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Original article

Adherence to dietary recommendations of Italian pregnant women and sociodemographic characteristics and lifestyles: Results of a cross-sectional study

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Abstract. *Background and aim:* Unhealthy dietary habits during pregnancy can lead to immediate and future adverse health consequences for mother and child. Italian Societ'y of Gynaecology and Obstetrics (SIGO) promulgated nutritional recommendations to promote correct food intake for future mothers. The study aimed to assess the adherence to dietary recommendations during the 3rd trimester of pregnancy and to evaluate the role of maternal characteristics and lifestyles. *Methods:* This cross-sectional study investigated dietary habits in a sample of women representative of physiologic pregnancies (n=572, mean age 33.4±5.2 y) living in Modena (Italy). Maternal diet (food consumption frequency), lifestyles and sociodemographic features were assessed by a questionnaire. Descriptive statistics and bivariate associations (Chi-square tests) were performed. *Results:* Adherence to SIGO recommendations varied among food categories. The highest compliance was observed for coffee/tea (93.5%), alcohol (76.6%) and white meat (63.6%). Adherence between 40-60% were observed for sweets (45.1%), bread/pasta/cereals (48.6%) and processed meat (56.8%), while adherence between 20-40% was highlighted for cheese (24.5%), potatoes (25.7%), eggs (25.9%), legumes (28.8%), fruit/vegetables (32.5%) and fish/seafood (38.8%). The lowest adherence was reported for milk/yogurt (15.4%) and red meat (17.3%). Smoking, younger age, lower educational level and unemployment appeared negatively influence adherence, including fruit/vegetables, fish, processed meat, alcohol, tea/coffee and soft drinks. *Conclusions:* Adherence to dietary recommendations among Italian pregnant women appeared low and influenced by several socio-demographic features and lifestyles. Targeted interventions and public health strategies to enhance maternal nutrition need to be implemented or reinforced to sustain women and children health, especially in most vulnerable groups. (www.actabiomedica.it)

Key words: nutrition recommendations, dietary habits, pregnancy, sociodemographic characteristics

Introduction

Proper nutrition during pregnancy is crucial for maternal health and foetal development as it is able to influence several outcomes such as birth weight, gestational diabetes, hypertension, pre-eclampsia and other pregnancy-related complications (1–3). Several national and international dietary guidelines have been promulgated worldwide to provide recommendations for balanced nutrient intake to promote optimal health during pregnancy (3–7). The Italian Society of Gynaecology and Obstetrics (SIGO) has drawn up thorough nutritional recommendations with the aim of promoting a correct food intake for pregnant and lactating women (6). Recommendations are based on the Mediterranean diet, that is widely recognized as one of the healthiest dietary patterns, rich in fruits, vegetables, legumes, and fish consumption (3). Despite the strong historical and cultural connection to the Mediterranean diet in Italy, adherence to dietary guidelines (5,8–10) in the general population remains suboptimal, with significant gaps especially in some nutritional categories with an overconsumption of red meat and cheese and an underconsumption of vegetables, legumes and fish (11). Furthermore, modern lifestyle changes and globalization are leading to a shift toward more Westernized diets, characterized by high consumption of processed foods, added sugars, and unhealthy fats as recently reported by several studies. (5,7,12–14). This transition poses a challenge for pregnant women as well who are encouraged to follow traditional dietary patterns but often face food environments that promote less healthy options. In many countries, an increasing percentage of pregnant women fail to meet the recommended intake particularly for certain food groups, such as cereals, legumes, vegetables, and dairy products has been observed (14-16). In addition, different lifestyles and women characteristics have emerged as factors potentially able to influence adherence to guidelines and recommendations (17–23). In the Italian context, compliance to guidelines and factors associated with nutritional adherence during pregnancy are scarcely investigated and no studies evaluated adherence to guidelines specifically designed for pregnant women (14–16). The aim of this study is, therefore, to assess the frequency of food and drink consumption during the last trimester of pregnancy and the adherence to recommendations specifically promulgated for Italian pregnant women in a representative sample of physiologic pregnancies in Modena (Northern Italy) and to evaluate changes in adherence according to their sociodemographic characteristics and lifestyles.

Patients and Methods

Study design and population

This is a cross-sectional study based on data collected by two previous studies, aimed at evaluating exposure to different environmental toxicants (trace elements and phthalates) for mothers, newborns and infants approved by Area Vasta Emilia Nord Ethics Committee (approval no. 108/15 2305 and 2018/num715) (24,25). In both studies, maternal dietary habits and lifestyles during pregnancy were investigated through a specifically designed questionnaire. Women living in the province of Modena (Italy) were randomly enrolled few hours after delivery at the Gynaecology and Obstetrics Unit of the Modena University Hospital between 2016 and 2020. Mothers who were ≥18 years old at delivery, who understood the Italian language and had a singleton pregnancy were eligible to participate. After signing informed consent, all enrolled women (N=572) women filled in the questionnaire determining the sample size of this study.

Data collection and variables creation

Mothers filled in a questionnaire aimed at collecting information on socio-demographic data (age, educational level, marital status, working pre or during pregnancy, nationality); anthropometric data (height, pre-pregnancy weight and weight during pregnancy); lifestyles (smoking habits before and during pregnancy) and dietary habits during the third trimester of pregnancy. Regarding diet, the questionnaire investigated the frequency of consumption for 63 foods and drinks. Possible answers for estimating the frequencies of food consumption were: never, less than once a month, 1-3 times a month, once a week, twice a week, 3-4 times a

week, 5-6 a week, daily, twice a day, three or more a day. After data collection, we categorized frequency consumption for each food or drink in 3 categories: "never/monthly or less", "weekly" and "daily" consumption. Then, in order to assess the adequacy of food group intake based on SIGO recommendations (6) for white, red, and processed meat, pasta/bread/cereals, eggs, sweets, fruit/vegetables, legumes, potatoes, cheese, milk/yogurt, fish/seafood, coffee/tea, alcohol (wine, beer or spirits) and soft drinks, we created a 3-level categorical variable for each food category classifying food consumption frequency as compliant to SIGO recommendations, lower or higher than recommended. Furthermore, we calculated the maternal pre-pregnancy Body Max Index (BMI) classifying women as underweight (BMI < 18.5), normal weight (BMI 18.5 - <25), overweight (25 - <30) or obese (≥30). Finally, we classified Gestational Weight Gain (GWG) into a 3-level categorical variable (recommended, less and more than recommended) relying on the SIGO nutritional recommendations based on Institute of Medicine (IOM) recommendations (26), that identify different ranges of recommended weight gain during pregnancy depending on pre-pregnancy BMI (12.5-18 Kg for women with a pre-pregnancy BMI < 18.5; 11.5-16 Kg for women with normal pre-pregnancy BMI; 6.8-11.4 Kg, for women overweight (BMI 25-29.9) pre-pregnancy; 5-9.1 kg, for women with a pre-pregnancy BMI>30).

Statistical methods

Firstly, we performed descriptive statistics. We summarized categorical variables by absolute and relative frequencies, while we used mean and standard deviation (SD) for numerical continuous variables.

Then, we evaluated by bivariate associations (Chi-square tests) dietary food consumption in accordance with SIGO recommendations in relation to lifestyle and maternal sociodemographic and anthropometric data, including maternal age (≤35/>35); pre pregnancy BMI (<30/≥30); educational level (≤high school/>high school); smoking habits (current smoker or ex-smoker/never smoker); working before pregnancy (yes/no); working during pregnancy (yes/no). Analysis was performed using SPSS version 29 (IBM Corp, Armonk, NY, USA).

Results

Population characteristics

A total of 572 women (mean age: 33.4±5.2 years) completed the food frequency questionnaire. Their main characteristics are reported in Table 1. Most women were Italian (87.7%), ≤35-year-old (66.1%), married or living with a partner (98.8%), with at least a high school diploma (87.2%) and no or former smokers (91.1%). Several women (82.3%) worked before pregnancy, and many (75.2%) continued working during pregnancy and were employed in a full-time work 6-8 hours per day (45.5%). Before pregnancy, about 15% of the sample was overweight (BMI 25-≤30) and 9.2% obese (BMI≥30). During pregnancy, only 41% of women had a correct weight gain according to recommendation while 32.5% and 26% of women respectively gained less or more weight than recommended.

Dietary habits during pregnancy

Almost all women (97%) reported following a Mediterranean diet model during pregnancy and 534 (93.4%) consumed extra virgin olive oil as a principal seasoning during pregnancy. During the third trimester of pregnancy (Table 2), all or nearly all women reported daily consumption of both fruit/vegetables (100%) and bread/pasta/cereals (99.3%). A majority also consumed milk/yogurt (68.7%) and coffee/tea (60.9%) daily. A weekly consumption frequency was mainly reported for potatoes (73.4%), fish/seafood (70.6%), white (79.4%) and red (70.3%) meat, eggs (71.9%), cheese (69.6%) and legumes (76.2%), although about a quarter of women reported consuming these food categories on a monthly or lower basis. Processed meat was consumed weekly by 54.4% of women, while 40.6% ate it monthly or less, and 20.5% reported no consumption. Sweets were consumed weekly or daily by 47.2% and 21.7% of women, respectively, with only 8.4% of women declaring no consumption during the third trimester. On the contrary, most women reported a very low frequency of consumption, usually monthly or lower, for alcohol (91.1%) and soft drinks (60.4%); however, a small percentage of women consumed them daily (4.6% for soft drinks and 1% for alcohol).

Table 1. Main characteristics of the study sample.

MATERNAL CHARACTERISTICS		**N (%)**
Total		572 (100)
Age at delivery (y)	≤35	378 (66.1)
	>35	194 (33.9)
Citizenship	Italian	502 (87.7)
	European (other than Italian)	45 (47.9)
	Extra European	25 (4.4)
Marital Status	Living with partner	565 (98.8)
	Single	7 (1.2)
Smoking habits	Yes	51 (8.9)
	No, never smoked	358 (62.6)
	No, ex-smokers	163 (28.5)
Education Level	Up to middle school	73 (12.8)
	High school	194 (33.9)
	Bachelor or more	305 (53.3)
Family Residence	Urban area	426 (74.5)
	Rural area	119 (20.8)
	Industrial area	15 (2.6)
	Mountainous or hilly area	12 (2.1)
Working	Yes, pre-pregnancy	471 (82.3)
	Yes, during pregnancy	430 (75.2)
Working daily hours	Not working	102 (17.8)
	<6 hours	79 (13.8)
	6-8 hours	260 (45.5)
	>8 hours	131 (22.9)
BMI before pregnancy	<18.5	46 (8.1)
	18.5-<25	385 (67.8)
	25-<30	85 (14.9)
	≥30	52 (9.2)
	Missing	4
Weight Gain (SIGO and IOM GL)[a]	Less than recommendation	183 (32.5)
	As recommended	234 (41.6)
	More than recommendation	146 (26)
	Missing	9
Delivery mode	Natural	410 (71.7)
	Caesarean	162 (28.3)
Gestational age at delivery	Term	518 (90.9)
	Preterm (<38w)	52 (9.1)
	Missing	2

[a] Weight Gain during pregnancy was classified according to SIGO and IOM (6,26).

Table 2. Food frequency consumption during the last trimester of pregnancy

Food	Never/Monthly N (%)	Weekly N (%)	Daily N (%)
Fruits and vegetables	0 (0.0)	0 (0.0)	572 (100)
Bread, pasta and cereals	0 (0.0)	4 (0.7)	568 (99.3)
Potatoes	141 (24.6)	420 (73.4)	11 (1.9)
Fish and seafood	163 (28.4)	404 (70.6)	5 (0.9)
White meat	105 (18.4)	454 (79.4)	13 (2.3)
Red meat	144 (25.1)	402 (70.3)	26 (4.5)
Processed meat	232 (40.6)	311 (54.4)	29 (5.1)
Eggs	148 (25.9)	411 (71.9)	13 (2.3)
Cheese	89 (15.5)	398 (69.6)	85 (14.9)
Legumes	61 (10.7)	436 (76.2)	75 (13.1)
Milk or yogurt	44 (7.7)	135 (23.6)	393 (68.7)
Sweets	178 (31.1)	270 (47.2)	124 (21.7)
Alcohol	521 (91.1)	45 (7.9)	6 (1.0)
Coffee/tea	80 (14.0)	143 (24.9)	349 (60.9)
Soft drinks	333 (60.4)	193 (35.0)	25 (4.6)

Adherence to SIGO recommendations (Table 3) varied greatly among food categories. The highest compliance (>60%) was observed for coffee/tea (93.5% of women), alcohol (76.6%) and white meat (63.6%). Adherence levels ranging between 40-60% were observed for sweets (45.1%), bread/pasta and cereals (48.6%) and processed meat (56.8%), while levels between 20-40% for cheese (24.5%), potatoes (25.7%), eggs (25.9%), legumes (28.8%), fruit and vegetables (32.5%) and fish/seafood (38.8%). The lowest adherence (<20%) was reported for milk or yogurt (15.4%) and red meat (17.3%). Different trends in non-adherence according to food and drink categories could be observed. Non-adherence to fruit and vegetable SIGO recommendations was always due to insufficient intake, as 67.5% of women reported daily consumption but failed to meet the recommended five servings per day. On the contrary, for soft drinks, sweets, processed meat, alcohol and coffee/tea no compliant women reported a consumption always in excess, even though frequency of non-adherence varied greatly among these food and drink categories, being respectively equal to 64.1% 54.9%, 43.2%, 23.4% and 6.5%. For the other food categories, both excessive and insufficient intakes were observed. Hover, consumption of red meat, bread/pasta/cereals, and cheese exceeded recommendations in many cases (56.1%, 45.3%, and 45.6% of women, respectively), while milk/yogurt (83%), eggs (71.9%), and fish/seafood (60.1%) were primarily under-consumed.Similar frequencies of excessive or reduced consumption were observed only for white meat, with 19.6% and 16.8% of women declaring to eat this food respectively less and more frequently than recommended. A comparable trend was observed for legumes, with women almost equally divided between those consuming them less (37.9%) and those consuming them more (33.4%) than recommended by SIGO.

Adherence to dietary recommendation and women characteristics

Figure 1 and Table 4 and report adherence to SIGO recommendations according to women socio-demographic characteristics and lifestyles for different food and drink categories. Several lifestyles and women characteristics appeared associated with

Table 3. Food frequency consumption according to SIGO recommendation during last trimester of pregnancy (6)

Food	As recommended N (%)	Less than recommended N (%)	More than recommended N (%)	SIGO recommendations
Fruit and vegetables	186 (32.5)	386 (67.5)	/	At least 5 portions a day
Bread, pasta and cereals	278 (48.6)	35 (6.1)	259 (45.3)	Every day, 1 portion for every meal
Potatoes	147 (25.7)	324 (56.6)	101 (17.7)	2 times a week
Fish and seafood	222 (38.8)	344 (60.1)	6 (1.0)	2-4 times a week
White meat	364 (63.6)	112 (19.6)	96 (16.8)	1-2 times a week
Red meat	99 (17.3)	152 (26.6)	321 (56.1)	1 time a week
Processed meat	325 (56.8)	/	247 (43.2)	≤ 1 time a week for baked ham, mortadella or Turkey breast. Avoid other types of cured meats
Eggs	148 (25.9)	411 (71.9)	13 (2.3)	An egg 2-4 times a week
Cheese	140 (24.5)	171 (29.9)	261 (45.6)	2 times a week
Legumes	165 (28.8)	216 (37.8)	191 (33.4)	2-3 times a week
Milk or yogurt	88 (15.4)	475 (83.0)	9 (1.6)	2-3 portions a day
Sweets	258 (45.1)	/	314 (54.9)	Occasional consumption (still once a week)
Alcohol	438 (76.6)	/	134 (23.4)	Occasional consumption of red wine (maximum 2-125 ml glasses for week) after the first trimester of pregnancy
Coffee/tea	535 (93.5)	/	37 (6.5)	Up to 2 cups a day of coffee or tea (or one of coffee and one of tea)
Soft drinks	198 (35.9)	/	353 (64.1)	Never

different levels of adherence to SIGO recommendations for many food and drink categories. In comparison to non-smoking, current and former smoking women reported a higher than recommended frequency of consumption for tea and coffee, alcohol, soft drinks and processed meat, while lower for fruits and vegetables. A lower educational level appeared significantly associated with a lower consumption for fruits and vegetables and fish/seafood, and with a higher consumption for meat, including processed meat. In comparison to older women, younger mothers during pregnancy reported more frequently a lower consumption for fish/seafood and an exceeding consumption for soft drinks, sweets, and white meat than older women.

Considering occupational status, we observed significantly different adherence levels to SIGO recommendations for fruits and vegetables, potatoes and milk/yogurt consumption in no working women compared to workers both before and during pregnancy. Pre-pregnancy BMI appeared to be related with different adherence trends depending on the food category. A strong and high compliance with recommendations was reported for sweets and fish and seafood in women with a pre-pregnancy BMI≥30. On the other hand, obese women showed a lower adherence to recommendations for fruits/vegetables, processed and red meat, yogurt/milk, cheese and soft drinks. During the last trimester of pregnancy, women with a weight gain

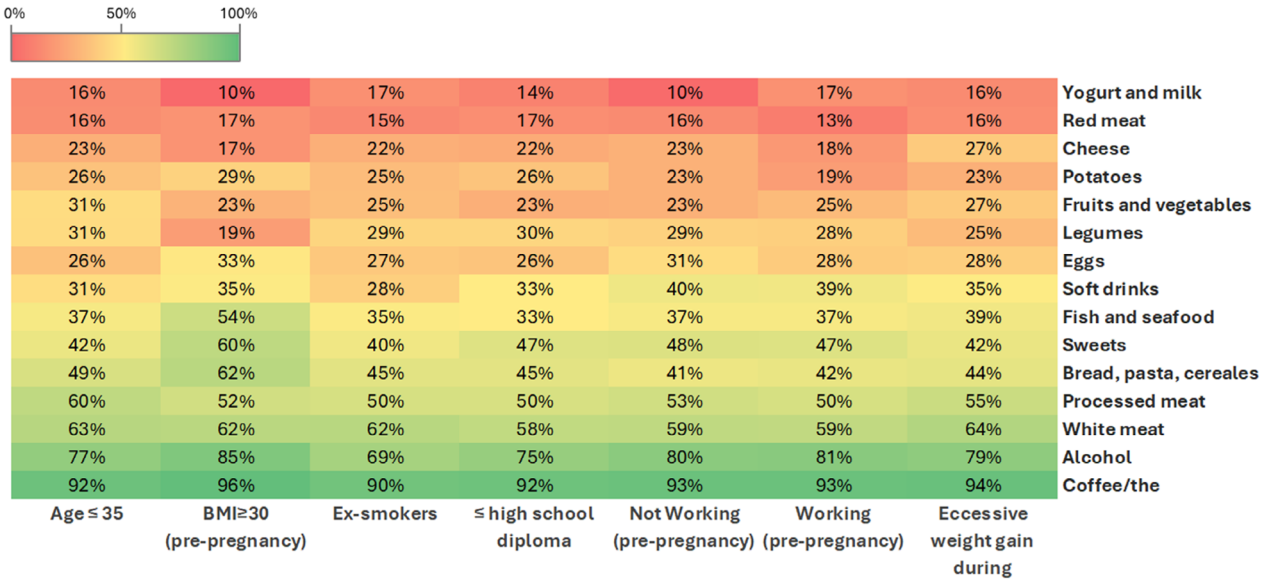

Figure 1. Adherence (%) to SIGO recommendations (6) during the last trimester-of pregnancy according to food and drinks categories and women characteristics

during pregnancy higher than recommended reported a lower adherence in consumption frequency for different food categories, including fruits/vegetable, bread/pasta/cereals, potatoes, processed meat, legumes, soft drinks, while a higher adherence was observed for fish/seafood, white meat and alcohol.

Discussion

This study investigated dietary behaviours, adherence to nutritional recommendations and their associated individual characteristics and lifestyles during the last trimester of pregnancy in healthy women living in the province of Modena, Italy. Overall, our findings highlight that during pregnancy women have a varied diet. However, a low adherence to nutritional recommendations promulgated especially for Italian pregnant women (SIGO recommendations) can be observed, with varying degrees of compliance depending on food categories, lifestyles and socio-demographic characteristics. More than half of our sample report a frequency of consumption not compliant with recommendations for several food or drink categories. Non-adherence shows different patterns for different food categories. Many healthy foods, including fruits and vegetables, fish, milk/yogurt, eggs, and potatoes, are often consumed less than recommended. On the other hand, soft drinks, sweets, cheese, bread/pasta/cereals are usually eaten by pregnant women with a frequency higher than recommended. Good nutrition during pregnancy is necessary for the improvement of maternal and newborn health. Rightly, all pregnant women eat fruits or vegetable every day, however, often consumption is lower than the five recommended daily portions. Focusing on meat, habits result conflicting, as most women have a high adherence to recommendations for white meat, while both the consumption of processed and red meat is still higher than recommended in a consistent part of the sample. Findings on legumes are contrasting as well, as women included in our study are equally divided among those who alternatively eat them with a lower or higher frequency than recommended, with the higher consumption that could reflect the fact that in recent years, diets promoting the consumption of legumes as a protein source have become trendy and are associated with significantly higher diet quality scores and greater intake of shortfall nutrients. Moreover, diets rich in legumes were also associated with improved weight-related

Table 4. Percentage of adherence to SIGO Recommendations (6) for different food and drink categories according to pregnant women's lifestyles and characteristics.

	Age (y)		BMI (pre pregnancy)		Smoker		Educational level		Work (pre pregnancy)		Work (pregnancy)		Weight Gain during pregnancy		
Adherence to SIGO Recommendations	**≤35**	**>35**	**<30**	**>30**	**No**	**Yes/ Ex**	**High school**	**Higher**	**No**	**Yes**	**No**	**Yes**	**Less**	**As**	**More**
Fruits/vegetables															
Less	69.3	63.9	66.7	76.9	**63.1**	**74.8**	**77.5**	**58.8**	**77.2**	**22.8**	**75.4**	**64.9**	62.3	67.9	72.6
As recommended	30.7	36.1	33.1	23.1	**36.9**	**25.2**	**22.5**	**41.3**	**65.4**	**34.6**	**24.6**	**35.1**	37.7	32.1	27.4
Bread/pasta/cereals															
Less	6.3	5.7	6.4	3.8	5.9	6.5	7.5	4.9	9.2	5.1	9.2	5.1	5.5	5.6	8.2
As recommended	49.2	47.4	47.3	61.5	50.6	45.3	44.9	51.8	42.3	50.7	42.3	50.7	50.5	50.0	43.8
More	44.4	46.9	46.3	34.6	43.6	48.1	47.6	43.3	48.6	44.2	48.6	44.2	43.7	44.4	47.9
Potatoes															
Less	55.3	59.3	57.2	50.0	55.3	58.9	53.6	59.3	**48.5**	**58.4**	**57.1**	**56.5**	56.8	54.7	59.6
As recommended	25.9	25.3	25.6	28.8	26.3	24.8	26.2	25.2	**22.8**	**26.3**	**19.0**	**27.9**	25.7	27.4	22.6
More	18.8	15.5	17.2	21.2	18.4	16.3	20.2	15.4	**28.7**	**15.3**	**23.9**	**15.6**	17.5	17.9	18.8
Fish/seafood															
Less	**62.4**	**55.7**	**61.4**	**44.2**	57.8	64.0	**65.2**	**55.7**	61.4	59.9	61.3	59.8	57.4	62.4	59.6
As recommended	**37.1**	**42.2**	**37.6**	**53.7**	41.1	35.1	**33.3**	**43.6**	36.6	39.3	36.6	39.5	42.6	35.9	39.0
More	**0.5**	**2.1**	**1.0**	**1.0**	1.1	0.9	**1.5**	**0.7**	2.0	0.8	2.1	0.7	0.0	1.7	1.4
White meat															
Less	**18.0**	**22.7**	20.0	17.3	20.9	17.3	**19.9**	**19.3**	16.8	20.2	**18.3**	**20.0**	18.6	23.9	15.1
As recommended	**62.7**	**65.5**	63.8	61.5	64.5	62.1	**58.4**	**68.2**	59.4	64.5	**58.5**	**65.3**	66.7	60.3	64.4
More	**19.3**	**11.8**	16.2	21.2	14.5	20.6	**21.7**	**12.5**	23.8	15.3	**23.2**	**14.7**	14.7	15.8	20.5
Read meat															
Less	27.2	25.3	26.6	26.9	25.7	28.0	25.8	27.2	26.7	26.5	28.2	26.1	36.8	26.8	25.3
As recommended	16.2	19.6	17.2	17.3	18.4	15.4	16.5	18.0	15.8	17.6	13.4	18.6	19.1	19.1	16.4
More	56.6	55.1	56.2	55.8	55.9	56.6	57.7	54.8	57.5	55.9	58.5	55.3	54.1	54.1	58.3
Processed meat															
As recommended	59.5	51.5	57.4	51.9	**39.1**	**50.0**	**49.8**	**63.0**	52.5	57.7	50.0	59.1	59.0	56.4	54.8
More	40.5	48.5	42.6	48.1	**60.9**	**50.0**	**50.2**	**37.0**	47.5	42.3	50.0	40.9	41.0	43.6	45.2

Eggs															
Less	71.7	72.2	72.5	63.5	72.9	70.1	70.4	73.1	66.3	73.0	69.0	72.8	74.9	71.8	69.2
As recommended	25.7	26.3	25.4	32.7	25.1	27.1	26.2	25.6	30.7	24.8	27.5	25.3	23.0	26.1	28.1
More	2.6	1.5	2.1	3.8	2.0	2.8	3.4	1.3	3.0	2.2	3.5	1.9	2.1	2.1	2.7
Cheese															
Less	32.0	25.8	29.5	34.6	30.2	29.4	34.1	26.2	36.6	28.5	**37.3**	**27.4**	35.5	29.1	24.0
As recommended	22.5	28.4	25.0	17.3	25.7	22.4	21.7	26.9	19.8	25.5	**18.3**	**26.5**	20.2	24.8	27.4
More	45.5	45.8	45.5	48.1	44.1	48.2	44.2	46.9	43.6	46.1	**44.4**	**46.1**	44.3	46.1	48.6
Legumes															
Less	37.8	37.6	37.0	46.2	39.1	35.5	33.7	41.3	30.7	39.5	34.5	38.8	35.5	38.9	39.7
As recommended	30.4	25.8	30.1	19.2	28.5	29.4	29.6	28.2	28.7	28.9	28.2	29.1	29.0	32.2	24.7
More	31.8	36.6	32.9	34.6	32.4	35.1	36.7	30.5	40.6	31.8	37.3	32.1	35.5	29.9	35.6
Milk/yogurt															
Less	82.5	84.1	82.4	88.5	84.4	80.8	83.9	82.3	**75.2**	**84.7**	**78.9**	**84.4**	81.4	83.8	84.2
As recommended	15.9	14.4	16.1	9.6	14.5	16.8	14.2	16.4	**19.8**	**14.5**	**16.9**	**14.9**	15.3	15.8	14.4
More	1.6	1.5	1.5	1.9	1.1	2.4	1.9	1.3	**5.0**	**0.8**	**4.2**	**0.7**	3.3	0.4	1.4
Sweets															
As recommended	**41.5**	**52.1**	**43.6**	**59.6**	**51.7**	**60.3**	46.8	43.6	47.5	44.6	47.2	44.4	51.9	41.9	41.8
More	**58.5**	**47.9**	**56.4**	**40.4**	**48.3**	**39.7**	53.2	56.4	52.5	55.4	52.8	55.6	48.1	58.1	58.2
Alcohol															
As recommended	77.0	75.8	75.8	84.6	**19.0**	**30.8**	75.3	77.7	80.2	75.8	81.0	75.1	77.0	75.2	78.8
More	23.0	24.2	24.2	15.4	**81.0**	**69.2**	24.7	22.3	19.8	24.2	19.0	24.9	23.0	24.8	21.2
Coffee/tea															
As recommended	92.3	95.9	93.2	96.2	**4.5**	**9.8**	91.8	95.1	93.1	93.6	93.0	93.7	93.4	93.2	93.8
More	7.7	4.1	6.8	3.8	**95.5**	**90.2**	8.2	4.9	6.9	6.4	7.0	6.3	6.6	6.8	6.2
Soft drinks															
As recommended	**30.8**	**46.0**	36.3	34.7	**59.6**	**71.8**	33.3	38.1	40.0	35.1	39.0	34.9	37.2	37.1	34.5
More	**69.2**	**54.0**	63.7	65.3	**40.4**	**28.2**	66.7	61.9	60.0	64.9	61.0	65.1	62.8	62.9	65.5

Percentages in bold resulted differing significantly by Chi square test ($P < 0.05$)

outcomes (27). On the other hand, a lower legumes consumption in Italy is in line with previous literature findings in general population (28,29) reflected in the diminished production in Italy in the last decades (30). The highest percentage of adherence to SIGO recommendation is observed for coffee, tea and alcoholic beverage consumption. These findings are valuable, nevertheless, when considering alcoholic consumption, the quite good adherence to SIGO recommendation, could be not sufficient to protect the foetus considering the highly negative potential impact of alcohol on health, given that WHO postulate no alcohol consumption during pregnancy (3,31,32). Several socio-demographic features and women lifestyles result associated to different levels of non-adherence. Smoking, younger age and lower educational level appear to negatively influence pregnant women adherence to recommendations, favouring the consumption of junk food and reducing compliance for healthier categories of food. This is particularly evident for fruits and vegetables, fish, processed meat, alcohol, tea/coffee and soft drinks. On the contrary, working both before and during pregnancy appears related to higher adherence to dietary recommendations for many food categories. Furthermore, women who experience excessive weight gain during pregnancy report lower adherence to various food and drink categories, while an interesting dual trend emerges when considering their pre-pregnancy BMI. In fact, pre-pregnancy obese women appear more likely to adhere to recommendations for fish and sweet consumption during the last trimester compared to other women, while showing lower adherence for many other food categories. These findings may be explained by the fact that our study focuses on dietary habits during the last trimester, a period when women experiencing weight-related issues are more likely to receive nutritional counseling. This also suggests that interventions are typically implemented once a problem becomes evident and that preventive actions are still not offered to all pregnant women.

Our results are consistent with previous evidence from studies conducted worldwide (17-21,33), showing as education, social class, marital status, physical activity, age, smoking are associated with different degrees of adherence to dietary guidelines during pregnancy (and also with pre-conceptional nutritional adherence). Overall, our findings are in line with those reported by other authors also for Italian women, even though comparisons are not always easy to carry out as different pregnancy periods and standards or recommendations were considered (15,16,33,34). Lisso and colleagues in 2022 assessed dietary intake of 176 pregnant women every trimester and found that, independently from BMI, women did not adhere to nutritional recommendations during the whole pregnancy, having lower caloric intake, protein and sugars excess and inadequacies in micronutrients intake (33).

Quattrini and colleagues aimed at evaluating adherence to Mediterranean diet in a group of 279 pregnant Italian women at the beginning of pregnancy. Approximately 60% of the women had a high level of adherence, and it was positively correlated age and educational level and negatively with BMI (34). Maugeri and colleagues investigated the impact of social determinants and lifestyles on dietary patterns ("western" of "prudent") of 332 pregnant women in Italy. They found that being younger, having a lower educational level and smoking were positively associated with the adherence to the "western" dietary pattern, while pre-pregnancy BMI was negatively associated with the adherence to the prudent dietary pattern (15). Finally, Anelli and colleagues collected data on 219 healthy normal-weight pregnant women about vitamin D and folate concentrations, as well as micronutrient intakes, and showed that they were consistently below the recommended range and that maternal adherence to the most prevalent "high meat, animal fats, grain" dietary pattern was negatively associated with gestational age, in line with our findings (16). Poor adherence to a proper dietary regimen during pregnancy, particularly for some food categories, represents a missed opportunity for prevention and demonstrates the importance of promoting effective public health interventions to improve dietary habits in order to preserve women and foetal health. Furthermore, pregnancy itself could become a timely phase for correcting dietary choices and improving future lifestyles. Several initiatives, such as information campaigns (35), cooking classes (36), or non-formal events, and different methodological approaches, including the use of informative brochures, social media channels or individual nutritional counselling, could be useful for improve all women

nutrition education both pre and during pregnancy, raising awareness of the related benefits for both mother and child. Moreover, public health interventions focusing on specific at-risk populations, such as smokers, younger, not working and with lower educational status women, should be reinforced and it would be appropriate to promote and explain the beneficial effects of Mediterranean diet starting from schools in order to raise young adults already prepared and aware. Public health interventions could address simultaneously different healthy lifestyles and habits, including the promotion of physical activity, in order to develop women's overall empowerment and favour the correct management of interconnected behaviours, reinforcing the well-being of women during pregnancy and beyond (37-40). Updated knowledge on healthy diet and on the importance to promote it must be reinforced in healthcare providers as well. Moreover, for public health specialists, skills in health communication play a primary role in health and well-being promotion, however often, these skills are lacking, representing important barriers for effective interventions. Tailored training programs starting from academic education should be implemented to address this issue (41-43). Several limitations exist within this study. The questionnaire used to estimate food intake frequencies was not designed specifically to assess adherence to SIGO recommendations and no data about size and weight of each food portion was directly collected. Furthermore, data are self-reported, and the questionnaire was filled out by mothers during the postpartum period, potentially reducing data accuracy. However, given that the questionnaire was completed during their stay in the Obstetric ward a few days after delivery, the risk of recall bias is low. On the other hand, strengths of this study are represented by the big sample of mothers included in the study, that is representative of the physiological pregnancies of the studied area, and by the several maternal socio-demographic characteristics and lifestyles collected and related both to pre-pregnancy and pregnancy, which we were able to cross-reference with eating habits. Furthermore, to the best of our knowledge this is the first attempt to assess adherence to dietary recommendations specifically promulged from Italian society of Gynaecology and Obstetrics for Italian pregnant women.

Conclusion

Adherence to dietary recommendations among Italian pregnant women appears to be low, with several socio-demographic factors and lifestyle choices significantly influencing compliance. Targeted interventions and public health strategies aimed at improving maternal nutrition need to be implemented or reinforced to sustain women and child health, especially in the most vulnerable groups.

Ethic Approval: This study was approved by Area Vasta Emilia Nord Ethics Committee (approval no. 108/15 2305 and 2018/num715).

Conflict of Interest: Each author declares that he or she has no commercial associations (e.g. consultancies, stock ownership, equity interest, patent/licensing arrangement etc.) that might pose a conflict of interest in connection with the submitted article.

Authors Contribution: L.D.P., C.G., L.P., L.L., M.A.C., conceptualized and designed the study, coordinated and supervised data collection, L.D.P, C.G. and M.A.C. drafted the initial manuscript, L.P. and L.E. reviewed and revised the manuscript. L.P., V.T., and L.L. and U.C., L.I., A.L. and F.F. collected data. L.D.P., C.G., L.P., V.T and L.L. critically analyzed and interpreted data, T.F., A.B., E.R. L.I. and F.F. critically reviewed the manuscript. All authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work. All authors contributed to the article and approved the submitted version. All authors have read and agreed to the published version of the manuscript.

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