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ORIGINAL ARTICLE

Nutritional knowledge and behavior of a sample of Algerian pregnant women

Amina Bayazid *, **Fatiha Larouci, Wahiba Hammoulia**

Department of Pharmacy, Faculty of Medicine, Djillali Liabes University, Sidi-bel-Abbes, Algeria. bayazid.amina@hotmail.com - fatihalarouci97@gmail.com - wahibahammoulia@gmail.com

Abstract

Background: A woman's diet during pregnancy can significantly affect her health, as well as her child's future development and well-being. **Aims:** Our objective was to assess the nutrition knowledge and behavior of a sample of pregnant women. **Subjects and Methods:** A cross-sectional study was carried out using a questionnaire among 100 pregnant women attending an antenatal clinic in Sidi-Bel-Abbes city (Algeria) from December 2019 to March 2020. **Results:** About 46% of women reported some changes in their eating habits during pregnancy. Some of them increased their consumption of certain foods like fruits (35%), vegetables (15%), dairy products (17%), etc. Others decreased their consumption of red meats (27%), offal (26%), raw milk-based cheeses (11%), pâté (10%), eggs (10%), salt (9%), sugary drinks (8%), poultry (8%), fish (6%), coffee (4%) and tea (4%). Women's reasons for these dietary changes were: spontaneous food cravings (52.2%), knowledge about food infectious risks (23.9%), and being recommended by a health professional (15.2%). Almost 33% of women benefited from nutritional counseling, which was mainly communicated orally (12.2% received a booklet or a brochure). Sources of nutrition-related information were: health professionals (69.6%), the media (15.2%), and family and friends (13.2%). About 63% of women had a pre-conceptional consultation. Almost 4% of them were immunized against toxoplasmosis. Another 19% were well-informed about its food-borne infectious risks. However, only 11% took the necessary precautions to avoid it. About 23% of pregnant women made some dietary restrictions due to their awareness of the infectious food risks related to listeriosis and their adverse effects on pregnancy. **Conclusions:** More attention should be paid to nutritional guidance among pregnant women for a healthy outcome for both mother and baby. This study emphasizes the importance of dietary counseling by attending doctors as an integral part of antenatal care.

Article information

* **Corresponding author:** Amina Bayazid. Department of Pharmacy, Faculty of Medicine, Boulevard Colonel Othmane, Sidi-Bel-Abbes, Algeria. Tel: +213772313693. Email: bayazid.amina@hotmail.com

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1 Introduction

It is well documented that inadequate maternal nutrition results in increased risks of short-term consequences such as intrauterine growth restriction (IUGR), low birth weight, preterm birth, prenatal and infant mortality, and morbidity. Moreover, excessive intake of nutrients during pregnancy can lead to some pregnancy complications (such as preeclampsia, gestational diabetes, macrosomia, and a higher prevalence of cesarean section) [1,2].

Moreover, it's also important to mention that certain foods can put pregnant women at a higher risk for food-borne diseases like uncooked meat, seafood, unpasteurized dairy products, etc. The consequences of foodborne illness can be particularly devastating during pregnancy because both the woman and her fetus are at risk [3].

Consequently, adequate knowledge and understanding of nutritional intake and dietary recommendations can help women to achieve a harmonious development of the fetus and healthy weight gain during pregnancy [4].

Nonetheless, despite the availability of pregnancy-specific healthy eating guidelines to guide dietary behavior, the dietary intakes of pregnant women do not appear to meet the recommendations [3]. This has been corroborated by several studies, one of which was recently carried out in western Algeria, where the majority of pregnant women did not comply with the nutritional recommendations regarding the intake of macronutrients (proteins, carbohydrates, lipids) and micronutrients (vitamins, minerals, and trace elements) [5].

Even further, another study conducted in the same region revealed that the majority (83.1%) of pregnant women took dietary supplements in order to fill their nutritional intake deficiencies [6] instead of opting for a varied and balanced diet that can provide them with all the nutrients and micronutrients they need.

According to the World Health Organization (WHO), nutritional advice was found to hold strong evidence as a mainstay intervention to improve dietary intake in pregnancy, reducing the risk of preterm birth by 54% [7].

Knowledge regarding a range of nutritional issues in pregnant women has previously been explored and published [8]. These issues include knowledge about nutritional requirements for pregnant women, infectious risk foods, etc., as well as the associated health risk of consuming said contaminated foods [8].

In this context, we considered it appropriate to conduct a study to assess the pregnancy nutrition knowledge, and sources of nutritional information used by pregnant women, as well as to explore the dietary behavior of pregnant women in Algeria.

2 Subjects and Methods

2.1 Subjects

In this cross-sectional study, 100 women in their first, second, or third trimester of pregnancy were recruited from a mother-child specialized hospital in Sidi-Bel-Abbès city (western Algeria), between December 2019 and March 2020. Before including these women in our study, the pregnancy was initially confirmed by the attending gynecologist (by ultrasound, urine, or blood beta-human chorionic gonadotropin "βHCG)". Women who were younger than 18 years of age were excluded. Informed consent has been obtained from all participants.

2.2 Methods

2.2.1 Data collection

All the data collected were obtained through face-to-face interviews. The questionnaire consisted of several questions divided into different sections: general information (age, pregnancy trimester, number of children, level of education, professional status), anthropometry (weight, height), and dietary information (dietary changes during pregnancy, food supplement use, etc.).

2.2.2 Statistical analysis

Data were analyzed using the Statistical Package for Social Sciences (SPSS) 22.0. Quantitative variables were expressed as mean ± standard deviation (SD) and qualitative variables as percentages.

3 Results

3.1 Sample description

Table 1 shows the sociodemographic and anthropometric characteristics of pregnant women. The age of the women who participated in the study ranged from 19 to 42 years old with an average age of 30 ± 6.6 years. Nearly 60% of pregnant women had a normal body mass index (BMI) before pregnancy. About 35% of the population was overweight or obese.

As for the gestation trimester, 7% of women were in the first trimester of pregnancy, 20% in the second trimester, and about 70% in the third trimester of pregnancy. More than half of the pregnant women were primiparous. About 68% of the interviewed women had a secondary or an intermediate school level, while 19% of the women had a lower school level (elementary). Almost 13% of them had a university degree. Only 14% of the women who cooperated in the survey were employed (Table 1).

3.2 Number of meals consumed per day

The number of meals consumed by pregnant women per day allows us to know whether this consumption is insufficient, sufficient, or even more than the norm. Figure 1 shows the number of meals taken per day by the participants.

Table 1: Sociodemographic and anthropometric characteristics of pregnant women

Characteristics	(n)	(%)
Maternal age (years)		
< 25 years	32	32
≥ 25 years	68	68
Pre-pregnancy BMI Category (kg/m²)		
- Under weight: BMI < 18.5	5	5
- Normal: 18.5 ≤ BMI ≤24.9	60	60
- Overweight: 25 ≤BMI ≤29.9	24	24
- Obese: BMI ≥ 30	11	11
Pregnancy trimester		
- First Trimester	7	7
- Second Trimester	20	20
- Third Trimester	73	73
Number of children		
- One	58	58
- Two or more	42	42
Educational Level		
- Elementary	19	19
- Intermediate - Secondary	68	68
- Bachelor's degree or higher	13	13
Professional status		
- Employee	14	14
- Housewife	86	86

BMI: body mass index

During the survey, 3.3% of pregnant women consumed 2 meals per day, and 19.5% ate 3 meals per day. More than half of the women ate 4 meals a day, and about 19% of the study population ate 5 to 6 meals a day (breakfast, a mid-morning snack, lunch, mid-afternoon snack, dinner, and an after-dinner snack). In general, the majority of pregnant women ate 3 to 4 meals per day (Figure 1).

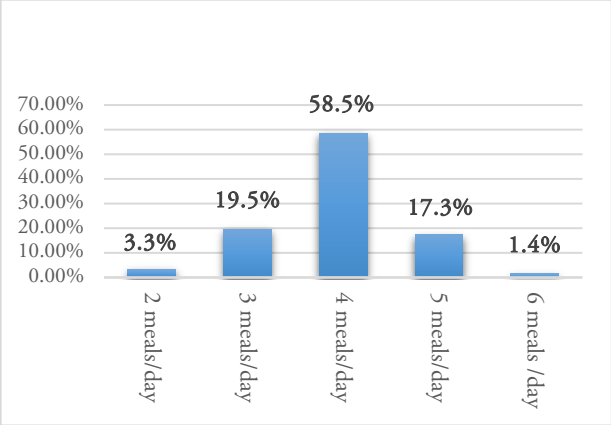

Figure 1: Number of meals consumed per day

3.3 Dietary changes

About 46% of pregnant women reported making changes to their eating habits during pregnancy, while more than 54% of surveyed women declared no change in their eating habits during pregnancy. Table 2 represents the change in consumption of certain food groups (giving the percentage of women whose consumption has increased, for whom consumption has decreased, and for which it has remained unchanged).

Participants mentioned that they increased their consumption of certain foods (Table 2): more fruits (35%), more vegetables (15%), more red meats (10%), more offal (9%), more dairy products (17%), more sweets (10%), etc.

There was also a decrease in the consumption of other foods like fewer red meats (27%), less offal (26%), fewer raw milk-based cheeses (11%), fewer pâté (10%), fewer eggs (10%), fewer salt (9%), fewer sugary drinks (8%), fewer fats (8%), less poultry (8%), fewer fishes (6%), less coffee (4%) and less tea (4%), less bread (4%).

3.4 Women's reasons for dietary changes

Figure 2 represents women's reasons for dietary changes. The answers were as follows: spontaneous food cravings 52.2%, knowledge about food infectious risks 23.9%, recommended by a health professional (doctor, midwife, or pharmacist) 15.2%, advised by friends and family 4.3%, managing weight gain 4.3%.

Table 2: Dietary changes by pregnant women

Type of food	Decreased consumption (%)	Increased consumption (%)	Unchanged consumption (%)
Red meats	27	10	63
Offal	26	9	65
Pâté	10	0	90
Poultry	8	10	82
Fish	6	4	90
Fruits	3	35	60
Vegetables	1	15	84
Fats	8	2	90
Sugary drinks	8	6	86
Sweets / confectionery	3	10	87
Dairy products	2	17	81
Raw milk-based cheese	11	0	89
Eggs	10	9	81
Bread	4	5	91
Salt	9	0	91
Coffee	4	0	96
Tea	4	0	96

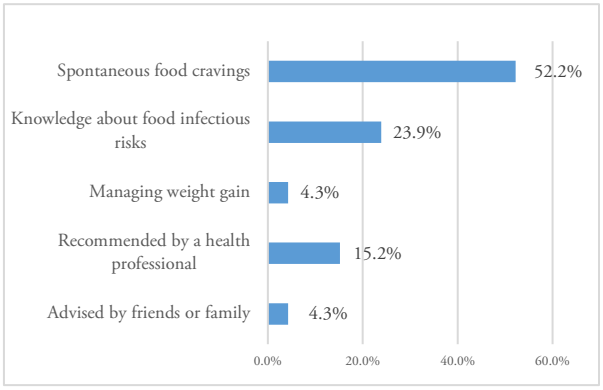

Figure 2: Women's reasons for dietary changes

3.5 Nutritional counseling

Table 3 represents the acquisition/sources of nutrition information. Almost 33% of the women had benefited from nutritional counseling about nutrition during pregnancy.

The results we obtained on nutritional counseling indicate that no woman consulted a nutritionist. The nutrition-related information sources were (Table 3) : health professionals (69.6%), the media (15.2%), family and friends (13.2%).

As shown in Figure 3 which represents the means of communicating nutritional information to pregnant women, this information was communicated primarily orally (about 12.2 % of the participants had received a booklet, a brochure, or a leaflet about nutrition during pregnancy).

Table 3: Acquisition/ Sources of nutrition information

	(%)
Acquisition of nutrition information	
Yes	33
No	67
If yes, Sources of nutrition information	
Family/ Friends	13.2
Media (Internet, television, magazine, social media)	15.2
Pharmacist	27.2
Gynecologist	42.4
Others	2

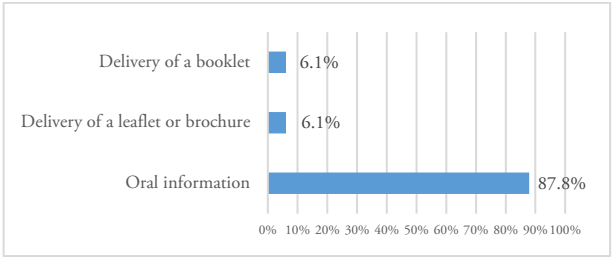

Figure 3: Means of communicating nutritional information to pregnant women

3.6 Foodborne toxoplasmosis and listeriosis

Figure 4 represents the toxoplasmosis immunization status of these pregnant women and the precautionary behaviors against toxoplasmosis and listeriosis. It shows that 4% of women were immunized against toxoplasmosis, while the majority of pregnant women were not (about 96%).

In this survey, 19% of women were well informed about the risk of toxoplasmosis, but only 11% of them took the necessary precautions against the food-borne infectious risks of toxoplasmosis (restriction on raw and undercooked meat, unwashed fruits and vegetables, etc.).

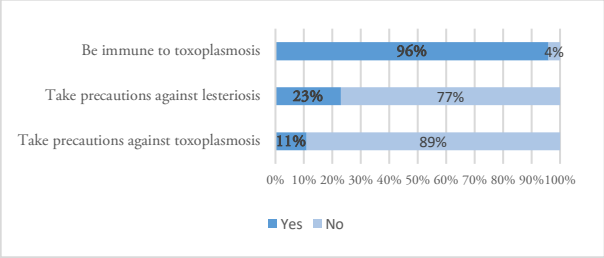

Figure 4: Toxoplasmosis immunization and precautionary behaviors against toxoplasmosis and listeriosis

About 23% of pregnant women made some dietary restrictions (pâté, raw milk-based cheeses, bloody and undercooked meats… etc.) due to their awareness of the infectious food risks related to listeriosis and their adverse effects on pregnancy.

3.7 Pre-conceptional consultation

About 63% of the women in this survey had conducted a pre-conceptional consultation with a health professional to discuss a maternity project.

3.8 Dietary supplements intake

In this study, 76% of pregnant women were taking dietary supplements. The most popular dietary supplements were: Gestarelle G3® 24.3%, Zanitra® 18.9%, Ferro sanol® 13.5%, and Genesia® 9.5%.

4 Discussion

Although the knowledge and habits of pregnant women greatly affect the quality of their nutritional intake, this topic remains very poorly documented in Algeria. Our nutritional survey is intended to assess the nutritional knowledge and behavior of a population of pregnant women living in Sidi-Bel-Abbes city.

Half of the pregnant women have reported changes in their nutritional behavior during their pregnancies. Cravings are most often for sweet foods (chocolate, sweets, fruit, drinks, cakes, etc.) and disgusts rather fish, meat, coffee, and cheese, which have rather pronounced smells and tastes. During pregnancy, some foods require special attention. We will discuss them below: Concerning coffee and tea which are both sources of high caffeine intake, WHO recommend for pregnant women with high daily caffeine intake (more than 300 mg per day), to lower daily caffeine intake during pregnancy in order to reduce the risk of pregnancy loss and low birth weight neonates. Indeed, during pregnancy, caffeine clearance from the mother's blood slows down significantly. Results from some observational studies suggest that excess intake of caffeine may be associated with growth restriction, reduced birth weight, preterm birth, or stillbirth [9].

With regard to fish, which are a source of several nutrients that are important for healthy fetal development, guidelines from Australia, Europe, and the USA encourage fish consumption during pregnancy [10-12]. The potential for contamination by heavy metals, as well as the risk of listeriosis, requires careful consideration of the shaping of dietary messages related to fish intake during pregnancy. It is important that the type of fish consumed is low in mercury [13].

Regular intake of liver, although generally not a problem in areas with retinol deficiency, can also cause toxicity owing to its high content of vitamin A [14]. The Finnish Food Safety Authority and the National Health Service recommend avoiding the consumption of liver during pregnancy given that it is rich in vitamin A [15].

Because of the teratogenic effects secondary to excessive vitamin A intake, the WHO recommends as safe during pregnancy a maximum dose of up to 10,000 IU daily or 25,000 IU weekly after the first 60 days of gestation [14].

Pregnancy can lead to unconscious psychological mechanisms of regression, amphibology, and desires. Thus, sweet cravings could be motivated by the fact that their consumption causes a sensation of pleasure. Disgust and changes in food perception may be due to olfactory exacerbation associated with increased levels of hormones during pregnancy. The most frequently encountered disgusts would tend to prevent the food-borne infectious risk during pregnancy because they affect so-called "at-risk" foods. However, their non-consumption exposes them to the risk of deficiencies and a decrease in the sensation of satiety, the latter being caused in particular by protein intake.

Food poisoning during the first three months of pregnancy could cause miscarriage. At a later stage of pregnancy, the pregnant woman could give birth prematurely [16]. This is why it is so important for women to monitor their diet during pregnancy. The epidemiological situation of toxoplasmosis in Algeria is not well documented. In fact, one study showed that the seroprevalence of toxoplasmosis in pregnant women is 47.8% in Annaba city [16], which is higher than the seroprevalence found by Houmadi *et al.* in the Marrakech-Safi region, Morocco (22.88%) [17]. Foodborne risks exist despite the fact that, in our culinary habits, we consume well-cooked meat. However, many Algerian women are active and have lunch outside their homes and are therefore at risk of contaminating themselves by ingestion of other foodstuffs (sandwiches, pâté, etc.) [16].

In this survey, 96% of women were found to be unimmunized against toxoplasmosis, but only 11% of them made dietary changes because of their knowledge of food infectious risks due to toxoplasmosis. Moreover, only 23% of these women took precautions against listeriosis. These results show that there is a

lack of knowledge about toxoplasmosis and listeriosis and their infectious risks to pregnant women and their fetuses. Our findings also showed that only 35% and 15% of women had respectively increased their fruit and vegetable intakes during pregnancy (Table 2), despite the fact that they are good sources of key nutrients like vitamins, minerals, trace elements, and fibers, etc. Besides, 17% of these women increased their consumption of dairy products, while 8% of them decreased their poultry consumption (Table 2). In fact, a recent study conducted in Morocco reported a statistically significant association between low birth weight and low consumption of meats, eggs, dairy products, and vegetables [18].

In addition, this low consumption of food groups, essential for the good evolution of pregnancy, could be explained by the cost of these foods. Several studies in the literature have indeed demonstrated the effect of socio-economic status on the quality of diet.

Approximately 63% of the interviewed women had conducted a pre-conceptional consultation with a health care professional. Pre-conceptional consultation is a good way to get back to the basics of a healthy diet. This consultation is also an appropriate time for the health professional to talk about future pregnancy and to remind patients that physical activity is healthy and can be maintained during pregnancy if it is mild, moderate, and appropriate. In addition, women will be able to be sensitized to the harms of excessive weight gain during pregnancy and therefore to the need to control weight gain during pregnancy without particular guilt. This consultation is even more important for overweight patients. It would be interesting to inform them of the benefits of losing weight before being pregnant. This is where pre-conceptional consultation takes its full interest. However, a Cochrane review, from 4 studies and 2,300 patients, evaluated the impact of a pre-conceptional consultation to identify behavioral risk factors associated with lifestyle counseling and to reduce modifiable risk factors such as toxic consumption and undernutrition. They did not find any improvement regarding prematurity, congenital malformations, or small weights for gestational age [19].

The primary source of nutrition-related information for pregnant women is the health professional (gynecologist and pharmacist), for 69.6% of them (Table 3). Next came the media for 15.2% of women and finally their entourages for 13.2%. Several hypotheses may explain these differences. First of all, the population of this study is more specific, since it is pregnant women. During pregnancy, the health professional is consulted more often, so it is logical that women discuss the subject of nutrition with them. This would explain the role of the consultant as the primary source of nutrition-related information for pregnant women in the study. However, a significant proportion of women prefer information that they find through the media and that is passed on to them by people around them. The media, therefore, occupy a significant place. However, it is important to ensure the reliability of the information received by these means, especially with regard to social networks on which there is erroneous information about nutrition and food. Besides, the majority of women in this population do not have higher education. This finding indicates that these women have little access to reliable and scientific information and will have more difficulty seeking information on their own, especially in terms of nutrition. Thus, the presence of a dietician in the gynecology department is necessary to advise women on a balanced diet for a healthy pregnancy. The authors acknowledge some limitations, like the absence of similar national studies to compare our findings with, and the COVID-19 outbreak that obliged us to interrupt the survey, which explains the small sample size.

In the end, although the study was carried out on a small scale, it provided a global view of the nutritional behavior and knowledge of a sample of Algerian pregnant women to be compared with other studies on a larger scale.

5 Conclusion

Maternal nutrition is considered an important pillar of the outcome of pregnancy for both mother and child. Women often make dietary changes during pregnancy. However, dietary modifications and the reasons for these changes are not well studied. This study described the dietary changes made by a population of pregnant women, the reasons for these dietary changes, and assessed their knowledge and awareness about nutrition.

This study showed that some women made changes to reduce their intake of some foods that could harm their pregnancy, but were less likely to increase their intake of foods that provide key nutrients. These findings give insight into how and why women make changes to their diets during pregnancy, and researchers and practitioners can use this information to develop practical interventions to help women optimize their dietary intake during pregnancy.

Author contribution: A.B conceived and designed the study, and undertook the literature research. All authors participated in the experiment and data acquisition. W.H. and F.L. performed the data analysis. A.B. carried out the statistical analysis, prepared, reviewed, and drafted the manuscript. All authors approved the final version before submission. All authors have read and agreed to the published version of the manuscript.
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ORCID
Amina BAYAZID: https://orcid.org/0000-0002-3764-7989

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