British Journal of Nutrition (2024), 132, 1052–1064 doi:10.1017/S0007114524001764

Association of sociodemographic, obstetric characteristics, lifestyle and food consumption with life satisfaction and optimism among overweight pregnant women

Ana Vitória Lanzoni Chaves[1], Natalia Posses Carreira[1], Maria Carolina Lima[1], Daniela Saes Sartorelli[2] and Lívia Castro Crivellenti[1]*

[1]*Programa de Pós-Graduação em Saúde Pública, Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo, Avenida Bandeirantes, 3900, Ribeirão Preto, SP 14049-900, Brasil*
[2]*Departamento de Medicina Social, Faculdade de Medicina de Ribeirão Preto, Universidade de São Paulo, Avenida Bandeirantes, 3900, Ribeirão Preto, SP 14049-900, Brasil*

(Submitted 22 February 2024 – Final revision received 12 July 2024 – Accepted 9 August 2024 – First published online 17 October 2024)

Abstract

The present study investigated the relationships between maternal characteristics and subjective well-being (life satisfaction and optimism) among overweight Brazilian adult pregnant women. A cross-sectional study utilising baseline data from a randomised controlled clinical trial was conducted. A total of 330 women were investigated. Maternal characteristics (sociodemographic, obstetric and lifestyle) were obtained through a structured questionnaire. Data on dietary intake were collected through two 24-h dietary recalls, and the usual diet was estimated using the Multiple Source Method. Life satisfaction and optimism were assessed using validated instruments. Both unadjusted and adjusted linear regression models were employed to investigate the relationship between maternal characteristics and subjective well-being. Sleep quality was found to be positively associated with life satisfaction. Miscarriage and smoking during pregnancy were negatively associated with this sentiment. Additionally, a positive association was observed between optimism and maternal characteristics such as sleep quality, desired pregnancy and alcohol consumption in the previous 30 d. Furthermore, it was found that the consumption of sugary drinks, dietary fibre and Ca were positively associated with this same feeling. The present study showed that some maternal and food consumption characteristics were associated with subjective well-being among overweight pregnant women. It is, therefore, essential to recognise predictors of maternal mental health given their relevance to the field of public health.

Keywords: **Pregnancy: Positive psychology: Lifestyle: Dietary intake: Sleep quality**

Health and well-being is one of the pillars integrated into the seventeen Sustainable Development Goals (SDG) established by the UN in 2015. Accordingly, actions related to mental health have been widely discussed, as well as the recognition of its relevant role in promoting integral human health throughout all the cycles of life[1].

Throughout history, motherhood has been viewed as a pinnacle of contentment and fulfilment. However, pregnancy is a complex process, permeated by several stressors, such as tiredness, feelings of guilt, responsibilities, physical changes and adaptations to the maternal social role[2]. These factors, combined with other changes occurring during this period, may be implicated in the incidence of mental health problems, mainly related to depression and anxiety[3,4].

Data from the National Health Survey (2019) highlighted a prevalence of approximately 14·0 % of depression among women of reproductive age[5]. Internationally, review studies observed prevalence rates between 9·5 % and 15·2 % for depressive symptoms and symptoms of anxiety, respectively[6,7].

Evidence suggests that some maternal characteristics may contribute to a negative effect on the mental health of these women[8]. These include sociodemographic conditions[9–11], obstetric characteristics[12,13], as well as lifestyle factors related to smoking habits[14], alcohol consumption[15] and sleep disturbances[16].

Nutrition is another crucial factor in promoting maternal and child health and well-being[17,18]. Maternal nutrition in recent decades, characterised by nutritional transition, has demon-

Abbreviation: UPF, ultra-processed foods.

* **Corresponding author:** Lívia Castro Crivellenti, email iacrivelenti@gmail.com

strated dietary patterns that include low consumption of fresh and minimally processed foods and high consumption of ultra-processed foods (UPF)[19]. According to the Nova classification, which considers the degree of industrial food processing[20], fresh and minimally processed foods such as fruits, vegetables and legumes are recommended as the basis for adequate, healthy and sustainable nutrition due to their nutritional composition and level of processing. Conversely, the excessive consumption of UPF such as soft drinks, processed meats and snacks should be avoided, as they have high energy density, are rich in sugars, fats, and Na, and poor in vitamins, minerals, and fibres, being detrimental to human health and also affecting cultural, social, and environmental aspects[21].

A cross-sectional study conducted among 712 Brazilian pregnant women identified that high consumption of sweets and sugars (91 %, PR 1·91, 95 % CI 1·19, 3·07), low consumption of fruits (43 %, PR 1·43, 95 % CI 1·04, 1·95) and pattern dietary characterised by foods popular in Brazilian culture (rice or noodles, French rolls, beans, coffee with sugar, margarine and artificial juices) (PR 1·43; 95 % CI 1·01, 2·02) were associated with a higher prevalence of depression among the women[22].

Although there is evidence on the relationship between maternal characteristics and food consumption with feelings of anxiety and depression, there is still little research that has evaluated these factors with the well-being of pregnant women. Therefore, there is an emerging need to understand positive subjective experiences in this important life cycle and understand their predictive factors. In this sense, the study of Positive Psychology explores the adjustment to the focus on the need to pay attention to healthy aspects, the study of qualities, emotions, positive subjective experiences and human potential. It also prioritises mental health prevention and promotion practices to understand the experiences and virtues of each individual[23].

In a cross-sectional study conducted among Brazilian pregnant women, a positive relationship was observed between the maternal education level and life satisfaction[24]. In a systematic review, data from two studies analysed together and conducted among 3570 American and Canadian pregnant women identified a trend that higher levels of optimism could reduce the chances of preterm babies, although without statistical significance[25].

Considering the importance of mental health in the scope of public health and the understanding of individual subjectivity in prenatal care, the objective of the present study was to investigate the association between maternal characteristics and subjective well-being (life satisfaction and optimism) among overweight Brazilian pregnant women.

Methods

Study design and location

This cross-sectional study was conducted between 2018 and 2021, utilising baseline data from a randomised controlled clinical trial conducted among overweight adult pregnant women attending Health Units in the municipality of Ribeirão Preto, located in the state of São Paulo, Southeast Brazil. A detailed description of the clinical trial can be found in the publication by Sartorelli et al.[26].

Sample size and selection

In this study, the sample consisted of all pregnant women who completed the first assessment of the clinical trial (main study) and had complete data on subjective well-being (life satisfaction and optimism) during pregnancy. Participants were recruited from seven Health Units in the municipality during prenatal consultations, with inclusion criteria including a minimum age of 18 years, gestational age of up to 15 weeks and 6 d, and pre-gestational BMI classified as overweight (between 25 kg/m^2 and 29·9 kg/m^2). Out of the 350 pregnant women included in the main study, fifteen did not undergo the first assessment (database). Thus, 335 women completed the first assessment; however, five women did not have complete data regarding life satisfaction and optimism. Therefore, the final sample consisted of 330 pregnant women (Fig. 1). The sample was considered sufficient to predict results from the secondary analyses employed[27].

Data collection

Feelings during pregnancy. Data on feelings were collected in person at the time of the first assessment through printed questionnaires completed by the pregnant women. To assess life satisfaction, defined as the individual's level of contentment upon self-reflection on their life[28,29], the Satisfaction With Life Scale (SWLS) was used. It consists of five sentences, utilising a Likert-type response scale ranging from strongly disagree (1) to strongly agree (7)[30].

To assess optimism, characterised as generalised positive and negative expectations about future life events and the hope that good things will happen in various situations, events and actions[31], the Revised Life Orientation Test (LOT-R) was used. The test comprises ten items measuring individuals' positive and negative expectations, with items 1, 4 and 10 assessing optimism, items 3, 7 and 9 assessing pessimism, and the remaining items (2, 5, 6 and 8) serving as filler items. Responses vary according to the subject's degree of agreement using a Likert-type scale with response options ranging from 1 (strongly disagree) to 5 (strongly agree)[32,33].

Maternal characteristics

Sociodemographic variables. Data on age, marital status, self-reported skin colour, education and paid activity were collected at the time of the first assessment, using a structured questionnaire developed by the clinical trial researchers, and the economic stratum was classified using the Brazilian Economic Classification Criteria (CCEB)[34]. The criteria were established according to the Brazilian Association of Research Companies (ABEP), based on possession of items, level of education of the head of the family and access to public services such as running water and paved streets.

Obstetric variables. This information was also collected through a structured questionnaire in the first evaluation of the study. Data regarding planned pregnancy, desired

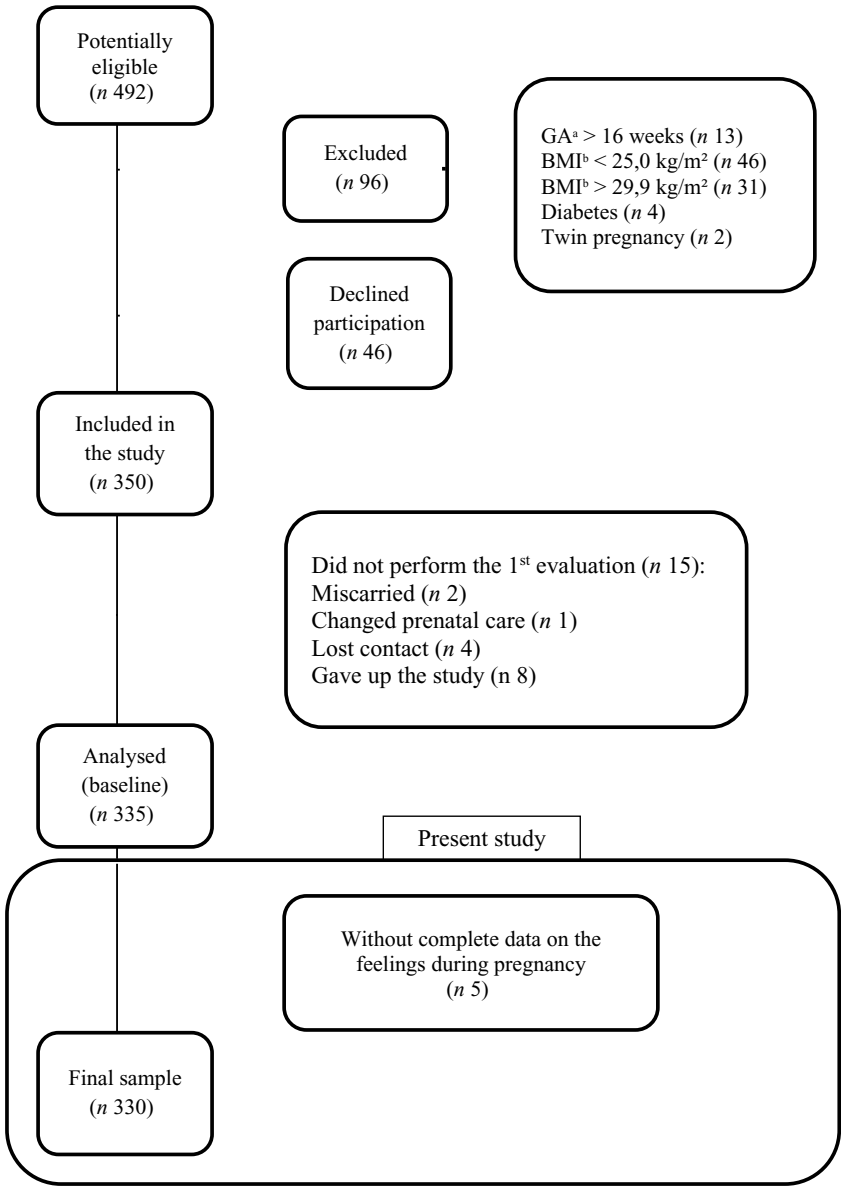

Fig. 1. Flow chart of participants in the clinical trial and present study (adapted from Sartorelli et al., 2023). [a]GA, gestational age; [b]BMI, body mass index.

pregnancy and abortion in a previous pregnancy were self-reported by the women. Information on gestational age was calculated based on data from the last menstrual period and later confirmed with an ultrasound examination.

Lifestyle variables. The consumption of alcoholic beverages in the last 30 d, smoking and sleep time were self-reported by the women using the structured questionnaire. Sleep quality was assessed using a Likert scale from zero (worst) to ten (best possible sleep) in the last 24 h, prior to the interview.

The regular practice of commuting and leisure physical activities was assessed using a questionnaire that includes data on these activities practiced the week before the interview with data on performance, frequency and duration. This questionnaire, previously validated for the population, is similar to the one adopted in the Risk and Protective Factor Surveillance System for Chronic Diseases by Telephone Survey (VIGITEL) study[35].

Food consumption variables. To assess dietary intake, trained nutritionists collected two 24-h dietary recalls in person on non-consecutive days with an 8-d interval, using the multiple-pass method[36]. The 24-h dietary recalls were obtained through the report of the pregnant women of all foods, preparations and beverages consumed on the day before the interview, as well as the quantity in household measures.

The Nutrition Data System for Research (NDSR) software, developed by the University of Minnesota in the USA, was employed, which uses the US Department of Agriculture American Table as a reference to calculate the nutritional value of foods[37].

The usual diet was estimated using the Multiple Source Method developed by the European Prospective Investigation into Cancer and Nutrition (EPIC). This statistical modelling technique estimates the usual consumption of foods and nutrient intake in three stages (the first stage estimates the probability of consuming a food item or nutrient on a random day; the second stage estimates the usual intake on consumption days; and the third stage calculates the individual's current intake based on the previous two stages)[38].

After estimating the usual diet, the foods were classified according to the Nova classification[20], considering the degree of industrial food processing, into: fresh or minimally processed foods, processed foods, processed culinary ingredients and UPF. However, only the group of fresh or minimally processed foods and UPF was considered for the analyses of this study. Fresh or minimally processed foods are obtained from nature or undergo minimal processing such as cleaning, selection, fermentation, pasteurisation, fractionation, packaging and other procedures carried out by the industry; examples include vegetables, legumes, fruits, rice, beans, milk, fresh meats and eggs. UPF are industrially manufactured and composed of excess sugars, Na, oils, hydrogenated fats and food additives added to make them more durable and palatable; examples include soft drinks, filled biscuits, instant noodles, candies and alcoholic beverages, among others. Culinary preparations were classified according to the ingredient present in the highest quantity in the recipe[21].

Furthermore, food consumption was evaluated using food markers characterised as healthy and unhealthy and according to some nutrients of interest during the gestational period. The food consumption markers adopted by the Food and Nutrition Surveillance System (SISVAN) were used as a theoretical reference[39]. The healthy markers considered are: beans, fresh fruits (without considering fruit juice), vegetables and/or legumes (without considering potatoes, cassava and yam); and unhealthy markers: hamburgers and/or sausages (ham, mortadella, salami and sausages); sweetened drinks (soda, boxed juice, powdered juice, boxed coconut water, guarana/currant syrups and fruit juice with added sugar); instant noodles, packaged snacks or savoury crackers; and filled cookies, sweets or treats (candies, lollipops, gum, caramel and gelatin). The nutrients of interest investigated were: carbohydrates, proteins, lipids, monounsaturated, polyunsaturated and saturated fats, dietary fibre, folate, *n*-3, Fe and Ca. To investigate the relationship between micronutrients and the outcomes, the micronutrients were adjusted by the energy through the residual method.

Data analysis

Descriptive analyses were used to evaluate the characteristics of overweight pregnant women according to the scores of positive feelings during pregnancy (in tertiles). The χ^2 test was used for categorical variables, with results expressed as relative (%) and absolute (*n*) frequency, and the Kruskal–Wallis test for continuous variables (non-normally distributed), with results presented as median (P25; P75). Both unadjusted and adjusted linear regression models (backward method) were used to investigate the relationship between maternal characteristics (sociodemographic, obstetric, lifestyle and dietary intake) and subjective well-being (life satisfaction and optimism). The variables included in the final model for adjustment were age, ethnicity marital status, education level, employment status, desired pregnancy, miscarriage, sleep quality, physical activity practice, smoking and alcohol consumption in the last 30 d. Data analysis was performed using the IBM SPSS software (version 25, SPSS Inc. Woking, Surrey), and a *P*-value < 0·05 was adopted as significant.

Results

In total, 330 women were investigated. The median (P25; P75) age of the pregnant women was 27 years (23; 32), the majority were married (75·2 %), of mixed race (52·7 %), reported 9–11 years of education (65 %) and were employed (59·7 %). During the 30 d preceding the interview, 14·6 % of the women reported consuming alcohol once or twice, 64·8 % were classified in economic stratum C and the median (P25; P75) of physical activity practice was 70 min/week (0; 180). While 77 % of women reported that the current pregnancy was desired, less than half of the sample (41·2 %) reported planning to become pregnant. Regarding maternal characteristics according to life satisfaction, a higher median of sleep quality was observed among pregnant women classified in the third tertile (indicating higher levels of satisfaction) compared with those classified in the first tertile. Conversely, more women who reported a previous miscarriage and smoking during pregnancy were observed in the first tertile of life satisfaction compared with the third tertile (Table 1). For optimism, more women with 12 or more years of education were categorised in the third tertile. There were no differences for the other characteristics analysed (Table 2).

In adjusted linear regression models, it was observed that better sleep quality was positively associated with life satisfaction (0·68 (0·42, 0·94) $P < 0·001$). However, previous miscarriage (–1·79 (–3·31, –0·26) $P = 0·022$) and smoking habit during pregnancy (–2·51 (–4·23, –0·79) $P = 0·004$) were negatively associated with this feeling (Table 3). Sleep quality (0·28 (0·07, 0·50) $P = 0·010$), desired pregnancy (1·33 (0·06, 2·60) $P = 0·040$) and alcohol consumption in the last 30 d (1·39 (0·04, 2·74) $P = 0·043$) also showed a positive association with optimism (Table 4).

No association was found between food consumption, according to the Nova classification, and subjective well-being (life satisfaction and optimism) (Table 5). However, it was observed that the consumption of sugary drinks (0·24 (0·07, 0·42) $P < 0·001$), dietary fibre (0·19 (0·04, 0·34) $P = 0·01$) and Ca (0·00 (0·00, 0·01) $P = < 0·001$) were positively associated with optimism (Table 6).

Discussion

This study explored the relationships between maternal characteristics (sociodemographic conditions, obstetric factors, lifestyle and dietary intake) and subjective well-being (life satisfaction and optimism) among overweight Brazilian pregnant women. In the field of maternal and child health, research

British Journal of Nutrition

Table 1. Sociodemographic, obstetric and lifestyle characteristics according to Life Satisfaction score, in tertiles. Ribeirão Preto, SP, Brazil, 2018–2021 (*n* 330)

		Life satisfaction – tertile						
		T1 (*n* 113)		T2 (*n* 118)		T3 (*n* 99)		
		5; 23[h]		24; 29[h]		30; 35[h]		
Maternal characteristics	Total	Median (P25; P75)/*n* (%)						*P*[i]
Sociodemographic								
Age								
Median	27	27		26		27		
P25; P75	23; 32	22; 31		23; 33		23; 31		0·67
Marital status								0·22
Married	248	75·2	80	70·8	95	80·5	73	73·7
Others	82	24·8	33	29·2	23	19·5	26	26·3
Self-reported skin colour[a]								0·13
White	101	30·6	26	23·0	40	33·9	35	35·4
Black	49	14·8	24	21·2	14	11·9	11	11·1
Mixed race	174	52·7	59	52·2	62	52·5	53	53·5
Education level[b]								0·93
≤ 8 years	72	21·8	26	23·2	23	19·5	23	23·2
9–11 years	214	64·8	73	65·2	78	66·1	63	63·6
≥ 12 years	43	13·1	13	11·6	17	14·4	13	13·1
Socio-economic stratum[c,f]								0·28
A + B	63	21·4	19	19·0	27	25·2	17	19·5
C	181	61·6	58	58·0	67	62·6	56	64·4
D + E	50	17·0	23	23·0	13	12·1	14	16·1
Employment status	197	59·7	60	53·1	76	64·4	61	61·6	0·19
Obstetric								
Gestational week								
Median	11	11		11		11		
P25; P75	9; 12	9; 12		9; 13		9; 12		0·69
Planned pregnancy	136	41·2	40	35·4	48	40·7	48	48·5	0·15
Desired pregnancy[d]	254	77·0	83	73·5	87	73·7	84	84·8	0·13
Miscarriage[e]	72	31·6	38	43·2	18	25·0	16	23·5	0·01*
Lifestyle								
Sleep quality								
Median	7	7		7		8		
P25; P75	5; 9	5; 8		6; 9		6; 10		< 0·001*
Physical activity practice (min/week)[g]								
Median	70	75		50		70		
P25; P75	0; 180	0; 210		0; 157·5		10; 140		0·16
Sleep time								0·46
Insufficient (< 7 h)	37	11·2	16	14·2	9	7·6	12	12·1
Adequate (7–9 h)	172	52·1	61	54·0	62	52·5	49	49·5
Excessive (> 9 h)	121	36·7	36	31·9	47	39·8	38	38·4
Smoking[b]								< 0·001*
Never smoked	238	72·3	74	65·5	88	75·2	76	76·8
Former smoker	39	11·9	9	8·0	17	14·5	13	13·1
Smoking during pregnancy	52	15·8	30	26·5	12	10·3	10	10·1
Alcohol consumption in the last 30 d	65	19·7	23	20·4	29	24·6	13	13·1	0·11

[a] Data available for 324 women.
[b] Data available for 329 women.
[c] Data available for 294 women.
[d] Data available for 327 women (3 declined to answer the question).
[e] Data available for 228 women (228 reported having been pregnant prior to the current pregnancy, and of these, 72 reported a previous miscarriage).
[f] According to ABEP criteria (2020).
[g] Leisure and commuting physical activity practice.
[h] Minimum and maximum score according to the tertile for Life Satisfaction.
[i] *P*-values obtained according to the Kruskal–Wallis test for continuous variables with non-normal distribution and χ^2 test for categorical variables.
*$P < 0{\cdot}05$.

investigating this association is scarce, highlighting the relevance of the present study. The approach to positive subjective experiences, as well as the understanding of their predictors, enables the exploration of the individual's strengths for achieving their potential[40,41].

In this study, a positive association between sleep quality and life satisfaction was observed. Conversely, smoking during pregnancy and a previous miscarriage were negatively associated with this feeling during pregnancy. These findings were also observed through the descriptive analyses, where pregnant

Table 2. Sociodemographic, obstetric and lifestyle characteristics according to optimism score, in tertiles. Ribeirão Preto, SP, Brazil, 2018–2021 (*n* 330)

			Optimism – tertile						
			T1 (*n* 99)		T2 (*n* 124)		T3 (*n* 107)		
			6; 22[h]		23; 27[h]		28; 30[h]		
Maternal characteristics	Total		Median (P25; P75)/*n* (%)						*P*[i]
Sociodemographic									
Age									
Median	27		26		27		27		
P25; P75	23; 32		23; 31		23; 30		23; 34		0·27
Marital status									0·36
Married	248	75·2	70	70·7	98	79·0	80	74·8	
Other	82	24·8	29	29·3	26	21·0	27	25·2	
Self-reported skin colour[a]									0·21
White	101	30·6	32	32·3	32	25·8	37	34·6	
Black	49	14·8	20	20·2	15	12·1	14	13·1	
Mixed race	174	52·7	46	46·5	74	59·7	54	50·5	
Education level[b]									0·03*
≤ 8 years	72	21·8	20	20·2	35	28·5	17	15·9	
9–11 years	214	64·8	71	71·7	74	60·2	69	64·5	
≥ 12 years	43	13·1	8	8·1	14	11·4	21	19·6	
Socio-economic stratum[c,f]									0·17
A + B	63	21·4	14	16·9	20	17·7	29	29·6	
C	181	61·6	54	65·1	71	62·8	56	57·1	
D + E	50	17·0	15	18·1	22	19·5	13	13·3	
Employment status	197	59·7	57	57·6	72	58·1	68	63·6	0·61
Obstetric									
Gestational week									
Median	11		11		11		11		
P25; P75	9; 12		9; 12		9; 13		9; 13		0·91
Planned pregnancy	136	41·2	41	41·4	48	38·7	47	43·9	0·72
Desired pregnancy[d]	254	77·0	71	71·7	95	76·6	88	82·2	0·25
Miscarriage[e]	72	31·6	25	36·8	27	29·0	20	29·9	0·54
Lifestyle									
Sleep quality									
Median	7		7		7·5		8		
P25; P75	5; 9		5; 9		6; 9		6; 10		0·35
Physical activity practices (min/week)[g]									
Median	70		75		60		60		
P25; P75	0; 180		0; 180		0; 180		0; 180		0·80
Sleep time									0·25
Insufficient (< 7 h)	37	11·2	11	11·1	16	12·9	10	9·3	
Adequate (7–9 h)	172	52·1	58	58·6	55	44·4	59	55·1	
Excessive (> 9 h)	121	36·7	30	30·3	53	42·7	38	35·5	
Smoking[b]									0·10
Never smoked	238	72·3	75	75·8	92	74·2	71	67·0	
Former smoker	39	11·9	9	9·1	10	8·1	20	18·9	
Smoking during pregnancy	52	15·8	15	15·2	22	17·7	15	14·2	
Alcohol consumption in the last 30 d	65	19·7	13	13·1	24	19·4	28	26·2	0·06

[a] Data available for 324 women.
[b] Data available for 329 women.
[c] Data available for 294 women.
[d] Data available for 327 women (3 declined to answer the question).
[e] Data available for 228 women (228 reported having been pregnant prior to the current pregnancy, and of these, 72 reported a previous miscarriage).
[f] According to ABEP criteria (2020).
[g] Leisure and commuting physical activity practice.
[h] Minimum and maximum score according to the tertile for Optimism.
[i] *P*-values obtained according to the Kruskal–Wallis test for continuous variables with non-normal distribution and χ^2 test for categorical variables.
*$P < 0{\cdot}05$.

women with higher median sleep quality were classified in the highest tertile of life satisfaction compared with those classified in the lowest tertile. Additionally, more women who reported a previous miscarriage and smoking during pregnancy were categorised in the lowest tertile of life satisfaction compared with the highest tertile.

To date, there is no evidence in the scientific literature that sleep quality and smoking habits are associated with life satisfaction. Studies suggest that unhealthy habits during pregnancy, such as sleep-related problems and smoking, can have implications for maternal and infant health. Sleep quality during pregnancy is directly related to low daytime productivity,

Table 3. Association between maternal characteristics and life satisfaction during pregnancy. Ribeirão Preto, São Paulo, Brazil, 2018–2021 (*n* 330)

	Life satisfaction[a]					
	Raw values			Adjusted values		
Maternal characteristics	*β*	95 % CI	*P*	*β*	95 % CI	*P*
Sociodemographic						
Age (years)	0·06	−0·05, 0·17	0·29			
Education (years of study)	0·09	−0·19, 0·38	0·52			
Marital status	0·73	−0·79, 2·26	0·34			
Self-reported skin colour[c]						
Black	−2·70	−4·76, −0·64	0·01	−1·20	−2·98, 0·57	0·18
Mixed race	−1·27	−2·75, 0·21	0·09	−0·95	−2·36, 0·45	0·18
Socio-economic stratum[b,c]						
C	−0·34	−2·02, 1·34	0·69			
D + E	−1·58	−3·75, 0·60	0·15			
Employment status	1·42	0·08, 2·75	0·04	0·53	−0·83, 1·88	0·45
Obstetric						
Gestational week (weeks)	−0·03	−0·32, 0·27	0·85			
Planned pregnancy[d]	1·59	0·26, 2·91	0·02	1·29	−0·01, 2·59	0·05
Desired pregnancy	1·28	−0·31, 2·87	0·12			
Miscarriage[e]	−2·26	−3·84, −0·68	0·01	−1·79	−3·31, −0·26	0·02
Lifestyle						
Sleep quality[f]	0·79	0·54, 1·03	< 0·001	0·68	0·42, 0·94	< 0·001
Physical activity practices (min/week)	−0·001	−0·005, 0·003	0·67			
Sleep time (hours)	−0·03	−0·30, 0·25	0·85			
Smoking[c]						
Former smoker	0·78	−1·27, 2·83	0·45	1·38	−0·51, 3·27	0·15
Smoking during pregnancy[g]	−2·51	−4·32, −0·69	0·01	−2·51	−4·23, −0·79	< 0·001
Alcohol consumption in the last 30 d	−0·40	−2·06, 1·26	0·64			

[a] Total score of the Satisfaction With Life Scale (SWLS).
[b] According to the ABEP criteria (2020).
[c] Reference category for categorical variables (dummy): self-reported skin colour: White; socio-economic stratum: class A + B; smoking: never smoked.
[d] Variables retained in the final backward regression model for planned pregnancy: ethnicity, sleep quality, miscarriage, and smoking.
[e] Variables retained in the final backward regression model for miscarriage: planned pregnancy, ethnicity, sleep quality and smoking.
[f] Variables retained in the final backward regression model for sleep quality: ethnicity, planned pregnancy, miscarriage and smoking.
[g] Variables retained in the final backward regression model for smoking during pregnancy: miscarriage, planned pregnancy, ethnicity and sleep quality.

safety risks, concerns, relationship problems with partners and risks for symptoms associated with depression and anxiety[42]. Regarding smoking habits, pregnant women should be advised about the perinatal risks associated with tobacco use, such as fetal growth restriction, low birth weight, increased perinatal mortality and other complications[43].

The literature reveals that pregnant women who have experienced previous miscarriages are more predisposed to mental health destabilisation and the occurrence of alcohol abuse, depressive disorders and a higher risk of suicide[44,45]. Furthermore, evidence suggests that women who have had a spontaneous or induced miscarriage have experienced temporary declines in overall life satisfaction and have shown lower satisfaction in various life domains, including social contact, leisure, family and relationships[46].

Sleep quality and desired pregnancy also presented a positive association with optimism. Although scarce in the literature, studies that evidence these relationships can be found, and it is understood that desired pregnancy can be characterised as a protective factor for mental health[47]. Additionally, some authors reinforce the importance of establishing a routine to promote regular sleeping and waking habits to ensure the well-being of pregnant women[48].

Studies that evaluated sleep among pregnant women reinforce that the psychological state during pregnancy is associated with sleep quality[49]. Furthermore, evidence suggests that repetitive negative thoughts are negatively associated with sleep quality[50] and that poor sleep quality is associated with symptoms of mental health problems, such as depression and stress[51].

Contrary to the hypothesis of the present study, a positive association was found between alcohol consumption during pregnancy and optimism. It is important to highlight that the consumption of alcoholic beverages is not recommended during pregnancy, even in small doses, due to the harmful side effects caused to the mother–child binomial[52]. A plausible explanation for the finding in the present study is the fact that this consumption is occasional, as observed in the study participants (frequency of 1–2 times in the month before the interview), and therefore, is related to a behaviour of social drinking. In a quantitative exploratory study conducted among pregnant women, it was observed that 10 % of the sample had the habit of consuming alcohol moderately, with 'the main motivational factor being their presence at parties and celebrations, as well as feeling happy and relaxed at the time of consumption'[53]. In these social occasions, it is understood that this habit could be an

Table 4. Association between maternal characteristics and optimism during pregnancy. Ribeirão Preto, São Paulo, Brazil, 2018–2021 (*n* 330)

	Optimism[a]					
	Raw values			Adjusted values		
Maternal characteristics	*β*	95 % CI	*P*	*β*	95 % CI	*P*
Sociodemographic						
Age (years)	0·08	–0·03, 0·17	0·06			
Education (years of study)	0·20	–0·02, 0·41	0·10			
Marital status	0·54	–0·63, 1·70	0·36			
Self-reported skin colour						
Black	–0·73	–2·32, 0·87	0·37			
Mixed race	–0·08	–1·23, 1·06	0·89			
Socio-economic stratum[b,c]						
C	–0·48	–1·82, 0·85	0·48			
D + E	–0·98	–2·71, 0·75	0·27			
Employment status	0·33	–0·70, 1·36	0·53			
Obstetric						
Gestational week (weeks)	0·12	–0·10, 0·34	0·29			
Planned pregnancy	0·27	–0·76, 1·29	0·61			
Desired pregnancy[d]	1·31	0·10, 2·51	0·03	1·33	0·06, 2·60	0·04
Miscarriage	–0·65	–1·86, 0·57	0·30			
Lifestyle						
Sleep quality[e]	0·30	0·10, 0·49	< 0·001	0·28	0·07, 0·50	0·01
Physical activity practices (min/week)	0·001	–0·002, 0·004	0·63			
Sleep time (hours)	0·02	–0·19, 0·23	0·85			
Smoking[c]						
Former smoker	1·18	–0·40, 2·76	0·14			
Smoking during pregnancy	0·01	–1·39, 1·41	0·99			
Alcohol consumption in the last 30 d[f]	1·27	0·01, 2·53	0·05	1·39	0·04, 2·74	0·04

[a] Total score of the Life Orientation Test-Revised (LOT-R).
[b] According to ABEP criteria (2020).
[c] Reference category for categorical variables (dummy): self-reported skin colour: White; socioeconomic stratum: class A + B; smoking: never smoked.
[d] Variables retained in the final backward regression model for desired pregnancy: sleep quality, alcohol consumption in the last 30 d, smoking and education level.
[e] Variables retained in the final backward regression model for sleep quality: desired pregnancy, alcohol consumption in the last 30 d, smoking and education level.
[f] Variables retained in the final backward regression model for alcohol consumption in the last 30 d: desired pregnancy, sleep quality, smoking and education level.

Table 5. Association between maternal food consumption according to the Nova classification and subjective well-being. Ribeirão Preto, São Paulo, Brazil, 2018–2021 (*n* 316)

	Life satisfaction[a]			Optimism[b]		
	β	95 % CI	*P*	*β*	95 % CI	*P*
Unprocessed and minimally processed foods (% E)[c]						
Raw	0·03	–0·03, 0·08	0·36	–0·02	–0·06, 0·02	0·32
Adjusted[d,e]	0·04	–0·03, 0·11	0·24	–0·03	–0·08, 0·03	0·29
Ultra-processed foods (% E)[c]						
Raw	–0·08	–0·15, 0·00	0·06	–0·02	–0·08, 0·04	0·49
Adjusted[f,g]	–0·07	–0·16, 0·02	0·13	0·00	–0·08, 0·08	0·96

[a] Total score of the Satisfaction With Life Scale (SWLS).
[b] Total score of the Life Orientation Test-Revised (LOT-R).
[c] %E, energy percentage.
[d] Variables retained in the final backward regression model for %E of unprocessed and minimally processed foods *v.* life satisfaction: age, miscarriage and sleep quality.
[e] Variables retained in the final backward regression model for %E of unprocessed and minimally processed foods *v.* optimism: age, marital status, education level, sleep quality and alcohol consumption in the last 30 d.
[f] Variables retained in the final backward regression model for %E of ultra-processed foods *v.* life satisfaction: miscarriage and sleep quality.
[g] Variables retained in the final backward regression model for %E of ultra-processed foods *v.* optimism: age, marital status, education level, employment status, desired pregnancy, miscarriage, sleep quality, physical activity practice, smoking and alcohol consumption in the last 30 d.
*$P < 0·05$.

opportunity for these women to express themselves and seek support, stimulating social interactions and strengthening identification and belonging to their social structure, even though it is considered a risk behaviour for maternal and child health[54,55].

Regarding optimism, through descriptive analyses, a higher frequency of women with 12 or more years of education was found categorised in the highest tercile for this feeling. In a cross-sectional study conducted with 222 Portuguese pregnant women, a positive association between education and positive

Table 6. Association between maternal food consumption according to food consumption markers and nutrients of interest, and subjective well-being. Ribeirão Preto, São Paulo, Brazil, 2018–2021 (*n* 316) (continued)

	Life satisfaction[a]			Optimism[b]		
	β	95 % CI	*P*	*β*	95 % CI	*P*
Food consumption marker (% E)[c]						
Beans						
Raw	−0·09	−0·31, 0·14	0·45	−0·15	−0·32, 0·03	0·10
Adjusted[e,f]	−0·02	−0·28, 0·23	0·85	−0·10	−0·30, 0·09	0·30
Fresh fruits						
Raw	0·08	−0·05, 0·21	0·23	0·08	−0·08, 0·18	0·15
Adjusted[g,h]	−0·00	−0·17, 0·16	0·93	0·02	−0·11, 0·15	0·76
Vegetables						
Raw	0·71	0·06, 1·37	0·03	0·17	−0·34, 0·67	0·51
Adjusted[i,j]	0·54	−0·30, 1·38	0·21	0·08	−0·59, 0·75	0·81
Sugary drinks						
Raw	0·05	−0·15, 0·24	0·63	0·14	−0·01, 0·29	0·07
Adjusted[k,l]	0·13	−0·10, 0·35	0·26	0·24	0·07, 0·42	< 0·001*
Stuffed cookies, sweets or treats						
Raw	−0·28	−0·59, 0·03	0·08	−0·07	−0·31, 0·17	0·56
Adjusted[m,n]	−0·33	−0·72, 0·05	0·09	−0·20	−0·50, 0·11	0·20
Hamburguer and/or sausages						
Raw	−0·17	−0·47, 0·12	0·25	−0·18	−0·41, 0·04	0·11
Adjusted[o,p]	−0·13	−0·48, 0·22	0·46	−0·13	−0·41, 0·14	0·34
Instant noodles, package snacks or salted biscuits						
Raw	−0·12	−0·27, 0·04	0·14	0·07	−0·05, 0·19	0·24
Adjusted[q,r]	−0·11	−0·29, 0·08	0·25	0·14	−0·00, 0·28	0·05
Macronutrients (% E)[c]						
Carbohydrates						
Raw	0·11	−0·03, 0·25	0·12	0·05	−0·05, 0·16	0·33
Adjusted[s,t]	0·08	−0·09, 0·24	0·35	0·08	−0·05, 0·20	0·25
Proteins						
Raw	−0·11	−0·47, 0·25	0·55	−0·13	−0·41, 0·15	0·35
Adjusted[u,v]	−0·07	−0·52, 0·38	0·76	−0·07	−0·41, 0·27	0·69
Lipids						
Raw	−0·13	−0·30, 0·05	0·15	−0·03	−0·16, 0·10	0·65
Adjusted[w,x]	−0·10	−0·31, 0·10	0·32	−0·09	−0·25, 0·07	0·29
Monounsaturated fat						
Raw	−0·22	−0·59, 0·15	0·24	−0·15	−0·43, 0·14	0·31
Adjusted[y,z]	−0·14	−0·58, 0·29	0·52	−0·22	−0·56, 0·12	0·21
Polyunsaturated fat						
Raw	−0·36	−0·80, 0·09	0·12	−0·12	−0·47, 0·23	0·50
Adjusted[a1,b1]	−0·42	−0·98, 0·14	0·14	−0·25	−0·69, 0·19	0·27
Saturated fat						
Raw	−0·17	−0·68, 0·33	0·50	0·12	−0·27, 0·51	0·55
Adjuster[c1,d1]	−0·04	−0·68, 0·60	0·91	−0·01	−0·51, 0·50	0·98
Micronutrients[d]						
Dietary fibres (g)						
Raw	0·07	−0·10, 0·24	0·41	0·11	−0·01, 0·24	0·08
Adjusted[e1,f1]	0·08	−0·11, 0·28	0·40	0·19	0·04, 0·34	0·01*
Folate (mcg)						
Raw	0·00	−0·00, 0·01	0·25	0·01	−0·00, 0·01	0·08
Adjusted[g1,h1]	0·01	−0·00, 0·01	0·21	0·01	−0·00, 0·01	0·14
n-3						
Raw	−1·21	−2·63, 0·20	0·09	−0·57	−1·66, 0·51	0·30
Adjusted[k1,l1]	−1·64	−3·40, 0·12	0·07	−1·07	−2·45, 0·31	0·13
Fe (mg)						
Raw	0·04	−0·25, 0·32	0·81	−0·08	−0·29, 0·14	0·50

Table 6. (*Continued*)

	Life satisfaction[a]			Optimism[b]		
	β	95 % CI	*P*	*β*	95 % CI	*P*
Adjusted[m1,n1]	0·14	–0·19, 0·47	0·42	0·00	–0·27, 0·27	0·99
Ca (mg)						
Raw	0·00	0·00, 0·01	0·08	0·01	0·00, 0·01	< 0·001*
Adjusted[o1,p1]	0·00	–0·00, 0·01	0·12	0·01	0·00, 0·01	< 0·001*

[a]Total score of the Satisfaction With Life Scale (SWLS).
[b]Total score of the Life Orientation Test-Revised (LOT-R).
[c]Food groups and macronutrients expressed in percent energetic %E.
[d]Micronutrients expressed in their measurement units and energy-adjusted values using the residual method.
[e]Variables retained in the final backward regression model for beans *v.* life satisfaction: age, education level, employment status, desired pregnancy, miscarriage, sleep quality and smoking.
[f]Variables retained in the final backward regression model for beans *v.* optimism: age, marital status, education level, sleep quality and alcohol consumption in the last 30 d.
[g]Variables retained in the final backward regression model for fresh fruit *v.* life satisfaction: age, marital status, education level, employment status, desired pregnancy, miscarriage, sleep quality and smoking.
[h]Variables retained in the final backward regression model for fresh fruits *v.* optimism: age, marital status, education level, employment status, miscarriage, sleep quality, physical activity practice, smoking and alcohol consumption in the last 30 d.
[i]Variables retained in the final backward regression model for vegetables and/or legumes *v.* life satisfaction: age, miscarriage and sleep quality.
[j]Variables retained in the final backward regression model for vegetables and/or legumes *v.* optimism: age, marital status, education level, employment status, miscarriage, sleep quality, physical activity practice, smoking and alcohol consumption in the last 30 d.
[k]Variables retained in the final backward regression model for sugary drinks *v.* life satisfaction: age, miscarriage and sleep quality.
[l]Variables retained in the final backward regression model for sugary drinks *v.* optimism: age, education level, sleep quality and alcohol consumption in the last 30 d.
[m]Variables retained in the final backward regression model for stuffed cookies, sweets or treats *v.* life satisfaction: miscarriage and sleep quality.
[n]Variables retained in the final backward regression model for stuffed cookies, sweets or sweets *v.* optimism: age, education level, sleep quality and alcohol consumption in the last 30 d.
[o]Variables retained in the final backward regression model for hamburger and/or sausages *v.* life satisfaction: age, education, miscarriage and sleep quality.
[p]Variables retained in the final backward regression model for hamburger and/or sausages *v.* optimism: age, marital status, education level, sleep quality and alcohol consumption in the last 30 d.
[q]Variables retained in the final backward regression model for instant noodles, packaged snacks or savoury biscuits *v.* life satisfaction: age, miscarriage and sleep quality.
[r]Variables retained in the final backward regression model for instant noodles, packaged snacks or savoury biscuits *v.* optimism: age, education level, sleep quality and alcohol consumption in the last 30 d.
[s]Variables retained in the final backward regression model for carbohydrates *v.* life satisfaction: age, education level, miscarriage and sleep quality.
[t]Variables retained in the final backward regression model for carbohydrates *v.* optimism: age, marital status, education level, sleep quality and alcohol consumption in the last 30 d.
[u]Variables retained in the final backward regression model for proteins *v.* life satisfaction: age, education level, employment status, desired pregnancy, miscarriage, sleep quality and smoking.
[v]Variables retained in the final backward regression model for proteins *v.* optimism: age, marital status, education level, sleep quality, physical activity practice and alcohol consumption in the last 30 d.
[w]Variables retained in the final backward regression model for lipids *v.* life satisfaction: age, education level, miscarriage and sleep quality.
[x]Variables retained in the final backward regression model for lipids *v.* optimism: age, marital status, education level, sleep quality and alcohol consumption in the last 30 d.
[y]Variables retained in the final backward regression model for monounsaturated fat *v.* life satisfaction: age, education level, miscarriage and sleep quality.
[z]Variables retained in the final backward regression model for monounsaturated fat *v.* optimism: age, education level, sleep quality and alcohol consumption in the last 30 d.
[a1]Variables retained in the final backward regression model for polyunsaturated fat *v.* life satisfaction: miscarriage and sleep quality.
[b1]Variables retained in the final backward regression model for polyunsaturated fat *v.* optimism: age, marital status, education level, sleep quality and alcohol consumption in the last 30 d.
[c1]Variables retained in the final backward regression model for saturated fat *v.* life satisfaction: age, marital status, education level, paid employment status, desired pregnancy, miscarriage, sleep quality and smoking.
[d1]Variables retained in the final backward regression model for saturated fat *v.* optimism: age, marital status, education level, employment status, miscarriage, sleep quality, physical activity practice, smoking and alcohol consumption in the last 30 d.
[e1]Variables retained in the final backward regression model for dietary fibres *v.* life satisfaction: age, education level, miscarriage and sleep quality.
[f1]Variables retained in the final backward regression model for dietary fibres *v.* optimism: education level, sleep quality and alcohol consumption in the last 30 d.
[g1]Variables retained in the final backward regression model for folate *v.* life satisfaction: age, miscarriage and sleep quality.
[h1]Variables retained in the final backward regression model for folate *v.* optimism: age, education level, sleep quality and alcohol consumption in the last 30 d.
[k1]Variables retained in the final backward regression model for *n*-3 *v.* life satisfaction: miscarriage and sleep quality.
[l1]Variables retained in the final backward regression model for *n*-3 *v.* optimism: age, education level, sleep quality and alcohol consumption in the last 30 d.
[m1]Variables retained in the final backward regression model for iron *v.* life satisfaction: age, education level, miscarriage and sleep quality.
[n1]Variables retained in the final backward regression model for iron *v.* optimism: age, marital status, education level, employment status, miscarriage, sleep quality, physical activity practice, smoking and alcohol consumption in the last 30 d.
[o1]Variables retained in the final backward regression model for Ca *v.* life satisfaction: miscarriage and sleep quality.
[p1]Variables retained in the final backward regression model for Ca *v.* optimism: age, sleep quality and alcohol consumption in the last 30 d.
*$P < 0·05$

mental health knowledge was verified. Additionally, characteristics such as residing in urban areas, professional activity, non-smoking, having a healthy diet, family planning, prenatal health care and attending a childbirth and parenting preparatory course contributed to the understanding that these associated factors can be protective for the physical and mental well-being of these women[56].

Regarding food consumption, no association was observed between food consumption, according to the Nova classification, and subjective well-being. There was a positive association between the consumption of sugary drinks, dietary fibre and Ca, and optimism. Research indicates that nutrition is an essential element, in the context of multidisciplinary care, for the treatment of problems related to mental health[57]. A cross-sectional study conducted with 858 pregnant women observed that family food insecurity was associated with low intake of fresh foods, greater screen exposure, shorter sleep duration and higher likelihood of previous depression and high stress[58]. Furthermore, studies that investigated the consumption of UPF in pregnant women observed a greater frequency of feelings of

depression among women who had a higher percentage of energy intake from the consumption of these foods[59].

Global data from analyses of the Global Dietary Database between the period 1990 and 2018 estimated an increase of approximately 16 % in the consumption of sugary drinks in the world population, relating this trend to marketing and easier access to consumption[60]. The consumption of sweetened drinks is often influenced by strategies that link their consumption to feelings of well-being and satisfaction, which may explain the findings of the present study.

A positive association between dietary fibre and Ca intake and optimism was also observed. Observational studies suggest that consuming foods high in fibre may be associated with improved mental health. The production of serotonin triggered by diets high in this nutrient can influence mood and consequently mental well-being[61]. Furthermore, evidence suggests that dietary fibre has properties to promote satiety and can modulate the intestinal microbiota, positively interfering with problems related to mental health[61–63].

There is no evidence in the literature between the association of Ca with subjective well-being. However, it is noteworthy that Ca-binding proteins are essential for the secretion of hormones and neurotransmitters, with Ca being responsible for cognitive functions, due to its action in the central nervous system[64].

In this context, enhancing the health of pregnant women through adequate nutrition is crucial for the mother–child binomial, favouring maternal mental health through their well-being[61]. Furthermore, another factor discussed in the literature about healthy habits that contribute to maintaining maternal well-being is the practice of physical activity. When there are no clinical and/or obstetric complications and there is no medical contraindication, this practice should be encouraged to provide benefits to maternal–fetal health and should be associated with the individuality of the pregnant woman with guidance on the modality, duration and intensity[65].

In the present study, a median of 70 min/week of physical activity was observed among overweight pregnant women. According to The American College of Obstetricians and Gynecologists (ACOG), physical activity during pregnancy is recommended, with a frequency of ≥ 150 min per week, as it can promote healthy weight gain throughout pregnancy, prevent back pain and pelvic, lumbar and joint region, promote intestinal function, improve blood flow, improve satisfaction with body image and self-esteem and promote the release of endocrine hormones (dopamine, endorphin and serotonin) that stimulate pleasure and happiness. Furthermore, it contributes to the reduction and/or prevention of diseases and complications such as gestational diabetes mellitus, hypertension, fetal growth restriction and cesarean birth[66].

Mourady et al. (2017) in a cross-sectional study carried out with 141 Lebanese pregnant women evaluated the impact of sociodemographic parameters on quality of life, physical activity and mental health problems during pregnancy. The findings suggest that the practice of total and light physical activity was positively correlated with psychological health and social relationships[67].

However, addressing psychological and social aspects during pregnancy is still neglected in the traditional prenatal care framework. As evidenced by scientific literature, there is a frequent disregard for elements related to mental health during pregnancy. In addition to this, public policies aimed at women's health are still disjointed, which hinders the comprehension of the scope and complexity of the problem[68]. It is necessary to move beyond interventions focused exclusively on biological aspects and concentrate efforts on promoting the healthy development of mother and child, through comprehensive physical and mental health care[69].

This study has some limitations, such as the cross-sectional design, preventing the identification of a temporal relationship. Additionally, the questionnaires about feelings were self-completed, reflecting the interpretation and level of understanding of women regarding the issues about them. Data on depression, anxiety or other mental health problems were not collected, making it impossible to identify the presence of these outcomes with the level of subjective well-being.

Concerning the strengths, the contribution of the findings of the present study to the scientific literature and their relevance stand out, considering the scarcity of studies investigating factors associated with subjective well-being (life satisfaction and optimism) during pregnancy. Data on food consumption were collected by trained nutritionists, through two dietary recalls, employing the multiple-pass method, and the usual diet was estimated through the Multiple Source Method. Additionally, the LOT-R is one of the most employed tools for assessing dispositional optimism due to its standardisation in analyses[70].

It was noted that some maternal characteristics, such as desired pregnancy and sleep quality, were associated with subjective well-being during pregnancy. Therefore, it is essential to recognise the predictors of maternal mental health, given their relevance to the public health arena and contribution to actions contemplated by the SDG.

Acknowledgements

The clinical trial was funded by the *Fundação São Paulo Fundação de Amparo à Pesquisa* (FAPESP 2017/15386-2, 2017/18980-2, 2021/06586-3, 2021/06486-9, 2021/06468-0), the *Conselho Nacional de Pesquisa Científica e Desenvolvimento Tecnológico* (CNPq 406000/2018-2 and 302.487/2018-2), the *Coordenação de Aperfeiçoamento do Ensino Superior Pessoal de Educação* (CAPES 2022/0001, 2022/0001) and the *Fundação de Apoio ao Ensino, Pesquisa e Assistência do Hospital de Clínicas de Ribeirão Faculdade de Medicina de Preto, Universidade de São Paulo* (FAEPA 1039/2018, 1114/2018, 61/2019, 62/2019 and 754/2021). The funders had no role in the study design, data collection, analysis, decision to publish or manuscript preparation.

A. V. L. C.: data collection, data tabulation, analysis and interpretation of results, and manuscript writing. N. P. C.: data collection, tabulation of food consumption data, analysis and interpretation of results, manuscript review and approval. M. C. de L.: data collection, tabulation of food consumption data, manuscript review and approval. L. C. C.: study conception, fieldwork coordination, data collection, manuscript review and

approval. D. S. S.: study conception, fieldwork coordination, manuscript review and approval.

On behalf of all authors, the corresponding author declares that there is no conflict of interest.

The clinical trial and the present study were approved by the Research Ethics Committee of the *Centro de Saúde Escola* of the *Faculdade de Medicina de Ribeirão Preto* (CAAE: 69.997.717.6.0000.5414 and CAAE: 65.405.222.0.0000.5414; respectively). All procedures were conducted following the Helsinki Declaration guidelines. Written informed consent was obtained from all pregnant women through the signing of the consent form.

References

1. United Nations Organization (2023) Sustainable Development Goals. The United Nations in Brazil. https://brasil.un.org/pt-br/sdgs (accessed December 2023).
2. Aliane PP, Ronzani TM, Silva CS, *et al.* (2008) Mental health assessment of pregnant women. *Gerais Rev Interinst Psicol* **1**, 113–122.
3. Pereira PK & Lovisi GM (2008) Prevalence of gestational depression and associated factors. *Arch Clin Psychiatry* **35**, 144–153.
4. World Health Organization (2007) *Department of Reproductive Health and Research. Maternal Mental Health and Child Health and Development in Resource-Constrained Settings. Report of a UNFPA/WHO International Expert Meeting: The Interface between Reproductive Health and Mental Health*. Hanoi, Vietnam: WHO. pp. 21–23.
5. Santos BNS, Araújo FG, Paula TF, *et al.* (2023) Prevalence of preconception health indicators among Brazilian women of reproductive age. *Ciênc Saúde Coletiva* **28**, 3367–3381.
6. Dennis CL, Falah-Hassani K & Shiri R (2017) Prevalence of antenatal and postnatal anxiety: systematic review and meta-analysis. *Br J Psychiatry* **210**, 315–323.
7. Falah-Hassani K, Shiri R & Dennis CL (2017) The prevalence of antenatal and postnatal co-morbid anxiety and depression: a meta-analysis. *Psychol Med* **47**, 2041–2053.
8. Gadelha IP, Aquino PS, Balsells MMD, *et al.* (2020) Quality of life of high risk pregnant women during prenatal care. *Rev Bras Enferm* **73**, 1–6.
9. Smolen JR & Araújo EM (2017) Race/skin color and mental health disorders in Brazil: a systematic review of the literature. *Ciênc Saúde Coletiva* **22**, 4021–4030.
10. Sufredini F, Catling C, Zugai J, *et al.* (2022) The effects of social support on depression and anxiety in the perinatal period: a mixed-methods systematic review. *J Affect Disord* **139**, 110–141.
11. Lopes ABF, Santis VGM & Rabello S (2018) A longitudinal study of mother-infant pairs: psychological suffering during motherhood. *Ágora (Rio J)* **21**, 34–49.
12. Ozgen L, Ozgen G, Simsek D, *et al.* (2022) Are women diagnosed with early pregnancy loss at risk for anxiety, depression, and perinatal grief? *Saudi Med J* **43**, 1046–1050.
13. Filha MMT, Ayers S & Gama SGN (2016) Factors associated with postpartum depressive symptomatology in Brazil: the Birth in Brazil National Research Study, 2011/2012. *J Affect Disord* **194**, 159–167.
14. Lopes KB, Ribeiro JP, Dilélio AS, *et al.* (2021) Prevalence of psychoactive substance use in pregnant and puerperal women. *Rev Enferm* **11**, 1–19.
15. Gosdin LK, Deputy NP, Kim SY, *et al.* (2022) Alcohol consumption and binge drinking during pregnancy among adults aged 18–49 years - United States, 2018–2020. *Morb Mortal Wkly Rep* **71**, 10–13.
16. Monção RA, Cordeiro PEG, Santos TN, *et al.* (2023) Sleep alterations and associated factors in pregnant women attended by primary health care. *Rev Port Enferm Saúde Ment* **29**, 75–89.
17. da Cunha GJG, Patu LJG, Ferreira JC de S, *et al.* (2022) Determining factors in the nutritional profile and food consumption of pregnant women care by the single health system. *Braz J Hea Rev* **5**, 9764–9779.
18. Graham M, Uesugi K & Olson C (2016) Barriers to weight-related health behaviours: a qualitative comparison of the socioecological conditions between pregnant and post-partum low-income women: barriers to weight-related health behaviours. *Matern Child Nutr* **12**, 349–361.
19. Graciliano NG, Silveira JAC & Oliveira ACM (2021) The consumption of ultra-processed foods reduces overall quality of diet in pregnant women. *Cad Saúde Pública* **37**, 1–17.
20. Brazil. Ministry of Health (2014) *Secretariat of Health Care. Primary Health Care Department. Dietary Guidelines for the Brazilian Population*, 2nd ed. Brasília: Ministry of Health.
21. Monteiro CA, Cannon G, Levy R, *et al.* (2016) NOVA. The star shines bright. Food Classification. Public health. *Word Nutr* **7**, 28–38.
22. Paskulin JTA, Drehmer M, Olinto MT, *et al.* (2017) Association between dietary patterns and mental disorders in pregnant women in Southern Brazil. *Rev Bras Psiquiatr* **39**, 208–215.
23. Seligman MEP, Steen TA, Park N, *et al.* (2005) Positive psychology progress: empirical validation of interventions. *Am Psychologist* **60**, 410–421.
24. Oliveira MAM, Souza WPS, Pimentel JDO, *et al.* (2014) Low-income late-age pregnant women: sociodemographic, gestational data and subjective well-being. *Psicol Teor Prat* **16**, 69–82.
25. Giangiordano I, Sahani H, Di Mascio D, *et al.* (2020) Optimism during pregnancy and obstetrical outcomes: a systematic review. *Eur J Obstet Gynecol Reprod Biol* **248**, 95–101.
26. Sartorelli DS, Crivellenti LC, Baroni NF, *et al.* (2023) Effectiveness of a minimally processed food-based nutritional counselling intervention on weight gain in overweight pregnant women: a randomized controlled trial. *Eur J Nutr* **62**, 443–454.
27. Katz MH (2003) Multivariable analysis: a primer for readers of medical research. *Ann Intern Med* **138**, 644–650.
28. Diener E, Emmons RA, Larsen RJ, *et al.* (1985) The satisfaction with life scale. *J Personality Assess* **49**, 71–75.
29. Lyubomirsky S, King L & Diener E (2005) The benefits of frequent positive affect: does happiness lead to success? *Psychol Bull* **131**, 803–855.
30. Zanon C, Bradagi M, Layous K, *et al.* (2013) Validation of the satisfaction with life scale to Brazilians: evidences of measurement noninvariance across Brazil and US. *Soc Indic Res* **114**, 1–11.
31. Scheier MF & Carver CS (1985) Optimism, coping, and health: assessment and implication of generalized outcome expectancies. *Health Psychol* **4**, 219–247.
32. Bastianello MR, Pacico JC & Hutz CS (2014) Optimism, self-esteem and personality: adaptation and validation of the Brazilian Version of The Revised Life Orientation Test (LOT-R). *Psico-USF* **19**, 523–531.
33. Pacico JC, Zanon C, Bastianello MR, *et al.* (2013) Adaptation and validation of the Brazilian version of the Hope Index. *Int J Testing* **13**, 193–200.
34. Brazilian Association of Research Companies (2019) Brazil Economic Classification Criteria. https://www.abep.org/criterio-brasil (accessed June 2023).

British Journal of Nutrition

35. Vigitel Brazil (2017) *Surveillance of Risk and Protective Factors for Chronic Diseases by Telephone Survey: Estimates of Frequency and Sociodemographic Distribution of Risk and Protective Factors for Chronic Diseases in the Capitals of the 26 Brazilian States and the Federal District in 2017*. Brazil: Ministry of Health, Brasília.
36. Moshfegh AJ, Rhodes DG, Baer DJ, *et al.* (2008) The US Department of Agriculture Automated Multiple-Pass Method reduces bias in the collection of energy intakes. *Am J Clin Nutr* **88**, 324–332.
37. United States Department of Agriculture (2016) *Nutrient Database for Standard Reference*. Beltsville, MD: Agricultural Research Service, USDA.
38. Harttig U, Haubrock J, Knüppel S, *et al.* (2011) The MSM program: web-based statistics package for estimating usual dietary intake using the Multiple Source Method. *Eur J Clin Nutr* **65**, 87–91.
39. Brazil. Ministry of Health (2015) Guidelines for Evaluation of Food Consumption Markers in Primary Health Care. Brasília, DF: Ministry of Health.
40. Passareli PM & Da Silva JA (2007) Positive psychology and the subjective well-being study. *Estud Psicol* **24**, 513–517.
41. Seligman MEP (2002) Positive psychology, positive prevention, and positive therapy. In *Handbook of Positive Psychology*, [CR Snyder & SJ Lopez, editors]. New York: Oxford University Press. pp. 3–9.
42. Ribeiro MC, Nakamura MU, Torloni MR, *et al.* (2015) Sleep quality in overweight pregnant women. *Rev Bras Ginecol* **37**, 359–365.
43. American College of Obstetricians and Gynecologists (2020) Tobacco and nicotine cessation during pregnancy: committee opinion, number 807. *Obstet Gynecol* **135**, 221–229.
44. Steinberg JR & Finer LB (2011) Examining the association of abortion history and current mental health: a reanalysis of the National Comorbidity Survey using a common-risk-factors model. *Soc Sci Med* **72**, 72–82.
45. Benute GRG, Nomura RMY, Jorge VMF, *et al.* (2011). Risk of suicide in high-risk pregnancy: an exploratory study. *Rev Assoc Med Bras* **57**, 583–587.
46. Huss B (2021) Well-being before and after pregnancy termination: the consequences of abortion and miscarriage on satisfaction with various domains of life. *J Happiness Stud* **22**, 2803–2828.
47. Almeida NMC & Arrais AR (2016) The psychological prenatal program as a prevention tool for postpartum depression. *Psicol Ciênc Prof* **36**, 847–863.
48. Felix NAR & Ceolim MF (2023) Sleep in pregnancy quarters: a longitudinal study. *Rev Gaúcha Enferm* **44**, 1–10.
49. Teoh AN, Kaur S, Mohd Shukri NH, *et al.* (2021) Psychological state during pregnancy is associated with sleep quality: preliminary findings from MY-CARE cohort study. *Chronobiol Int* **38**, 959–970.
50. Vafapoor H, Zakiei A, Hatamian P, *et al.* (2018) Correlation of sleep quality with emotional regulation and repetitive negative thoughts: a casual model in pregnant women. *J Kermanshah Univ Med Sci* **22**, e81747.
51. Gao M, Hu J, Yang L, *et al.* (2019) Association of sleep quality during pregnancy with stress and depression: a prospective birth cohort study in China. *BMC Pregnancy Childbirth* **19**, 1–8.
52. Pavesi E, Amorim MVS, Boing AF, *et al.* (2023) Influence of alcohol and tobacco consumption on maternal and perinatal outcomes of puerperal women attended at the Brazilian National Health System. *Rev Bras Saude Mater Infant* **23**, 1–8.
53. Oliveira TR & Simões SMF (2007) The alcoholic beverage consumption by the pregnant women: an exploratory study. *Esc Anna Nery* **11**, 632–638.
54. Silva MB & Lyra TM (2015) The female drinking: socialization and loneliness. *Saude Debate* **39**, 772–781.
55. Cook JD (2003) Biochemical markers of alcohol use in pregnant women. *Clin Biochem* **36**, 9–19.
56. Nelas P, Chaves C, Coutinho E, *et al.* (2021) Pregnant women's knowledge of positive mental health. *Int J Dev Educ Psychol Rev INFAD Psicología* **2**, 225–232.
57. Barros MBA, Medina LPB, Lima MG, *et al.* (2021) Association between health behaviors and depression: findings from the 2019 Brazilian National Health Survey. *Rev Bras Epidemiol* **24**, 1–15.
58. Cheng ER, Luo M, Perkins M, *et al.* (2023) Household food insecurity is associated with obesogenic health behaviours among a low-income cohort of pregnant women in Boston, MA. *Public Health Nutr* **26**, 943–951.
59. Badanai NL, Zuccolotto DCC, Crivellenti LC, *et al.* (2019) Association of dietary patterns and degree of food processing with feelings of depression in pregnancy. *Rev Bras Saúde Mater Infant* **19**, 591–600.
60. Lara-Castor L, Micha R, Cudhea F, *et al.* (2023) Sugar-sweetened beverage intakes among adults between 1990 and 2018 in 185 countries. *Nat Commun* **14**, 1–19.
61. Yelverton CA, Rafferty AA, Moore RL, *et al.* (2022) Diet and mental health in pregnancy: nutrients of importance based on large observational cohort data. *Nutrition* **96**, 1–7.
62. Yano JM, Yu K, Donaldson GP, *et al.* (2015) Indigenous bacteria from the gut microbiota regulate host serotonin biosynthesis. *Cell* **161**, 264–276.
63. Ramina S, Mysza MA, Meyerb K, *et al.* (2020) A prospective analysis of dietary fiber intake and mental health quality of life in the Iowa Women's Health Study. *Maturitas* **131**, 1–7.
64. Blampied M, Bell C, Gilbert C, *et al.* (2020) Broad spectrum micronutrient formulas for the treatment of symptoms of depression, stress and/or anxiety: a systematic review. *Expert Rev Neurother* **20**, 351–371.
65. Umpierre D, Coelho-Ravagnani C, Tenório MC, *et al.* (2022) Physical Activity Guidelines for the Brazilian population: recommendations report. *J Phys Act Health* **19**, 374–381.
66. American College of Obstetricians and Gynecologists (1994) *Exercise during Pregnancy and the Postpartum Period*. Washington, DC: O College.
67. Mourady D, Richa S, Karam R, *et al.* (2017) Associations between quality of life, physical activity, worry, depression and insomnia: a cross-sectional designed study in healthy pregnant women. *PLoS One* **12**, 1–15.
68. Costa DO, Souza FIS, Pedroso GC, *et al.* (2018) Mental disorders in pregnancy and newborn conditions: longitudinal study with pregnant women attended in primary care. *Cien Saúde Colet* **23**, 691–700.
69. Vescovi G, Flach K, Teodózio AM, *et al.* (2022) Mental health during pregnancy, childbirth, and early childhood: a critical analysis of Brazilian public policy. *Cad Saúde Colet* **30**, 525–537.
70. Chiesi F, Galli S, Primi C, *et al.* (2003) The accuracy of the life orientation test–revised (LOT–r) in measuring dispositional optimism: evidence from item response theory analyses. *J Pers Assess* **95**, 523–529.

British Journal of Nutrition