


Research Articles

Antenatal nutrition services offer in primary health care facilities of Kolda region, Senegal

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Background

Both under and overnutrition have been associated with poor pregnancy outcomes. Hence, quality nutrition services are essential during pregnancy to help ensuring a healthy diet for expecting women especially in countries where malnutrition including anaemia is high, such as Senegal. Based on the Donabedian model of quality of care, the offer of nutrition services during antenatal care (ANC) was assessed in health facilities of Kolda region, Senegal.

Methods

A cross-sectional descriptive survey was conducted among a random sample comprising 30% of the ANC providers of the region. Data on conditions and environment of health facilities were collected through direct observations as well as information on available equipment, materials and drugs/supplements. Data on ANC workforce such as their qualifications and supervision were gathered through a questionnaire. ANC providers were also asked to self-report their offer of nutrition services, including counseling.

Results

With the exception of blood analyses equipment as well as calcium and energy-protein supplements, over 90% of health facilities had materials, equipment and supplies for providing nutrition services. ANC providers were either midwives or nurses as required by national standards but over 60% were not supervised every two months as prescribed. About 20% of them had received some training in maternal nutrition. Only 30% of ANC providers reported asking pregnant women about eating habits including the use of iodized salt, resting and sleeping habits and 15% on night blindness. Regarding nutrition counseling, 60% mentioned that they were always providing general dietary advice, 50% recommended specific foods to gain weight and 20% reported talking always about potential side effects of iron and folic acid supplementation.

Conclusions

Although health providers have qualifications to perform ANC and work in a conducive environment, their capacities to provide nutrition services may be suboptimal. To some extent, this situation may contribute to the limited offer of nutrition services.

In spite of all efforts undertaken up to now, maternal mortality remains of concern with a global ratio at 211 per 100 000 live births.¹ More than 90% of maternal deaths occur in low- and middle-income countries (LMIC), and Sub-Saharan Africa accounts for 66% of the global burden.¹ It is clear that more investments are required to achieve the sustainable development goal of less than 70 per 100 000 live births by 2030.²

To address maternal mortality, evidence-based interventions with high return on investments have been identified,³ one of them being improving woman nutrition during the prenatal period.^{3,4} Yet to do so, it is essential to have an

enabling environment such as a health care workforce capable of providing good quality antenatal care (ANC) and equipped with appropriate supply as well as working in a healthy and comfortable environment.^{3,5} This has been corroborated by Downe et al.⁶ who investigated healthcare providers' views and experiences in providing ANC well as factors influencing their provision. Results showed that the local infrastructure, the cost of services, the clinical environment, the organization of services, resources and working conditions of health staff as well as their attitude were framing the provision of ANC and their uptake by women.

ANC visits are unique opportunities to prevent, detect,

alleviate and manage health issues during pregnancy which may impact both mothers and babies.⁷ Unfortunately, at the global level, the latest data show that only 65% of women attended the four recommended antenatal visits⁸ during the last pregnancy: in Sub-Saharan Africa, this proportion was even lower, at 53%.⁸ Yet, ANC constitutes a platform to promote optimal eating behaviors during pregnancy and could help at reducing anaemia that affects 63% of pregnant women in Senegal.⁹

Even though comprehensive and quality ANC should be provided to each pregnant woman, LMIC are still struggling for offering such package which includes nutrition interventions.⁴ In Senegal, to ensure access to optimal ANC, the Ministry of Health and Social Action has recently issued guidelines that prescribe the content of each ANC visit¹⁰ based on international recommendations.^{4,11} Nutrition interventions are part of the package. However, to our knowledge, no investigations have been performed to evaluate whether or not government recommendations are implemented, especially with regards to nutrition services which are key for positive pregnancy outcomes.

As part of a larger study aiming to assess the offer and uptake of quality nutrition services during ANC visits, the objective of this paper was to describe the availability of material resources as well as qualifications of ANC providers and their self-assessed provision of nutrition services to pregnant women in health facilities of Kolda region in Senegal. This area is well known for its malnutrition rates among women and young children, which are among the highest of the country.^{9,12}

METHODS

CONCEPTUAL FRAMEWORK

The Donabedian conceptual framework¹³ was used to guide this research. It refers to three distinct dimensions for the analysis of the quality of health care, namely: structure, process, and outcomes, which are also interrelated.

The structure component consists of the assessment of available resources for providing care as well as their organization. It includes health facilities, equipment and financing. The second aspect, the evaluation of process, relates to the examination of the care provision itself. It encompasses the assessment of human resources and thus, it also involves making a professional judgment of elements and details of care based on comparisons with pre-established standards. Outcome analysis is the assessment of the final outcomes of care, usually specified in terms of health, well-being and patient satisfaction. Given the focus of the present paper, the data collection was conducted to gather information on the two first components namely the structure and the process. In particular, we were interested through the process dimension to: 1) collecting information on the availability of materials and functional equipment; 2) identifying the availability and qualification of health personnel. Concerning the process dimension, it was about self-reported services offered, especially nutrition services by ANC providers.

PRELIMINARY STEPS

DEVELOPMENT OF SURVEY TOOLS

To gather data on elements of the two components of the Donabedian model, the tool set from the “Quality Assessment of Nutrition Services” package developed by Helen Keller International (HKI)¹⁴ was used. This guide was developed specifically for assessing the quality of nutrition services during the pre- and post-natal period for women as well as during childhood. To assess each component of interest, namely the structure and some elements of the process, the following tools were used:

- The structure: the checklist from the HKI package was used to record all material, equipment and inputs available in health infrastructure needed to provide nutrition services, as well as information on the health infrastructure itself.
- The process: the interview guide of the HKI package was used to gather information on types of services offered by each healthcare provider as well as on her/his qualifications.

All above tools were translated into French. Moreover, before initiating the field study, interviews were conducted by the main author with resource persons from various organizations working in the field of reproductive health, particularly nutrition, to collect relevant documentation on national standards on ANC.¹⁰ Items on these standards were added to the survey tools.

TRAINING OF SURVEYORS

A total of ten (10) surveyors were recruited based on the following criteria: speaking Pulaar (the most spoken language in Kolda region), having at least secondary level education and at least five years of experience in surveys as well as having a training background as a midwife or a nurse.

Two training sessions of five days each were held in November and December 2018 in Dakar, Senegal, at the *Institut de formation et de recherche en Population, Développement et Santé de la Reproduction* (IPDSR) of the Université Cheikh Anta Diop. The investigators were trained on data collection methods and tools, including the administration of consent forms. During the training, each survey tool was also reviewed and translated in Pulaar language with the entire group of surveyors to ensure common understanding of each question and observation to be asked/made. Surveyors were also briefed on social and/or religious specificities of the survey area.

All the tools were pre-tested in a rural area of the neighbourhood health facilities with nine providers from two facilities.

STUDY SITE

Senegal is located on the West African coast with a population of around 15 million inhabitants in 2017.¹⁵ The proportion of the population living below 1.90 \$ per day is estimated at 33 %.¹ The region of Kolda, with a population of about 750 000 inhabitants, is situated on the Eastern part of

the country.¹⁵

Although the majority (over 95%) of ANC were offered by qualified health staff in every region of the country including Kolda, national data revealed that only 63% and 40% of women had received respectively at least 90 tablets of iron and folic acid (IFA) and deworming during their last pregnancy.⁹ These proportions were even lower in Kolda region (36% and 24% respectively),⁹ which made this region a site of particular interest for the present study.

TYPE OF STUDY AND PARTICIPANTS

This was a cross-sectional descriptive survey. All health workers offering ANC in all public health infrastructures (1 hospital, 4 health centers and 60 health posts) of the Kolda region were listed, for a total of 88. Thirty percent of them were randomly selected to participate in this study.

DATA COLLECTION

The data collection was conducted in December 2018 and January 2019 by five teams of two surveyors in all three districts of the Kolda region namely Kolda, Médina Yoro Foulah and Vélingara.

First, in each of the selected health facility, by using the checklist and through direct observations, all educational materials (e.g. counseling cards), equipment (e.g. scale, height board) and inputs (e.g. medicines, micronutrient supplements, bednets) available in the health infrastructure to provide nutrition services were recorded. This exercise was conducted by a surveyor jointly with the head of each health post or with the chief of midwives in health centers and in the hospital. Information and observations on the health infrastructure (e.g. cleanliness, access to improved water and sanitation, waste disposal) was also gathered with the checklist.

After the completion of the checklist, a face-to-face interview of about 60 minutes was conducted privately with the ANC provider, using the interview guide. Data on the following were collected: qualifications of the health provider, her/his experience in provision of ANC (in years), nutrition and other ongoing trainings received in the past years, their duration and qualifications of trainers, visits and feedbacks from supervisors, services said to be offered by the provider during ANC including content of the nutrition counseling.

At the end of each day of data collection, all survey tools were reviewed by the main author to ensure completeness and accuracy.

DATA ANALYSIS

The data entry was performed on SPSS software (version 23, IBM Corporation, Armonk, NY, USA) by the main author, his assistant and two of the surveyors who had experience in data entry and cleaning. To ensure quality of the data entry, data of a random sample of 10 completed questionnaires and 10 observation grids were entered by each person. To check the error rate, a random sample of 10 items was selected for each tool and the percentage of errors in the data entry was estimated. Initially, a percentage of al-

most 5% was calculated. Another series of the same number of questionnaires and checklists was entered and an error percentage of less than 1% was reached.

Upon completion of the data entry, matrices were developed to organize data under each national standard. As such, data from each tool were placed under the appropriate government standard. For some items not included in national standards but part of HKI tools, international standards were consulted to check their relevance for optimal ANC services. For instance, motorcycle and bicycle were not included as such in national Senegalese standards as mandatory equipment for the provision of ANC services. However, they were considered in our analysis given their role in supporting outreach services such as immunization.¹⁶ Also, only long-lasting impregnated bednets were considered as per the national standards recommendations.¹⁰ On the other hand, in spite of the fact that multiple micronutrient supplements were present in some health facilities, this item was not retained given the WHO recommendation with regards to their non relevance for optimal ANC care.^{17,18} Although not included in national standards, qualifications of trainers were also considered given the potentially limited capacities of some trainers especially for nutrition training.¹⁹

Thereafter, data were classified according to the aforementioned components of the Donabedian model¹³ namely structure and process as follows: a) structure: description of the health facility and its environment, availability of materials, equipment, nutritional supplements and information/education/communication (IEC) materials, b) process: description of the ANC workforce, general services and counseling services said to be offered by health providers during ANC visits.

The proportions of all health facilities who were adhering (yes or no) to each standard, either governmental¹⁰ or international^{4,16} were calculated. Similarly, percentages of structures equipped with each required materials, equipment and other inputs recommended for ANC were computed.

With regards to the ANC workforce, proportions of health providers with the recommended professional background (as per the national standards: first choice, being a midwife, or second choice, a nurse or, third choice, a nurse-assistant), who had received supervision in the past two months and feedbacks from supervisors (yes or no) were assessed.¹⁰ In addition, percentages of health providers who had received any types of trainings provided by the health district staff and topics, nutrition training either provided by the district or others (e.g. regional or central level health staff) and their specific topics were assessed, as well as the point/moment in time of nutrition trainings. Proportions of trainings provided by trainers with different qualifications (e.g. doctors, nutritionists, nurses, midwives) were also calculated.

To help in determining the direct offer of ANC services by providers, proportions of health providers who declared offering “always” different services (recommended by the national standards) during ANC visit were calculated. In addition, with regards to counseling services offered during ANC, percentages of health providers who mentioned doing each action point recommended in the national standards

Table 1. Percentages of health facilities according to availability of materials, equipment, nutritional supplements and education material*

% of health facilities	General material and equipment	Nutritional supplements	Educational material by topic
≥ 90	Seats for clients Mid-upper arm circumference tape (MUAC) Foetal heartbeat listening device Blood pressure apparatus & Stethoscope Cupboard Vaccination kit including ice packs Examination table Scissors Disposable needles Soap for handwashing Prenatal health cards ANC and family planning registers Obstetric delivery table Height board for adult Child health cards	Vitamin A capsules (100 UI) Dewormers Iron and folic acid supplements Vitamin A capsules (200 UI) Parasite control prophylaxis	Family planning
70 - 89	<i>Impregnated bednets</i> <i>Lab equipment for urine analysis</i>		Breastfeeding HIV/AIDS Iron deficiency Vitamin A deficiency General nutrition during pregnancy
50 - 69	Ambulance, <i>Motorcycle</i>	Micronutrient powder Malaria prophylaxis (e.g. Fansidar)	Vitamin A deficiency General nutrition Zinc deficiency Young child complementary feeding
30 - 49	Vehicle Lab equipment for blood analysis Sterilized needles	Fortified corn soya bean-based cereals (CBS/CBS+)	Iodine deficiency
< 30	<i>Bicycle</i>	Protein-energy supplement Calcium supplement	Others (e.g. tuberculosis, malaria, monitoring/importance of ANC)

*Items in *italic font* are international recommendations (Sodha & Dietz, 2015)¹⁶

were also assessed.

RESULTS

On total, ANC services of one hospital, two health centers and 21 health posts were assessed in the study. The response rate was 100%. In fact, during the data collection, there was a national strike and three members of the health providers union who were initially selected to participate to this study did not agree to be included. There were replaced by alternates who were also selected randomly from the list. Compliance to environmental standards by health facilities is described in [Figure 1](#). Overall, more than 90% of health facilities had access to an improved water source (which for 70% was running water) and were electrified. In addition, three quarters had fluid-free walls and were free of excess dirt and dust. Around 50% had a garbage bin in the consultation room, and 85% were burning waste. All structures were also equipped with latrines, mainly (73%) manu-

ally flushable latrines (results not shown).

Different types of materials and equipment were available in all health facilities such as mid-upper arm circumference (MUAC) tape, vaccination kit and obstetric table ([Table 1](#)). Height board for adult measurement, iced packs for immunization activities, child health cards and long-lasting impregnated bednets were found in more than 80% of health facilities as well as IFA supplements, vitamin A capsules and dewormers. Lab equipment for testing blood was available in about 40% of the structures. Calcium and protein-energy supplements were available in around 25% of structures while fortified corn-soya bean-based cereals and malaria prophylaxis were found respectively in 40% and 50% of facilities. IEC materials on family planning, breastfeeding and HIV/AIDS were found in around 90% of the health facilities while IEC materials on iron and vitamin A deficiencies and general nutrition for adults were observed in around 70% and on iodine deficiency, in 44% ([Table 1](#)).

With regards to the ANC workforce, of all providers, around 80% were midwives, 15% nurses and 4% were as-

Table 2. Description of the ANC workforce: Proportion (%) of ANC providers according to their qualification background, timing of last supervision visit and type of trainings received in past years (N = 27)*

% of ANC providers	Qualification/ of health provider	Timing of last supervision visit	Training and Topics covered
≥ 90			<i>Had followed training sessions (any)</i>
70 - 89	<i>Midwife</i>		
50 - 69		> two months	
30 - 49		≤ two months	Family planning HIV/AIDS ANC
< 30	Nurse Nurse's assistant		Malaria Nutrition or cervical cancer screening or pregnancy monitoring Biomedical waste treatment, youth reproductive health Others (e.g. post-abortion care, immunization)

*Items in *italic font* are government standards (MSAS, 2018)¹⁰

Table 3. Organization of ANC services in facilities: Availability of staff, consultation days and schedule (N = 27)

% of health facilities*	Availability of staff in the facility	ANC days	ANC consultation schedules
≥ 90	Monday - Sunday		
50 - 69			8 am - 4 pm
30 - 49		Monday - Sunday Monday - Friday	
< 30		Monday - Saturday Monday - Thursday	8 - 12 am At any time Others

* There was no percentage between 70-89%.

sistant nurses (Table 2). All midwives were female while all other ANC providers were male. In addition to the tasks involved in the function of midwife and nurse, 33% of interviewed providers also performed the administrative position of head of post or master midwife. Otherwise, it was noted that more than 90% of ANC providers were present in health facilities from Monday to Sunday (Table 3). However, although ANC were not offered every day (less than 40%), at least 80% of the facilities offered them from Monday to Friday and most frequently between 8 am and 4 pm.

Around 30% of health providers had been supervised in the last two months (Table 2) and, among those, half did receive feedbacks during the last supervision visit. The most frequent topics addressed during feedback was the filling out of the ANC register (18,5%) and family planning issues (7,4%). It also appeared that providers had been working in their structure for an average of 2,7 years though they had an average of 4,52 years ($\pm 0,70$) of experience doing ANCs (results not shown). Nevertheless, 15% of providers had been offering ANCs for less than a year (results not shown).

Nearly all providers (96%) participated in periodic training sessions organized by their health district (Table 2). A

total of 35 topics were covered during these trainings. The most covered subjects were family planning (48%), HIV/AIDS (44%) and ANC (33%). When considering all nutrition trainings provided either by the district, the region or the central level, 41% of ANC providers were trained on nutrition mostly by doctors or nutritionists and around 60% benefited from this training in the past year. However, 22% of providers reported that they had not received any training in nutrition in the past few years. Over 50% of health providers who benefited from a nutrition capacity-building activity were trained on maternal nutrition while around a third had received training on micronutrient supplementation, deworming and protein-energy supplementation (Table 4). A total of 16 topics were covered during nutrition trainings, several of them being covered during the same training session.

With regards to services offered during ANC consultations, as reported by health providers, different physical assessments were performed by more than 70% of them (Table 5). Specifically, most providers claimed they were always collecting information on woman weight, height, MUAC, presence of oedema and anaemia signs as well as on uterine height and body temperature. Samples of urine and blood

Table 4. Description of the ANC workforce: Proportion (%) of ANC providers by type of nutrition training received in past years (N= 27)

% of ANC providers	Timing of last training in nutrition	Professional background of trainers	Topics covered in training sessions (N=16)
50 - 69		Doctors Nutritionists	Maternal nutrition during pregnancy
30 - 49	6 - 12 months		Iron-folic acid supplementation Micronutrient deficiency Deworming Protein-energy supplementation Other topics e.g. breastfeeding (N=10)
< 30	< 6 months 6 - 12 months > 12 months Have not received nutrition training	Nurses Midwives Others (e.g. social worker)	Vitamin A supplementation only Calcium supplementation

Table 5. Assessments services during ANC visits: Proportions of ANC providers self-reporting doing always different services (N= 27)

% self-reporting doing it "always"	Direct practices / assessments items	Verbal assessment items
≥ 90	Measures weight Performs a breast exam, takes blood pressure Measures woman uterine height, checks tetanus toxoid status	Assesses number of previous pregnancies Assesses if sleeping under bed net Asks age and uptake of iron and folic acid supplements
70 - 89	Measures height & arm circumference Assesses blood pressure, checks for anaemia signs (e.g. pale hand palm/ inner eyelids) Checks immunization status Listens foetal heartbeat, checks for oedema Collects urine Measures woman temperature Takes a blood sample	Asks outcome of last pregnancy & if tested for HIV/AIDS Asks the date of last tetanus toxoid injection Asks if taking malaria prophylaxis
50 - 69		Asks HIV/AIDS status Asks the uptake of deworming Asks about appetite
30 - 49		Asks about daily workload Inquires about breastfeeding plan Asks about eating habits Asks if use iodized salt
< 30		Asks about resting and sleeping habits Asks about night blindness

were also collected by more than 70% of providers.

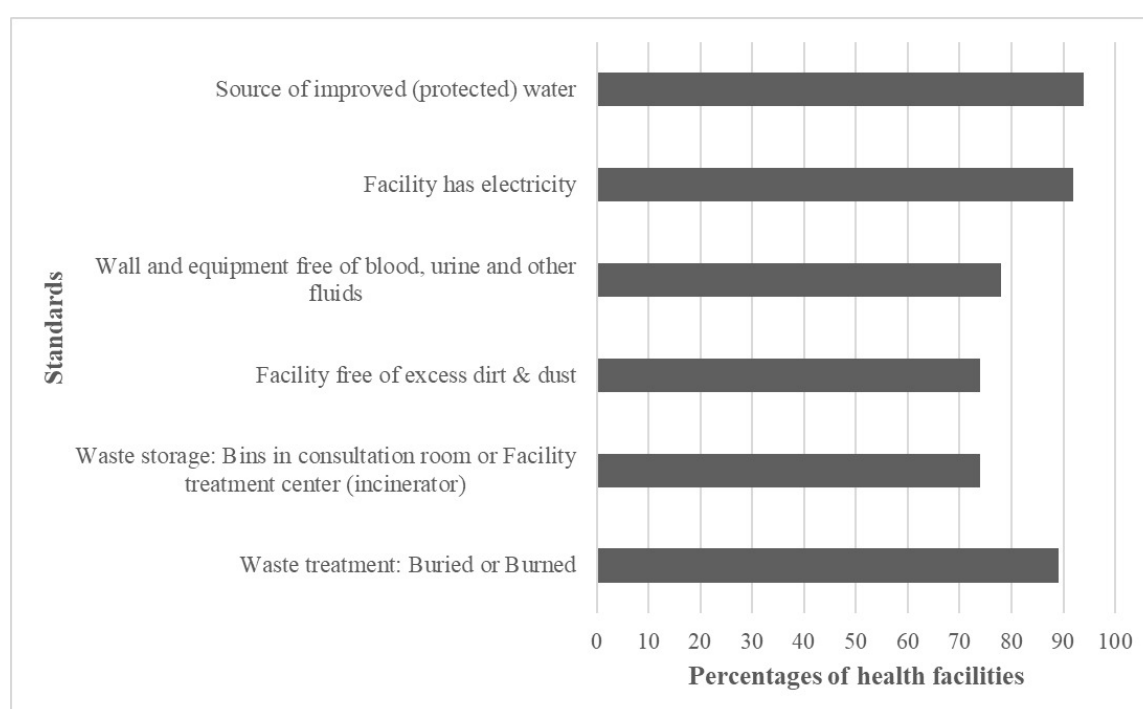
In the case of verbal assessment, different questions were reported by ANC providers as being always asked to women during consultations (Table 5). Over 90% of them mentioned always enquiring about the outcome of previous pregnancies, if the woman was sleeping under a bednet and was taking IFA. Half of health providers reported always asking women about their appetite and around 30% mentioned always asking about eating habits, the use of iodized salt, resting and sleeping habits and slightly less (15%) about night blindness.

With regards to counseling services offered during ANC

visits, over 90% of ANC providers declared always talking about the importance of sleeping under bednet and suggested to test for HIV status (Table 6). Almost 9 out of 10 also reported always explaining to women the importance of taking IFA while 7 out of 10 reported advising how to take them. Around 60% mentioned that they were always providing general dietary advice, while 50% said they advised about specific foods to gain weight and around 45% talked about the importance of gaining adequate weight. About 20% reported talking always about potential side effects of IFA.

Table 6. Counseling services offered during ANC visits as reported by health providers: % of ANC providers self-reporting always providing counseling on different action points (N= 27)

% reporting doing it "always"	Action points included in counseling
≥ 90	Talks about the importance of sleeping under bed net Suggests testing for HIV/AIDS
70 - 89	Explains how to take iron and folic acid supplements Talks about the importance of taking iron and folic acid supplements regularly Provides advice on danger signs and talk about the importance of taking malaria prophylaxis Suggests the avoidance of coffee and tea
50 - 69	Provides advice on exclusive breastfeeding & talk about the importance of taking parasite prophylaxis or treatment Provides general dietary advice Suggests to reduce workload Suggests to increase sleeping/resting hours Provides advice on specific foods to eat to gain adequate weight
30 - 49	Talks about the importance of gaining adequate weight Suggests the avoidance of alcohol and of tobacco products Explains the lactational amenorrhea method for birth spacing Talks about the importance of using iodized salt
< 30	Talks about potential side effects of iron and folic acid supplements

**Figure 1. Percentages of health facilities adhering to government essential environmental standards or international recommendations**

DISCUSSION

The objective of this article was first to assess whether the health facilities visited had all the necessary materials and equipment to adequately provide nutrition services during ANC. Then, data on the availability of qualified personnel was collected as well as services reported by health providers as being offered during ANC in health facilities located in the Kolda region, Senegal. The Donabedian mod-

el¹³ was used to guide the data collection on the structure and process components of the framework. Thereafter, standards of the Ministry of Health and of Social Action of Senegal developed to ensure the provision of quality ANC were used to assess if the ANC offer complied with these standards. In the few cases where there were no government standards, international recommendations were used.

Our results show that the general environment in healthcare facilities was seemingly better in Kolda than in

other developing countries and even in nearby regions of Southern Senegal (Ziguinchor, Sédhio, Tambacounda, Kedougou and Bakel) where the quality of infrastructure was reported to be generally poor, as only half of the health facilities had access to electricity while 25% had running water in the structure.²⁰

In our study, most facilities were meeting national requirements with regards to minimal essential environmental health conditions which could help avoiding the development of infection during the stay or visits of individuals.^{5,21} In addition, women would be more willing to consult for ANC if services are offered in clean and attracting structure⁶; a good reason to maintain the state of facilities as in those of the present study, both for women and for health providers for whom adequate working conditions are also essential.

Adult length board and scale, MUAC tape, IFA and vitamin A supplements were found in almost all facilities as opposed to equipment for blood analyses, ambulance, and calcium and protein-energy supplements. These results are comparable with findings of studies conducted in Bangladesh and Uganda which showed that almost all health facilities had a weighing scale and IFA tablets while between 30-50% had calcium supplements.^{22,23} In our context, the limited number of health facilities having calcium and protein-energy supplements may be attributed to the fact that these government standards are not fully implemented - although more than 20% of women in reproductive age are undernourished (BMI < 18.5) and for whom calcium intake may be limited.^{24,25} The limited amount of government resources could be a constraint to the implementation of these interventions including the supply of calcium and protein-energy supplements in health facilities. In fact, even for IFA tablets, national data show that the availability has been reduced over the years.²⁶

With regards to materials for blood testing, they should be available in every facility as WHO recommends a full blood count testing for diagnosing anaemia during pregnancy or when not possible, the use of a haemoglobinometer.¹⁷ Similarly, to our context, in some LMIC, Downe et al.⁶ have also pointed out the limited availability of diagnostic equipments for anaemia testing even though it should be offered in each structure¹⁰ and ideally, nearby women's home.

Remarkably, in our context, it appears that almost all structures had a health provider with the recommended background (either a midwife or a nurse), a situation not always met in LMIC.²⁷ More than 90% of them were present in facilities on a daily basis and almost all offered consultations every working day. Among those providers offering ANC, 20% were male. For many women, this could be, according to Mayca, "a barrier for not seeking ANC because of the shame and embarrassment associated with physical assessment" (cited by Downe⁶), or even mistrust.²⁸

Among ANC providers, around 30% were also fulfilling the position of head of the health facility. This dual role likely increased their workload and may have reduced their time allocation to ANC. According to Briggs and Garner, "health care workers in South Africa also face operational challenges such as multi-tasking and overwork."²⁹

In spite of the fact that health workers with appropriate

initial training were providing ANC, they were not supervised as often as it should be. This is a major constraint for capacity-building of ANC providers and consequently, for optimal provision of quality care. Supervision has many benefits which have been documented. A systematic review on supportive supervision has shown that the identification and the resolution of problems through supervision increases provider's motivation and confidence and translates into an improvement in quality of care³⁰ such as nutrition services.³¹

Almost all ANC providers in this study had received some in-service training, but less than half benefited from a nutrition training and only 20% were trained on maternal nutrition, a similar proportion to the 17% observed by Mallick et al.³² at national level. The focus of capacity-building activities was rather on family planning and HIV/AIDS even though the HIV/AIDS prevalence in the Kolda region is 1.5% while malnutrition affects one woman out of two.¹² Most trainers were doctors or nutritionists. Although nutritionists were mentioned in several occasions as being the providers of nutrition trainings, it is unlikely that they had a bachelor/licence in human nutrition. In Senegalese context, the "nutritionist" term is generally applied to specialists in health (e.g. medical doctors), biology and in natural sciences who have obtained a graduate degree in nutrition. In West Africa, it has been reported that nutrition training of health professionals (with similar background to those involved in the provision of nutrition trainings in our setting) was poor³³ which raises questions about the quality of the training and of trainees' capacities in nutrition. Even if IEC material was available, not all facilities had materials on nutrition during pregnancy topics such as the provision of IFA, the importance of using iodized salt or gaining appropriate weight, or even on general nutrition. However, prenatal health cards which contain written nutrition messages were observed in almost all structures. Nevertheless, this situation is unfortunate given that appropriate IEC materials facilitate the communication of information by health providers, especially in the case of predominantly illiterate populations in Senegal where less than one in two women aged 15-49 years is literate¹² and thus, unlikely to read messages available in health cards.

Nutrition-related assessments and services including nutrition counseling did not always appear to be a priority in health facilities. Besides reporting doing general examination like checking for anaemia signs and taking weight, which is indeed nearly universally performed in Senegal,^{12,32} verbal assessment seems to focus on family planning, HIV/AIDS and malaria, with limited attention to nutrition-related behaviors. In fact, only 30% of providers asked about eating habits and the use of iodized salt, a few more asked about appetite and a few less about night blindness. It is noteworthy though that, as reported by ANC providers, a major part of the assessment consisted in simple tests/examinations/checklist items (such as measuring weight or height, taking blood, checking immunization status) which do not necessarily lead to extended exchanges with women. On the opposite, asking about their appetite, eating habits or workload may require more exchanges and, consequently, more time which may explain why these questions are not always asked. Providers may also be more

comfortable dealing with topics that are more often covered during the trainings, unlike nutrition services.

Counselling is generally provided in most health facilities but still, actions points covered are often related to malaria and HIV/AIDS followed by the importance of taking IFA supplementation and how to take it. However, more than 30% of ANC providers reported not providing counseling on the importance of reducing workload, dietary advice neither on specific foods to gain weight. As also reported in other LMIC countries,³² few mentioned potential side effects of IFA as well as reasons and how to take IFA while about one pregnant woman out of two benefited from general nutrition counseling in Brazil³⁴ and Tanzania.³⁵

Our study has several strengths that should be highlighted. First, the use of existing national standards as the basis for the analysis of the offer of services is new. Other studies^{22,36} on the same topic have rather used standards that were set by a group of practitioners or were international standards. We have also used tools that have been developed to assess the implementation of international standards^{9,11,18,37} and were contextualized to Senegal. To our knowledge, it is also the first time that nutrition services offered during ANC are investigated in an African country.

This study has also some limitations that need to be recognized. First, the small sample size is a limitation to the extrapolation of our results to other regions of Senegal. In addition, some elements of the structure component of the Donabedian model were not investigated such as financing which could have impacted the offer of nutrition services given the implementation of the National Results-Based financing programme which provides rewards to health providers for the achievement of specific health targets for ANC.²⁰ Another limitation was the strike of health care staff which has led to the postponing of the data collection and to the reorganization of the study logistics. Moreover, besides conditions of the health facility and availability of materials, equipment and other inputs, information on the offer of nutrition services was reported by ANC providers which may not entirely reflect the reality. The outcomes component also deserves to be examined.

CONCLUSIONS

Using the Donabedian model, we aimed to assess elements relevant to the structure and the process components of the offer of nutrition services during ANC in health facilities located in the Kolda region, Senegal. Besides some limitations with regards to the access to equipment and material, health facilities were conducive to the offer of nutrition services. Almost all providers had the initial qualification required by national standards to offer ANCs. Nevertheless, improving nutrition capacities of ANC providers is commended to enable them to provide nutrition services which are crucial for the outcome of the pregnancy. Next step will be to get a deeper knowledge on the process component but also of the outcome aspect of the Donabedian model, in order to have a better appreciation of the quality of nutrition services.

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ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This research was approved by the Human Research Ethics Committee of Laval University (# 2018-139 A-1/19-12-2018)) and the Comité National d'Éthique pour la Recherche en Santé (CNÉRS) of the Ministry of Health and Social Action of Senegal (#000103). The informed consent obtained from study participants was written, using consent forms that were signed by the surveyor and the research participant.

AVAILABILITY OF DATA AND MATERIALS

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

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AUTHORSHIP CONTRIBUTIONS

EABN: Conceptualization, Methodology, Formal analysis, Investigation, Data Curation, Writing - Review & Editing, Visualization

IG: Conceptualization, Methodology, Formal analysis, Data Curation, Writing - Review & Editing, Visualization, Project administration.

SB: Conceptualization, Methodology, Formal analysis, Data Curation, Writing - Review & Editing, Visualization, Project administration, Funding acquisition.

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SUPPLEMENTARY MATERIALS

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