [1.29-3.34]	
Nationality					
Foreign	52	19	36.54	1.20 [0.81 -1.75]	0.3784
Benin national	458	140	30.57		
Educational background					
Any	238	99	41.60	0.54 [1.49-2.22]	0.0082
Primary	104	28	26.92	0.75 [1.75-3.63]	
Secondary	155	29	18.71	1	
Higher	8	1	12.50	1.41 [0.69-32.31]	
Litteracy	5	2	40	0.56 [0.47-7.56]	
Mother's occupation					
Peasant/Shepherd	11	4	36.36	1.09 [0,75-5.35]	0.0050
Student/pupils	27	5	18.52	1 .85 [1.43-8.01]	
Civil servants	32	7	21.27	1.61 [1.43-6.14]	
Handcraft workers	103	25	24.27	1.49 [1.85-4.02]	
Retailers	141	37	26.24	1.40 [1.87-3.53]	
Householders	196	81	41.33	1	
Mother's caring for one versus two or more children under 5 years					
≥ 2	203	75	36.95	1.35 [1.05-1.74]	0.0222
1	307	84	27.30		

Table 3: Relationship between the characteristics of children aged 12-23 months, socio-demographic characteristics of mothers or child-minders and drop-out between BCG and measles immunization, district of Parakou in 2013.

is similar to the one found in the works carried out by Akpaka Nago et al. in the region of Oueme in Benin in 2006 where 99.8% of the children were born in a public or private maternity and 0.20% at home [16]. Our result is different from the one reported by Sacho in the health district of Gao in Mali in 2003 where 40.48% of the children were born at home [17]. The children born at home had a risk 3.02 times higher of not getting completely immunized at their 1th birthday compared with the children born in a public or private maternity ($p<0.0001$). This could be explained by the fact that women, after home delivery, rarely have access to Information, Education and Communication (IEC) sessions. It is not an easy task to join them again in order to sensitize them for the immunization of their children. On the contrary, immunization at birth is part of the new-born healthcare package in the public health centres.

Educational background of mothers or child minders

In this work, the association between mothers or child minder's educational background and drop-out between BCG and measles immunization was statistically significant ($p<0.0001$). Aka, et al. had found the same results in 2007 in Côte d'Ivoire. This study claims that the lack of school attendance was associated with the incomplete and/or wrong immunization status of the child [18]. Our results are different from the ones of Djego et al. who had found in Benin that the educational background did not influence child immunization status. An explanation of this may be the homogeneity of the population (90% of mothers did not attend school) studied in their research works [19].

According to the results of our works, this raises the issue of literacy of uneducated population, especially mothers or child minders, and setting up by health services of efficient communication programmes suited to target communities. Hence, the low educational level of mothers or child minders has a negative impact on child immunization status.

Mothers or child minder's knowledge about EPI immunization schedule

In this research work, only 17.45% of the respondents knew EPI immunization schedule. This result is lower than the one reported by other authors such as Akpaka Nago et al. (68.00% of the respondents) [16] and Diédhiou et al. (38.10% of the mothers) [12]. In 46.67% of the cases, investigated mothers or child minders were neither enrolled at school nor literate in our study. Therefore, we can understand that few of them (47.22%) know the number of immunization sessions

Variables	Total (N)	Drop-out between BCG and measles immunization		RP [IC at 95%]	p-value
		Number (n)	Frequency (%)		
Knowledge of the immunization advantages					
No	122	49	40.16	1 1.42 [1.08-1.85]	**0.0140**
Yes	388	110	28.35		
Knowledge of the immunization schedule					
Insufficient	421	142	33.73	1 1.77 [1.13-2.76]	**0.0068**
Acceptable	89	17	19.10		
Knowledge of the child immunization status					
No	203	139	68.47	1 10.5 [6.81-16.22]	**<0.0001**
Yes	307	20	6.51		
Mothers' or childminders' perception of immunization services' organization					
Healthworkers welcoming patients at their arrival					
Bad	62	23	37	1 1.22 [0,86-1,74]	**0,2830**
Good	448	136	30.36		
Waiting time					
Long	313	116	37.01	1.70 [1.26-2.29]	0.0003
Not long	197	43	27.83	1	
Quality of informations received after immunization					
Not Good	441	147	33.33	1.92 [1.13-3.26]	0.0079
Good	69	12	17.39	1	
Missed opportunities					
Yes	227	87	38.33	1.51 [1.16-1.95]	0.0018
No	283	72	25.44	1	
Distance from home to health facilities					
Long	179	63	35.20	1.21 [0.94-1.57]	0.1496
Acceptable	331	96	29.00	1	
Fear of AEFI (n=460)					
Yes	240	77	37.75	1.40 [1.07-1.83]	0.0134
No	256	69	26.95	1	
Immunization date post sponing					
Yes	184	78	42.39	1.71 [1.32-2.20]	<0.0001
No	326	81	24.85	1	

Table 4: Relationship between knowledge of child immunization status and immunization advantages, mother's or childminder's perception of immunization services organization and drop-out between BCG and measles immunization, district of Parakou in 2013.

required for a child to be fully immunized before one (01) year of age, particularly when those sessions are not preceded by information and education sessions for mothers. This fact shows a deficit in the quality of EPI communication. The ignorance of the number of sessions could foster immunization drop-outs or abandonments.

In fact, if 87.25% of mothers or child minders knew correctly the age at which child must be administered Bacillus Calmette-Guerin (BCG) vaccine, only 50.20% knew the age of the last vaccine (measles vaccine). This result confirms the deficiencies noted in the communication in favor of immunization. Due to the length of time which separates the administration of third dose of EPI pentavalent vaccine and the one against measles, mothers or child minders who do not know the age of measles vaccine administration and who do not remember the date of appointment for child immunization (34,24%) could fail to bring their child for immunization. Besides, it emerges from our work that mothers or child minders who knew the immunization schedule properly kept appointments for child immunization than the ones who did not know it (p=0.0068). This observation confirms the result obtained by Sawadogo who found that lack of knowledge about immunization schedule was one of the major reasons for non-immunization of children [20]. The number of fully immunized children should be increased through schedule control by parents, particularly mothers. Beyond knowledge of immunization schedule, a point should be clarified, for it could partially explain this immunization drop-out. In fact these are series of national immunization days that have been going on in Benin since 1996. They probably led to the disruption of the usual routine immunization which should retain the population.

Mothers or child minder's knowledge on child immunization status on the day of survey

In this work, 60.20% of investigated mothers or child minders knew child immunization status on the day of survey. The children of the mothers who did not know the immunization status of their child ran 10.51 times more risks of not getting fully immunized before their 1th birthday than those of mothers who knew the immunization status of their child (p<0.0001). Sawadogo had found that 9% of the mothers or child minders knew the immunization status of their child [20].

On the one hand, this finding could be due to the low level of knowledge of mothers or child minders on EPI immunization schedule (17.45%). On the other hand, this lack of information may be a cause of drop-out since they have no reference to help them remember and duly comply with immunization periods. In 91.18% of the cases, investigated mothers or child minders claimed that there was no mechanism which reminded them of the appointment date if they have forgotten.

Factors	Total	number	p value	Chi 2
Insufficient Knowledge of Child immunization status	203	139	_	_
Place of bith (birth at home)	17	15	0.49	0.47
Immunization date post sponing	**184**	**78**	**0.005**	**7.62**
Waiting time (long)	**313**	**116**	**0.000064**	**15.91**
Missed opportunities	**227**	**87**	**0.000496**	**12.13**
Mother's occupation				
Pesant/Shepherd	-	-	0.279	-
Student/pupils	**27**	**5**	**0.0054**	**7.74**
Civil servants	**32**	**7**	**0.0057**	**7.63**
Handcraft workers	**103**	**25**	**0.000019**	**18.27**
Retailers	**141**	**37**	**0.0000056**	**20.62**
Householders	**196**	**81**	**0.0032**	**8.68**
Knowledge of immunization schedule	**421**	**142**	**0.0000012**	**23.63**
Quality of information received after immunization (insufficient)	**441**	**147**	**0.0000006**	**24.85**
Educational background				
Any	**238**	**99**	**0.00209**	**9.46**
Primary	**104**	**28**	**0.000072**	**15.76**
Secondary	**155**	**29**	**<0.000001**	**34.07**
Higher	8	1	0.07	-
Literate	5	2	0.51	-
Fear of AEFI	**240**	**77**	**0.0000079**	**19.97**
Knowledge of immunization advantages	**122**	**49**	**0.0078**	**7.06**
Mothers caring for more than two under five years children	**203**	**75**	**0.00037**	**12.67**

Table 5 : Attempt of finding factors associated with drop-out between tuberculosis and measles immunization among children in Parakou district in 2013 using multivariate analysis and taking knowledge of children's immunization status by their mothers as reference.

Waiting time

Out of the 510 surveyed mothers, 61.38% of them or child minders found the waiting time long. Immunization drop-out was significantly associated with the length of waiting time (p=0.0003).

In the research works done by Sylla, 84% of the mothers had mentioned long queues; these constituted one of the main causes of non-immunization of children [21].

On the one hand, long waiting time could be due to the fact that many centers immunize on average twice a week according to their planning (one session for BCG on Mondays and one session for measles vaccine on Fridays); as a result there are considerable numbers of mothers or child minders on the day of immunization. On the other hand, those long queues are due to the delay in the performance of immunization sessions following the less than optimal organization of services and sub-optimal distribution of tasks at the immunization sites. These malfunctioning cases would not encourage mothers or child minders to use immunization services on a regular basis. The too long waiting before care is still an important issue in the service management of Benin health system.

To reduce those malfunctioning cases and risk of immunization drop-out, WHO and UNICEF have proposed the regular implementation of mop-up campaigns in the villages or town areas/sections. Moreover, to reduce missed appointments, a very simple experience could be tried by using reminders through phone calls, particularly since in most of our areas telephone coverage with GSM has significantly improved.

We did not discuss in this work the relationship between mothers' socio-economic conditions and immunization drop-out as presented in other works [8], for the immunization programme has remained free of charge and an effort has been made to improve population's accessibility.

Conclusion

The advances introduced by the immunization programmes are obvious and they assuredly remain one of the biggest successful achievements in public health. This work addresses the immunization drop-outs issue in the district of Parakou in a context of administrative immunization coverage higher than 100% and high rate of drop-out between tuberculosis and measles immunization. In addition, the ratio of children fully and properly immunized at 1 year of age (68.82%) in the district of Parakou is still low because of high drop-out rate (31.18%) associated with a poor level of knowledge on EPI target diseases and immunization status by their mothers. At the end of this work, the factors associated with drop-out between tuberculosis and measles immunization were postponement of child immunization date, long queue before child being immunized, missed opportunities, some main occupations of mothers or child minders, poor level of knowledge on EPI target diseases and immunization schedule, insufficient quality of information received after immunization, educational background, fear of AEFI, poor knowledge of immunization advantages, number of under 5-year children among siblings. This work did not address the issue of the time of the drop-out through EP immunization schedule.

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