Community-Based Maternal and Neonatal Health Services in Kolda and Sedhiou Districts of Senegal

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Abstract

Introduction: A recent assessment of the Millennium Development Goals has shown significant gaps in most developing countries, particularly with regard to the decline in maternal and infant mortality. Unaccess to health services is a major obstacle to reducing maternal and infant mortality. To support the Ministry of Health and Social Action in the implementation of its Strategic Plan for Reproductive Health (2012-2015), the NGO Micronutriment Initiative has developed a project based on Community-based Maternal and Neonatal Health services (CBMNH), which will be implemented at the level of the Kolda region. The general objective of this study is to carry out a situational analysis of maternal and neonatal health in the health districts of Kolda and Sedhiou to help the implementation and the evaluation of the project.

Method: It was a descriptive and analytical cross-sectional survey. The study included women who gave birth between February 2013 and January 2014. The sampling was random at two degrees. The sample size was 471 women for each of the two health districts. The data collected during an individual interview focused on prenatal consultation (PNC), delivery, postnatal consultation (PONC) and exclusive breastfeeding (EBF). The quantitative analysis of the data consisted of the estimation of the main indicators, the comparison of the indicators between the health district of Sedhiou and the health intervention district of Kolda. Multivariate analysis identified factors associated with PNC, delivery, and EBF.

Results: In total, 965 women were interviewed. The results of the study show that the average duration of PNC1 ranged from 3.41 months in Sedhiou to 3.82 months in Kolda. The proportion of women with full PNC was 38.8% and 54.9% respectively in Kolda and Sedhiou. The proportion of women who took iron-folic acid for at least 90 days ranged from 78.8% (Sédhiou) to 71.7% (Kolda). The delivery was carried out by trained staff in 61.0% and 57.4% respectively in Kolda and Sedhiou. The EBF was initiated in the first hour in 47.0% (Kolda) and 52.6% (Sédhiou).

The results of the multivariate analysis showed that the early use of PNC services was related to low household income (0.65 [0.50-0.86]), proximity to the health facility (1.93 [1.34-2.78]) and multiparity (1.4 [1.05-1.87]). Completion of all PNC was associated with household income and early PNC1 (3.65 [2.58-5.18]). With regard to iron-folic acid intake, it was more common in women who achieved early PNC1 (2.19 [1.58-3.04]) and all PNC (3.58 [2.22- 5.77]). The delivery by trained personnel was related to the proximity of the structure (2.43 [1.75-3.37]), but also to the preparation of the delivery. Women who knew the period of the MBF (1.37 [1.04-1.81]) and the protective role of the EBF (1.71 [1.28-2.27]) started their children early at the EBF.

Conclusion: The results of the study show that the use of reproductive health services was linked to environmental, economic, cultural and structural factors. Improving the accessibility of these services requires joint action by the government, NGOs, community actors and the involvement of the population. This will be done through the construction, equipping and rehabilitation of health facilities, strengthening the knowledge of providers, community actors, women and support groups.

Keywords: maternal and neonatal health, community-based services, health districts, Senegal

1. Introduction

The maternal and child health is a major concern in developing countries. This interest is justified by the importance of maternal and infant mortality. Among the indicators monitored by WHO, it is at the level of these two targets that we note the greatest difference between the high et low resource countries. According to the WHO, most maternal and infant deaths (99%) occur in developing countries, more than half of them in sub-Saharan Africa (WHO, 2012). A recent assessment of the Millennium Development Goals (MDG) has shown significant gaps in most developing countries [UN 2013]. In Senegal, the maternal mortality rate is 392 deaths per 100,000 live births and the neonatal mortality rate is 29 deaths per 1,000 live births (National Agency of Statistics and Demography, 2012).

The factors related to maternal and infant mortality are well documented because they have been the subject of several studies (Khan et al., 2006). It is noted that deliveries sometimes occur in bad conditions of asepsis, complications are diagnosed late and evacuation to health facilities for better care is often very difficult. In Senegal, 26.8% of deliveries take place at home and the situation is more worrying in rural areas (39.2%) (Ministry of Health, Public Hygiene and Prevention, 2012). Under these conditions, newborns often benefit from precarious care. To all these factors is added the geographical and financial inaccessibility. Even when care is available, it is difficult to access because of the precarious economic situation of the populations. Households have few resources because almost half live below the poverty line. And when these resources are available, they are directed to other areas deemed to be priorities. The policy of the State of Senegal is to provide quality care as close as possible to the population through health structures and community-based services. According to WHO, about 80% of maternal deaths are due to severe bleeding, infections, high blood pressure and abortions (WHO, 2012); these deaths could be avoided through the implementation of key interventions offered as part of a continuum of care linking families and communities to health systems.

To accelerate progress in reproductive health, the Ministry of Health and Social Action of Senegal (MHSAS) has developed its Strategic Plan for Reproductive Health 2012-2015, whose objectives are focused on strengthening the community component of interventions to improve access to maternal and neonatal health (Ministry of Health, Public Hygiene and Prevention, 2012). It is within this framework that the Micronutriment Initiative (MI) is providing support to the MHSAS to help operationalize the implementation of this approach through a process that includes conducting a situational analysis at the national level.

The general objective of this study is to make a situational analysis of maternal and neonatal health in the districts of Kolda and Sedhiou before the implementation of the intervention.

2. Methodology

2.1 Quotation

In this study, the goal is to perform baseline measurements and compare indicators and baseline characteristics between intervention and control areas. The study was carried out in the Kolda district selected as an intervention zone. The control district was chosen in the region of Sedhiou. According to the characteristics of the three districts of this region, that of Sedhiou seems the most appropriate because of its geographical location, socio-cultural similarities, the situation of health indicators, and the isolation of certain areas. Thus, the intervention district was compared to the control district during the baseline measurement and secondarily to assess the effectiveness of the intervention.

In this present study, the aim is to do the situational analysis, that is to say the pre-test through a descriptive and analytical transversal study.

2.2 Study Population

It is represented by all women of reproductive age in health districts of Kolda and Sedhiou.

2.3 Sampling

A two-stage random survey was conducted. The first degree consisted of the census districts (CD) of villages or neighborhoods and the second degree by women who had a newborn in the 11 months preceding the survey.

a.   The Statistical Unit

Women who gave birth during the 11 months preceding the survey.

b.   Inclusion Criteria

Was included in the study, any woman who gave birth:

• A live or lifeless child at birth following a delivery in the health districts of Kolda and Sedhiou;

• During the 11 months preceding the survey.

c.   The Criteria of Non-Inclusion

Was not included any woman:

• Absent during two passes;

• Or refusing to give consent and / or assent to the interview.

d.   The Size of the Sample

It was estimated on the basis of a 95% confidence interval (α= 0.05 and 1-β = 0.9), calculated according to the method of Casagrande and Pike- [Casagrande JT, Pike MC, Smith PG. 1978], and a non-response rate estimated at 5%.

e.   The Sampling Method

For the recruitment of statistical units, a two-stage random survey was conducted.

• First-degree sampling

This sampling consists of selecting the census districts (CD) to be included in the study.

It was necessary to randomly draw the number of CDs for each SD from the updated list of all DRs in the districts of Kolda and Sedhiou.

The random selection of the DRs was done using the Emergency Nutrition Assessment (ENA) software for each district.

• Second degree sampling

This sampling concerns the selection of women in the CDs. The selection of the statistical units was made by a draw of the villages or districts composing each CD. Thus, at the level of each selected neighborhood or village, all the women fulfilling the selection criteria were chosen until the necessary number was reached.

2.4 Key Variables of the CBMNH Project of Kolda

at. Key variables

The data collection focused on the key variables of the CBMNH project of Kolda project.

• The prenatal consultation

She was appreciated on the number and the period of the first PNC (PNC1). This information is collected during the individual interview with the woman and the exploitation of the pregnancy logbook. NPC knowledge and practices were appreciated.

• Iron and folic acid

The use of iron and folic acid was appreciated by the individual interview and the exploitation of the pregnancy logbook.

• Childbirth performed by trained staff

Delivery by trained staff was appreciated during the individual interview with the woman, the collection of the place of delivery and the person who assisted the woman.

• Exclusive Breastfeeding (EBF)

Breastfeeding should be exclusive for up to six months. It must also be initiated just in the first hour of birth. These aspects were sought during the individual interview with the woman. Knowledge about breastfeeding has also been sought.

2.5 Data Analysis

The data was analyzed with the R Software Survey package or the Stata software. This was done for univariate, bivariate and multivariate analysis. The data analysis consisted of two parts: a descriptive part and an analytical part.

Descriptive part

Qualitative variables were described with 95% frequency and confidence interval and quantitative variables by the average, confidence interval, and standard deviation.

Analytical part

It allowed the comparison of the main indicators between the intervention district and the control district.

• The bivariate analysis was done using the following statistical tests: the Khi² for the comparison of the proportions, the Student or the ANOVA for the comparison of the averages. When distributions were not normal, Mann Withney and Kruskall Wallis non-parametric tests and Fisher's exact test were used.

This bivariate analysis also identified the factors associated with the key variables.

• A multivariate analysis was used to account for confounders.

This multivariate analysis allowed to model the key variables of the study that constituted the dependent variables. The explanatory variables related to personal characteristics, knowledge and practices in sexual and reproductive health.

The model was developed using the approach described by Hosmer and Lemeshow (Hosmer & Lemeshow, 1989). All explanatory variables whose p are less than 0.25 were considered for the final model. The variables that were not selected (except those whose p are greater than 0.8) were introduced one by one and the model comparison was made by the likelihood ratio. Then, by a descending procedure, the least significant variables were removed one by one, and the comparison was made by the likelihood ratio test. Confusion was sought by a decrease of more than 10% in the beta coefficient (Greenland, 1989).

2.6 Ethical Considerations

Newsletters were sent to the various administrative authorities. At each district level, the administrative and local authorities have been informed. Informed consent was sought from all persons 18 years of age and older participating in the study. For persons under the age of 18, the consent of the parents or guardian has been requested, together with their consent.

They have been informed beforehand of the personal health questions that will be asked.

The identity of the individuals who consent to participate was noted on a specific card and kept in secret. In all subsequent uses of the results, anonymity will be respected, no information to find a participant will be included. The approval of the National Ethics Committee for Health Research in Senegal was obtained before the start of field activities.

3. Results

3.1 Descriptive Parts

Table 1. Distribution of women by health districts

Health District	N	%
Kolda	484	50,2
Sedhiou	481	49,8
Total	965	100,0

A total of 965 women were interviewed.

Characteristics of mothers

Table 2. Main characteristics of the mothers of the 2 health districts

	KOLDA		SEDHIOU	
	%(IC95%)	N	% (IC95%)	N
Mother's logbook				
Logbook available	80,5[76,7-83,9]	389	76,0[71,9-79,7]	364
Notebook not available	14,5[11,5-18,0]	70	20,0[16,6-24,0]	96
No logbook	05,0[03,3-07,4]	24	04,0[02,5-06,2]	19
Child birth logbook				
Logbook available	78,4[74,4-81,9]	377	77,8[73,7-81,4]	371
Logbook not available	09,6[07,2-12,6]	46	15,7[12,6-19,4]	75
No logbook	12,1[09,4-15,4]	58	06,5[04,5-09,2]	31
Schooling				
None	59,5[55,0-63,9]	287	64,7[60,2-69,0]	310
Primary	25,7[21,9-29,9]	124	20,0[16,6-24,0]	96
Secondary	14,3[11,4-17,8]	69	14,6[11,6-18,2]	70
Higher	00,4[00,1-01,7]	2	00,6[00,2-02,0]	3
Income generating activities				
Yes	40,0[35,6-44,5]	193	50,7[46,0-55,3]	232
The Head of household income				
Inferior to 50000	51,8[47,2-56,3]	250	63,3[58,7-67,7]	288
50000-100000	32,8[28,7-37,3]	158	26,1[22,1-30,6]	111
100000-200000	13,1[10,3-16,5]	63	11,3[08,5-14,8]	48
Superior to 200000	02,9[01,7-05,0]	14	02,9[01,6-05,1]	12

Property owned by the household

Table 3. Main household possessions in the 2 health districts

Socio-economic characteristics	KOLDA		SEDHIOU	
	%(IC95%)	N	% (IC95%)	N
Energy consumed by the household				
Electricity	01,7[0,8-03,4]	8	10,2[07,7-13,4]	49
Bottle gas	00,6[2,2-02,0]	3	01,0[00,4-02,6]	5
Coal	15,7[12,7-19,4]	76	21,7[18,1-25,7]	104
Firewood	81,6[77,8-84,9]	394	59,8[55,2-64,2]	287
Main source of drinking water				
Tap water	06,6[04,6-09,3]	32	08,5[06,3-11,5]	41
Pump well	02,1[01,1-03,9]	10	04,2[02,6-06,5]	20
Well dug	89,9[86,7-92,3]	434	84,2[80,5-87,3]	404
Rainwater	01,2[00,5-02,8]	6	03,1[01,8-05,2]	15
Toilet type				
Flush valve	06,4[04,5-09,1]	31	04,2[02,6-06,5]	20
Latrines	84,1[80,4-87,1]	406	75,1[70,9-78,8]	361
No toilet-bush	09,1[06,8-12,1]	44	15,2[12,2-18,8]	73

Knowledge and advice received by women

Table 4. Distribution of women according to the knowledge and advice received in the 2 health districts

	KOLDA		SEDHIOU	
	%(IC95%)	N	% (IC95%)	N
Interest of EBF				
Ensure healthy food for the child	47,9[43,4-52,5]	232	55,3[50,7-59,8]	266
Protect the child against infections	54,3[49,8-58,8]	263	51,4[46,8-55,9]	247
Protect the mother against close pregnancies	16,5[13,4-20,2]	80	15,6[12,5-19,2]	75
PNC performed during pregnancy				
Number of PNCs to be performed during pregnancy (4)	74,2[70,0-78,0]	359	73,4[69,2-77,2]	353
Medication used to fight anemia				
Folic Acid Iron Association	97,3[95,3-98,5]	471	92,5[89,7-94,6]	445
Medication used to fight bleeding				
Misoprostol	02,1[01,1-03,9]	10	04,0[02,5-06,2]	19
Health program				
Attendance at an awareness session	77,1[73,0-80,7]	373	50,3[45,8-54,9]	242
Aspect addressed awareness				
Theme on the health of mother and child	47,5[43,0-52,1]	230	25,4[21,6-29,5]	122
The preparation of the birth				
Choice of the person who will attend the delivery	23,6[19,9-27,6]	114	22,2[18,7-26,3]	107
Choice of place of delivery	34,5[30,3-39,0]	167	40,1[35,7-44,7]	193
Purchase and storage of soap	52,5[47,9-57,0]	254	47,4[42,9-52,0]	228
Money for emergency	53,9[49,4-58,4]	261	51,8[47,2-56,3]	249
Preparation of clean linen	71,9[67,6-75,8]	348	61,1[56,6-65,5]	294
At least 4 PNC				
Advice implementation 4 CPN	78,7[74,7-82,2]	381	69,4[65,1-73,5]	334
Advice				
Advice on importance taking iron	96,1[93,8-97,6]	465	86,1[82,6-89,0]	414

Main indicators of the CBMNH project

Table 5. Main indicators of the CBMNH project

	KOLDA		SEDHIOU	
	%(IC95%)	N	% (IC95%)	N
		484		481
Pregnant women recognize the importance of PNC and the use of health services for PNC, childbirth and PoNC				
% of women who received iron-folic acid supplementation during their last pregnancy (logbook)	74,2[70,0-78,0]	359	79,6[75,7-83,1]	389
% of women who received iron-folic acid supplementation during their last pregnancy (mother)	96,3[94,1-97,7]	466	94,2[91,6-96,0]	453
Average duration of the PNC 1	3,81[3,59-4,20]	267	3,41 [3,20-3,61	217
% of women who achieved PNC 1 at most at 3 months	51,7[45,5-57,8]	138	61,8[54,9-68,2]	134
% of women who took iron-folic acid supplementation for at least 90 days during their last pregnancy as recommended (logbook)	71,7[67,4-75,0]	347	78,8[74,8-82,3]	379
% of women who achieved at least 4 PNC during their last pregnancy (woman)	38,8[34,5-43,4]	188	54,9[50,3-59,4]	264
% of women who achieved at least 4 CPNs during their last pregnancy (logbook)	18,0[14,7-21,8]	87	30,4[26,3-34,7]	146
% of women whose delivery was performed by trained staff.	61,0[56,4-65,3]	295	57,4[52,8-61,8]	276
% of newborns who received postnatal care by a health professional	61,7[57,4-66,0]	299	77,9[74,2-81,6]	375
% of women or newborns who received post natal care by a health professional	64,0[59,6-68,3]	310	82,1[78,3-85,4]	395
% of newborns who received postnatal care by a community worker	10,7[7,9-13,4]	52	9,7[7,0-12,3]	47
% of women who received postnatal care by a community worker	14,7[11,7-18,2]	71	13,7[10,8-17,2]	66
% of newborns who received postnatal care by a professional or community worker	70,2[66,1-74,3]	340	80,9[77,4-84,4]	389
% of women receiving postnatal care by a professional or a community agent	72,1[67,8-76,0]	349	83,8[80,1-86,9]	403

Table 6. Main indicators of the CBMNH project

	KOLDA		SEDHIOU	
	%(IC95%)	N	% (IC95%)	N
		484		481
Community health staff provide quality care for PNC and childbirth				
% of newborns who received PoNC by trained community-level staff	10,7[7,9-13,4]	52	9,7[7,0-12,3]	47
% of parturient who received PoNCs by trained community-level staff	14,7[11,7-18,2]	71	13,7[10,8-17,2]	66
% of women who received Misoprostol at the time of delivery at the community level	4,2[00,1-21,1]	1	0	00
% of pregnant women who planned the delivery	20,9[17,4-24,8]	101	22,1[18,5-26,1]	106
% of pregnant women who planned the delivery with a Bajenu Gox (**BG**)	1,2[0,5-2,8]	6	2,5[1,4-4,4]	12
% of pregnant women who plan a delivery with a Bajenu Gox (choose who will attend the birth)	2,5[1,3-4,4]	12	3,1[1,8-5,2]	15
% of pregnant women who plan to give birth with a Bajenu Gox (choose place of birth)	4,1[2,6-6,4]	20	4,2[2,6-6,5]	20
% of pregnant women who plan to give birth with a Bajenu Gox (buy and keep a bar of soap)	4,8[3,1-7,2]	23	5,0[3,3-7,4]	24
% of pregnant women who plan to give birth with a Bajenu Gox (put a little money aside for emergencies)	5,0[3,3-7,4]	24	4,6[3,0-7,0]	22
% of pregnant women who plan to give birth with a Bajenu Gox (prepare clean linen)	6,0[4,1-8,6]	29	5,2[3,5-7,7]	25
% of parturient who initiated breastfeeding within one hour of birth	47,0[42,6-51,7]	228	52,6[48,0-57,1]	253
% of parturient who practice exclusive breastfeeding at 6 months	64,7[57,9-71,0]	139	60,4[53,9-66,6]	145
% of women who received advice on early initiation of EBF during pregnancy with BG	6,6[4,6-9,3]	32	11,2[8,6-14,5]	54
% of women who received advice on the importance of EBF during pregnancy with BGs	6,4[4,5-9,1]	31	11,2[8,6-14,5]	54

3.2 Bivariate Analysis

3.2.1 Factors Determining Early PNC

Table 7. Factors associated with early PNC

	Early PNC (%)	P
Personal characteristics		
Level of education		0.001
None	941 (19.8)	
Primary or more	499 (28.6)	
Household income		0.001
Inferior 50 000	713 (17.2)	
50 000 or more	686 (28.1)	
Revenue Generating Activity		0.28
Yes	747 (23.9)	
No	686 (21.6)	
Nearest health facility		0.001
Less than 5 km	783 (28.6)	
5 km or more	661 (16.0)	
Time to go to the nearest health facility		0.001
Less than 15 mn	561 (27.0)	
15 mn or more	883 (19.8)	
Parity		0.001
0-3	766 (19.8)	
More than 3	678 (30.3)	
Attend an awareness program		0.04
Yes	759 (25.0)	
No	681 (20.5)	
Knowledge		
Period PNC1		0.001
Yes	1117 (26.5)	
No	327 (10.4)	
Number of CPN during pregnancy		0.001
Yes	909 (26.6)	
No	474 (15.4)	
Important advice PNC		0.005
Yes	912 (28.5)	
No	521 (13.3)	

3.2.2 Factors Determining Complete Prenatal Consultation

Table 8. Factors associated with complete PNC

	complete PNC (%)	P
Personal characteristics		
Level of education		0.001
None	941 (10.4)	
Primary or more	499 (20.8)	
Household income		0.001
Inferior 50 000	713 (09.0)	
50 000 or plus	686 (18.5)	
Revenue Generating Activity		0.676
Yes	747 (14.3)	
No	686 (13.5)	
Nearest health facility		0.001
Less than 5 km	783 (18.5)	
5 km or more	661 (08.6)	
Time to go to the nearest health facility		0.001
Less than 15 mn	561 (21.0)	
15 mn or more	883 (09.5)	
Parity		0.001
0-3	766 (16.4)	
More than 3	678 (11.2)	
Attend an awareness program		0.001
Yes	759 (17.2)	
No	681 (10.4)	
Knowledge		
Period PNC1		0.001
Yes	1117 (16.2)	
No	327 (07.3)	
Number PNC during pregnancy		0.001
Yes	909 (19.4)	
No	474 (04.6)	
Importance advice PNC		0.001
Yes	912 (18.5)	
No	521 (05.6)	
Early CPN1Realization		0.001
Yes	330 (31.5)	
No	1114 (08.9)	

3.2.3 Determinants Iron Consumption within 90 Days

Table 9. Factors associated with iron consumption within 90 days

	Consumption of iron for 90 days (%)	P
Personal characteristics		
Level of education		0.001
None	890 (50.9)	
Primary or more	475 (64.4)	
Household income		0.001
Inferior 50 000	665 (50.9)	
50 000 or plus	662 (63.1)	
Revenue Generating Activity		0.051
Yes	707 (53.4)	
No	653 (58.6)	
Nearest health facility		0.001
Less than 5 km	750 (60.6)	
5 km or more	617 (49.4)	
Time to go to the nearest health facility		0.001
Less than 15 mn	541 (64.1)	
15 mn or more	826 (50.50)	
Parity		0.007
0-3	734 (58.9)	
More than 3	633 (51.6)	
Attend an awareness program		0.001
Yes	738 (62.3)	
No	628 (47.6)	
Knowledge		
Period PNC1		0.001
Yes	1088 (58.2)	
No	279 (45.5)	
Number of PNC during pregnancy		0.001
Yes	891 (61.5)	
No	431 (47.5)	
Role of the iron		0.24
Yes	1298 (55.8)	
No	66 (48.4)	
Importance advice PNC		0.001
Yes	896 (61.4)	
No	454 (44.3)	
Important advice about iron consumption for 90 days		0.001
Yes	1181 (58.7)	
No	183 (36.1)	
Early PNC1 achievement		0.001
Yes	327 (71.8)	
No	1040 (50.5)	

Full PNC achievement		0.001
Yes	201 (83.6)	
No	1166 (50.8)	

3.2.4 Delivery by a Trained Staff

Table 10. Factors associated with performing delivery by trained staff

	Delivery by a trained staff Yes (%)	P
Personal characteristics		
Level of education		0.001
None	933 (51.5)	
Primary or more	498 (64.3)	
Household income		0.001
Inferior 50 000	707 (49.6)	
50 000 or plus	683 (62.4)	
Revenue Generating Activity		0.51
Yes	741(54.9)	
No	683 (56.6)	
Nearest health facility		0.001
Less than 5 km	779 (70.0)	
5 km or more	683 (39.1)	
Time to go to the nearest health facility		0.001
Less than 15 mn	560 (73.0)	
15 mn or more	873 (44.9)	
Parity		0.001
0-3	762 (61.4)	
More than 3	671 (49.6)	
Attend an awareness program		0.003
Yes	753 (59.6)	
No	678 (51.8)	
Knowledge		
Period PNC1		0.001
Yes	1110 (60.1)	
No	323 (41.5)	
Number of PNC during pregnancy		0.001
Yes	907 (60.5)	
No	469 (49.9)	
Role of the iron		0.001
Yes	1327 (58.1)	
No	96 (27.1)	
Importance advice PNC		0.001
Yes	906 (63.0)	
No	508 (43.5)	

	Delivery by a trained staff Yes (%)	P
Importance advice about iron consumption for 90 days		0.001
Yes	1194 (60.5)	
No	234 (33.3)	
Childbirth preparation advice		0.001
0	432 (42.8)	
1-3	704 (56.2)	
4-5	287 (76.3)	
Early PNC1achievement		0.001
Yes	329 (71.4)	
No	1104 (51.2)	
Full PNC achievement		0.001
Yes	202 (84.6)	
No	1231 (51.2)	
Complete intake of iron for 90 days		0.001
Yes	755 (66.5)	
No	603 (47.6)	
Childbirth preparation		0.001
0	262 (37.0)	
1-3	752 (53.3)	
4-5	414 (72.9)	

3.3 Multivariate Analysis

3.3.1 Factors Determining Early Prenatal Consultation

Table 11. Factors determining early prenatal consultation

	OR [95%CI]	P
Personal characteristics		
Level of education		0,06
None	1	
Primary or more	1.32 [0.99-1.76]	
Household income		0.003
Inferior 50 000	1	
50 000 or plus	0.65 [0.50-0.86]	
Revenue Generating Activity		0.14
Yes	1	
No	1.23 [0.93-1.61]	
Nearest health facility		0.001
Less than 5 km	1	
5 km or more	1.93 [1.34-2.78]	
Time to go to the nearest health facility		0.56
Less than 15 mn	1	
15 mn or more	0.90 [0.63-1.28]	
Parity		0.023
0-3	1	
More than 3	1.4 [1.05-1.87]	
Attend an awareness program		0,24
No	1	
Yes	0.84[0.63-1.12]	
Knowledge		
Period PNC1		0.001
No	1	
Yes	2.19 [1.44-3.34]	
Number of PNC during pregnancy		0.043
No	1	
Yes	1.38 [1.01-1.88]	
Importance advice about PNC		0.001
No	1	
Yes	1.95 [1.40-2.70]	

3.3.2 Factors Determining Full Prenatal Consultation

Table 12. Factors determining full prenatal consultation

	OR [95%CI]	P
Personal characteristics		
Level of education		0,036
None	1	
Primary or more	1.47 [1.07-2.11]	
Household income		0.014
Inferior 50 000	1	
50 000 or plus	0.64 [0.45-0.95]	
Revenue Generating Activity		0.474
Yes	1	
No	1.14 [0.80-1.61]	
Nearest health facility		0.105
Less than 5 km	1	
5 km or more	1.49 [0.92-2.42]	
Time to go to the nearest health facility		0.05
Less than 15 mn	1	
15 mn or more	1.56 [0.99-2.44]	
Parity		0.3
0-3	1	
More than 3	1.21 [0.84-1.75]	
Attend an awareness program		0,045
No	1	
Yes	0.69 [0.47-1.0]	
Knowledge		
Period PNC1		0.85
No	1	
Yes	1.05 [0.62-1.79]	
Number of PNC during pregnancy		0.001
No	1	
Yes	3.73 [2.27-6.14]	
Importance advice about PNC		0.001
No	1	
Yes	2.2 [1.39-3.48]	
Practice		
Early PNC achievement		0.001
No	1	
Yes	3.65 [2.58-5.18]	

3.3.3 Factors Determining Iron-Folic Acid Intake for at Least 90 Days During Pregnancy

Table 13. Factors determining iron-folic acid intake for at least 90 days during pregnancy

	OR [95%CI]	P
Personal characteristics		
Level of education		0,014
None	1	
Primary or more	1.41 [1.07-1.86]	
Household income		0.018
Inferior 50 000	1	
50 000 or plus	0.74 [0.58-0.95]	
Revenue Generating Activity		0.086
Yes	1	
No	0.81 [0.63-1.03]	
Nearest health facility		0.344
Less than 5 km	1	
5 km or more	1.17 [0.84-1.63]	
Time to go to the nearest health facility		0.309
Less than 15 mn	1	
15 mn or more	1.19 [0.85-1.68]	
Parity		0.06
0-3	1	
More than 3	1.28 [0.99-1.65]	
Attend an awareness program		0,004
No	1	
Yes	0.68 [0.53-0.89]	
Knowledge		
Period PNC1		0.264
No	1	
Yes	1.19 [0.88-1.62]	
Number of PNC during pregnancy		0.058
No	1	
Yes	1.29 [0.99-6.14]	
Importance advice about PNC		0.047
No	1	
Yes	1.32 [1.1-1.72]	
Advice importance of taking iron for 90 days		0.001
No	1	
Yes	2.06 [1.38-3.06]	
Practice		
Early PNC achievement		0.001
No	1	
Yes	2.19 [1.58-3.04]	
Full PNC achievement		0.001
No	1	
Yes	3.58 [2.22-5.77]	

3.3.4 Factors Determining Delivery by Trained Staff

Table 14. Factors determining delivery by trained staff

	OR [95%CI]	P
Personal characteristics		
Level of education		0,171
None	1	
Primary or more	1.22[0.92-1.62]	
Household income		0.051
Inferior 50 000	1	
50 000 or plus	0.78 [0.6-0.1]	
Revenue Generating Activity		0.134
Yes	1	
No	1.22 [0.94-1.57]	
Nearest health facility		0.001
Less than 5 km	1	
5 km or more	2.43 [1.75-3.37]	
Time to go to the nearest health facility		0.014
Less than 15 mn	1	
15 mn or more	1.54 [1.09-2.17]	
Parity		0.002
0-3	1	
More than 3	1.5 [1.15-1.95]	
Attend an awareness program		0,602
Yes	1	
No	1.08 [0.82-1.41]	
Knowledge		
Period of PNC1		0.067
No	1	
Yes	1.34 [0.98-1.83]	
Number of PNC during pregnancy		0.787
Yes	1	
No	0.96 [0.73-1.27]	
Role of the iron		0.277
No	1	
Yes	1.36 [0.78-2.38]	
Advice on importance PNC		0.207
No	1	
Yes	1.2 [0.9-1.59]	
Advice importance taking iron for 90 days		0.028
No	1	
Yes	1.55 [1.07-2.28]	

Childbirth preparation advice		0.003
0	1	
1-3	1.02 [0.7-1.48]	
4-5	2.13 [1.28-3.55]	
Practice		
Early PNC achievement		0.61
No	1	
Yes	1.09 [0.78-1.52]	
Full PNC achievement		0.001
No	1	
Yes	2.52 [1.59-4.0]	
Consumption of iron for 90 days		0.006
No	1	
Yes	1.46 [1.11-1.91]	
Childbirth preparation		0.003
0	1	
1-3	1.59 [1.02-2.47]	
4-5	2.27 [1.35-3.81]	

4. Discussion

This study allowed us to measure the main basic indicators of the SCSMN project, to compare them and finally to model the factors determining the PNC, the delivery and the early initiation to the EBF at Kolda district level. At first, factors influencing PNC, childbirth and then those influencing EBF were analyzed.

4.1 Prenatal Consultation

The PNC is a special moment of contact between the provider and the pregnant woman. It allows the detection of health problems and their follow-up in the mother and the fetus. It also allows the prevention of childhood diseases by vaccinating the mother (VAT for example). It should be an opportunity to give many tips for the implementation of health programs and should allow to retain the patient in relation to health facilities, including the place of delivery. In Senegal, four PNCs are proposed, the first of which in the first trimester of pregnancy. In this study we focused on early PNC, complete PNC, and iron-folic acid consumption during pregnancy.

The results of our study show that 51.7% of women achieved PNC in the first three months in Kolda against 61.8% in Sédhiou. The average duration of the PNC is lower in Sédhiou than in Kolda. The results of the multivariate analysis show that early PNC is related to personal characteristics, PNC knowledge, and advice received about the importance of PNC.

Several studies have shown the role of the economic level in the use of health services for prenatal care (Magadi et al., 2000; Koné-Péfoyo & Rivard, 2006; Faye, Manga et al., 2011). It allows the satisfaction of needs and access to structures in case of suffering. Wilkinson and Marmot in the report on the social determinants of health have shown the role of income on the health status of populations. This situation is found both among the poor and the rich. Solving health problems involves reducing inequalities. This requires the involvement of all actors, including political ones. The inaccessibility of structures is not only financial, but also geographical (Faye, Manga et al., 2011]. In rural areas, women are often obliged to travel more than five kilometers to reach the nearest health facility due to poor road infrastructure and inadequate transportation.

The achievement of early PNC is linked to the knowledge of the period and the number of PNCs needed during pregnancy. Particular emphasis should be placed on sensitizing women in health facilities for a better knowledge of PNC but also at home by Bajenu Gox and Relays, particularly in primigravida who do not yet have a great experience of pregnancy. Indeed, there are still some buildings surrounding pregnancy (Ndiaye et al., 2005). This makes the statement late to avoid evil spirits (Niang, 2003).

To be effective the PNC must be early but also complete. The proportion of women who completed the complete PNC in Kolda is 38.8% in our study. This proportion is even lower if we rely on the mother's health record (18%). This difference can be explained by under-reporting of providers. The results of our study are similar to those found in EDS IV with a national average of 40% (Ndiaye, Salif, & Mohamed Ayad, 2006) but are lower than the national average in EDS V (50%) [Ministry of Health (Senegal)]. However, this proportion was 41% in rural areas. Faye A in a study conducted in Gossas found that 35% of women had achieved 4 PNC (A. Faye, M. Faye, et al., 2010). It should also be noted that, of the women who have done a PNC1, most do not perform the four PNCs. Similar results have been found in EDS IV and V. This raises the problem of continuity of services. A special effort should be directed towards interventions aimed at getting women to continue PNCs at the level of structures but also at community level through greater involvement of support groups. Bajenu Gox too can play a big role at this level by accompanying women in this process. The results show that women who had received information about PNC were more likely to complete four PNCs hence, the importance of emphasizing women's awareness and information in order to improve their knowledge. In fact, knowledge improves as well PNC1, PNC coverage and iron-folic acid intake for at least 90 days.

Iron-acid consumption for 90 days is a recommendation of the Reproductive Health Directorate. The results of the multivariate analysis show that accessibility is a major determinant in the consumption of iron-folic acid during pregnancy. Community actors can play an important role in reducing these difficulties by facilitating access at the community level. However, the results of the study show that they are very weakly involved in the distribution of iron.

4.2 Delivery

Home birth by unskilled people in poor asepsis conditions is one of the leading causes of maternal death, unlike in developed countries where delivery is done by trained staff. Home delivery ranged from 39% in Kolda while in Sedhiou this proportion was 41.3%. In the EDS-MICS 2010-2011, 56% of deliveries took place at home in Kolda. The national average, which was 38% in 2005, decreased to 28.8% in 2010-2011 (National Agency for Statistics and Demography, 2012).

Unlike developed countries where it is well planned with the presence of qualified personnel, home delivery in Africa is very problematic. The results of our study show that it is mainly related to the preparation of childbirth. Similar results were found by Faye and al in a study conducted in five regions of Senegal (Faye et al., 2010). The preparation of childbirth helps to better involve women in the management of pregnancy. Indeed, the identification of the health facility where the childbirth is to take place and the person who must perform it, allows the woman to have more information about the pregnancy especially during the delivery period. The surprise effect of childbirth is often responsible for home delivery (Bolam et al., 1998). Often, women do not know the time of delivery. Particular emphasis should be placed on the preparation of delivery during PNCs. But this assumes that health care providers are equipped enough to do so, which is not often the case. These aspects should be taken into account during their training. The involvement of Bajenu Gox can be an alternative. However, the results of the study show a low involvement of the latter. In this project, special emphasis should be placed on greater involvement of the Bajenu Gox.

The preparation for childbirth can be hindered by the woman's position in society. Her limited decision-making power in the household does not give her the ability to negotiate and make certain decisions (Nikièma, Haddad, & Potvin, 2008). She is also often very badly seen in these societies because considered as an interference with the divine will. It is clear that to get around these cultural barriers, it is important to involve husbands, religious and customary leaders.

The situation is all the more alarming that the government has implemented a policy of free of charge cesarean delivery (Witter, Armar-Klemesu, & Dieng, 2008). The Free of charge responds to logic of social justice that aims to prevent the poorest from being marginalized and falling into permanent exclusion (De La Rocque, 1996). In most countries where these policies have been put in place, they have promoted access to care for the poor (Ensor & Ronoh, 2005), thereby reducing social inequalities in health (Nabyonga, Desmet, & Karamagi, 2005). However, some writings show that they do not always benefit the poorest (Asante et al., 2007). In some contexts, they would have even benefited the non-poor more than the poor (Leighton & Diop, 1995). Indeed, In order to benefit from this free service, you must have access to health services.

In our study, distance is the main factor of geographic accessibility (Pison, 2000). Similar results have been found in Burkina Faso (Haddad, Noutgara, & Ridde, 2004), Kenya, Rwanda, Sudan (Pearson & Shoo, 2005) and Uganda (Mbonye, 2001). The accessibility of health facilities poses real problems in developing countries, particularly in Africa. In rural areas, one in three women must travel more than five kilometers to reach the

nearest health service, 80% for the nearest hospital due to faulty road infrastructure and inadequate means of transport.

Competing Interests Statement

The authors declare that they have no competing or potential conflicts of interest.

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