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Research Article

Evaluation of Obstacles to Low Coverage of Routine Vitamin A Supplementation in 2021 in the Guédiawaye Health District in Dakar, Senegal

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Abstract

Introduction: Micronutrient deficiencies, particularly the most serious deficiencies of iron, vitamin A and iodine, are a major public health problem in developing countries. Vitamin A deficiency is one of the most common nutritional deficiencies and one of the most serious, as it greatly increases the risk of death and predisposes to numerous infectious diseases. Routine vitamin A supplementation in children aged between 6 and 59 months is the strategy used in Senegal to combat micronutrient deficiencies. The aim of this study is therefore to assess the obstacles to the low coverage of routine vitamin A supplementation (VAS) in the Guédiawaye district of Dakar in 2022. Methodology: This is a descriptive and analytical cross-sectional study using a quantitative and qualitative method. The cluster sampling method was chosen for the quantitative study. The study population consisted of all mothers/caregivers of children aged 06 to 59 months, providers, and community stakeholders. Results: The practice of supplementation was statistically related to the level of education of those surveyed (p=0.00), communication by health workers (p=0.001) and community stakeholders (P=0.003). Knowledge of the benefits on child growth (p=0.003), the fight against blindness (0.017), the strengthening of the immune system (p=0.001) and the fight against infections (p=0.002) are statistically linked to the practice of VAS. Non-supplementation with vitamin A was 2.3 times higher among children aged over 24 months (p= 0.016); 3.1 times higher among uneducated women (P=0.001) and 3 times higher (0.001) among women who had received no information about VAS. The qualitative results show that a number of reasons were given, including lack of familiarity with the schedule, forgetting to keep appointments at different times, stopping the vaccination cycle and household chores. Conclusion: the obstacles to vitamin A supplementation in Guédiawaye are mainly linked to a lack of knowledge about vitamin A and the non-existence of a proper VAS communication strategy. Hence the need to step up communication with the public.

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Keywords

Evaluation, Obstacles, Vitamin A Supplementation, Guediawaye, Senegal

1. Introduction

Micronutrient malnutrition is a global problem facing poor and rich countries alike. It is considered an obstacle to socio-economic development because of its effects on health, learning capacity and productivity. Vitamin A deficiency is one of the most frequent nutritional deficiencies, and one of the most serious, as it greatly increases the risk of death and predisposes to numerous infectious diseases. According to the World Health organization (WHO) [1], vitamin A deficiency is a major public health problem affecting an estimated 190 million pre-school children, mainly in the African and South-East Asian regions [2].

Infants and young children have an increased need for vitamin A to support their rapid growth and help them fight infections. At this age, insufficient intakes of this vitamin can lead to deficiency which, if severe, is likely to cause visual impairment (night blindness) or increase the risk of morbidity or mortality in the event of infection by common childhood diseases such as measles or diarrheal diseases [3]. In children, the combination of underweight, micronutrient deficiencies (iron, vitamin A and zinc) and sub-optimal breastfeeding is responsible for 7% of deaths and 10% of the total burden of disease [4]. Vitamin A deficiency alone is responsible for almost 6% of deaths in children under 5 in Africa, and 8% in South-East Asia. Vitamin A deficiency alone is responsible for almost 6% of deaths in children under 5 in Africa, and 8% in South-East Asia [4]. The risk of deficiency evolves over the life cycle, and is particularly high when needs increase. They have multiple consequences for women of reproductive age, particularly during pregnancy and breastfeeding, and for infants and children. They have a negative impact on children's development, in particular cognitive development, cause losses in productivity and education, and increase maternal and infant morbidity and mortality. Furthermore, it has been established that when a country's infant and child mortality rate exceeds 70 per 1000, vitamin A deficiency is a public health problem [5]. Vitamin A deficiency is also qualified as a severe public health problem when at least 20% of children aged between 6 and 59 months have a serum retinol level less than or equal to 0.70 µmol/l (biochemical deficiency) [6]. In Senegal, this rate, estimated at 138 per thousand in 2002 [7], amply justifies interventions to combat vitamin A deficiency. Vitamin A supplementation (VAS) is one of the most cost-effective interventions to reduce infant and child mortality. Vitamin A supplementation in children aged 6-59 months living in developing countries is associated with a reduced risk of all-cause death, and lower incidence of measles and diarrhea in children [8]. Vitamin supplementation has been shown to reduce mortality in children under 5 by 23 [6-9]. A meta-analysis of 19 randomized clinical trials showed that VAS reduced the risk of all-cause mortality by 12-24% [8]. The risk of deficiencies evolves over the life cycle, and is particularly high as needs increase. Deficiencies have a negative impact on children's development, particularly cognitive development, cause losses in productivity and education, and increase maternal and infant morbidity and mortality [9]. Vitamin A supplementation is estimated to reduce mortality in children under the age of 5 by 23% [9]. Vitamin A supplementation can restore intestinal integrity and thus reduce the severity of certain diarrhea episodes [10]. The role of this vitamin in innate and adaptive immunity may also include reducing susceptibility to and/or severity of other infections [11, 12]. Many countries have incorporated vitamin A supplementation strategies for infants and children into their national health policies [13, 14]. The distribution of this vitamin has been incorporated into routine health services, for example through the introduction of twice-yearly "special days", during which vitamin A administration is combined with other child survival interventions such as deworming or nutritional education. Distributing high-dose Vitamin A Capsules (VACs) twice a year to at least 80% of children aged 6-59 months, has always been one of the greatest challenges VAS programs [15]. To achieve good coverage, VAS administration has been successfully integrated into immunization schedules and is given during routine vaccinations to children aged 6-59 months in several countries. Today, despite this strategy, coverage remains low, especially in the 12–59-month age group, and many countries have faced challenges in moving from a campaign approach to VAS integrated into routine health system services. Challenges have been identified in all WHO-defined health system building blocks (service delivery, human resources, health information systems, access to essential medicines, financing and governance) [16]. However, many countries have faced challenges in moving from a campaign approach to VAS integrated into routine health system services. In Senegal, the distribution of high-dose VACs twice a year to at least 80% of children aged 6-59 months has always been one of the biggest challenges of Vitamin A Supplementation programs. The country embarked very early on the path of vitamin A supplementation through Local Supplementation Days (LSDs) followed by Child Survival Days (CSDs), before opting a few years ago to integrate it into routine services. This routine

VAS was first introduced in 2013 through a pilot project in two districts before being gradually extended to cover all regions by 2019 [17]. Despite this new strategy Senegal has faced challenges that have been identified in all the constituent elements of health systems defined by the WHO (service delivery, human resources, health information systems, access to essential medicines, financing and governance) [17].

The district of Guédiawaye in the Dakar suburbs will record the lowest rates in the second half of 2021, with rates dropping from 67.1% to 24% among children aged 6 to 11 months, and from 60.7% to 39.8% among children aged 12 to 59 months between the first and second halves of 2021 [18]. Thus, the aim of our study is to assess the obstacles associated with the low coverage of routine vitamin A supplementation in children aged 6-59 in the Guédiawaye health district in the Dakar region, Senegal.

2. Study Framework

The study was carried out in the Guédiawaye health district, which is essentially located in an urban area. It is located in the western part of the Dakar region and covers an area of 27 km². It is a coastal city located northeast of Dakar, on the northern coast of the Cape Verde peninsula, built on a series of dune ridges separated by dry lakes and fertile lowlands known as "Niayes". Guédiawaye department has a desert climate according to the Köppen-Geiger classification. Over the year, the average temperature is 24.3 °C and rainfall averages 537.7 millimeters. The population is estimated at 433,844, with a density of 16,068 inhabitants per km². It is made up of 3rd age people (65790), women of reproductive age (126789) and children aged 0-5 (12984). All ethnic groups are represented, with the phenomena of rural exodus and the displacement of Wolof populations from the slums of Dakar. The population's socio-cultural diversity is rooted in its ethnic diversity. Beliefs, perceptions, taboos and prohibitions are major obstacles to health promotion. The main economic activities are agriculture, livestock breeding and trade, which is favored by the two weekly markets on Thursday and Monday, while industry is almost non-existent.

Indicators of health coverage in terms of qualified personnel, compared with the standards of the National Health Development Plan and the WHO, show gaps of 20 doctors, 52 nurses and 55 midwives. In addition, the district has 100 ACs, 806 relays, 170 BGs and 100 home-care providers, who are responsible for treating cases of uncomplicated malaria at home and in the “daaras”. Indicators generally monitored during annual reviews in 2021 in the district: Proportion of malnourished children cured 33%, Proportion of cases of Acute Respiratory Infection treated with antibiotics 98.4% and Proportion of cases of diarrhea cured with ORS/Zinc 99.5%, vitamin A coverage for children aged 6 to 59 months 59.8%.

3. Materials and Methods

3.1. Study Period

The study was conducted from district level during period 2 to april 30, 2021.

3.2. Type of Survey

This is a descriptive and analytical cross-sectional study using a mixed method with two approaches, quantitative and qualitative.

3.3. Target Population

The study population consists of:

a. Providers and community players in the district
b. District management team members
c. Mothers and caregivers of children aged 6 to 59 months

3.4. Sampling

3.4.1. Quantitative Approach

(i). Inclusion Criteria

Mothers or caregivers of children aged 06 to 59 months living in the Guédiawaye district's area of responsibility.

(ii). Criteria for Non-Inclusion

a. Refusal to participate in interview
b. Absent on the day of the survey
c. Omission of child's date of birth in absence of vaccination record
d. Ill on the day of the survey

(iii). Sampling Method

Cluster sampling was chosen for this survey. The sampling frame consisted of an exhaustive list of public health facilities in the Guédiawaye district. We considered each health facility as a cluster. A total of 13 health facilities were identified, constituting the 13 clusters to be surveyed. Households were selected from the clusters using the random method. With the help of the head of the station's area of responsibility, the interviewer identified the center of the cluster. The interviewer randomly selected the direction to be followed, using the bottle method, which involves throwing a bottle and following the direction indicated. The first concession found in this direction was the first to be visited. At each concession, a household with a child aged between 6 and 59 months was selected at random. Subsequent concessions were selected by skipping one each time. When the direction was exhausted, the interviewer turned right each time until the number of households planned for the cluster was reached.

(iv). Sample Size Calculation

The sample size at household level is calculated using Schwartz's formula

$$N= \varepsilon^2. p. q /i^2$$

n: sample size; ε: reduced deviation; p: proportion of target having the given trait: 60.7% [18]; q: 1 - p: 39.3% and i: desired precision: 5%

A total of 366 households in 13 clusters were surveyed in the Guédiawaye health district. A weighting was applied to obtain the exact distribution of the number of households to be surveyed within each cluster, taking into account the population covered. This is calculated by dividing the population within each cluster by the total population, then multiplying by the total number of households to be surveyed.

3.4.2. Qualitative Approach

Sampling was purposive and included

a. For the district health center team, it was decided to interview the nutrition focal point, the District Chief Medical Officer and his deputy, the Expanded Program on Immunization supervisor and the Primary Health Care manager.
b. For the twelve posts covered by the district, we chose 5 posts according to the size of the population covered.
c. For community actors, we chose 4 of the 7 outposts that were not selected, as they were involved in more community activities.
d. All mothers or caregivers of children aged 6 to 59 months residing in households in the health district and who agreed to take part in the focus groups.

3.5. Data Collection

3.5.1. Quantitative Approach

(i). Data Collection Tools

A household questionnaire was used to collect data from mothers/caregivers of children aged 6 to 59 months.

Tablets were used for data collection. The selected interviewers were trained in the use of the different concepts contained in the questionnaire and in the use of the tablet.

(ii). Data to Be Collected

Among mothers and caregivers, the following data were collected:

a. Household characteristics
b. Socio-demographic characteristics of children aged 6 to 59 months
c. Level of knowledge about VAS
d. Routine VAS communication strategies
e. Access to VAS supplementation services

3.5.2. Qualitative Approach

(i). Data Collection Tools

Several interview guides were drawn up and used to conduct the following interviews:

a. Interviews with health care providers and community actors: a total of 54 semi-structured interviews were organized with health care providers in the Guédiawaye commune.
b. Two focus groups with mothers or guardians of children aged 6 to 59 months living in the district's area of responsibility. To respect the homogeneity criterion relating to the organization of focus groups, we set up two groups: one composed exclusively of young mothers or babysitters aged under 35, and another of older mothers or babysitters over 35. This will minimize certain biases. Each group would comprise 10 to 12 beneficiaries.

(ii). Data to Be Collected

1). For providers and community players

a. Knowledge of the importance of vitamin A supplementation and its deficiency for child health.
b. The types of strategies used to administer vitamin A:
c. Availability of vitamin A inputs at facility level
d. Implementation of VAS at community level
e. Assessment of the level of VAS coverage in the area
f. Problems encountered with VAS at facility and community level (accessibility, refusals, rumors).

2). For the focus group with mothers and caregivers,

3.6. Data Analysis

3.6.1. For the Quantitative Study

a. Data entry was carried out using Excel software, with EPI Info 7 software used for reconciliation.
b. Data analysis was carried out with R software for quantitative data, averages with standard deviation were presented, and frequencies with confidence intervals were calculated for qualitative variables. Descriptive analyses relating to the main indicators, bivariate analyses between the main variable and the independent variables with a CH_2 test were carried out, multivariate analyses were carried out using logistic regression.

3.6.2. For the Qualitative Study

Data were collected via interviews and focus groups were transcribed, pre-coded, coded and finally categorized for analysis according to the appropriate methodology.

3.7. Ethical Considerations

The Chief Medical Officer of the Guediawaye health district authorized the study after reviewing the study protocol.

Informed consent was obtained from the mother or guardian before including her child aged 6 to 59 months. Informed consent was also obtained from providers and community stakeholders. All were informed that their participation was voluntary and that they could withdraw consent at any time. Data were collected anonymously and confidentially. Results were forwarded to the District Chief Medical Officer to enable him to make informed decisions about routine Vitamin A supplementation.

3.8. Limits

As the collection coincided with the rainy season, it was not easy to mobilize mothers/caretakers and community players, which led to several postponements of appointments. This situation increased the number of days scheduled for the collection, which in turn increased the number of days for the collection. The mobility of the target group in a commune where most of the population are immigrants, constantly shuttling back and forth between their locality of origin and Guédiawaye. At the health post level, the organization of care units means that not all health workers are at the same level of information about vitamin A supplementation. As a result, the majority of health workers declined to answer questions during the interview, due to a lack of information on vitamin A.

4. Results

4.1. Results Quantitative Survey

4.1.1. Descriptive Results

(i). Results of the Household Survey

Sociodemographic characteristics of mothers and caregivers of children aged 6 to 59 months

A total of 366 mothers/caretakers were enrolled. Age was recorded for 341 mothers/caregivers, with an average of 33.4±8.9 years and extremes of 18 and 69 years. The 30-39 age group (40.4%) was the most represented, followed by the 20-29 age group (31.1%).

Almost all (95%) were married, mainly in monogamous relationships (80.5%). A further 2.5% were single, 1.4% divorced and 1.1% widowed.

The average number of children aged between 6 and 59 months was 1±0.6, with extremes of 1 and 6 children. More than three-quarters (78.7%) of mothers/caregivers had one child aged 6-59, 17.2% had 2 children and only 0.5% had 4 or more children.

Around three quarters of respondents (73%) were educated, mainly to primary (31.4%) or secondary (30.1%) level. The uneducated represented 27% and 2.2% were literate.

Half of the respondents (50.5%) were housewives; 22.4% were engaged in commercial activities; 6% were employed in the private sector; 2.7% were civil servants.

In terms of equipment, we note that almost all households were equipped with telephones (99.2%), televisions (98.9) and ventilators (94%).

Household characteristics and possessions.

Table 1 and figure 1 shows the results of household characteristics and possessions.

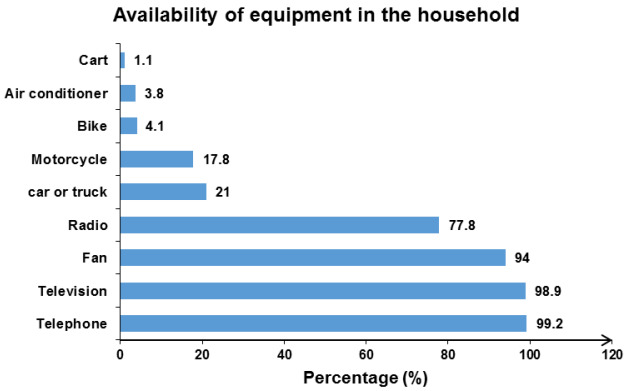

Figure 1. *Distribution of respondents by household equipment availability.*

Table 1. *Results of household characteristics and possessions.*

Characteristics Household	Absolute Frequency	Relative Frequenc Y (%)
Principal source of drinking water		
Private Tap Wat	343	93,7
Public tap water	15	4,1
Buying packaged water	8	2,2
Types of household toilets		
Modern public toilets	154	42,1
Private latrine	135	36,9
Modern private toilets	77	21,0
Principal type of fuel		
Gas	306	83,6
Coal	59	16,1
Firewood	1	0,3
Principal Wall construction material		
Cement house	363	99,2
Terra cotta house	2	0,5
Wooden house	1	0,3
Principal Roof construction material		
Concrete	281	76,8
Sheet metal	56	15,3

Characteristics Household	Absolute Fr équency	Relative Fr équenc Y (%)
Tile	28	7,7
Other	1	0,3
Principal Roof construction material		
Tiles	281	76,8
Cement	77	21,0
Earth	8	2,2

Around 94% of households used private tap water; 42.1% had modern public toilets; 83.6% used gas as their main fuel; 99.2% of houses were made of cement; 76.8% were slab and tiled; as for equipment, we note that almost all households were equipped with telephones (99.2%), televisions (98.9%) and fans (94%).

In terms of equipment, we note that almost all households were equipped with telephones (99.2%), televisions (98.9) and fans (94%).

Routine VAS communication strategies

Of the 366 mothers/caregivers surveyed, only 40.2% were aware of VAS. Health workers (51.0%) were the main actors in raising awareness of VAS, followed by neighbors in 12.9% of cases, television in 11.6% and community actors in 10.9% of cases.

Knowledge of VAS by mothers/caregivers

The results showed that 43.2% had been informed about vitamin A by health workers, 25.4% were informed by relays/Badjenou-Gox 31.4% had received no information about vitamin A.

Some 72.7% of mothers/caregivers knew about vitamin A capsules, and only 38.5% knew about the benefits of VAS. Contributing to child growth (88.7%), strengthening the child's immune system (63.8%), fighting infection (46.1%), fighting blindness (45.4%), improving health (39%), fighting disease (10.6%) were the main benefits cited.

Over half the people surveyed (53.6%) were unaware of which foods were rich in vitamin A. However, they had identified vegetables (34.7%), fruit (23.2%) and breast milk (15.6%) as foods rich in vitamin A.

More than half the people surveyed (56.4%) did not know the age at which they received their first dose of vitamin A. Only 39.3% had specified the age at which they took their first dose of vitamin A at 6 months.

More than half of respondents (65.3%) were unaware of the number of vitamin A doses to be administered per year. However, only 31.4% of respondents stated that the child should take two doses per year. With regard to the maximum age for vitamin A intake, only 36.3% specified 5 years, 13.1% said over 5 years, and 45.6% did not know the age of administration.

A total of 51% of respondents said they had received information on the benefits of vitamin A when supplementing their children. In 42% of cases, they had stated that VAS helps to ensure the child's growth, enables good nutrition in 36% of cases, and protects eyesight in 35% of cases. However, some 49% of respondents said they had not received any explanation of the benefits of vitamin A.

Most respondents (64.8%) had received no information about upcoming VAS appointments. Only 6.8% had been informed about appointments in 6 months and every 6 months.

(ii). Survey Results for Children Aged 6 to 59 Months

Sociodemographic characteristics of children aged 6-59 months

For a total of 366 households surveyed, 466 children aged 6-59 months were enrolled. Mothers (80.9%) were the main respondents of child-related information. The majority of children were female (54.7%). The sex ratio was 0.82. The mean age of the children was 29.2 ±15.2 months, with extremes of 6 and 59 months. The median was 29 months. Twenty percent of children (20%) were aged 6-11 months, 24% were aged 12-23 months, and the 24–59-month age group (56.6%) was the most represented. In all, 80% of children were aged between 12 and 59 months, and 20% between 6 and 11 months.

The exact date of birth was found for all children. For 52.6% of children, birth dates were deduced from health records or vaccination cards, and for 47.4% the age was given by a civil status document.

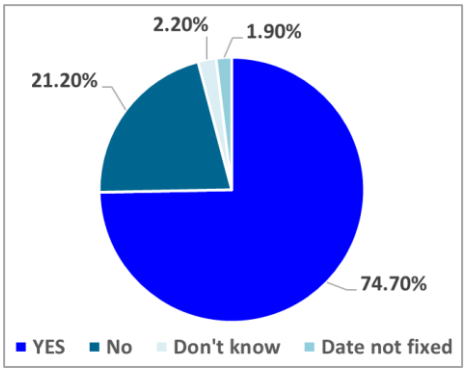

Figure 2. *Distribution of children according to VAS coverage (N=466).*

Vitamin A supplementation coverage

In the 6 months preceding the survey, 74.7% (n=348) of children aged 6-59 months had received vitamin A supplements, compared with 21.2% and 2.1% who did not know. Of the 348 children aged 6-59 months who were supplemented, 20.4% were aged 6-11 months and 79.6% were aged 12-59 months.

Age at first dose of VAS in children aged 6-11 months

Among supplemented children aged 6-11 months, 80.2%

had taken the first dose of VAS, and among these, the mean age at first VAS intake was 6.4±1.1 months, with extremes of 6 and 11 months. And more 17.3% were supplemented after 6 months, and 2.5% of mothers were unaware of their child's age at the time of the first dose of vitamin A.

The health center or health post (48.1%) was the main place for VAS. In addition, 23.6% had received vitamin A supplements at home.

Home visits by the relays/Badjenu Gox (33.9%), vaccination sessions (30.7%) and vitamin A intake appointments (30.5%) were the main VAS occasions.

Concerning the attitude towards taking VAS, 25% (n=89) had waited for the agent to arrive and 74.4% (n=259) had gone to the health facility. The main reasons why mothers/caregivers waited for VAS were lack of information on the continuation of VAS (44.9%), and waiting for the relays/Badjenu Gokh to pass (39.3%).

Reasons for not taking VAS

Lack of information about the next appointment (64.6%) was the main reason for non-compliance with VAS. (Figure 3)

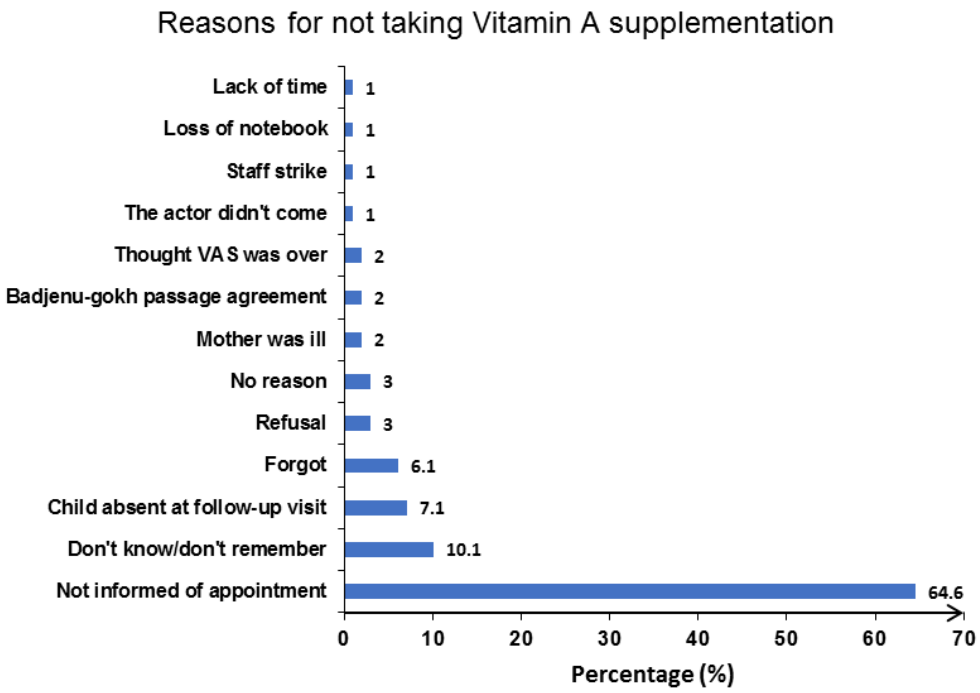

Figure 3. *Distribution of children according reasons for not taking Vitamin A Supplementation.*

4.1.2. Analytical Results

(i). Bivariate Analysis

Factors associated with vitamin A supplementation are presented in Tables 2 to 8. Routine vitamin A supplementation was statistically related to mother/guardian education level, with a p-value of 0.001. VAS coverage was lower among non-educated respondents. No relationship was found between VAS coverage and respondents' age group (P=0.476), marital status (p=0.972), and main occupation (p=0.363). Vitamin A supplementation was statistically related to VAS communication strategies, notably those from health workers (p=0.001), Community Health Workers (p= 0.003), information from people in the household (p= 0.022) and television (p= 0.022).

VAS was statistically linked to knowledge of the benefits of VAS for children, specifically: VAS promotes child growth (p=0.003), VAS fights blindness (p=0.017), VAS strengthens the child's immune system (p=0.001) and VAS fights infections (p=0.002). VAS was also statistically linked to knowledge of vitamin-rich foods, particularly those with dark green leaves (p=0.0150). It was statistically linked to knowledge of VAS intake conditions, particularly knowledge of age at 1st VAS dose (p= 0.006), knowledge of number of VAS doses per year (p= 0.005), and knowledge of maximum VAS intake age (p= 0.001). VAS was statistically related to sources of information on vitamin A, notably health agents (p= 0.001) and relays / "Badjenou Gox" (p= 0.001). VAS was statistically related to children's age. Coverage of vitamin A supplementation was higher among children aged 6-12 months, with a p-value of 0.019.

(ii). Multivariate Analysis

At the end of the multivariate study, the factors associated with not taking VAS were: (table 9)

a. Children's age: not taking VAS was 2.3 times higher among children aged over 24 months, with a p=0.016.
b. Education: non-use of VAS was 3.1 times higher among uneducated mothers/caregivers, with a p= 0.001.
c. Knowledge of the benefits of VAS: not taking VAS was 2.1 times higher among mothers/caregivers unaware that VAS strengthens the child's immune system, p=0.026.
d. Information on vitamin A: not taking VAS was 3 times higher among mothers/caregivers who had received no information on the vitamin, with a p= 0.001.

Table 2. *VAS over the last 6 months by mothers/caregivers' characteristics.*

Socio-demographic characteristics of mothers/caregivers		**VAS over the last 6 months**				
		No		**Yes**		
		N	**%**	**N**	**%**	**P**
Age range of mothers/caregivers	Under 25	11	19,6	45	80,4	0,476
	25-34 years old	60	27,8	156	72,2	
	35-44 years old	28	21,4	103	78,6	
	Over 45	11	30,6	25	69,4	
	Don't know	8	29,6	19	70,4	
Marital status	Married	114	25,5	333	74,5	0,972
	Single	2	20,0	8	80,0	
	Divorced	1	20,0	4	80,0	
	Widowed	1	25,0	3	75,0	
Level of education	Out of school	52	44,1	66	55,9	0,001*
	Primary	24	16,7	120	83,3	
	Secondary	28	19,3	117	80,7	
	Higher	12	25,5	35	74,5	
Principal professional activity	Literate	2	16,7	10	83,3	
	Civil servants	2	15,4	11	84,6	0,363
	Private sector employee	10	35,7	18	64,3	
	Shopkeeper	27	25,7	78	74,3	
	Housewife	65	27,7	170	72,3	
	Craftsman/self-employed	4	21,1	15	78,9	
	Unemployed	3	25,0	9	75,0	
	Pupil/student	3	21,4	11	78,6	
	Hairdresser/ Dressmaker	4	12,5	28	87,5	
	Other (please specify)	0	0,0	8	100,0	

Table 3. *VAS over the last 6 months by communication strategy.*

Communication strategies		VAS over the last 6 months					
		No		Yes			
		N	%	N	%	Total	P-value
Town criers	No	117	*25,3*	346	*74,7*	463	0,749
	Yes	1	*33,3*	2	*66,7*	3	
Mobilisers	No	117	*25,6*	340	*74,4*	457	0,322
	Yes	1	*11,1*	8	*88,9*	9	
Health workers	N	106	*28,7*	263	*71,3*	369	0,001*
	Yes	12	*12,4*	85	*87,6*	97	
Community players	No	117	*26,2*	329	*73,8*	446	0,003*
	Yes	1	*5,0*	19	*95,0*	20	
Volunteer	No	116	*25,2*	344	*74,8*	460	0,650
	Yes	2	*33,3*	4	*66,7*	6	
Word of mouth	No	116	*25,7*	336	*74,3*	452	0,335
	Yes	2	*14,3*	12	*85,7*	14	
Person in the household	No	117	*26,4*	327	*73,6*	444	0,022*
	Yes	1	*4,5*	21	*95,5*	22	
Neighbourhood	No	115	*25,8*	330	*74,2*	445	0,234
	Yes	3	*14,3*	18	*85,7*	21	
Radios	No	118	*25,4*	347	*74,6*	465	0,560
	Yes	0	*0,0*	1	*100,0*	1	
Television	No	117	*26,4*	327	*73,6*	444	0,022*
	Yes	1	*4,5*	21	*95,5*	22	

Table 4. *VAS over the last 6 months following knowledge of the VAS product.*

Knowledge of the benefits of VAS for children		VAS over the last 6 months					
		No		Yes			
		N	%	N	%	Total	P value
VAS promotes children's growth	No	93	*29,4*	223	*70,6*	316	0,003*
	Yes	25	*16,7*	125	*83,3*	150	
VAS combats blindness	No	107	*27,4*	283	*72,6*	390	0,017*
	Yes	11	*14,5*	65	*85,5*	76	
VAS boosts a child's immune system	No	104	*29,0*	255	*71,0*	359	0,001*
	Yes	14	*13,1*	93	*86,9*	107	
VAS fights infections	No	109	*28,2*	278	*71,8*	387	0,002*

Knowledge of the benefits of VAS for children		VAS over the last 6 months					
		No		Yes			
		N	%	N	%	Total	P value
VAS improves children's health	Yes	9	*11,4*	70	*88,6*	79	
	No	107	*27,0*	290	*73,0*	397	0,052
VAS fights disease	Yes	11	*15,9*	58	*84,1*	69	
	No	116	*25,9*	332	*74,1*	448	0,157
	Yes	2	*11,1*	16	*88,9*	18	

Table 5. *VAS over the last 6 months according to knowledge of vitamin A-rich foods.*

Knowledge of foods rich in vitamin A		VAS over the last 6 months					
		No		Yes			
		N	%	N	%	Total	P value
Foods of animal origin	Non	109	26,1	309	73,9	418	0,269
	Oui	9	18,8	39	81,3	48	
Fruit	Non	94	26,5	261	73,5	355	0,304
	Oui	24	21,6	87	78,4	111	
Vegetables	Non	83	27,9	215	72,1	298	0,094
	Oui	35	20,8	133	79,2	168	
Dark green leaves	Non	116	26,6	320	73,4	436	0,015*
	Oui	2	6,7	28	93,3	30	
Don't know	Non	42	19,0	179	81,0	221	0,003*
	Oui	76	31,0	169	69,0	245	

Table 6. *VAS in the last 6 months according to knowledge of conditions for taking VAS.*

Knowledge of the conditions for taking VAS		VAS over the last 6 months					
		No		Yes			
		N	%	N	%	Total	P value
Age at 1st VAS dose	Non	83	29,9	195	70,1	278	0,006*
	Oui	35	18,6	153	81,4	188	
Knowledge of the number of VAS doses per year	No	93	29,2	226	70,8	319	0,005*
	Yes	25	17,0	122	83,0	147	
Knowledge of the maximum age for taking VAS	No	89	30,5	203	69,5	292	0,001*
	Yes	29	16,7	145	83,3	174	

Table 7. *VAS over the last 6 months according to sources of information on vitamin A.*

Sources of information on vitamin A		VAS over the last 6 months					
		No		Yes			
		N	%	N	%	Total	P value
Health workers	No	85	32,9	173	67,1	258	0,001*
	Yes	33	15,9	175	84,1	208	
community players	No	118	26,0	336	74,0	454	0,041
	Yes	0	0,0	12	100,0	12	
Home care provider	No	117	25,4	344	74,6	461	0,783
	Yes	1	20,0	4	80,0	5	
Relay/Badjenu Gox	No	98	27,9	253	72,1	351	0,024*
	Yes	20	17,4	95	82,6	115	
Radio	No	115	25,1	343	74,9	458	0,424
	Yes	3	37,5	5	62,5	8	
Television	No	116	25,8	333	74,2	449	0,190
	Yes	2	11,8	15	88,2	17	
Newspapers	No	115	24,9	346	75,1	461	0,073
	Yes	3	60,0	2	40,0	5	
A member of the household	No	116	25,8	333	74,2	449	0,190
	Yes	2	11,8	15	88,2	17	
Another person outside	No	111	24,5	342	75,5	453	0,016*
	Yes	7	53,8	6	46,2	13	
No information	No	59	18,7	257	81,3	316	0,001*
	Yes	59	39,3	91	60,7	150	

Table 8. *VAS over the last 6 months according to child data.*

Data on the child		No		Yes		
		N	%	N	%	P value
Child's sex	Male	55	26,1	156	73,9	0,737
	Female	63	24,7	192	75,3	
Age of child	12-59 months old	11	13,4	71	86,6	0,006*
	12-59 months old	107	27,9	277	72,1	
Number of children aged 6-59 months	1 child	91	24,9	275	75,1	0,663
	≥2 children	27	27	73	73	

Table 9. Factors associated with not taking VAS.

Factors associated with not taking VAS in the last 6 months in the district of Guédiawaye	AOR [IC à 95%]	P value
Age of children		
6-11 months	1	
12-59 months	2,5 [1,3-4,9]	0,008*
Respondent's schooling		
Yes	1	
No	3,1 [2,0-5,0]	0,001*
Knowledge of VAS to boost children's immune systems		
Yes	1	
No	2,1 [1,1-4,0]	0,001*
Information on vitamin A		
Yes	1	
No	3,0 [1,9-4,7]	0,001*

4.2. Results Qualitative Survey

4.2.1. Results with VAS Providers

(i). Knowledge of Vitamin A

The majority of providers surveyed are aware of the routine vitamin A supplementation program. However, most had very limited knowledge of the benefits of Vitamin A. Only a few providers (Head Nurses) who work in EPI services give relatively precise answers on the advantages and disadvantages of vitamin A:

"*Vitamin A has its virtues: it helps prevent infections, fights blindness, and is good for growth*".

On the other hand, providers in maternity wards, notably midwives, have little knowledge of vitamin A. According to them, this is due to their lack of involvement in vitamin A supplementation activities. Most of them feel that VAS is the responsibility of EPI service staff.

"*Well, I don't know much about vitamin A. It's the people in the EPI department who know the most about it, which is why I can't say much about it*".

As for the consequences of the absence of Vit A supplementation, blindness and stunted growth are cited by most providers. Among providers with a very low level of knowledge about Vitamin A, the majority made the link between Vitamin A deficiency and malnutrition.

"*Vitamin A deficiency can cause children to present severe acute malnutrition, because the child doesn't eat normally, which can lead to low weight, and he won't eat normally anymore*".

With regard to knowledge of foods rich in vitamin A, it emerged from the interviews that there is no single group of foods recognized by all providers as containing vitamin A.

"*I've heard that "bouye" (monkey bread) contains vitamin A, but apart from monkey bread, I don't know. "Tomatoes, coconuts, fish, meat, local fruits.*"

Most of them don't have precise knowledge about vitamin A-rich foods, they tend to quote often the foods they recommend to malnourished children.

"*You need a variety of foods, and the mother makes sure the child eats foods he can digest. When the child is malnourished, we advise the mother to give him beans, cowpeas and eggs.*"

With regard to the vaccination schedule, most of the providers interviewed know that supplementation starts at six months and lasts until five years. However, some did not mention the six-monthly cyclical frequency of VAS:

"*According to what I've learned, it's from six months onwards, that's when we give the child blue vitamin A. And at twelve months, that's when he starts taking red vitamin A*". *and this should continue until 59 months*".

Regarding the dosage of vitamin A capsules, most providers recognize the existence of two colors for each age group (blue for 6-11 months and red for 12 and 59 months). However, only a minority master the dosage per unit according to the World Health Organization standard, which states that children aged 6-11 months should receive a single vitamin A dose of 100,000 IU, and children aged 12-59 months should receive a vitamin A dose of 200,000 IU twice a year.

"*From 6 to 11 months we give 4 drops and after a year, we give 8 drops, we give that twice a year, that's what I do*". "*I think the blue is 500,000 and the red 1 million. But I only*

keep the blue and red colors according to age groups". "*According to what I've learned, from six months onwards, that's when we give the child blue vitamin A. And at twelve months, that's when they start taking red vitamin A. And that's where I stop.*"

(ii). Platforms Used for Vitamin A Supplementation

The different platforms used in the Vitamin A supplementation program at the health posts visited are: vaccination, which is the most widely used platform, consultations with sick children and advanced strategies.

"*VAS and EPI can bring problems because at the vaccination level there are a lot of things to do, you have to check the child's vaccination record, check if the appointments is respected, fill in the record, fill in the stock register.*" *We're under more pressure.*

Secondly, we have consultations for sick children, which providers see as an opportunity to supplement children:

"*For VAS, we usually take a census of the children who come for consultations, take their booklet and check if they are six months old and have not taken Vitamin A, we give it to them*".

Lastly, we have advanced strategies, i.e. community visits. Most providers believe that advanced strategies are the most effective means of supplementing the maximum number of children, as described below:

"*Advanced strategies are the best platform for reaching our targets, and the VAS we do at community sites is important because it enables us to reach as many children as possible when we go to them*"

Despite this, advanced strategies are the weak link in the system of platforms used to supplement children, for a variety of reasons:

- Firstly, the irregularity of outings observed at health facilities due to a lack of funding, and of partners:

"*In Guédiawaye we have difficulties especially at community level, we have 36 sites that are closed with the withdrawal of partners*".

- Secondly, there is the lack of motivation on the part of community players. Most providers deplore the lack of commitment on the part of community players, as indicated by the following comments:

"*The problems are lack of interest due to lack of knowledge of the benefits of vitamin A, and lack of motivation on the part of community players*"

Guédiawaye is considered to be one of the first cities to welcome migrant traders from the center, and is therefore a crossroads city, with a high level of mobility that poses the problem of target follow-up.

"*The main problem is that the mothers don't come to the appointment for the VAS, and then they don't give the right address and telephone numbers.*"

Alternatives found by some providers to encourage mothers/caregivers to keep appointments include calling them on the phone or giving incentives to motivate them.

"*Even if they're late, we do everything we can to ensure that the child receives a supplement. For example, if he was due to receive the dose in July and we haven't seen him, we call the mother in August and if she comes, we give the dose*".

(iii). Vitamin A Supply

Health posts are supplied via a simple circuit that runs from the medical region via the district to the health post. But in this circuit, only the heads of health posts are involved, as they are responsible for placing orders at district level:

"*We place the order at district level, and if the product is available, we pick it up ourselves*".

Unlike the other products, Vitamin A is not managed by the agent for practical reasons. Most providers have had to deal with Vitamin A shortages, particularly with the blue capsule, and this can be explained by the fact that the 6–11-month target group is more present in the facilities because of the EPI. However, there is a lack of information about the causes of these shortages. The simplistic nature of the circuit puts providers in a wait-and-see posture. Despite their inability to document the breaks, some providers are implementing coping strategies that enable them to get around the episodic breaks:

"*In any case, lately it's been the blue-colored vitamin A that's been in short supply. You know, red is eight drops, and when the blue runs out, we have to take the red, but we only use four drops for six-month-olds, i.e. we divide it up. And that's a waste too, because you open a red capsule to administer only four drops, and the rest is often lost, because you end up throwing it away because you can't administer the rest to another child*".

(iv). Data Management (DHIS2) and Notification

Data management in DHIS2

Interviews revealed that various collection tools are used by providers for data management, ranging from notebooks to registers and TACOJO (daily scoring table).

"*There's the child's health record, registers, home visit forms for relays, the immunization register the Monitoring and Promotion of Growth register and global reports too*".

There is a lack of harmonization of collection tools and media, which poses a problem of data collection reliability.

"*We need a single form for collecting vitamin A*".

The interviews also showed that the majority of providers do not master the DHIS2.

"*I don't use DHIS2; at the end of the consultation, I count the vitamins A given and put it in my stock sheet*".

"For DHIS2, there are a lot of parameters, you can omit things without realizing it, there's a lot of repetition. And not everyone masters it".

Data notification

Most of the providers interviewed pointed to under-reporting of Vitamin A data, linked to a number of fac-

tors: data management, forgetfulness, overlapping activities and unsuitable tools...

"*We can't talk about good collection, but we can always improve it, there's always under-notification, work overload, sometimes we're overwhelmed by patients and we forget to notify*".

"*Field relays are in such a hurry to achieve their objective that they often prioritize vaccination or deworming activities to the detriment of vitamin A, which is why vitamin A is under-reported in their data sheets*".

(v). VAS Communication

Communication strategies

Many service providers consider that communication is the exclusive responsibility of community players, particularly the "Badienou Gox" who act as an interface between health structures and the population, especially women. As a result, they are unaware of the strategies, content and key messages, and have difficulty making an objective assessment of the quality of awareness-raising:

"*We always try to communicate through community players, and at the facility level we communicate about the usefulness of Vitamin A*". "*As far as communication is concerned, it's the talks we give here when the mothers come, but it's the "Badienou Gox" and the relays who take the communication to the community level*".

In the absence of a well-designed communication plan, the network of community players is the channel most used by providers to bring communication to the people, for the following reasons: the proximity of community players to the targets, and their knowledge of the terrain.

Messages

The messages conveyed during these social mobilization sessions focus more on the consequences of vitamin A deficiency, such as blindness or low weight, but no explanations or information aimed at raising the level of understanding of mothers/caregivers are given.

"*When parents understand the importance of Vitamin A, they come back, so we can always improve communication on the importance of Vitamin A and respect for appointments up to 59 months, and the consequences of children not taking supplements*".

4.2.2. Results with Community Actors

Interviews with community players indicate that VAS alone is not the subject of outings or campaigns like the other programs. Most of the players admitted to having taken vitamin A supplements during vaccination or deworming campaigns:

"*If there's a vaccination campaign, it's an opportunity to supplement with vitamin A. We're always checking on the children. We're always checking on children who haven't taken vitamin A, and we take the opportunity to supplement them with vitamin A*".

Most community workers are aware of the importance of vitamin A, its usefulness and its consequences.

"*We know that vitamin A promotes children's growth and improves their visibility*"."We know that vitamin A helps children grow and improves their visibility". "Vitamin A helps children grow and improves their vision, because now we see children as young as primary school starting to wear corrective lenses, so we want to avoid that".

As far as the vaccination calendar is concerned, the information obtained from the majority of community players is precise about the start of supplementation, and indicates the color according to age, but does not mention the exact dosage according to age group:

"*The blue capsule is given to children aged 06 to 09 months, and the red vitamin is given to children over a year old*". "*Supplementation starts at six months and it's the blue capsule that's given. And if it's a year or more, we give the red capsule, so it's from 6 to 59 months*". "*Yes, as soon as the child is six months old, he must take vitamin A, when he is one year old, he must take vitamin A, if he is 18 months old, he must take vitamin A, if he is 24 months old, he must take vitamin A, in any case every six months until he is five years old*".

As for knowledge of foods rich in vitamin A, like the health providers, the interviews revealed that most of the community relays and "Badienou Gox" also have limited knowledge of foods rich in Vitamin A.

"*Foods such as beans and porridge (a mixture of wheat, corn, etc.) are, for me, foods rich in vitamin A. Natural juices are also rich in vitamin A. Natural juices are also rich in vitamin A and complete the child's diet*".

We noted that the community players' knowledge of vitamin A stems from their strong involvement in the implementation of the advanced strategies, and the training sessions received at district level:

"*We are trained at the health center or health post, where we receive all the information, we need about vitamin A*".

Communication with community players takes the form of talks and Integrated Home Visits (IHVs). The interviews show that most community players do not distinguish between activities carried out in the field and communication:

"*We only have one channel, which is to walk and enter homes, and that's door-to-door, because we do home visits, we add other things to it, sometimes we have other messages to convey. As soon as you arrive at a woman's home and see a child, you immediately ask for his booklet. Now that's the only channel we have, door-to-door*".

They focus on results, while blurring communication about the VAS to avoid refusals and suspicions:

"*The players come to the homes announcing only that today there is a VAS session, they do this without taking the time to properly inform the mothers. Because the players want to have the maximum number of children that the post has set for them and they don't have the time to explain. So the players want to save time and the mothers don't want to*

understand either".

4.2.3. Results with Mothers/Caregivers

Discussions with mothers/caregivers of children of all ages revealed that the majority of the interviewees were not familiar with vitamin A. Some mothers/caregivers had heard about the drops and had seen the different colors:

"*I think that my child has received white vitamin A. I think so because at the post office they don't tell us anything, you don't have a clear explanation*".

Among all the mothers/guardians interviewed, the information shows that the majority have a vague knowledge of vitamin A; they have no information on how to start taking vitamin A, nor on the dosage, nor on the benefits.

"*I think the red drop is to make our bones strong, but they didn't tell us anything about it*".

The lack of knowledge about the benefits of vitamin A among the majority of mothers/caregivers is explained by an information deficit. This shows the place of vitamin A in the activities of the providers, who see it as a kind of graft to their essential activities.

When it came to starting to take vitamin A, the discussions showed that most mothers/caregivers were unaware of when to start taking vitamin A, and we noticed confusion between the drops for polio and those for vitamin A.

"For me, after I've finished these vaccinations, I don't know if I'm going to take vitamin A," said the mothers/caregivers. "*I think that once the child has completed these vaccinations, he should come and take vitamin A*". "*Yes, from 9 months onwards, when the child is born, we check its weight and health and then we supplement it with vitamin A*".

Most mothers/caregivers believe that vitamin A supplementation starts at nine months, because that's when the rubella and measles vaccinations are given, and children who haven't had their first dose of vitamin A are supplemented at that time. And again, the lack of communication means that most mothers regard this date as the start of VAS.

As for the symptoms of vitamin A deficiency, mothers/caregivers who have no specific knowledge of vitamin A find it difficult to recognize the signs of vitamin A deficiency.

"*The child is ill, he doesn't behave like a normal child*". "*I really don't know myself*".

When it comes to foods rich in vitamin A, most mothers/caregivers talk about foods for sick children, especially the malnourished, because they have learnt this from the health posts, which inform them through cooking demonstrations or home visits about the right foods for underweight children.

"*I know about carrots, which should be prepared by crushing them to make puree and giving them to the child*". "You have to give him liquid food for his digestion, that's what's good for him".

The group discussions revealed that the targets did not have a clear idea of how to administer vitamin A supplements.

"*You don't even know what they're doing, you just see that they've given your child the drops*". "*My child has had the drops, but I don't even know what they are, after the vaccine they gave him drops and the nurse told me that they lower the temperature*".

The only positive aspect revealed by the mothers/caregivers was the absence of pain when administering the drops, unlike with vaccines where the providers are overwhelmed by the children's cries.

"*The community health workers and the 'Badi énou Gox' came to the houses but they only told us that we had come for a vitamin A supplementation session, but they didn't tell us anything, we didn't know what the point was. "When the community relays come to provide vitamin A, there were many parents who refused to let their child receive the drops because of rumours, which is why when the relays come they say they are there to deworm and at the same time they take the opportunity to provide VAS*".

This framed account reflects the perception that most of the custodial mothers have of vitamin A administration.

"*To be honest, no one ever said anything to me, they gave me the vaccine and then let me go. But at the private Catholic health centers, they talk to you and give you advice. At the public health center, they don't tell you what to feed your child. When you come, they look at your book to see if the child has come for the vaccine or the drops, then they give him what he needs and let you go. When the child is malnourished, if you go to the "sisters of the private structures" or to the pediatric ward, you can watch a cooking demonstration*".

This lack of communication is seen by some mothers/caregivers as a way for community workers to get around the obstacles to Vitamin A supplementation, such as refusal or opposition from husbands. As a result, the relays use vaccination or deworming as a screen for VAS. This approach means that they do not explain Vitamin A. This approach by community workers with targets has a perverse effect, in other words, mothers/guardians will have a devaluing perception of Vitamin A, they see it as a non-essential activity.

Most mothers/caregivers admit that health facilities are their primary sources of knowledge and information about health:

"*To get information, it's during appointments at the health center, where certain information is given*".

The participants also admit to having received information through the network of community players during home visits and talks. The main sources of knowledge about health for mothers/caregivers are obtained through health facilities or community players.

As far as messages are concerned, the discussions show that the majority of mothers/caretakers receive standard messages on the different stages of the EPI; appointments; Exclusive Breastfeeding (EBF) and the management of illnesses such as diarrhea:

"*I know that at the maternity hospital when you give birth the midwives tell you that you shouldn't give the child food*

and drink before six months, after six months you can give it eggs and curdled milk". "The messages often focus on the Vaccination Appointments".

It emerged from the discussions that most of the mothers/caregivers felt that communication should now be done via mobile phones and digital technology:

"*We need to use the phones to take each mother's number and inform her about the VAS*". "*We can also use the phone and create a WhatsApp group where we can get information about Vitamin A, as the world is changing and WhatsApp groups solve a lot of problems*". "*We can also use the phone and YouTube to receive information, because when you receive information afterwards you can inform the rest of the group and share the information with those who don't have phones*".

The information gleaned from the group discussions reveals the need to adapt communication to women's behaviour towards New Information and Communication Technology. When it comes to the best times to inform mothers/caregivers, the majority said that the afternoons are the ideal time for several reasons: during the day, they are busy with housework or economic activities at the market, but the evenings are often devoted to meetings and tontines.

On the other hand, when it comes to information broadcast on radio or television, most of them think that family gatherings in the evening in front of the small screen are more appropriate for receiving health information, particularly about VAS:

"*For me, 7 or 8 o'clock in the evening is a good time to get information*".

5. Discussion

5.1. Socio-Demographic and Economic Characteristics of Households

Age was recorded for 341 respondents, with an average of 33.4±8.9 years and extremes of 18 and 69 years. The 30-39 age group (40.4%) was the most represented. In the study by Diouf, J. B. N. on vitamin A supplementation in children in the health district of Guédiawaye, Senegal in 2018, the median age of mothers was 28 years [19]. In the study by Bassoum O. et Al on factors associated with delayed vitamin A supplementation in children aged 6 to 11 months in a health center in Dakar, Senegal, found that the most represented age group of mothers was between 20 and 29 years, with 62.75% [20]. In the study by Anselm S Berde et al on coverage and factors associated with vitamin A supplementation in children aged 6-59 months in twenty-three sub-Saharan African countries conducted from 2011 to 2015, 27.9% of mothers or childminders were in the 25-29 age group [21]. In Burkina Faso, Sombie's study of women's knowledge and use of foods fortified with vitamin A in the city of Bobo-Dioulasso found that the mean age (± standard deviation) of women was 29.01 (± 7.3) years. [22]. The results of our study show that almost all the women surveyed (95%) were married and essentially monogamous (80.5%), which corroborates the results of Bassoum, who found that 85.25% were married, and Sombie, who found that almost two-thirds of the women (62.1%) were living with a partner [22].

Three quarters of the respondents in our study (73%) were educated, mainly to primary (31.4%) or secondary (30.1%) level, which is in line with the results of Bassoum, who found that 31.5% of mothers had reached secondary level [20], and Anselm, who found that 43.8% had no formal education at all [21]. Half of the respondents (50.5%) were housewives, which is close to the results of Bassoum where 54.25% of mothers were unemployed [20] and those of Sombie who found that housewives represented 50.9% of the population. [22] and for Anselm's results, a higher proportion of mothers 65.5% were working. [21]

5.2. Knowledge of Vitamin A Supplementation

In our study, only 38.5% of respondents were aware of the benefits of VAS. The contribution to the child's growth (88.7%), the strengthening of the child's immune system (63.8%) and the fight against infections (46.1%) were the main advantages cited. Meanwhile, in the Bassoum study, the proportions of mothers who knew that VAS reduces the risk of diarrhoea, night blindness, measles and malnutrition were estimated at 46.75%, 37.25%, 36.5% and 55.5% respectively. Overall, 35% of respondents had sufficient knowledge [20].

The majority of respondents (53.6%) were unaware of foods rich in vitamin A. However, 34.7% had identified vegetables and 23.2% fruits rich in vitamin A.

Felix Ovono, in his study on Vitamin A in unsupplemented Gabonese children and the relationship with ocular and nutritional pathologies, found that 69.3% of respondents had little knowledge of vitamin A-rich foods, which are also not widely consumed by the population as a whole. [23]

More than half the respondents (65.3%) did not know how many doses of vitamin A to administer per year. However, only 31.4% of respondents stated that the child should take two doses per year. With regard to the maximum age for taking vitamin A, only 36.3% specified 5 years and 45.6% did not know. The study by Bassoum O. revealed similar rates, with 37.25% and 15.75% of mothers knowing that the first and last doses of VAS should be given at just six months and 59 months respectively. As for the interval between two doses of VAS, only 14.25% of mothers knew that it was six months [20]. The source of information on vitamin A was health workers in 43.2% of cases; 31.4% had not received any information on the vitamin. Thus 51% of respondents said that they had received information about the benefits of vitamin A when supplementing their children. In 42% of cases, the respondents had stated that VAS helps to ensure the child's growth; in 36% of cases, it enables good nutrition and in 35% of cases vitamin A protects eyesight. However, around 49%

of those surveyed said that they had not received any explanation of the benefits of vitamin A. Similarly, Bassoum revealed in his study that 65.50% of the mothers surveyed had never heard of VAS for children; only 138 clients (34.50%) had been informed about it. Doctors, midwives, friends and the vaccination record were the main sources of information about VAS in children; these sources were cited in 30.43%, 25.36%, 18.12% and 22.46% of cases respectively [20].

5.3. Coverage of Vitamin A Supplementation for Children Aged 06-59 Months

Out of a total of 366 households surveyed, 466 children aged 6-59 months were enrolled.

The average age of the children was 29.2 ±15.2 months, and the 6–12-month age group (20%) was the most represented. This contrasts with the study by Anselm S Berde, which showed that the majority of children were aged between 36 and 47 months [21].

During the last 6 months prior to the survey, 74.7% (n=348) of children aged 6-59 years were supplemented with vitamin A compared with 21.2% who were not and 2.1% who did not know. Of the 348 children aged 6-59 months who were supplemented, 20.4% (n=71) were aged 6-11 months and 79.6% were aged 12-59 months (n=277). Over 80% of children had taken vitamin A by 6 months, 17.3% after 6 months and 2.5% of mothers did not know their child's age at the time of the first dose of vitamin A. This rate is higher than that found by Anselm S Berde, who showed a coverage rate of vitamin A supplementation in children aged 6 to 59 months of 59.4% [21]. In the study by Diouf, J. B. N, of the 366 children aged 6-59 months surveyed, 188 (51.4%) had not received vitamin A. The coverage rate was higher for children aged over 23 months (65.6%). Before 12 months, the coverage rate was 36.8% and between 12 and 23 months, 64.6% [19]. In the Bassoum study, 31.25% of the 400 children surveyed had received VAS late, i.e., after the age of six months [20].

Most of those surveyed (64.8%) had not received any information about forthcoming VAS appointments. Lack of information about the next appointment (64.6%) was the main reason for non-compliance with the VAS. Among the 348 children aged 6-59 months receiving vitamin A supplementation, 64.1% of mothers/carers were informed of the VAS appointment. Lack of information about the continuation of VAS (44.9%) and waiting for the Badjenu Gokh (39.3%) were the main reasons for waiting for VAS. In the Bassoum O study, lack of knowledge of the VAS timetable was the reason for VAS delays in 72% of cases. Lack of time and forgetting the appointment were cited by 28.8% and 17.6% of respondents respectively [20].

5.4. Factors Associated with Not Taking VAS

Age of child

VAS was statistically linked to the age of the children. Coverage of vitamin A supplementation was higher in children under 12 months, with a p-value of 0.019. Not taking VAS was 2.3 times higher in children aged over 24 months, with a p value of 0.016.

This can be explained by the fact that vitamin A supplementation is part of the care package for children under 24 months of age. During this period, the child is systematically supplemented with vitamin A every 06 months during vaccination appointments or at each contact with the health service. VAS was therefore combined with EPI calendar activities before the age of 24 months. Beyond that age, mothers or caregivers' do not see the point of travelling to the health facility just for the VAS. Most of them think that the VAS integrated into the EPI stops at the end of the vaccination schedule. These women are unaware that supplementation must continue until the age of 5. Diouf, J. B. N, found that children aged between 24 and 59 months were 3.41 times more likely not to receive vitamin A than infants aged between 6 and 12 months. This could be due to the fact that vitamin A supplementation is integrated into immunization activities in Senegal, and that the older the child, the less contact there is with these services [19].

Level of education of mothers/ caregivers'

VAS coverage was lower among respondents with no education. Non-use of VAS was 3.1 times higher among uneducated women, with a p-value of 0.001. In other words, vitamin A supplementation was statistically correlated with the level of education of the people surveyed, with a p-value of 0.001. In effect, these mothers or childminders who do not have the right information on the usefulness of VAS for children prefer not to take it.

Difficult access to the right information for these respondents is an obstacle to the smooth running of VAS for children aged 0-59 months. The fear of supplementing their child because of rumours about the product means that many prefer not to bring their child to health service delivery points.

The same observation was made in the study by Diouf, J. B. N, which showed that lack of education among parents and lack of knowledge about measures to protect against disease were associated with the absence of vitamin A supplementation. [19] This shows that parental involvement in health care and education decisions promotes better adherence to health interventions. This suggests that educating parents could help improve vitamin A supplementation coverage rates.

In the study by Anselm S Brede: Tthe mother's level of education played a role in VAS in children aged 6 to 59 months. A plausible explanation for this finding is that formal education improves health and nutrition as well as raising awareness of the benefits of VAS [21].

Mohamed Ag Ayoya found in his study of the determinants of high vitamin A supplementation coverage among pre-school children in Mali that the education of fathers, rather than mothers, appeared to be significantly associated with child coverage. This is because mothers need the approval of their spouses to make decisions about their chil-

dren's health. This suggests that fathers, particularly those with a lower level of education, should be considered a priority target for children's nutritional education [24].

Mothers' or caregivers' knowledge of the benefits of VAS

VAS was statistically linked to knowledge of the benefits of VAS for children, specifically: VAS promotes child growth (p=0.003), VAS combats blindness (p=0.017), VAS strengthens the child's immune system (p=0.001) and VAS combats infections (p=0.002). Failure to take VAS was 2.1 times higher among women unaware that VAS strengthens the child's immune system (p=0.026). VAS was statistically linked to knowledge of the conditions for taking VA, particularly knowledge of the age at which the 1st dose of VAS is taken (p= 0.006), knowledge of the number of doses of VAS per year (p= 0.005), knowledge of the maximum age for taking VAS (p= 0.001) and was also statistically linked to knowledge of foods rich in vitamin A, particularly dark green leaves (p=0.0150). Lack of awareness of the benefits of vitamin A for children means that most mothers or childminders are not interested in VAS. For fear of seeing their children fall ill, they are often prepared to use any means available. Once made aware of the benefits of the product in improving children's health, these respondents no longer hesitate to use VAS. In Bassoum O's study, mothers' low level of knowledge about VAS was significantly linked to a delay in VAS use; the risk was multiplied by 3.39.

Mothers' low level of knowledge about VAS is an obstacle to the timely provision of VAS. Therefore, on the one hand, the capacities of these resource persons need to be strengthened in order to provide reliable information. On the other hand, this result provides evidence that notification of VAS in the vaccination record is important for good health information management. [21].

Sources of information about vitamin A

Not taking the VAS was 3 times higher in women who had not received any information about the vitamin, with a p= 0.001. These women knew neither the product, nor why it was used, nor how often it was administered, and so naturally did not use VAS.

VAS was statistically linked to sources of information about vitamin A, in particular health workers (p= 0.001) and the Relais/Badjenu Gox (p= 0.001). Health workers followed by the Badjenu Gox were the main sources of information for mothers or caregivers. This resulted in a large number of children receiving VAS in the group.

Vitamin A supplementation was statistically linked to VAS communication strategies, particularly those involving health workers (p=0.001), CHWs (p= 0.003), people in the household (p= 0.022) and television (p= 0.022).

This communication strategy via health workers, relays and television had shown its effectiveness in positively influencing the majority of mothers or childminders.

The results of the Bassoum O. study show that the fact of never having heard of VAS was significantly linked to VAS delay; the risk being multiplied by 2.93. This means that children whose mothers stated that they had never heard of VAS were more likely to have a delayed VAS, compared with their counterparts whose mothers had received information about VAS. In this study, the main sources of information cited were doctors, midwives, friends and the vaccination record [21]. In the study by Amynah Janmohamed and co, different modes of communication were used to raise community awareness of VAS campaigns, depending on the context of each country. The main sources of communication were community health workers (24%), community broadcasts using vehicle loudspeakers (21%), health facility staff (19%) and radio messages (16%). A large percentage of respondents said they had received information about the VAS campaigns from community health workers in Burkina Faso (55%) and Sierra Leone (45%); from health workers in Guinea (44%) and Kenya (34%). Community leaders were important communication agents in Tanzania (46%) and Mozambique (38%), and community broadcasts were key sources of information in Nigeria (43%) and Sierra Leone (34%). The high level of respondent awareness (99%) of VAS campaigns and the >90% coverage achieved in the two Sierra Leone surveys confirm the importance of effective outreach to target communities. Health facility staff and radio messages were also important communication channels for VAS and, therefore, should be used more effectively to raise awareness of the importance of vitamin A supplementation for young children and for nutritional messages [25]. In the study by Hamadoun S., the main sources of information for mothers interviewed after leaving the distribution site were: health workers (39%), relatives/neighbours/friends (37%), local leaders (24%) and radio stations (25%) [26].

6. Conclusions

The study of routine vitamin A supplementation in the Guédiawaye commune revealed the circumstances that helped or hindered implementation of the strategy. Previously, strategies had been implemented to improve the nutritional status of children aged 0-5 through projects and programs to combat malnutrition and improve child survival. Not all of these child health interventions have produced the expected results, which has prompted the introduction of VAS into routine activities at operational level. The results of this study are therefore intended to shed some light on the extent to which the objectives set for the VAS program have been achieved. Even though the majority of providers are aware of VAS, they have little knowledge of the product. The organization of care units, which makes the EPI the main entry point for VAS, means that staff from other departments are not very involved. In addition, there are frequent breaks in service which prevent continuity of service. Among providers, the study shows that the DHIS2 is the prerogative of head nurses, and this monopolization has a negative impact on data management and reporting. Furthermore, communication strategies are not well developed

and most providers do not feel involved in communication, leaving this area to the relays and Badienou Gox. Following these results, we recommend that the district chief medical officer: strengthen the training of health providers, particularly in PCME, so that they appropriate VAS strategies; systematically integrate VAS into all services and at all contact points; involve all health providers in the VAS program and avoid compartmentalization of health services; and finally, develop communication strategies to strengthen routine VAS.

Abbreviations

CSDs: Child Survival Days
EBF: Exclusive Breastfeeding
LSDs: Local Supplementation Days
VACs: Vitamin A Capsules
VAS: Vitamin A Supplementation
WHO: World Health Organization

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Conflicts of Interest

The authors declare no conflicts of interest.

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