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FEEDING HABITS, NUTRITIONAL STATUS OF PREGNANT WOMEN, AND LOW BIRTH WEIGHT IN THE HEALTH DISTRICT OF GAROUA I, NORTH CAMEROON: A CROSS-SECTIONAL STUDY

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ABSTRACT

Low birth weight is a public health problem in developing countries, and this can be linked to food practices and nutritional status of women before and during the pregnancy. The aim of this study was to evaluate the influence of food practices and nutritional status of pregnant women on birth weight in the health district of Garoua 1 located in the North-Cameroon. For this purpose, 55 women in the third trimester of pregnancy, attending antenatal care in three health centres of the district were recruited. A questionnaire was administered to them to collect information on sociodemographic and economic characteristics, and antenatal care. This information included age, marital status, matrimonial regime, level of education, number of antenatal clinical visits attended, and profession. The twenty-four-hour dietary recall was used to determine Individual Dietary Diversity Score and Food Consumption Frequency. Body Mass Index and Total Weight Gain were calculated. The results obtained showed that most of pregnant women of Garoua 1 were under-educated, with more than a quarter who had never gone to school, without any source of income, and were housewives. These conditions favour poor food practices as shown by the results which indicated that 25.4% of interviewed women consumed less than three meals per day, and 67.3% had a poor Individual Dietary Diversity Score, indicating that they did not consume more than two food groups per day. Individual Dietary Diversity Score and Food Consumption Frequency of the women significantly influenced ($p<0.05$) the birth weight of the babies. It is the same for Body Mass Index and Total Weight Gain which had a significant influence ($p<0.05$) on the birth weight. Indeed, a low Body Mass Index at the beginning of the pregnancy, and insufficient Total Weight Gain during pregnancy increased by 3.35 and 7.12 times, respectively the risk of having an infant with a low birth weight. Nutrition education campaigns to women of childbearing age are recommended to alleviate the problem, and to improve overall living conditions in the community.

Key words: Pregnant women, Food practices, Nutritional status, Low Birth Weight, Garoua

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INTRODUCTION

Infant malnutrition is a major public health problem in many sub-Saharan Africa countries, and it starts most often from a low birth weight (LBW) [1]. Low birth weight is defined as any birth of a living child with a weight lower than 2.5 kg. It is a key indicator of the health status of a new-born [2]. The principal LBW cause is related to maternal malnutrition from conception to childbirth. Pregnant women with poor nutritional status, living under difficult conditions and poorly fed, have more risk to give birth to LBW infants, and produce poor quality milk for breastfeeding [1].

Low birth weight can have perinatal and neonatal morbidity and mortality [3], growth, psychomotor and cognitive development disorder as consequences. It presents a high risk for type 2 diabetes and cardiovascular diseases in adulthood [4,5,6]. Infant mortality related to malnutrition remains very high and alarming in developing countries, and the fact that LBW is one of the main causes, justifies the need for continuous investigation on this key indicator.

Worldwide, around 20 million children are born yearly with a LBW, corresponding to 14.5% of global births [7]. This accounts for 7% of the births in developed countries in contrast to 17% in developing countries [8]. In the latter, 53% of under-5 deaths are associated with LBW [9]. In Cameroon, 7% of children weigh less than 2.5 kg at birth, and in the North Region, which is one of the most affected by malnutrition, children with LBW represent 63.2% of children under 5 years old suffering from chronic malnutrition [10].

Given that the major cause of this problem stems from the feeding practices of women, it is recommended that healthy and adequate food consumption in pregnant women be encouraged [11]. The aim of this is to promote optimal nutrition of the foetus, through the advocacy for proper maternal nutritional care even before conception. However, if this measure is not observed in the developed countries, LBW remains a problem of public health in the developing countries [12]. This can be due to little interest shown in the nutritional follow-up of pregnant women during antenatal care, and the ignorance of the population as far as the nutritive value of local foods is concerned [13].

No study has clearly established the level of impact of food practices and the nutritional status of pregnant women on birth weight, in Cameroon in general, and in the most affected areas. The present work was set up based on these observations and has a general objective to evaluate the impact of the food

practices and nutritional status of pregnant women on infant birth weight in the Garoua 1 health district.

MATERIALS AND METHODS

Type and Period of the Study

This study was a descriptive cross-sectional study which lasted three months, from November 1st, 2018 to February 1st, 2019 in the three most attended health centres of the Garoua 1 health district: *Kolléré, Ouro-Kanadi* and *Souari.*

Participants to the study

The target population group was made up of all the pregnant women in the 3rd trimester of pregnancy, having attended their antenatal care (AC) in one of the aforementioned health centres. Women who had twin pregnancies were excluded. Sampling was done according to the non-probabilistic method meaning that the recruitment was consecutive among all pregnant women in line with the inclusion criteria. On this basis, 55 pregnant women were recruited as the sample.

Data collection

A questionnaire of 18 questions grouped into 2 sections was used to collect information. The first section focused on the identification of the women, and the second section contained socioeconomic and demographic characteristics. Information on AC was found in the medical records.

Anthropometric parameters

Weight was measured every month within the 3rd trimester of pregnancy. Knowing that there is a direct link between foetal development and weight gain during pregnancy, the latter was determined using equation 1.

$$\mathrm{TWG} = \mathrm{W}_2 - \mathrm{W}_1 \quad (1)$$

(TWG: Total Weight Gain in kg; W_2: Weight at the end of the pregnancy in kg; W_1: Weight at the beginning of the pregnancy in kg).

Weight and height at the beginning of the pregnancy were collected from medical files and Body Mass Index (BMI) at the beginning of the pregnancy determined using equation 2.

$$\mathrm{BMI} = \mathrm{W}/\mathrm{H}^2 \quad (2)$$

(BMI in kg/m^2; W: Weight at the beginning of the pregnancy in kg; H: Height in m).

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Babies were weighed immediately after childbirth using a mechanical scale for babies (precision 10g).

Evaluation of food practices

The 24-hour dietary recall method was used to assess food practices of women, especially the Individual Dietary Diversity Score (IDDS) providing information on the average number of food groups consumed, and the Food Consumption Frequency (FCF) showing the average number of meals consumed per day. All these assessment tools were gotten from the Guide for food diversity measurement designed based on seven food groups [14]. Individual Dietary Diversity Score (IDDS) is poor when it is ≤ 3 food groups, acceptable between 4 and 5 food groups, and good when it is ≥ 6. In the same way, FCF is weak when it is ≤ 2 meals/day, good between 3 and 4 meals, and high from 5 meals.

Statistical tools

The completed questionnaires were analysed using the software Sphinx Lexica version 5 and Microsoft Office 2016. The software Statgraphics Centurion XVI version 16.1.18 was used to do the khi2 test to determine correlations between study parameters. The criterion of statistical significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

Socioeconomic and demographic characteristics

The distribution of the studied sample according to characteristics evaluated is shown in Table 1. More than half of the women (69.1%) were between 20 and 34 years, the rest being under 20 (23.6%) or over 34 years (7.3%). Almost all these women were married (98.2%), 76.4% in monogamous and 21.8% in polygamous marriages. Concerning level of education, a high level of illiteracy among the participants was observed, where 32.7% had never been to school. Those who had gone to school stopped at primary (27.3%) and secondary levels (36.4%), with a meagre 3.6% having university education. It is also observed from Table 1 that no woman had attended the minimum of 6 AC recommended (1 per month from the fourth month up to delivery) [15]. Only 16.4% attended 4 to 5 AC, while the majority (74.5%) attended just 3 AC and 9.3% less than 3 AC throughout their pregnancy. More than three quarter (78.2%) of participants were housewives, about 7.2% were workers and 14.5% small traders.

Pregnancy out of recommended procreation age limits (20-35 years) presents more risks for the baby, including the risk of LBW [15]. This can be explained by the physiological immaturity of the bodies of very young mothers, and/or

insufficient energy reserves [16]. Thus, for 30.9% of pregnant women aged less than 20 or more than 35 years, the risk to have LBW infants is higher.

Regarding level of education, studies show that level of education has a significant influence on the nutritional status of pregnant and lactating women [17,18], and on infant birth weight [19], with the least educated being strongly at risk of nutrient deficiencies. Indeed, women with proper education are more informed on the use of available food resources than the illiterate ones [20]. Moreover, the most educated women are more interested in nutrition questions and the link between food and health [21]. Given that birth weight is related to the nutritional status of women, which is influenced by their level of education, and seeing that the study results show that 32.7% of women had no level of education, and 27.3% with a primary level, it can be said that the risk of LBW is present in these proportions of the study population.

Most of the women who took part in the survey were housewives (78.2%), which supposes that they did not have any income generating activity, implying a total dependence on their husbands for food provisions. A limited access to the resources can have major consequences such as food restrictions which may impair the nutritional status of the pregnant woman, and this could be more accentuated in polygamous homes where there is great dispersion of food resources due to the number of the household. About 22% of the studied population were in this situation.

No woman attended the minimum of 6 AC recommended (table 1). This can be explained firstly by the low number of medical structures in the Garoua 1 health district, leading to long waiting hours and secondly long distances to the health centres can be inconvenient for most women. Also, the illiterate women did not necessarily perceive the importance of AC, thus, the tendency for little or no motivation to attend AC. Considering that it is during AC that women receive counselling about their diet according to the pregnancy stage, a low number of AC can be harmful for the pregnant woman and the foetus [19,22]. This is because the woman does not gain from nutritional counselling intended in enabling her to manage the pregnancy and avoid a poor nutritional and health status that is known to cause Intra Uterine Growth Retardation (IUGR) and LBW.

All these socioeconomic and demographic parameters are closely linked. Early marriages as highly practiced in this part of the country has a major consequence on a large proportion of undereducated or uneducated young girls. This further leads to lack of competence needed to acquire decent jobs and have access to

resources, thereby making them housewives very early in life and totally financially dependent on the family head. All these increase the risk of nutrient deficiencies and health problems for the mother and her baby.

Food practices of pregnant women interviewed

With regards to FCF and IDDS of women, Table 2 reveals that a quarter of them consumed less than 3 meals/day and about 2/3 consumed from 1-2 food groups/day. This means that the majority (74.6%) of these women daily consumed an acceptable number of meals, but mostly non-diversified as represented by 67.3%.

Seeing that 21.8% of the pregnant women consumed only 2 meals/day, there, therefore, is a risk of LBW, and this risk increases for 3.6% who ate only a meal/day. The poor FCF is due to the skipping of meals as some skipped breakfast and/or lunch, and only ate by midday or in the evening. This may be due to nausea and tiredness often experienced by certain pregnant women. Nevertheless, poor FCF still remains a danger for foetal growth.

Concerning IDDS, Table 2 indicates that most of the surveyed women (68.2%) did not diversify their meals. In other words, they consumed foods only from the same and a limited number of food groups. This can be explained by the low economic level of most of the surveyed women. The purpose of IDDS is to reflect, instantaneously, the capacity of an individual to consume a diversity of foods [23]. Given that food should be consumed daily from approximately all food groups, frequently eating from a low number and specific food groups while neglecting others, these women and their babies could thus be at risk of nutritional deficiencies due to inadequate variety of nutrients.

Anthropometric parameters of women

Body Mass Index (BMI) and Total Weight Gain (TWG)

Body Mass Index of the women at the beginning of the pregnancy shown in Table 3 was used to assess their nutritional status at this stage of their pregnancy state. Results showed that 3/4 of pregnant women of the Garoua I health district had a normal weight at the beginning of the pregnancy, while 16.4% were underweight and 9.1% overweight. Thus 16.4% of these women (underweight) were at a high risk of having LBW babies, knowing that nutritional status of the woman prior the pregnancy might have serious consequences on the growth and development of the foetus [24,25].

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During pregnancy, BMI is no longer appropriate to assess the nutritional status of the woman, because many other parameters such as blood volume, placenta, foetus, mammary glands and others influence the body weight. Thus, the most suitable tool to evaluate nutritional status during pregnancy is weight gain. For good development of the foetus, it is recommended that a woman gains between 12.5-18 kg during the pregnancy if she is underweight at the beginning of pregnancy, between 11.5-16 kg if she has a normal weight, and 7-11.5 kg if she is overweight [26]. It, thus, arises from Table 3 that most underweight women (66.7%) did not reach the required weight gain. Among women having a normal weight, those who gained weight were 9.8%. In general, 18.2% of women (10 women/55) did not reach the recommended weight gain.

Many underweight women did not gain the weight necessary for a healthy pregnancy, and this can be explained by the fact that during the pregnancy, they continued with the poor feeding habits which they had before. As for the women with normal weight, inadequate weight gain may be due to food restrictions, because of the fear of gaining much weight and being unable to lose it after delivery, or having the baby grow too big and probably causing complications during delivery. They, therefore, tend to significantly reduce their food and calorie intake. Yet, poor nutritional status of the mother is the first cause of IUGR, and consequently, LBW in developing countries [27]. This risk is more accentuated for underweight women because the cause of LBW is double due to both a poor nutritional status before, and insufficient weight gain during the pregnancy.

Baby's birth weight

Within the period of study, 25.5% of babies had a LBW, and for 64.3% of them, the cause was IUGR while for 35.7%, the cause was related to a premature birth (table 4). In general, premature babies with a shortened gestation, as well as those having suffered from IUGR, are significantly underweight in contrast to children born full-term having suffered no issues during the pregnancy. A similar report has been done in a study on the repercussions of nutritional and socio-demographic status of pregnant women on the birth weight of their babies [28].

The results of Table 4 show that IUGR is the main cause LBW in the community of study, as represented by 2/3 of cases. In developing countries in general, IUGR is mainly due to a chronic malnutrition of a pregnant woman, the other risk factors being infections (particularly malaria), age of woman, weight gain during pregnancy, nutritional status prior to conception, food intake and chronic maternal pathologies (hypertension for example) [29]. Apart from chronic pathologies, all these risk factors were found in this sample of pregnant women.

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Relationship between food habits of women and birth weight

The relationship between LBW, IDDS and FCF is presented in Table 5, and this reveals that concerning IDDS, out of all babies born with a LBW, 50% were from women with a poor IDDS, 42.9% were from mothers having an acceptable IDDS, and only 7.1% from mothers with a good IDDS. Concerning FCF, the majority of children with a LBW (64.3%) were from women who consumed only 2 meals or less per day. For 21.4% and 14.3% of children with a LBW, the mothers, consumed 3 and 4 meals, respectively per day. Looking further, 100% (4/4 women) of those who consume only one meal per day, 38.5% (5/13) of those consuming only 2 meals per day, and 13.1% (5/38) with an intake of at least 3 meals/day had given birth to LBW babies.

The correlation ($p<0.05$) between LBW and IDDS indicates that the less the women diversify their food intake, the more they are at risk to give birth to LBW babies. It is the same with the significant correlation ($p<0.05$) between FCF and LBW which shows that the less a pregnant woman feeds daily, higher is the probability to give birth to a LBW baby. The results of Table 5 also indicate that many children having a satisfactory birth weight were from women consuming at least three meals per day. These observations show the importance of a balanced diet during pregnancy for good development of the foetus. It has been shown that the feeding habits of the women, in particular dietary diversity and FCF, are significant determinants of IUGR [28].

Relationship between nutritional status of women and birth weight

Table 6 presents the relationship between nutritional status of women and the birth weight of the baby. Among underweight women, 77.8% gave birth to LBW babies, against 22.8% who gave birth to babies with a normal weight. Among women with a normal weight, 17.1% gave birth to LBW babies, and 82.9% had babies with normal weight. No overweight woman gave life to a child with a LBW. Concerning TWG during pregnancy, among women who had not reached the appropriate weight gain, 100% of those who were underweight at the beginning of pregnancy had babies with LBW, in contrast to 75% of women having a normal weight. Concerning women who reached the required weight gain, 50% of those underweight gave birth to LBW babies versus 11.8% for those who had a normal weight.

It also arises from Table 6 that among women who had not reached appropriate weight gain during pregnancy, 90% gave birth to LBW babies, while only 11.1%

gave birth to LBW babies among women having gained a normal weight or more during pregnancy.

Relative Risk (RR) indicates that poor nutritional status (underweight) of the mother at the beginning of the pregnancy increased by 3.35 times the risk of LBW, and this risk is increased by 7.12 times in the case of insufficient weight gain during pregnancy. These results show that nutritional status of the mother has a significant impact on the growth of the foetus, and consequently on the birth weight as shown by several studies [30, 31, 32]. These results also agree with those of other works which highlighted the impact of nutritional status of the woman on the birth weight of the baby [24, 33, 34]. Thus, these two parameters must be taken into consideration at the beginning and throughout the pregnancy to avoid giving birth to fragile children who will generate additional costs to families already living in poverty.

Apart from the food practices and nutritional status of the woman, all the other studied parameters must be taken into account in the setting of studies on LBW, knowing that there are several factors leading to LBW infants: socio-demographic (maternal age, educational level and economic status) and antenatal care being very significant [35,36,37].

CONCLUSION

In conclusion, poor food practices, poor nutritional status of pregnant women and inadequate weight gain during pregnancy are strongly correlated to LBW in the health district of Garoua 1. Some factors such as under-schooling and the poor financial autonomy of women may also be associated to this situation. They must then be considered in the planning of nutrition interventions to alleviate LBW in that community and in the northern part of Cameroon in general. Moreover, the Ministry of public health should carry out public awareness campaigns and use incentives to encourage the pregnant women to improve their attendance of antenatal care or render AC visits easier for those women who cannot access them.

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Conflict of Interest

Authors do not have any conflict of interest to disclose.

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Contribution of authors

This work was carried out in collaboration among all authors. Author ENF designed the study and supervised the overall work. Author WDN structured and wrote the first draft of the manuscript. Author DDZ collected data in the field (in the hospital and at home). Authors AMD and BM supervised the work in the field. All the authors read and approved the final manuscript.

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Table 1: Socio-demographic characteristics of pregnant women

Parameters	Range	Number of women	Percentage (%)
Age (years)	≤19	13	23.6
	[20-34]	38	69.1
	≥35	4	7.3
Marital status	Married	54	98.2
	Divorcee	1	1.8
Matrimonial regime	Monogamy	42	76.4
	Polygamy	12	21.8
	None	1	1.8
Level of education	None	18	32.7
	Primary	15	27.3
	Secondary	20	36.4
	University	2	3.6
Number of AC*	[1-2]	5	9.1
	3	41	74.5
	[4-5]	9	16.4
Profession	Small trader	8	14.5
	Employee public sector	2	3.6
	Employee private sector	2	3.6
	Housewife	43	78.2

*AC: Antenatal Care

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Table 2: FCF and IDDS of the women*

Parameter	Range	Number of women	Percentage (%)
FCF	1 meal	2	3.6
	2 meals	12	21.8
	3 meals	35	63.7
	4 meals	6	10.9
IDDS	Poor	37	67.3
	Acceptable	16	29.1
	Good	2	3.6

*FCF: Food Consumption Frequency; IDDS: Individual Dietary Diversity Score

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Table 3: BMI and TWG of the women

Nutritional status (BMI)*	TWG** (kg)	Number of women	Percentage 1[a]	Percentage 2[b]
	<12.5	6	10.9	66.7
Underweight	[12.5-18]	2	3.6	22.2
(< 18.5 kg/m²)	>18	1	1.8	11.1
	Total	9	16.4	100
	<11.5	4	7.3	9.8
Normal weight	[11.5-16]	34	61.8	82.9
(18.5 – 24.9 kg/m²)	>16	3	5.4	7.3
	Total	41	74.5	100
	<7	0	0	0
Overweight	[7-11,5]	5	9.1	100
(24.9 - 30 kg/m²)	>11.5	0	0	0
	Total	5	9.1	100

*BMI at the beginning of the pregnancy; **TWG: Total Weight Gain during pregnancy; (a) Percentage according to total number of women (b) Percentage according to a range of BMI

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Table 4: Distribution of new-born babies according to their birth weight

Parameters	Range	Number of children	Percentage (%)
Weight of birth (kg)	<2.5	14	25.5
	>2.5	41	74.5
	Total	55	100
Low birth weight (<2.5 kg)	Premature baby	5	35.7
	IUGR	9	64.3
	Total	14	100

IUGR: Intra Uterine Growth Retardation

Table 5: Relationship between food habits (IDDS and FCF) and nutritional status (BMI) of pregnant women and LBW

Variables		Number of women	Number of babies				
			LBW n (%)	NBW n (%)	Total	Khi2	P
IDDS	Poor	29	7 (50)	22	29	16.1	0.00*
	Acceptable	23	6 (42.9)	17	23		
	Good	3	1 (7.1)	1	3		
FCF	1 meal	4	4 (28.6)	0	4	14.5	0.02*
	2 meals	13	5 (35.7)	8	13		
	3 meals	31	3 (21.4)	28	31		
	4 meals	7	2 (14.3)	5	7		

*Significant correlation between LBW, IDDS and FCF at P<0.05; IDDS: Individual Dietary Diversity Score; FCF: Food Consumption Frequency; LBW: Low Birth Weight; NBW: Normal Birth Weight

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Table 6: Relationship between BMI, weight gain and LBW

Nutritional status	Weight gain (kg)	Number of women	Number of babies		Khi2	P
			LBW n (%)	NBW n (%)		
Underweight	< 12.5	6	6 (100)	0 (0)		
	[12.5-18]	2	1 (50)	1 (50)		
	> 18	1	0 (0)	1 (100)		
	Total	9	7 (77.8)	2 (22.2)		
Normal weight	< 11.5	4	3 (75)	1 (25)	32.5	0.00*
	[11.5-16]	34	4 (11.8)	30 (88.2)		
	> 16	3	0 (0)	3 (100)		
	Total	41	7 (17.1)	34 (82.9)		
Overweight	< 7	0	0 (0)	0 (0)		
	[7-11.5]	5	0 (0)	5 (100)		
	>11.5	0	0 (0)	0 (0)		
	Total	5	0 (0)	5 (100)		

*Significant correlation between LBW, weight gain and BMI status at P<0.05; LBW: Low Birth Weight; NBW: Normal Birth Weight

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