

## Evaluation of the nutritional status and care of pregnant women in the Allada-Toffo-Zè health zone (Benin)

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### Abstract

This work aims to assess the nutritional status of pregnant women in the health zone of Allada-Toffo-Zè. It consisted of conducting an interview with pregnant women meeting the criteria of pregnant women and coming for prenatal consultation. During this study, 200 pregnant women were surveyed in health facilities in the health zone. The results showed that 80% of pregnant women have never received nutritional advice, which leads them to not control their diet. In addition, there is a relationship between the malnutrition of pregnant women and the age of pregnant women, and their profession. Indeed, pregnant women aged over 30 years are 1.85 times more malnourished than pregnant women under 20 years of age ( $p=0.007$ ). Also, resellers or shopkeepers are 1.49 times more malnourished than housewives ( $p=0.001$ ). Finally, weight and MUAC were associated with malnutrition in pregnant women. Therefore, pregnant women weighing more than 55 kg were malnourished than pregnant women weighing less than 55 kg ( $p=0.01$ ). Those whose MUAC greater than 24 cm were malnourished ( $p=0.003$ ).

**Keywords:** Nutritional status; Women; Pregnant; Consultation

### 1. Introduction

Malnutrition is a pathological condition resulting from the deficiency of one or more essential nutrients in the diet, or, conversely, from an excess of certain types of food. It is a major problem in most sub-Saharan African countries mainly among mothers and children (Anoni, 2017). During pregnancy and at each stage of the growth and development of the fetus, the needs of the mother-child couple change as well as the range of nutrients of maternal origin that it is necessary to provide. The mother's ability to provide these nutrients depends on the nature and extent of her reserves as well as the ability of her metabolism to create a nutrient environment suitable for each stage of fetal development (Weber et al., 2015). Problems related to malnutrition can have a significant influence on the nutritional status of pregnant women and on the health status of the child at birth or of the newborn. Subsequently, these children may present during their first years less physical growth, that is to say not meeting the conditions necessary for the expression of their genetic potential. Also, during adolescence, their pubertal growth may be delayed and diminished. Poverty, lack of education and insufficient food are factors known to play an important role in the nutritional status of women and their families in developing countries (Kabira et al., 1997). Pregnant women are more likely to give birth to low birth weight infants and to offer them less breast milk. The World Health Organization (WHO) estimates that the global rate of low birth weight is 15.5% worldwide, or 20 million newborns. The incidence of low birth weight infants is not uniform across the world; it is greater in Third World countries, about 16%, compared to that in developed countries, which is about 7%

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(UNICEF, 2004). In Africa, this incidence affects 14.3% of newborns and can even reach 18% in the Republic of Benin. Moreover, almost 35% of this problem contributes to the maintenance of infant mortality in the country (Fourn et al., 1999). Consequently, in developing countries, prevention of the incidence of low birth weight becomes important and requires special attention from the public health sector. It has been determined that prenatal nutritional interventions may have beneficial effects on the birth weight of children (Briley et al., 2002; Rush, 1981). In addition, a pregnant woman suffering from malnutrition runs an increased risk of complicated delivery, death from postpartum hemorrhage, miscarriage or stillbirth. Similarly, low maternal weight gain throughout pregnancy increases the risk for the child of being premature or of low birth weight (Han et al., 2011). Efforts to improve the nutritional health of mothers and children must be undertaken in order to solve the problem of malnutrition in underdeveloped developing countries. It is therefore urgent to assess the nutritional status of pregnant women in the Allada-Toffo-Zè health zone.

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## 2. Material and methods

### 2.1. Study framework

The study was carried out in the health zone of Allada-Toffo-Zè in the department of the commune of the Atlantic during the period of June-September 2022.

### 2.2. Material

The equipment used in this study consists of the following elements :

- A maintenance chart administered to pregnant women ;
- A scale, personal scale with a maximum capacity of 200 kg will be used to take the weights of the various pregnant women ;
- A measuring rod graduated in millimeters and with a maximum range of 220 cm will be used to take the sizes of these women in a standing position ;
- A tape measure to measure arm circumference ;
- A health record of the mother will be consulted to obtain information on the woman as well as the constants.

### 2.3. Methods

#### 2.3.1. Data collection techniques

To collect the data needed for the study, the following techniques are used :

- An interview with pregnant women meeting the criteria for pregnant women and coming to a prenatal consultation during the study period ;
- A documentary review of the files or maternal cards of pregnant women on the follow-up of the pregnancy.

#### 2.3.2. Data analysis tools

EXCEL and SPSS software are used for the various analyzes and data processing.

#### 2.3.3. Data processing and analysis

Data processing was done using EXCEL, SPSS and WORD software. The data is entered using Excel software and then exported to SPSS software. The statistical analysis of the results was carried out on EXCEL and SPSS software which was used on the one hand for the presentation of graphs and tables; and on the other hand, for the calculation of percentages and averages. Also, SPSS software was used for the correlation test.

In this study, a bivariate analysis through which we tried to highlight the different factors associated with malnutrition in pregnant women (dependent variable) was carried out. To do this, we used cross tables with the prevalence ratio, the 95% confidence interval.

#### 2.3.4. Possible ethical and administrative considerations

This study is conducted in the strict framework of respect for the principles of research for scientific purposes. Before carrying out the survey, prior authorization was requested from the coordinating doctor of the health zone responsible for the health center in the study area. For each interview, it was a question of first obtaining the informed consent of the target women. These target women are informed about the objectives of the survey. They are given the opportunity

to ask clarifying questions throughout the survey. They will have the choice to refuse to participate in the operation and even to resign in the middle of an investigation. The information from this survey is collected and processed in complete anonymity to guarantee confidentiality.

### 2.3.5. Study population

The study population consists of all pregnant women who came for a prenatal consultation during the study period.

### 2.3.6. Sampling

Sampling was exhaustive considering all registered pregnant women covering the study period. Women who agreed to take part in the study are recruited.

### 2.3.7. Anthropometric measurements of the mother

The pregnant woman was weighed and measured to estimate weight (in kg) and height (in meters). The BMI of mothers is obtained using the following formula: weight over height squared ( $W/T^2$ ) expressed in  $\text{Kg/m}^2$ . And arm circumference.

## 3. Results

### 3.1. Point of the survey

Table I shows the distribution of pregnant women surveyed by health facility.

A total of 200 pregnant women were surveyed in health facilities (**HF**) in the Allada-Toffo-Zè health zone. All respondents gave their informed consent, i.e. a participation rate of 100%.

**Table 1** Distribution of pregnant women surveyed by ZS-ATZ health facilities ( HF) in 2022

FS	Workforce obtained	Percentage (%)
HF ADJAN	10	5.00
HF AGBANOU	7	3.50
HF AGON	6	3.00
HF AHOUANNOZOUN	10	5.00
HF AHOZONNOUDE	10	5.00
HF ATTOGON	10	5.00
HF DAME	8	4.00
HF DAWE	9	4.50
HF DODJI BATA	10	5.00
HF HEKANME	10	5.00
HF HOUEGBO	10	5.00
HF KOUNDOUIPOE	10	5.00
HF LISSEGAZOUN	10	5.00
HF SEDJE DENOU	10	5.00
HF SEKOU	10	5.00
HF SOYO	10	5.00
HF TANGBO	10	5.00
HF TOGOU DO	10	5.00

HF ALLADA CENTRE	10	5.00
HF TOFFO	10	5.00
HF ZE	10	5.00
TOTAL	200	100.0

### 3.2. Sociodemographic characteristics of respondents

The distribution of respondents according to their socio-demographic characteristics is presented in Table II. The average age of pregnant women was 25.04 years  $\pm$  4.838 years with extremes of 16 years and 37 years.

**Table 2** Distribution of respondents according to their socio-demographic characteristics in the ZS-ATZ in 2022 (n=200)

	Fréquency	
	Absolute	Relative (%)
Age Range (years)		
<20	24	12.00
[20-30 [	132	66.00
$\geq$ 30	44	22.00
Profession of the pregnant		
Household	60	30.00
Reseller/Trader	62	31.00
Craftswoman	49	24.50
Student	4	2.00
Apprentice	13	6.50
Official	12	6.00
Occupation of the spouses		
Artisan	151	75.50
Dealer/Trader	17	8.50
student	6	3.00
Official	26	13.00

### 3.3. Type of consultation, month of pregnancy and number of CPNs already performed by pregnant women

Among the pregnant women surveyed :

- 85% had come for a prenatal consultation, i.e. 170 out of 200;
- 15% had come for a curative consultation, i.e. 30 out of 200;
- 33% and 43% were between 0 and 3 months of pregnancy respectively for prenatal and curative consultation;
- 42% and 43% were between 4 and 6 months of pregnancy respectively for prenatal and curative consultation;
- 24% and 13% were between 7 and 9 months of pregnancy respectively for prenatal and curative consultation;
- 1% and 0% were at 9 months or more of pregnancy respectively for prenatal and curative consultation.

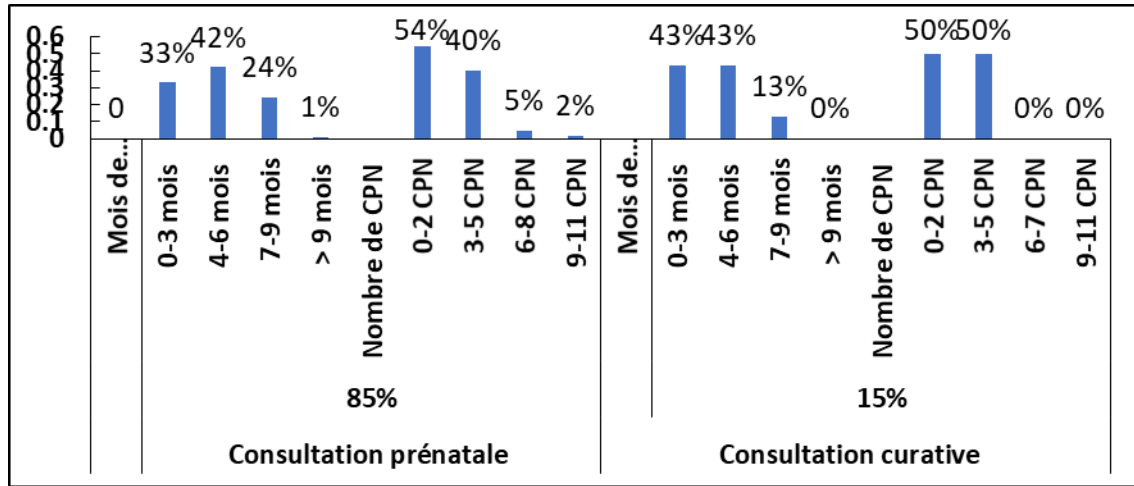


Figure 1 Month of pregnancy and number of ANC performed by pregnant women in ZS-ATZ 2022

### 3.4. Nutrition advice to pregnant women by the health worker

The percentage of pregnant women who did or did not receive nutritional advice from the midwife in the study area is shown in Figure 2. From the analysis of these results, it should be noted that among the pregnant women surveyed, only 10% said they had received nutritional advice from midwives.

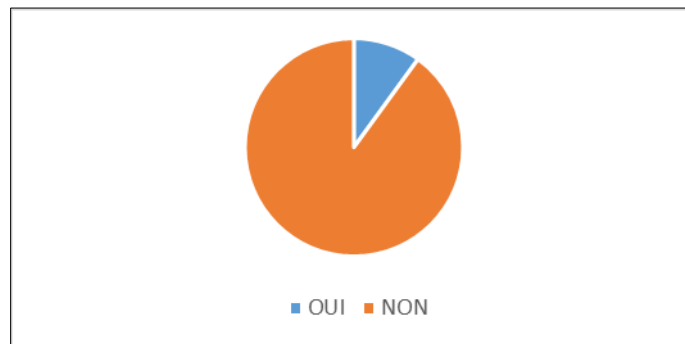


Figure 2 Percentage of pregnant women having received or not receiving nutritional advice from the midwife in the ZS-ATZ in 2022

### 3.5. Number of pregnant women who control their diet during pregnancy

Figure 3 presents the percentage of pregnant women surveyed who do or do not control their diet in the study area. Of the 200 pregnant women surveyed, 45 said they controlled their diet, i.e. 23% of pregnant women.

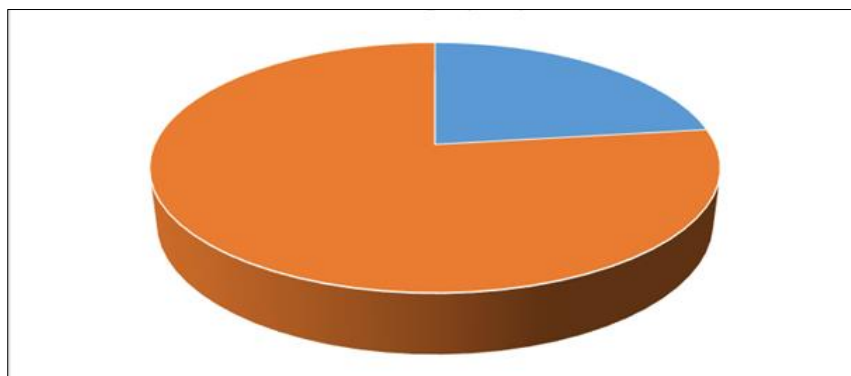


Figure 3 Percentage of pregnant women surveyed who do or do not control their diet in ZS-ATZ 2022

### 3.6. Respondents' anthropometric measurements

The table above presented the weight, height and MUAC of the pregnant women surveyed by section

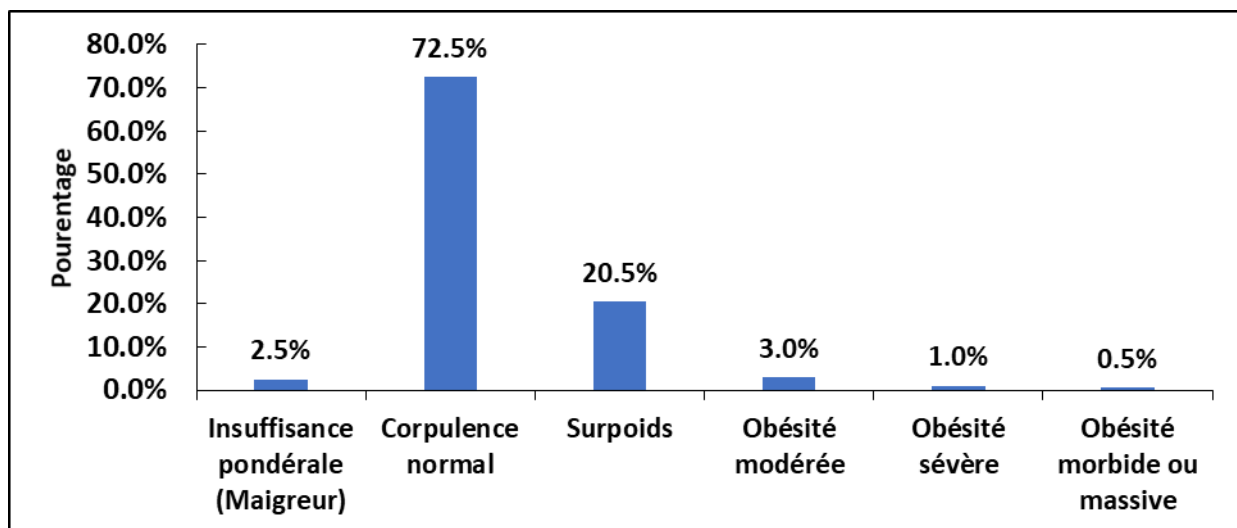
**Table 3** Distribution of respondents according to their anthropometric measurements in the ZS-ATZ in 2022 (n=200)

	Fréquence	
	Absolute	Relative (%)
Weight (kg)		
<55	45	22.50
≥55	155	77.50
Size (m)		
<1,55	40	20.00
≥1,55	160	80.00
Arm circumference (cm)		
<24	46	23.00
≥24	154	77.00

### 3.7. Body Mass Index (BMI) of pregnant women surveyed

The nutritional status of the pregnant women surveyed according to their BMI is presented in Figure 4. According to the calculations of the BMI of the pregnant women, the average BMI of the pregnant women was 23.43 kg/m<sup>2</sup> ±3.23 kg/m<sup>2</sup>. The BMI of the pregnant women in our study is between 17.28 kg/m<sup>2</sup> and 39.73 kg/m<sup>2</sup>. The most represented BMI was 20.95 kg/m<sup>2</sup>.

The figure opposite shows us the interpretation of the nutritional status of pregnant women according to their BMI



**Figure 4** Nutritional status of pregnant women surveyed according to their BMI in the ZS-ATZ in 2022

### 3.8. Frequency of the nutritional status of pregnant women

Table IV shows the frequency of malnutrition in pregnant women. Of the 200 surveyed, 145 of the pregnant women surveyed had a normal state of nutrition (normal corpulence), i.e. a percentage of 72.5%; 55 of the respondents had a state of malnutrition (Low weight (Thinness), Overweight, Moderate obesity, Severe obesity and Morbid or massive obesity) i.e. a percentage of 27.5% (Table IV). The frequency of the state of malnutrition among pregnant women in ZS-Allada-Toffo-Zè in 2022 is 27.5% with a 95% CI = [21.44%; 34.24%].

**Table 4** Frequency of malnutrition among pregnant women surveyed in the ZS-ATZ in 2022 (n=200)

	Effectif	Fréquence	IC <sub>95%</sub>
Etat de nutrition normale	145	72.5%	65.76-78.56
Etat de malnutrition	55	27.5%	21.44-34.24

### 3.9. Sociodemographic characteristics of respondents

Table V presents the data relating to the relationship between the socio-demographic characteristics of the respondents and the frequency of malnutrition in pregnant women.

**Table 5** Relationship between socio-demographic characteristics and malnutrition of pregnant women in ZS-ATZ in 2022 (n=200)

	Total N=200	Malnutrition n=55	%	RP	[IC 95% RP]	P-value
Age Range (years)						
<20	24	6	25.00	1.00	0.00	0.00
[20-30 [	132	23	22.73	1.03	0.80-1.32	0.80
≥30	44	26	59.09	0.54	0.35-0.83	0.007
Profession of the pregnant						
Household	60	10	30.00	1.00	0.00	-
Reseller/Trader	62	27	43.55	0.67	0.52-0.86	0.001
Craftswoman	49	13	26.53	1.04	0.82-1,2	0.68
Student	4	1	1.82	1.07	0.59-1.93	1.00
Apprentice	13	1	1.82	1.31	1.04-1.65	0.18
Official	12	3	25.00	1.07	0.74-1.54	1.00
Occupation of the spouses						
Artisan	151	37	24.50	1.00	0.00	0.00
Dealer/trader	17	6	35.29	0.85	0.59-1.23	0.33
student	6	3	50.00	0.66	0.29-1.48	0.35
Official	26	9	34.62	0.86	0.64-1.16	0.27

### 3.10. Nutrition advice given by a health worker and diet control

According to the bivariate analysis, pregnant women who did not control their diet were 1.2 times more likely to be malnourished than pregnant women who controlled their diet (p=0.04).

**Table 6** Relationship between the roles of midwives and the malnutrition of pregnant women in the ZS-ATZ in 2022 (n=200)

	Total N=200	Malnutrition n=55	%	RP	[IC 95% RP]	P-value
Have received nutritional advice						
Yes	19	5	26.32	1.00	0.00	0.00
No	181	50	27.62	0.93	0.32-2.73	0.90
Food control						
Yes	45	6	13.33	1.00	0.00	0.00
No	155	43	27.74	0.83	0.71-0.96	0.04

### 3.11. Respondents' anthropometric measurements

Table VII presents the data relating to the relationship between the anthropometric measurements of respondents and malnutrition.

**Table 7** Relationship between the anthropometric measurements of respondents and the malnutrition of pregnant women in the ZS-ATZ in 2022 (n=200)

	Total N=200	Malnutrition n=55	%	RP	[IC 95% RP]	P-value
Weight (kg)						
<55	45	6	13.33	1.00	0.00	0.00
≥55	155	49	31.61	0.78	0.67-0.92	0.01
Size (m)						
<1,55	40	8	20.00	1.00	0.00	0.00
≥1,55	160	47	29.38	0.88	0.73-1.06	0.23
Arm circumference (cm)						
<24	46	5	10.87	1.00	0.00	0.00
≥24	154	50	32.47	0.75	0.65-0.87	0.003

### 3.12. Summary of associated factors

**Table 8** Summary table of factors associated with malnutrition in pregnant women surveyed in the ZS-ATZ in 2022

Factors	Variables	Terms	RP	[IC 95% RP]
Sociodemographic characteristics	Age (years)	<20 ans (Réf)	1	-
		≥30 ans	0.54	0.35-0.83
	Occupation	Household (Réf)	1.00	0.00
		Reseller/Trader	0.67	0.52-0.86
Food control	Food control	Yes (Réf)	1.00	0.00
		No	0.83	0.71-0.96
Anthropometric measurements	Weight(kg)	Yes (Réf)	1.00	0.00
		No	0.78	0.67-0.92
	Arm circumference (cm)	Yes (Réf)	1.00	0.00
		No	0.75	0.65-0.87

Ref=Reference; RP=Prevalence Ratio; 95%CI=95% Confidence Interval



#### 4. Discussion

The age group of [20-30]years is the most representative in our study with a proportion of 66%. Resellers or traders represent a proportion of 31%. More than half of our study population has a primary education level (53.91%). More than 80% of respondents come for prenatal consultation, which testifies to the level of awareness of the latter. In addition, this study shows that 80% of pregnant women have never received nutritional advice, which leads them to not control their diet.

According to the bivariate analysis, there is an association between the malnutrition of the pregnant women and the age of the pregnant women, and their profession. Indeed, pregnant women aged over 30 years are 1.85 times more likely to be malnourished than pregnant women under 20 years of age ( $p=0.007$ ). In addition, resellers or shopkeepers are 1.49 times more malnourished than housewives ( $p=0.001$ ).

In addition, weight and MUAC were associated with malnutrition in pregnant women. Thus, pregnant women weighing more than 55 kg were malnourished than pregnant women weighing less than 55 kg ( $p=0.01$ ). Those whose MUAC less than 24 cm were malnourished ( $p=0.003$ ). For pregnant women a MUAC <230 mm (moderate risk) is recommended as stated in the Sphere Project standards (2004).

Indeed, a poor diet of women of childbearing age can lead to infertility, spontaneous abortions during the first weeks of pregnancy due to poor placental or embryonic implantation, pre-eclampsia, impaired fetal growth or even long-term effects on the child's life (Cetin et al., 2010). Similarly, a MUAC <240 mm implies a risk of fetal growth retardation. The use of this admission threshold in feeding programs would therefore make it possible to target the problem of malnutrition of both the mother and the fetus, by contributing to an improvement in birth weight. A MUAC <210mm is often used in emergency response. The choice should be made based on the proportion of women in each category and the resources available (WHO, 2013). The nutrition of the mother before pregnancy therefore deserves greater attention because nutritional factors at the very beginning of pregnancy, and also before pregnancy, play a key role in the installation of the fetal growth path (Ramachandran, 2015; Kumarasamy et al., 2005). Fetal growth is strongly regulated by nutrient intakes that affect placental function. Both the size and efficiency of the placenta and fetal growth can be affected by the nutritional status of the mother before and very early in pregnancy, which has a greater effect than maternal nutrition at a later stage of pregnancy. This confirms the importance of maternal nutritional factors before and at the very beginning of pregnancy on fetal growth, and potentially postnatal growth and body phenotype. Maternal nutrition before and during pregnancy is particularly important for a favorable pregnancy outcome in many developing countries, where women start pregnancies undernourished and their nutritional status worsens during pregnancy due to increased nutrient requirements (Agrahar-Murugkar and Pal, 2004).

The Community Therapeutic Care (TCC) approach is proposed in this study as well as the management of folic acid, iron and vitamin A. Indeed, a woman who had a good diet during adolescence and during preconception, however, needs specific micronutrient intakes during pregnancy for her health and that of the fetus. Dietary intakes of folic acid, iron, calcium and zinc are particularly important for optimal pregnancy outcome, especially in malnourished women (Murphy et al., 2014). Folic acid supplementation during the first trimester of gestation significantly reduces neural tube defects (Ramakrishna et al., 2012). Also, vitamin and mineral supplementation is associated with a reduced risk of low birth weight, especially for gestational age, and prematurity. In addition, anemia is a serious public health problem in most developing countries. A meta-analysis carried out to investigate the relationship between anemia and pregnancy outcome in low-income and middle-income countries, revealed that there is a very strongly significant relationship between anemia during pregnancy and the risk of low birth weight, prematurity, perinatal and neonatal mortality (Rahman et al., 2016). A major feature for iron balance during pregnancy is that iron requirements are not evenly distributed throughout its duration. The exponential growth of the fetus implies that iron requirements are almost negligible in the first trimester and that more than 80% relate to the last trimester. Total daily iron requirements, including baseline iron losses (0.8 mg), increase during pregnancy from 0.8 mg to about 10 mg during the last 6 weeks of pregnancy (Hallberg, 1988). Studies have shown that prenatal calcium supplementation reduces the risk of Low Birth Weight (LBW), zinc, omega 3 and multiple micronutrient supplementation before delivery, respectively reduces the risk of prematurity (<37 weeks), very premature infants (<34 weeks) and FPN. Also, currently implemented interventions that attempt to balance protein-energy balance and iron and folic acid supplementation during pregnancy have been shown to significantly reduce the risk of LBW by approximately 20-30% in controlled environments (Ramakrishna et al., 2014).

## 5. Conclusion

A suitable and balanced diet during pregnancy is essential to cover nutritional needs and is positively associated with the health of the mother, the fetus and the child. In southern Benin, the dietary diversity of women did not change before and during pregnancy, but the food groups used in consumption sometimes differ between preconception and the first trimester of pregnancy on the one hand and from one trimester to another. on the other hand. This diversity is influenced by the parity of the woman and her socio-economic level. Although most nutrient intakes do not meet the recommended intakes, they are higher before pregnancy than during pregnancy. This revealed that by taking into account the factors determining the choice of food within the population, an awareness management based on the role and the composition of the different groups could contribute to a better dietary diversity of women and thus to a better impact of nutritional interventions. To support and make this awareness-raising effective, it is necessary to have a national nutritional composition table and standardized and validated collection tools.

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## Compliance with ethical standards

### *Disclosure of conflict of interest*

No conflict of interest to be disclosed.

### *Statement of ethical approval*

If studies involve use of animal/human subject, authors must give appropriate statement of ethical approval. If not applicable then mention 'The present research work does not contain any studies performed on animals/humans subjects by any of the authors'.

### *Statement of informed consent*

Informed consent was obtained from all individual participants included in the study.

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