

Influence of nutritional counseling on pregnant women in rural communities.

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Abstract— *The effect of nutritional counseling during pregnancy was evaluate. Thirty-six pregnant women from two rural communities were intervened. Anthropometric measurements were taken, and they answered the frequency food questionnaire, and. At the beginning of the research, more than 50% of the participants were having an imbalanced diet regarding macronutrients. After the nutritional counseling, changes in their diet were observed, although not all changes resulted to be significant ($p>0.05$). Nutritional counseling does have an influence on pregnant women nutrition; however, it must be considered a cultural, social and economic context of people to have a greater impact.*

Keywords— *nutrition, foods, pregnancy, health promotion, rural community.*

I. INTRODUCTION

The nutrition estate of a pregnant woman may have an important influence on the health results of the fetus and the mother. The need to evaluate the growth and development of the fetus has become a priority due to the number of children with prenatal growth alterations mainly in developing countries [1].

Among the multiple risk factors that interfere in the intrauterine growth of the fetus, it has been determined that the nutritional factors represented by both the preconception weight as well as the mother's gestational weight gain have a greater influence on the product's weight [2]. A deficient weight gain during pregnancy according to the nutritional maternal estate, allows cataloging the mother of having a high risk of premature labor and a low weight newborn. In addition, the risk of congenital anomalies increases, as well as conditioning the pancreatic development, the hormonal status of the fetus and the concentration of biomarkers at the birth of diabetes mellitus and metabolic syndrome [3].

Pregnancy is a crucial stage, there are very important physiological changes, where food is one of the most important factors for health and well being of a pregnant woman for adequate growth and development of the baby.[4,5]

The energetic cost and the nutrients during pregnancy have been evaluated by the subcommittee in the tenth edition of the Recommended Dietary Allowances (RDA) within the National Academy of Sciences of the U.S.A. The quantitative increase of the energetic and nutritional needs of the pregnant woman starts from the second trimester thanks to the metabolic adaptations that are produced [6]. Regarding the daily energy intake, it should never overpass 2.500-2.600 kcal/day and in no case, it is recommended that a caloric intake lower than 1.700 kcal/day [7].

It is considered that there are many beliefs about the nutrition of a pregnant woman. Many ideas without a medical support that may harm the health and the nutritional state of both the mother and the fetus. This phenomenon exists in urban and rural areas and it is more evident in women with a low educational level [8]. Political strategies have created social support programs so Mexican families can have a better life quality. Those programs have about 5 million families all over the country in rural and urban areas [9]. This program conditions the economic support to the participation of people in health sessions or medical care with the purpose of reducing the main nutritional problems suffered by people of different sectors such as overweight, anemia and micronutrient deficiency [10]. However, in spite of the efforts made to stop nutritional problems mainly in women and children (one of the most vulnerable sectors), deaths still occur in those groups because of nutritional oversights.

Pregnant women must pay special attention to consuming foods rich in energy and proteins, as well as those that have vitamins and minerals, mainly calcium, iron, folic acid, and iodine.[11,12]

Nutritional education and counseling are focused on improving the quality of the diet by teaching women which are the foods and amounts they must eat for optimal nutrition.

Different studies carried out with pregnant women show that an educational intervention during pregnancy can be effective to improve their health and nutrition.[13-15]

The nutritional evaluation of the pregnant woman consists of initial evaluation and follow up. The initial evaluation will allow determining the nutritional state of the pregnant woman and estimating the possible risk of a low weight newborn, delay of intrauterine growth and a small newborn for gestational age [16]. The purpose of evaluating the follow up is to provide nutritional counseling to pregnant women, as well as complying with the instructions given at the initial evaluation.

In this research, it was evaluated the effect on nutritional counseling on pregnant women living in rural areas. This aims at improving their food intake and therefore their nutritional state to decrease complications during pregnancy related to malnutrition and/or overweight. This document is a template. An electronic copy can be downloaded from the conference website. For questions on paper guidelines, please contact the conference publications committee as indicated on the conference website. Information about final paper submission is available from the conference website.

II. MATERIAL AND METHODS

A. Sample

The type of study was quasi-experimental, a cross-sectional, before and after study. It was a convenience sample with 36 pregnant women who met the following criteria: between 16 and

40 years old, healthy women, single fetus pregnancy, with no more than 13 weeks of gestation. Two rural community were studied. There were 15 women from the community 1 and 21 women from community 2. It was taken into account that none of them were participating in nutrition programs nor micronutrient supplements.

B. Dietary intake

The participants answered a food frequency questionnaire validated by the Mexican population before and after an educational intervention. The consumed food portions were specified with models, geometrical figures and a photo album with real size home utensils. The food frequency questionnaires were added to the Nutricloud [17] platform for their analysis. It has the necessary tools to identify the food frequency, the energy, the quality index of the diet based on the characteristics of the right diet established by the Mexican Official Standard 043 which establishes the criteria to provide nutritional counseling.

C. Anthropometric indicators

Once the expectant mother was included in the project, it was evaluated the weight (SECA® weighing scale model 813, precision=100 grams) and size (SECA® portable stadiometer model 206, precision=0.1 cm) by using conventional techniques [18,19]. The weeks of gestation and the weight gain will be analyzed in the database GestationalWeightGain of the Intergrowth21 platform. The weight gain during pregnancy will also be estimated according to the suggestions of the Institute of Medicine (U.S.A.) [20]

D. Nutritional counseling

The nutritional counseling consisted of 20 sessions, distributed in one session per week, of one hour each session, during 20 weeks. Topics like the biochemistry of food, the importance of macronutrients during pregnancy, the importance of micronutrients during pregnancy, exercising during pregnancy, myths and realities of cravings during pregnancy and gestational weight gain, were tackled. Nutritional counseling was carried out by health personnel who received previous training. During the sessions, there were also exercises for pregnant women and food preparation workshops; besides, brochures with relevant information were given to the participants.

E. Data analysis and processing

The data analysis and processing were carried out in the SPSS software, version 19.0, except that, for the dietary intake, it was used a specialized platform like the one previously described. The statistical test Wicoxon was used to obtain the significance ($p < 0.05$). An easy way to comply with the conference paper formatting requirements is to use this document as a template and simply type your text into it.

III. RESULTS

A. Anthropometric evaluation

Table 1 shows the percentages of pregnant women who presented low, normal or high weight gain, according to their anthropometric measurements and their gestation weeks. It is observed that more than 45% of pregnant women had a normal weight gain in both communities. However, overweight women were also considered (33.3%).

TABLE I

Frequency and percentage of pregnant women according to their weight.					
Community 1					
Low		Normal		Hight	
3	20%	7	46.6%	5	33.3%
Community 2					
Low		Normal		Hight	
3	14.2%	11	52.4%	7	33.3%

B.Evaluation of dietary intake.

The results of the analysis of the macronutrients present in the diet of the participants from the two rural communities are shown in Table 2. It is observed that more than 50% of pregnant women who participated had an unbalanced diet regarding all macronutrients. After the educational intervention, only women from the community 2 had significant differences ($p < 0.05$) in lipids, carbohydrates, and proteins intake. On the other hand, there was an improvement in fiber intake in all participants, with a significant change ($p < 0.05$).

TABLE II

Frequency and percentage of pregnant women according to macronutrient intake, before and after nutritional counseling										
Macronutrients	Community 1					Community 2				
	Pre-nutritional counseling		Post-nutritional counseling		p-value	Pre-nutritional counseling		Post-nutritional counseling		p-value
	f	%	f	%		f	%	f	%	
Lipids										
Balance	4	26.7	3	20	0.317	0	0	6	28.6	0.031
Unbalance	11	73.3	12	80		21	100	15	71.4	
Proteins										
Balance	5	33.3	3	20	0.157	10	47.6	16	76.2	0.016
Unbalance	10	66.7	12	80		11	52.4	5	23.8	
Carbohydrates										
Balance	6	40	7	46.7	0.317	2	9.5	6	28.6	0.004

Unbalance	9	60	8	53.3		19	90.5	15	71.4	
Fiber										
Very low-low	14	93.3	10	66.7	0.046	12	57.1	7	33.3	0.046
Sufficient	1	6.67	5	33.3		9	42.9	14	66.7	

Table 3 shows the micronutrient intake (iron, calcium, sodium) besides water intake. Before the nutritional intervention, it is observed a clear difference in calcium and iron intake among participants from both communities. In women from the community 2 prevails enough intake of these micronutrients, while more than 70% of women from the community 1 have a very low to low intake. However, regarding the portion of sodium intake stands out that 95.2% of women from the community 2 have an elevated to very elevated intake, compared to women from the community 1 where only 46.7% present this type of intake. Regarding water intake, more than 50% of women presented an intake that goes from low to very low. After the educational intervention, significant changes were observed in the calcium, iron and sodium intake of pregnant women from the community 2 ($p < 0.05$), while in women from community 1 it was observed a considerable water intake. However, in this group of women, it was observed a moderate intake of sodium, but the change was not statistically significant ($p > 0.05$).

TABLE III

Frequency and percentage of pregnant women according to micronutrient and water intake, before and after nutritional counseling										
Micronutrients	Community 1					Community 2				
	Pre-nutritional counseling		Post-nutritional counseling		p-valor	Pre-nutritional counseling		Post-nutritional counseling		p-valor
Calcium	f	%	f	%		f	%	f	%	
Very low-low	14	93.3	11	73.33	0.083	7	33.3	1	4.58	0.039
Sufficient	1	6.67	4	26.67		14	66.7	20	95.2	
Iron										
Very low-low	11	73.33	11	73.33	1	9	42.9	1	4.8	0.008
Sufficient	4	26.67	4	26.67		12	57.1	20	95.2	
Sodium										
Moderate	8	53.3	11	73.33	0.083	1	4.8	5	23.8	0.149
High-very high	7	46.7	4	26.67		20	95.2	16	76.2	
Water										

Very low-low	12	80	5	33.33	0.008	13	61.9	7	25.3	0.011
Sufficient	3	20	10	66.67		8	38.1	14	66.7	

Table 4 shows the estimation of daily intake by food subgroup. More than 50% of women from the community 1 have a regular-good intake of fruits and vegetables, cereals and legumes, and it remained that way after the counseling. Pregnant women from the other community had a very low or low intake of fruits, vegetables, and cereals, nevertheless, it was possible to improve their intake after the intervention ($p>0.05$). Regarding the intake of saturated and polyunsaturated fats, more than 60% of all participants presented a high or very high intake before the educational support, highlighting that 100% of pregnant women of the community 2 had a high-very high intake of saturated fats before and after the nutritional counseling.

TABLE IV

Frequency and percentage of women according to consumption by food group, before and after nutritional counseling.										
Food group	Community 1					Community 2				
	Pre-nutritional counseling		Post-nutritional counseling		p-value	Pre-nutritional counseling		Post-nutritional counseling		p-value
	f	%	f	%		f	%	f	%	
Fruits and vegetable										
Very low-low	5	33.3	0	0	0.025	21	100	13	61.9	0.016
Regular-good	10	66.7	15	100		0	0	8	38.1	
Cereals										
Very low-low	3	20	8	53.3	0.025	17	81	11	52.4	0.023
Regular-good	12	80	7	46.7		4	19	10	47.6	
Legumes										
Very low-low	2	13.3	4	26.7	0.157	6	28.6	0	0	0.063
Regular-good	13	86.7	11	73.3		15	71.4	21	100	
Saturated Fats										
Moderate	1	6.67	8	53.3	0.008	0	0	0	0	1
High-very high	14	93.3	7	46.7		21	100	21	100	
Polyunsaturated Fats										

Moderate	6	40	2	13.3	0.046	3	14.28	9	42.9	0.014
High-very high	9	60	13	86.7		18	85.71	12	57.1	

Table 5 shows how sufficient is the energy consumed through the nutrition of pregnant women who were studied. It was found that before the nutritional counseling, 26.7% of women from the community 1 present a deficient intake lower than 50% of the daily caloric intake, while only 20% had a sufficient intake. However, after the intervention, it was observed that 80% had a deficient intake, while 20% of people kept a sufficient intake. In the case of pregnant women from the community 2, it is observed that 42.9% of them exceed in more than 50% of the energy required per day. After nutritional education, 52.4% had a sufficient intake.

TABLE V

Frequency and Percentage of pregnant women according to their intake of Kcal, before and after the nutritional advice										
	Community 1					Community 2				
	Pre-nutritional counseling		Post-nutritional counseling		p-value	Pre-nutritional counseling		Post-nutritional counseling		p-value
	F	%	F	%		F	%	F	%	
Deficient in 50%.	3	20	6	40	0.065	1	4.8	1	4.8	0.64
Deficient in more than 50%.	4	26.7	6	40		1	4.8	1	4.8	
Exceed in more than 50%	1	6.7	0	0		9	42.9	4	19	
Exceed in less than 50%.	4	26.7	0	0		3	14.3	4	19	
Sufficient intake	3	20	3	20		7	33.3	11	52.4	
Total	15	100	15	100			100	1	100	

IV. DISCUSSION

Overweight and obesity have become a public health problem which entails complications during pregnancy, birth and postpartum, generating risk for the mother and the fetus, over all in developing countries. There are few studies that show the impact that implementing a nutritional plan has on the control of gestational weight gain; nevertheless, techniques used in successful interventions involve physical activity and counseling from a nutritionist,

complementing with motivation on weight control, feedback on the progress and continuous follow-up. With this type of strategies, it has been obtained an increase in fruit and vegetable intake and a notorious decrease in sugar intake. Together with the implementation of physical activity, it is achieved that 24.5% of patients stop being sedentary [21].

In this research, physical activity was not implemented in the participants, this was maybe a factor of not observing significant changes in the nutritional state of all participants, as every participant had a sedentary lifestyle. Besides, the bad nutritional habits of the participants were exposed due to their long-established diet based on fast food available in the region, rich in fat and carbohydrates. In spite of this situation, participants from the community 2 managed to have a higher intake of fruit, vegetables, and legumes; besides, participants with a diet balanced in lipids and proteins, significantly increased. In studies where a nutritional education has been taught to pregnant women, it has been observed an increase of energy and of protein intake [12-14], although it is recommended to have personalized counseling to strictly monitor the needs of each participant and to have a protein supplement to see better results in their intake.

This research work showed the obvious difference that exists between women from one community and the other. Participants from the community 1 presented less significant changes in their nutrition, highlighting a poor intake of micronutrients like calcium and iron. Studies reveal that the sufficient intake of micronutrients during pregnancy prevent a low weight in the newborn and prevent premature births [14,22]. Dietary supplements with iron and folates are more common in an intervention to improve the nutritional state of pregnant women. It has been shown that supplements with iron in women during their gestational stage reduce 70% of anemia at the end and reduce 19% of the rate of having a low weight newborn [23]. In addition, mixtures of micronutrients have been tested in pregnant women in developing countries as it is common to find deficiencies in more micronutrients, and it has been reported a decrease of 11-13% of low-weight newborns and premature births. However, the effect on anemia prevalence during pregnancy and at the end of pregnancy has a better result by treating it only with iron [11,24]. On the other hand, the study suggests that calcium supplements during pregnancy could decrease hypertension disorders during gestation [25].

The substantial difference between both communities could possibly be because of the social context that surrounds them. According to the study conducted in Australia, few women eat recommended foods, intake nutrients, nor have the recommended levels of activity because of social, economic and personal factors [26]. Therefore, it is recommended to have personalized counseling.

It was reported that 4 out of 6 women had some change in their nutrition; mostly a decrease in sugar and/or lipids. In contrast, they find hard to eliminate sodas, bread or candies. This reaffirms the need of considering that nutrition is a process in which diverse social dimensions interfere and one of them is nutritional culture shared by a family or the group that surrounds them, where, in order for a nutritional plan to work. It is necessary to consider the social dimensions of nutrition, otherwise, the nutritional plans will be quite unsuccessful leading to quitting the diet [27].

IV. CONCLUSION

To change nutritional habits with the purpose of improving the nutritional estate of a person, it is necessary to follow a complex process. The reasons why few women manage to follow

the recommended nutritional and physical activity guidelines during pregnancy are not clear. Although knowledge is considered an essential first step to change a behavior, it may not be enough to change. Health professionals who have constant contact with pregnant women may play an important role in educating and supporting the intentions and efforts of women to have a healthy lifestyle. However, it is recommended to give individual support in order to identify the nutritional needs of each participant and give particular counseling according to their social, cultural and economic context.

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