



ORIGINAL ARTICLE

Predictive factors for nutritional behavior among pregnant women attending antenatal care clinic in 6th of October City

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Keywords

Pregnancy • Nutrition • Life-style behavior • Eating habits • Antenatal care

Summary

Background. Good maternal nutrition during pregnancy is important to ensure health for both the mother and the foetus. This study aimed to assess nutritional knowledge and behavior among a group of Egyptian pregnant women in addition to identify the factors influencing both their nutritional knowledge and behavior.

Methods. This comparative cross sectional study included 300 pregnant women attending the antenatal care clinics in 6th of October University private hospital and El-Hussary primary health care (PHC) unit. The data was collected through a modified nutritional survey that was translated from Spanish to Arabic and revised by language experts for clarity.

Results. Almost all of the women attending the private hospital were university educated while about half of the women attending the PHC unit were graduated from technical education. In general, the level of knowledge about food requirements of both groups was satisfactory good; however, neither of them fulfilled

the WHO recommendations of food intake during pregnancy or the optimum number of meals per day. The mean of random blood glucose was higher among the women attending the PHC unit; the BMI, mid arm circumference and subcutaneous fat were higher among the same group as well. In regard to fulfilling the WHO recommended servings per day, only starch and fat items were fulfilled by both groups, whereas the other three items (vegetables, fruits and dairy products) were merely included in the diets of both groups.

Conclusions. Healthy behavior among pregnant women in both group were influenced by their educational level, occupation as well as their pre-gestational BMI. Those were the only three significant predictive factors, where women with higher education showed an active lifestyle. In addition, women starting with normal BMI before pregnancy had better healthy behaviours including the choice of healthy diets.

Introduction

Maternal under-nutrition, including macro- and micronutrient deficiencies, is a significant public health problem in many developing countries [1]. Malnutrition in pregnancy not only has an ill effect on the newborn, but also impairs the mother's own health. When the pregnant woman's diet does not supply the required nutrients for her needs and for those of the fetus, the fetal requirements are met by withdrawing these from the tissues of the pregnant mother. This tissue depletion weakens the mother and increases the probability of serious complications [2]. Thus, good maternal nutrition during pregnancy is important to ensure health for the mother and the growing fetus. This presupposes a diet with sufficient energy, with a variety of nutrients, minerals, and vitamins, and the mother's avoidance of toxins and contaminants [3].

Poor quality diet during pregnancy has been found to be associated with maternal excess weight gain, pre-eclampsia, preterm birth or even miscarriage. In addition, excess weight gain and imbalanced diet, particularly among obese women during pregnancy

have been identified as risk factors for abnormal glucose tolerance [4].

Poor infant outcomes have also been linked with poor maternal nutrition. These include inadequate development, low birth weight and an increased risk of developing chronic diseases later in life adult diseases proposed to have a fetal origin, and linked with nutrition during pregnancy, include cardiovascular diseases, diabetes and issues associated with bone mass formation [4].

Women's knowledge, attitudes, and practices concerning nutritional issues related to pregnancy vary depending on level of education, age, and social class [5]. In Egypt, most of the women take their knowledge from neighbors and this makes an environment of misconceptions and myths [6]. That is why the long standing unfinished agenda of under nutrition in developing countries now co-exists with a different type of malnutrition-obesity. Egypt like other developing countries is battling with this double burden of malnutrition [7].

WHO has issued a new series of recommendations to improve the quality of antenatal care in order to reduce risk of still births and pregnancy complications and give women a positive pregnancy experience, one

of its core contents is the nutrient needs in pregnancy with special enforcement on the application of these recommendations in the developing countries and among poor communities [8].

Few studies have explored factors related to maternal nutrition and weight gain during pregnancy, including barriers and cultural beliefs as drivers of food consumption [9]. Consequently, the lack of published data in this area raises the need for studying the nutritional behavior among Egyptian pregnant women. No previous study in Egypt (according to literature) investigated the possible predictive factors for Nutrition among pregnant women.

AIM OF THE STUDY

To assess nutritional knowledge and behavior among a group of Egyptian pregnant women in addition to identify the factors influencing their nutritional knowledge and behavior.

Methods

A comparative cross-sectional study was carried out in 6th of October City in two settings:

- Family Medicine Unit (El-Hussary PHC Unit) a public clinic in 6th of October City;
- University Private Hospital Clinic (October 6th Private University Hospital Clinic).

Data Collection took 3 months from January to April 2017, and the total number of the study population was 300 pregnant women in reproductive age.

Convenient sample was drawn from both public and private clinics.

Sample size was calculated using PASS[®] version 11 Program [10], setting the confidence level at 95%, the margin of error at 0.05, and the power (1-β) at 0.8. Assuming that the distribution response is 50% among study population, taking in consideration 20% drop out rate, the needed sample size was 300 pregnant women.

Firstly, approval from the Research Ethical Committee Board (Faculty of Medicine, Ain Shams University) was obtained. Thereafter, administrative approval from the Directors of El-Hussary Family Medicine Unit and Private Hospital Clinic have been taken. Questionnaire used was anonymous and confidentially of data was assured.

Data was collected through a modified valid interview nutritional survey questionnaire [11]. It was translated from Spanish to Arabic and revised by language experts for clarity and absence of misinterpretation.

A pilot study was conducted on 15% of the sample size (n = 45), to identify the clarity of the questions and test its validity and reliability where some modifications were made based on participants' feedback. Instrument reliability was tested, where Cronbach's alpha was more than 0.7 for all items.

1. Interview questionnaire to assess nutrition knowledge and dieting behavior during pregnancy. Main components items were:

- general characteristics (personal, obstetric data);

- general health status for the mother;
- current dietary habits;
- food frequency;
- knowledge regarding nutrition needs during pregnancy (energy intake - nutrients supplementation);
- optimal nutrition items in the WHO 2016 antenatal care guidelines [8].

2. Nutritional assessment:

- anthropometric measures: height, current pregnant women weight, body mass index (BMI), Mid Upper Arm Circumference (MUAC), triceps subcutaneous fat;
- laboratory analysis measures: hemoglobin level by gm/dl and random blood sugar.

STATISTICAL ANALYSIS

First, the following descriptive analysis was done: frequency, percentages, mean and standard deviation (SD). Thereafter, a comparison was done using Student t-test for quantitative variables and Fisher exact test for qualitative variables. The adjusted predictive factors were obtained by logistic regression analysis. All variables in the interview questionnaire were considered as possible candidates for the final model. P values lower than 0.05 are considered statistically significant. Data was collected and statistically analyzed using SPSS package for windows (Statistical Package for Social Science) program version 20, IBM Inc, 2011.

Results

The present study was conducted among a total of 300 pregnant women attending the Family Medicine Unit (El-Hussary unit) in 6th October City, and university private hospital clinic (October 6 University). Educational level and age in years were studied and shown in Table I. The mean age of the sample from the private hospital was 26.96 ± 3.937 , most of them (99.3%) were university educated, while that for the sample from the PHC unit was 26.80 ± 5.684 where nearly half of them were graduated from technical education (skills diploma) and about third of them were illiterate (27.3%). Current pregnancy details – including gestational age, number of foetuses and gravidity – as well as the obstetric history of the participating mothers were studied during their antenatal care visits and are shown in Table II. There was a statistically significant difference between numbers of foetuses in both groups. Almost all of the women in both the private hospital and the PHC unit had a single fetus, 92.7% and 98.0% respectively. Less than half of the studied women in the private hospital were pregnant with their first pregnancy (47.3%) while in PHC unit group it was third of the participants (33.3%). There was a statistically significant relation between both groups and proximity between pregnancies, gravidity, past history of low birth weight and number of children with P values of 0.001, 0.001, 0.009 and 0.000 respectively. Gestational age and number of miscarriages

in both groups were not statistically significant with p values of 0.081 and 0.281 respectively.

Anthropometric measurements [current weight, preconceptional weight, height, BMI, MUAC and triceps subcutaneous fat] of both groups were studied along with the laboratory results of random blood sugar and hemoglobin levels (Tab. III). There was a statistical significance between height, BMI, mid arm circumference and haemoglobin level in both groups as the P values were 0.000, 0.024, 0.000 and 0.000 respectively. Women attending the private hospital showed a slightly less pregestational weight, current weight, BMI and MUAC in comparison with women attending the PHC unit. Triceps subcutaneous fat measuring was statistically insignificant. There was a statistically significant relationship between random blood glucose in different groups as the mean of random blood glucose among women in the private hospital group was 91.70 ± 22.110 and that of the PHC unit group was significantly higher (93.88 ± 24.021); the data calculated was taken from only 293 participants.

Regarding dietary habits nearly half (44%) of the private hospital participants have three meals per day and regularly have breakfast as well while nearly 72% of the participating women in the PHC unit were taking two

meals per day and regularly had their breakfast. More than half of the studied women (60%) in the private hospital had regular multivitamins intake, while only about one third (36.7%) of the studied women attending the PHC unit did. More than half of the group from the private hospital (63%) were taking regular iron supplements during their pregnancy, while just about one third (35.3%) of the women in the PHC unit did the same.

There was a statistical insignificance difference between both groups regarding the consumption of food rich in prebiotics with p value of 0.11. As per the use of butter, about three quarters (76.7%) of the studied women from the private hospital denied using it compared to 94.7% of the women attending the PHC unit. Almost all of the women from both groups reported using sun flower oil in their diet.

Table IV shows that nearly half (45.3%) of the studied women in the private hospital had the right knowledge of daily carbohydrates requirements, compared with only 10% of the women in the PHC unit group did. Moreover, more than three quarters (78%) of those in private hospital had the right knowledge about daily requirement of vegetables and fruits, whereas only about half (56%) of those in the PHC unit had this

Tab. I. General characteristics of studied women during their antenatal care visits.

Variable/ Category		Groups of study		Statistical test	P-value
		Private hospital (n = 150)	PHC unit (n =150)		
Educational level	Illiterate	-	41 (27.3%)	$\chi^2 = 293.027$	0.000
	Primary	-	26 (17.3%)		
	Preparatory	-	17 (11.3%)		
	Diplom	-	62 (41.3%)		
	Secondary	1 (0.7%)	3 (2.0%)		
	University	149 (99.3%)	1 (0.7%)		
Age in years		26.96 ± 3.937	26.80 ± 5.684	t = 0.283	0.777

Tab. II. Current pregnancy and obstetric history of studied women during their antenatal care visits.

Variable/ Category		Groups of study		Statistical test	P-value
		Private hospital (n = 150)	PHC unit (n =150)		
Fetus	Single	139 (92.7%)	147 (98.0%)	$\chi^2 4.795$	0.029
	Twin	11 (7.3%)	3 (2.0%)		
Duration between current and previous pregnancy	Less than a year	1 (0.7%)	4 (2.7%)	$\chi^2 17.238$	0.001
	More than a year	71 (47.3%)	69 (46.0%)		
	Exactly a year	7 (4.7%)	27 (18.0%)		
	No previous pregnancies	71 (47.3%)	50 (33.3%)		
Gravidity	First	71 (47.3%)	50 (33.3%)	$\chi^2 24.562$	0.001
	Second	37 (24.7%)	25 (16.7%)		
	Third	17 (11.3%)	37 (24.7%)		
	Forth	16 (10.7%)	11 (7.3%)		
	Fifth	5 (3.3%)	16 (10.7%)		
	Sixth	3 (2.0%)	5 (3.3%)		
	Seventh	1 (0.7%)	3 (2.0%)		
	Eighth	0 (0%)	3 (2.0%)		
Past history of low birth weight	Yes	9 (6.0%)	23 (15.3%)	$\chi^2 6.856$	0.009
	No	141 (94.0%)	127 (84.7%)		
Gestational age by weeks		20.07 ± 9.826	22.14 ± 10.699	t = -1.748	0.081
Number of children		0.71 ± 0.965	1.33 ± 1.364	t = -4.544	0.000
Number of miscarriages		1.63 ± 1.087	1.38 ± 8.61	t = 1.086	0.281

Tab. III. The anthropometric measurements and laboratory measurement of pregnant women during antenatal care visits.

Groups of study	Private hospital (n = 150) mean ± SD	PHC unit (n =150) mean ± SD	Statistical test	P-value
Current weight in kg	77.6 ± 13.9	79.7± 12.9	t = -1.329	0.185
Height in cm	162.3 ± 5.3	159.8 ± 6.2	t = 3.680	0.000
Height in meters	1.6±.05	1.6 ± .06	t = 3.680	0.000
BMI	26.9 ± 4.6	28.1± 4.3	t = -2.275	0.024
Mid Upper Arm Circumference	28.2 ± 3.5	29.6 ± 3.5	t = -3.591	0.000
Triceps S.C. fat	21.9 ± 5.5	22.26 ± 5.7	t = -0.584	0.560
Hemoglobin level by gm ^a	11.309 ± 1.07	10.7 ± 1.08	t = 4.077	0.000
Random blood sugar ^b	91.7 ± 22.1	93.8 ± 24.02	t = -0.804	0.422
Preconceptional weight	70.8 ± 12.3	71.8 ± 12.4	t = -0.706	0.481
Weight groups	Under weight	3 (2.0%)	1 (.7%)	X ² = 4.880
	Normal	51 (34.0%)	37 (24.7%)	
	Over weight	54 (36.0%)	68 (45.3%)	
	Obese	42 (28.0%)	44 (29.3%)	

^a: data calculated with a sample size of n = 289; ^b: data calculated from a sample of n = 293.

Tab. IV. Knowledge of daily requirements from each food group according to WHO Recommendations for antenatal care.

Variable / Knowledge	Groups of study		Total	Chi-square test	P-value	
	Private hospital (n = 150)	PHC unit (n = 150)				
Daily requirements of carbohydrates	Right knowledge	68 (45.3%)	15 (10.0%)	83 (27.7%)	52.347	0.000
	Wrong knowledge	82 (54.7%)	135 (90.0%)	217 (72.3%)		
Daily requirement of vegetables and fruits group	Right knowledge	117 (78.0%)	84 (56.0%)	201 (67.0%)	20.130	0.000
	Wrong knowledge	33 (22.0%)	66 (44.0%)	99 (33%)		
Daily requirement of milk and dairy products group	Right knowledge	117 (78.0%)	106 (70.7%)	223 (74.3%)	8.114	0.044
	Wrong knowledge	33 (22.0%)	44 (29.3%)	77 (25.7%)		
Daily requirement to meat group	Right knowledge	126 (84.0%)	108 (72.0%)	234 (78.0%)	6.755	0.080
	Wrong knowledge	24 (16.1%)	42 (28.8%)	66 (22%)		
Daily requirements of fat group	Right knowledge	99 (66.0%)	67 (44.7%)	166 (55.3%)	17.947	0.000
	Wrong knowledge	51 (34.1%)	83 (55.3%)	134 (44.6%)		

knowledge. Similarly, more than three quarters (78%) of the women in the private hospital and 70.7% of those attending the PHC unit had right knowledge about the daily requirement of milk and dairy products. About two thirds of participating women from the private hospital had the right knowledge of the daily requirements of fat compared with 44.7% of the PHC unit group. Nearly all groups showed statistical difference except meat group (p value = 0.080).

In general, the level of knowledge about food requirements of both groups was satisfactory good especially for daily requirements of meat group and milk groups, then vegetables and fruits, then fat, then carbohydrates groups, however, they failed to fulfill the daily requirements completely. After contrasting our results to the WHO antenatal care guidelines, it is shown in both groups that for food group in carbohydrate and fat only; and there was statistical significance in starch and meat groups with p values of 0.013 and 0.006 respectively. Neither of the two studied groups fulfilled WHO requirements concerning the number of servings of vegetables, fruits and dairy products (Tabs. V, VI).

Generally, women who fulfilled three items of WHO requirements were 8% in the private hospital group and in the PHC unit (0.7%). Taking into consideration that the consumption of starch and fats group were exceeding

the recommended amount by WHO, as the consumption of starch was 12.2 and that of the fat group was 9.

As shown in Tables V and VI, only a small number of factors could show a promise in predicting or influencing maternal diet; and education wasn't one of them. There was statistically significant difference in educational level and weight group in both groups as the p values were 0.008 and 0.000 (Tab. VI). Among women who were university graduates, 8% fulfilled three items and 83.3% fulfilled two items. Dietary habits and knowledge of daily requirements according to the WHO antenatal guidelines were also studied as predictive factors. The right knowledge of daily requirements of five food groups shows a statistical difference. About 7% of the sample size fulfilled three items from the carbohydrate group; while from the meat group, only 5.1% fulfilled three items. Vegetables and fruits group showed 4.5% regarding fulfilling 3 items, the least percentage of women (4%) fulfilled three items of WHO antenatal care recommendations from milk and dairy products group.

Discussion

This study included 300 pregnant women attending 6th of October private hospital and El-Hussary PHC unit for antenatal care. We assessed their sociodemographic

Tab. V. Proposed predictive factors for nutritional behavior among pregnant women attending ante natal care clinic regarding sociodemographic and maternal history.

Variable	Category	Fulfilling one item	Fulfilling two items	Fulfilling three items	Total	P-value
Educational level	Illiterate	4 (9.8%)	36 (87.8%)	1 (2.4%)	41 (100%)	0.008
	School graduated	4 (3.7%)	105 (96.3%)	0 (0.0%)	109 (100%)	
	University graduated	13 (8.7%)	125 (83.3%)	12 (8.0%)	150 (100%)	
Occupation	Professional worker*	5(7.2%)	65 (81.2%)	8(11.6%)	69(100%)	0.019
	Technical worker**	4(6.5%)	56(90.3%)	2(3.2%)	62(100%)	
	House wife	12(7.1%)	145(91.1%)	3(1.8%)	169(100%)	
Gravidity	First	11 (9.1%)	104 (86%)	6 (5%)	121 (100%)	0.361
	Second	6 (9.7%)	53 (85.5%)	3 (4.8%)	62 (100%)	
	≥ third	4 (3.4%)	109 (93.2%)	4 (3.4%)	117 (100%)	
Chronic diseases (n = 56)	Yes	4 (19.0%)	50 (18.8%)	2 (15.4%)	56 (18.7%)	0.953
Past history of low birth weight	Yes	1 (4.8%)	29 (10.9%)	2 (15.4%)	32 (10.7%)	0.581
	No	20 (95.2%)	237 (89.1%)	11 (84.6%)	268 (89.3%)	
Duration between current, previous pregnancy	Less than a year	0 (0.0%)	5 (1.9%)	0 (0.0%)	5 (1.7%)	0.611
	More than a year	10 (47.6%)	125 (47.0%)	5 (38.5%)	140 (46.7%)	
	Exactly a year	0 (0.0%)	32 (12.0%)	2 (15.4%)	34 (11.3%)	
Weight groups	Underweight	3 (75.0%)	1 (25.0%)	0 (0.0%)	4 (100.0%)	0.000
	Normal weight	11 (12.5%)	72 (81.8%)	5 (5.7%)	88 (100.0%)	
	Overweight	4 (3.3%)	112 (91.8%)	6 (4.9%)	122 (100.0%)	
	Obese	3 (3.5%)	81 (94.2%)	2 (2.3%)	86 (100.0%)	

*: professional worker: (Doctor, Teacher, Computer office, Lawyer, Engineer, Employed, Manager); **: technical worker: (Nurse, Technician Laboratory, Vender, Coiffeur).

Tab. VI. Proposed predictive factors for nutritional behaviour among pregnant women attending antenatal care clinic regarding dietary habits and knowledge of daily requirements.

Variable	Category	Fulfilling one item	Fulfilling two items	Fulfilling three items	Total	P- value	
Dietary habits	Having breakfast	Regularly	8 (4.6%)	157 (90.2%)	9 (5.2%)	174 (100.0%)	0.272
		Infrequent	10 (11.8%)	72 (84.7%)	3 (3.5%)	85 (100.0%)	
		Rarely	3 (7.3%)	37 (90.2%)	1 (2.4%)	41 (100.0%)	
	Consumption of milk and milk products	Yes	15 (7.3%)	181 (88.3%)	9 (4.4%)	205 (100.0%)	0.947
		No	6 (6.3%)	85 (89.5%)	4 (4.2%)	95 (100.0%)	
	Consumption of fruits	Yes	20 (7.5%)	235 (87.7%)	13 (4.9%)	268 (100.0%)	0.274
		No	1 (3.1%)	31 (96.9%)	0 (0.0%)	32 (100.0%)	
	Consumption of eggs	Yes	16 (7.2%)	199 (89.2%)	8 (3.6%)	223 (100.0%)	0.553
		No	5 (6.5%)	67 (87.0%)	5 (6.5%)	77 (100.0%)	
	Consumption of meat	Yes	16 (7.1%)	198 (88.0%)	11 (4.9%)	225 (100.0%)	0.704
		No	5 (6.7%)	68 (90.7%)	2 (2.7%)	75 (100.0%)	
	Consumption of vegetables	Yes	18 (6.4%)	250 (89.0%)	13 (4.6%)	281 (100.0%)	0.206
		No	3 (15.8%)	16 (84.2%)	0 (0.0%)	19 (100.0%)	
	Consumption of processed meat	Yes	7 (10.8%)	54 (83.1%)	4 (6.2%)	65 (100.0%)	0.271
		No	14 (6.0%)	212 (90.2%)	9 (3.8%)	235 (100.0%)	
	Consumption of fish	Yes	20 (7.4%)	239 (88.2%)	12 (4.4%)	271 (100.0%)	0.702
No		1 (3.4%)	27 (93.1%)	1 (3.4%)	29 (100.0%)		
Fat	Unsaturated	Yes	20 (6.9%)	260 (89.3%)	11 (3.8%)	291 (100%)	0.023
		No	1 (11.1%)	6 (66.7%)	2 (22.2%)	9 (100%)	
	Saturated	Yes	10 (6.8%)	129 (87.2%)	9 (6.1%)	148 (100%)	0.340
		No	11 (7.2%)	127 (90.1%)	4 (2.6%)	152 (100%)	
Supplement	Take supplement of multivitamins	Yes	12 (8.3%)	125 (86.2%)	8 (5.5%)	145 (100.0%)	0.416
		No	9 (5.8%)	141 (91.0%)	5 (3.2%)	155 (100.0%)	
	Take iron supplement	Yes	12 (8.1%)	129 (87.2%)	7 (4.7%)	148 (100.0%)	0.707
		No	9 (5.9%)	137 (90.1%)	6 (3.9%)	152 (100.0%)	
Right knowledge of daily requirements of	Carbohydrates	6 (7.2%)	71 (85.5%)	6 (7.2%)	83 (100.0%)	0.626	
	Milk and dairy products group	16 (7.2%)	198 (88.8%)	9 (4.0%)	223 (100.0%)	0.983	
	Vegetables and fruits group	16 (8.0%)	176 (87.6%)	9 (4.5%)	201 (100.0%)	0.904	
	Fat group	11 (6.6%)	145 (87.3%)	10 (6.0%)	166 (100.0%)	0.424	
	Meat group	17 (7.3%)	205 (87.6%)	12 (5.1%)	234 (100.0%)	0.146	

features, nutritional status, and life style behaviours. Our main aim was to assess nutritional knowledge and behavior among a group of Egyptian pregnant women in addition to identify the factors influencing their nutritional knowledge and behavior. Our results, however, didn't show much difference between the two groups in terms of dietary habits, but indicated the predictive factors for identifying their behaviours.

Educational level and socioeconomic status have been proven to affect maternal and child health [12, 13]. Since a higher level of education means a better understanding of the nutritional needs and healthy habits during pregnancy [14], we have already anticipated that the group of women from the private hospital would have better behaviours and better nutritional status as almost all of them had a higher education as opposed to the group from El-Hussary PHC where only 7% completed their higher education. Thus, it can be inferred that the group of women from the PHCU would be more subjected to the present adverse health effects.

Differences between anthropometric variables were noted. The mean current BMI for both groups was above normal ranges (overweight), however, the BMI of the PHC unit group was higher than that of the other one. This can be attributed to the marked educational difference and socioeconomic status between the two groups where a lower educational level was proven to be associated with a higher BMI [14, 15]. Moreover, the PHC unit group showed a higher pre-gestational weight in comparison with the private hospital group, but there has not been any statistical evidence on the differences between both groups regarding weight gain during the pregnancy.

Mid upper arm circumference was another statistically significant anthropometric measurement during pregnancy, especially to indicate the potentiality of LBW infants rather than a measurement for obesity. A cut-off value of < 23 cm was recommended in African population to consider pregnant women for a feeding program [16]. By contrasting this data to our results, we found that the mean MUAC of both groups was above cut-off values.

Women attending El-Hussary PHC unit reported worse self-perceived health, where 24% of them considered their health as weak. This assessment of course is subjective and it was contradicted by the later obtained results as both groups presented similar health patterns and food intake.

Regarding lifestyle habits, both groups showed similar results in smoking assessment. About 4% of each group kept smoking during pregnancy. This is against the known data about the relation between sociodemographic factors and maternal smoking where lower socioeconomic status and lower educational levels are associated with lower rates of smoking cessation during pregnancy [17]. Nevertheless, it is important to state the cultural difference in Egypt and the possibility of active denial for the fear of shaming. A sedentary lifestyle in general (adjusted by the number of sleeping hours, TV watching, and physical activity) was more

pronounced in the PHC unit group. This is in accordance with the previously stated higher BMI in this particular group, where several studies were published stating that lower physical activity during pregnancy was associated with higher BMI [18, 19].

Eventually, regarding the intake of supplements, it was as speculated by previous papers, the women attending the private hospital were more compliant to their supplements specially Iron and multivitamins. The PHC unit group's poor compliance could be attributed to less resources and less education as shown by one study conducted on Finnish pregnant women proving that there is a positive correlation between educational levels and supplement intake [20].

Different studies were carried out to assess the maternal adherence to the recommended diet during pregnancy. Similar results to ours showed that mothers ate less fruits and vegetables and had inadequate calcium intake either through diet or through supplements [21]. In contrast, a study carried out in Canada showed that women had adequate calcium and vegetables intake, while they lack the recommended amounts of cereals, fat and starch [22]. However, these data are from different countries and comparing different recommendations thus they can't be comparable to each other.

In 2014, misinformation and poor maternal knowledge about healthy diet in Egypt were studied by the Maternal and Child Health Investigation Program. The study indicated that there was a gap between the knowledge of the mothers about harmful foods during pregnancy and the actual amounts of food consumed [23]. In our study, this was shown in both populations, where neither of them fulfilled the WHO recommendations of food intake during pregnancy or the optimum number of meals per day. Less than half of the women attending the private hospital had three or more meals per day, and about 27% of the PHC unit group did. In regard to fulfilling the WHO recommended servings per day, only starch and fat items were fulfilled by both groups, whereas the other three items were merely included in the diets of both groups.

To our knowledge there hasn't been any studies assessing the predictive factors of dietary habits during pregnancy. But in general, a number of studies assessing the relation between education and diet found out that the higher the education the better the diet and the lower the weight of the mother [14, 16, 23]. However, this hasn't been the case here, since a small number of factors could show a promise in predicting or influencing maternal diet and education wasn't one of them. These factors are current pregnancy weight and parity, with the latter having a lower statistical significance. This was determined by comparing the results of the consumption of 5 main food items (fat, starch, fruits and vegetables, milk and dairy products, meat and beans) to the WHO recommended portions during pregnancy. None of the two groups of women could fulfil the 5 items or even 4 items, and assessment was done based on the fulfilment of one, two or three items. Regarding weight, a positive correlation

was observed, as the BMI increases, the number of women fulfilling two items of the 5-groups increases. The main limitation of our current study is that it is a cross sectional study (just one setting interview) which gives us less information about studied women. However, the fact that this sampling protocol has been applied before in previous studies should support the validity of this investigation to some extent. Another shortcoming is that the dietary intakes assessed in the study all depended on recalls depending on the retrospective memory of the subject. This is a very subjective method for assessing nutrition, but this was compensated by the presence of other validated factors in the nutritional survey such as the anthropometric measurements as well as the dietary intakes and the food frequency questionnaire. One more thing that should be taken into consideration is the possible denial and under-reporting of unhealthy habits especially among obese females which are more afraid of the judgment. This problem couldn't be solved under the circumstances of this investigation as it needs more targeted questionnaires and family visits.

Conclusions

In conclusion, Healthy behavior among pregnant women in both groups was influenced by their educational level, occupation as well as their pre-gestational BMI. Those were the only three significant predictive factors, where women with higher education showed an active lifestyle. In addition, women starting with normal BMI before pregnancy had better healthy behaviours including the choice of healthy diets. Both groups of women ate food rich in starch, carbohydrates and fats while ignoring other groups to some extent.

RECOMMENDATIONS

1. Counselling is recommended to be done during antenatal care visit to assess nutritional intake during pregnancy.
2. The role of family physician should be reinforced in the antenatal care clinics, giving the right health education modified according to the educational level of the mothers, their occupation and their BMI.
3. Food production authorities are recommended to supply pregnant women with fortified products (containing the lacking supplements and proteins) that are low in cost and easy to reach.
4. Nutritional care programs should be updated for pregnant women adjusting to the differences in educational level and occupation differences among women.

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Conflict of interest statement

The authors declare no conflict of interest.

Authors' contributions

DAN field work supervision, analysis strategy and design, data management, data analysis and interpretation of results, decision making on content and paper write-up and revision of final draft. HSE field work supervision, analysis strategy and design, data management, data analysis and interpretation of results, decision making on content and paper write-up and revision of final draft. EAS field work supervision, analysis strategy and design, data management, data analysis and interpretation of results, decision making on content and paper write-up and revision of final draft. MFA field work supervision, analysis strategy and design, data management, data analysis and interpretation of results, decision making on content and paper write-up and revision of final draft.

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