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Sources of information about gestational weight gain, diet and exercise among Brazilian immigrant women living in the USA: a cross-sectional study

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Abstract

Objective: The objective of this study was to assess sources of information about gestational weight gain (GWG), diet and exercise among first-time pregnant Brazilian women in the USA.
Design: Cross-sectional survey.
Setting: Massachusetts, USA.
Participants: First-time pregnant Brazilian women.
Results: Eighty-six women, the majority of whom were immigrants (96·5 %) classified as having low acculturation levels (68 %), participated in the study. Approximately two-thirds of respondents had sought information about GWG (72·1 %), diet (79·1 %) and exercise (74·4 %) via the internet. Women classified as having low acculturation levels were more likely to seek information about GWG via the internet (OR = 7·55; 95 % CI 1·41, 40·26) than those with high acculturation levels after adjusting for age and receiving information about GWG from healthcare provider (doctor or midwife). Moreover, many respondents reported seeking information about GWG (67 %), diet (71 %) and exercise (52 %) from family and friends. Women who self-identified as being overweight pre-pregnancy were less likely to seek information about diet (OR = 0·32; 95 % CI 0·11, 0·93) and exercise (OR = 0·33; 95 % CI 0·11, 0·96) from family and friends than those who self-identified being normal-weight pre-pregnancy.
Conclusions: This is the first study to assess sources of information about GWG, diet and exercise among pregnant Brazilian immigrants in the USA. Findings have implications for the design of interventions and suggest the potential of mHealth intervention as low-cost, easy access option for delivering culturally and linguistically tailored evidence-based information about GWG incorporating behavioural change practices to this growing immigrant group.

Keywords
Pregnancy
Gestational weight gain
Information
Brazilian
Internet
USA

Gestational weight gain (GWG) is a very important modifiable risk factor associated with short- and long-term health outcomes (e.g. maternal and child obesity and obesity-related chronic diseases such as diabetes, hypertensions, etc.) for both a woman and her newborn[1]. Nonetheless, evidence suggests that approximately 40–60 % of women of childbearing age (18–49 years) in the USA experience excessive GWG[2].

Pregnancy is a critical life stage for promoting health and preventing diseases[1,2]. Maintaining or adopting healthy behaviours (e.g. diet, physical activity, etc.) during pregnancy has the potential to prevent excess GWG and associated adverse health risks during pregnancy and beyond[3]. Pregnancy is a time when many women are motivated to improve their health behaviours for their infants' health[1,4]. It also a time when women are more likely to seek health information to answer questions about pregnancy, their health and that of their offspring[1,4]. Pregnant women's access to evidence-based information about GWG, diet and physical activity is key to their achieving healthy GWG, and,

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ultimately, the prevention of obesity-related diseases for both the mother and her newborn[5–7].

Although evidence suggests that pregnant women value advice they receive from their healthcare providers (HCP) the most, recent studies also indicate that many pregnant women are not receiving or receiving inconsistent advice from HCP about GWG, diet and physical activity[8–10]. A lack of consistent advice from HCP increases the demand for alternative sources of information[8–11]. The internet is one of the most popular sources of pregnancy information for women of childbearing age in the USA as it provides easy and quick access to information about a wide range of pregnancy-related topics that can influence women's decision-making associated with all aspects of pregnancy[6–12]. According to the Pew Research Center, about 80 % of adult women of childbearing age in the USA use the internet to obtain health information during their pregnancies[13]. Studies indicate that pregnant women also rely on interpersonal relationships for information during pregnancy[7,10,12,14].

Brazilians represent a rapidly growing immigrant population in the USA, with the country now being home to the largest population of Brazilians outside Brazil[15]. According to the American Community Survey, Massachusetts is the state with the second largest population of Brazilians after Florida[15]. Currently, there is a dearth of maternal health research focused on Brazilian immigrant women in the USA. Like many immigrants, Brazilians face many barriers to accessing and utilising healthcare in a new country such as lack of health insurance, financial difficulties, language barriers and lack of interpreters, cultural differences in views about health, health literacy, differences in health expectations and discrimination based on race or accent, etc.[16,17]. These barriers may influence how Brazilian immigrant women experience healthcare during pregnancy[16–19]. Given the importance of pregnancy as a critical life stage for health promotion and disease prevention for women and their newborn, the purpose of this study was to assess sources of information about GWG, diet and exercise among first-time pregnant Brazilian women living in Massachusetts, USA.

Methods

Study design and sample

We conducted an exploratory cross-sectional survey of first-time pregnant Brazilian women living in Massachusetts, USA to assess sources used to seek information about GWG, diet and exercise during pregnancy. Data collection occurred between December 2018 and June 2019 in selected communities in Massachusetts, with large Brazilian immigrant populations. Women were eligible to participate if they: (a) self-identified as Brazilian; (b) were pregnant with their first child (a single birth); (c) were ≥14 weeks gestation; (c) were 18 years of age or older; (d) lived in Massachusetts; (e) spoke Portuguese or English and (f) provided informed consent[17].

Recruitment

Study participants were recruited using strategies successfully employed in our previous studies with Brazilian communities in Massachusetts, which included posting flyers at local Brazilian businesses and community-based social and health services agencies and attending events and making announcement at predominantly Brazilian churches[20]. Interested individuals called the phone number listed on the flyer or spoke with study staff at church events[20]. Participants were also recruited through network sampling, a 'word of mouth' or snowball approach of acquiring participants, with participants enrolled in the study asking their Brazilian friends pregnant with first child if they would be interested in participating in the study[20]. Research staff, Brazilian immigrants and members of the Brazilian communities participating in the study engaged their personal and community contacts to recruit participants. In addition, women were recruited using social media (Facebook postings). All interested individuals were screened in-person or via telephone by study staff.

Data collection and survey measures

After determining study eligibility and prior to enrolling in the study, eligible participants were read the informed consent form in their preferred language (English or Portuguese) by a trained bilingual, bicultural interviewer. After providing informed consent (written or verbal), participants completed a brief interviewer-administered survey either in-person or via telephone in their preferred language.

The brief survey included fifteen items adapted from a previous study[21] and additional sociodemographic and acculturation questions. The fifteen adapted items were distributed across five domains: (1) information received during prenatal care (three questions); (2) sources used to seek information during pregnancy (six questions); (3) beliefs about the safety of GWG and weight management strategies (two questions); (4) self-perception of current GWG (two questions) and (5) knowledge and perception about postpartum weight loss (two questions). The survey was translated into Portuguese (Brazilian) for the present study and pilot-tested (four pregnant women who are not included in this study) prior to use. The current study is focused on participants' responses to questions related to sources used to seek information about GWG, diet and exercise during pregnancy (six questions) and information received from HCP (i.e. doctor or midwife) during prenatal care (three questions).

Sources used to seek information about gestational weight gain, diet and exercise

Participants responded to questions (yes, no and do not know) about information sources (internet, family members and friends) used during pregnancy to learn about GWG, diet and physical activity. The first set of questions asked included: 'I used the internet to search for information about weight gain during pregnancy', 'I talked to family

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members about weight gain during pregnancy' and 'I talked to friends about weight gain during pregnancy'. The same questions were then asked for diet and exercise.

Information received from healthcare providers about gestational weight gain, diet and exercise

Participants also responded to three questions (yes, no and do not know) about information received about GWG, diet and exercise from HCP (doctor or midwife) during prenatal care. The questions asked included: 'My doctor or midwife recommended how much weight I should try to gain during pregnancy', 'My doctor or midwife gave me advice on exercise during pregnancy' and 'My doctor or midwife gave me advice on what to eat during pregnancy.'

Sociodemographics, acculturation level and access to healthcare

The survey also assessed participants' self-identified pre-pregnancy weight status (underweight, normal weight, overweight and obese) and sociodemographic characteristics (age, marital status, country of birth, years of residency in the USA, primary language spoken, educational attainment (<high school, ≥high school) and annual household income (US$ <40 000, US$ ≥40 000). In addition, participants reported if they had regular access to a HCP (yes, no), if they had health insurance (yes, no) and type of health insurance (government-sponsored, private). They also reported if they were enrolled (yes, no) in the Special Supplemental Nutrition Program for Women, Infants, and Children. The sociodemographic questions used in the current study have been used in our previous studies and are similar to those used in several of studies conducted with Brazilian immigrants in the USA[16,17,20,22,23].

Last, the survey assessed participants' acculturation level using the Short Acculturation Scale for Hispanics (SASH), a twelve-item scale validated for use in Latino populations[24]. The SASH assesses language use, media use and ethnic social relations. The scale has good reliability (Cronbach's α reliabilities 0·92–0·89 for the overall SASH scale, 0·89 for language use, 0·88 for media preference and 0·72 for ethnic and social relations)[24,25]. Acculturation scores were computed by averaging across the twelve items, measured on a scale of 1 to 5, and scores were then dichotomised (high *v.* low). The scale developers recommend an average of 2·99 as the cut-point scores equal to or above this point represent higher levels of acculturation and scores below this point represent lower levels of acculturation[24]. We used the recommended cut-point scores to categorise women as having a low acculturation level (SASH < 2·99) or a high acculturation level (SASH ≥ 2·99)[24]. The average time for completing the survey was 15 min. Participants received a $20 gift card at the end of the interview for their participation.

The present study was conducted according to the ethical principles described in the Helsinki declaration. This study received ethical approval from the Internal Review Board at the University of Massachusetts Boston (Internal Review Board no. 2018068). Participants received information about the study, both verbally and in writing. Participation in the study was voluntary, and the participants were informed that they could withdraw at any time without providing a reason.

Data analysis

Descriptive statistics were calculated for all key variables using means and standard deviations for continuous variables and frequencies and percentage for categorical variables. χ^2 and Fisher's exact tests were used as appropriate to determine if there were differences in the sources used to seek information about GWG, diet and exercise by self-reported pre-pregnancy weight status, sociodemographic variables, acculturation and type of health insurance. Associations between demographic characteristics (i.e. self-reported weight status, sociodemographics, acculturation and access to healthcare) and sources of information were assessed in binary logistic regression analysis. Only those characteristics significantly associated ($P \leq 0{\cdot}05$) with the outcome were adjusted for in binary logistic regression analysis, and OR were calculated. All analyses were performed using SAS 7.1 (SAS Institute).

Results

Sample characteristics

The study sample included eighty-six women. As shown in Table 1, participants had a mean age of 28·3 years old (SD = 4·7; range 19–39 years). The majority of women (96·5 %, *n* 83) were born in Brazil and reported they had lived in the USA for an average of 10·7 years (SD = 7·3). All women reported Portuguese as their primary language, and 67·4 % (*n* 58) were classified as having low acculturation levels. Most respondents (96·5 %, *n* 83) were married, 35 % (*n* 30) reported completing high school or less, and about half (48·8 %; *n* 42) reported a household income of <$40 000/year, which is below the federal poverty line[26].

All women were pregnant with their first child, and the mean gestation was 27·5 weeks (SD = 5·6; range 14–38 weeks). Approximately, 73 % reported that they were a normal-weight pre-pregnancy (72·1 %; *n* 62), while 25·6 % (*n* 22) reported being overweight and 2·3 % (*n* 2) being underweight. All women reported having regular access to healthcare, with most (89·5 %; *n* 77) having government-sponsored health insurance (MassHealth). In addition, more than half of respondent (55·8 %; *n* 48) were enrolled in the Special Supplemental Nutrition Program for Women, Infants, and Children programme (see Table 1).

Sources used to seek information about gestational weight gain, diet and exercise

Seeking gestational weight gain, exercise and diet information via the internet

Overall, about two-thirds of the women reported using the internet to find information about GWG (72·1 %, *n* 62), diet

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Table 1 Participants' characteristics

Characteristics (*n* 86)	Mean	SD
Gestation (weeks)	27·5	5·6
Immigration age (years)	16·7	9·6
	n	%
Maternal age (mean = 28·3; SD = 4·7)		
<25	27	31·4
≥25–<35	52	60·5
≥35	7	8·1
Marital status		
Married	83	96·5
Separated/divorced	2	2·3
Single	1	1·2
Household income		
<US$ 40 000	42	48·8
≥US$ 40 000	16	18·6
Refuse to report	28	32·6
Education		
<High school diploma	30	34·9
≥High school diploma	56	65·1
Health insurance		
Government sponsored (MassHealth)	77	89·5
Private	9	10·5
Enrolled in the WIC Program		
Yes	48	55·8
No	36	41·9
Missing	2	2·3
Self-reported weight status at start pregnancy		
Underweight	1	1·2
Healthy/normal weight	62	72·9
Overweight	22	25·9
Country of origin		
Brazil	83	96·5
USA	3	3·5
Years residency in the USA* (mean = 10·7; SD = 7·3)		
<10 years	42	48·8
≥10 years	44	51·2
SASH score (mean = 2·6; SD = 0·7)		
<2·99	58	67·4
≥2·99	28	32·6
Receiving information about GWG from HCP		
Yes	53	61·6
No	32	37·2
Do not know	1	1·2
Receiving information about diet from HCP		
Yes	70	81·4
No	15	17·4
Do not know	1	1·2
Receiving information about exercise from HCP		
Yes	71	82·6
No	14	16·3
Do not know	1	1·2

WIC, Special Supplemental Nutrition Program for Women, Infants, and Children; SASH, Short Acculturation Scale for Hispanics; GWG, gestational weight gain; HCP, healthcare providers.
*All women (*n* 86) were asked to report including the three who reported being born in the USA.

(81·3 %, *n* 70) and exercise (75·6 %, *n* 65) during pregnancy. In the binary logistic regression analysis, women who were younger (OR = 1·13; 95 % CI 1·01, 1·26) and those classified as having low acculturation levels (SASH < 2·99; OR = 7·09, 95 % CI 1·53, 32·98) were more likely to seek information about GWG on the internet than women who were older or classified as having high acculturation levels (SASH ≥ 2·99), respectively (see Table 2). In contrast, women who reported having more than high school education (OR = 0·38; 95 % CI 0·14, 1·00) were less likely to use the internet to seek information about GWG than women who had had a high school diploma or less (see Table 2). Similarly, women who reported having private health insurance were less likely to use the internet to find exercise information (OR = 0·20; 95 % CI 0·05, 0·82) than women who reported having government health insurance (MassHealth) (see Table 2).

In the binary logistic regression analysis adjusting for age and receiving advice about GWG from HCP, women who were classified as having low acculturation levels (SASH < 2·99) were more likely to seek information about GWG on the internet (OR = 7·55; 95 % CI 1·41, 40·26) than

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Table 2 OR and 95 % CI from binary logistic regression analysis predicting seeking information about gestational weight gain (GWG) during pregnancy via the internet and from family and friends

	Sought information about GWG via the internet										Sought information about GWG from family and friends									
	No		Yes		Bivariable associations			Multivariable associations			No		Yes		Bivariable associations			Multivariable associations		
	n	%	*n*	%	OR	95 % CI	*P*-value	OR	95 % CI	*P*-value	*n*	%	*n*	%	OR	95 % CI	*P*-value	OR	95 % CI	*P*-value
Maternal age (mean)	30·1	4·5	27·6	4·6	1·13	1·01, 1·26	0·03	1·07	0·94, 1·21	0·31	29·3	4·1	27·9	5·0	1·07	0·97, 1·17	0·20			
Marital status																				
Married	22	95·7	61	100·0	1·00	Ref	–				27	96·4	56	98·3	1·00	Ref	0·60			
Separated/divorced	1	4·4	0	0·0	–	–					1	3·6	1	1·8	2·11	0·13, 35·04				
Household annual income																				
<US$ 40 000/year	16	88·9	26	65·0	4·31	0·86, 21·48	0·07				18	78·3	24	68·6	1·65	0·49, 5·59	0·42			
≥US$ 40 000/year	2	11·1	14	35·0	1·00	Ref					5	21·7	11	31·4	1·00	Ref				
Education																				
<High school	12	52·2	16	26·7	1·00	Ref	0·05				9	32·1	19	33·9	1·00	Ref	0·71			
≥High school diploma	11	47·8	44	73·3	0·38	0·14, 1·00					19	67·9	37	66·1	1·20	0·46, 3·12				
Health insurance																				
Government (MassHealth)	21	91·3	55	88·7	1·00	Ref	0·73				24	85·7	53	91·4	1·00	Ref	0·43			
Private	2	8·7	7	11·3	0·75	0·14, 3·90					4	14·3	5	8·6	1·77	0·44, 7·17				
Self-reported weight status																				
Normal weight	15	65·2	47	78·3	1·00	Ref	0·21				16	59·3	46	80·7	1·00	Ref	0·04			
Overweight	8	34·8	13	21·7	1·97	0·69, 5·65					11	40·7	11	19·3	2·94	1·07, 8·06		2·74	0·98, 7·64	0·05
SASH score																				
<2·99	21	91·3	37	59·7	7·09	1·53, 32·98	0·01	7·55	1·41, 40·26	0·02	20	71·4	38	65·5	1·32	0·49, 3·51	0·58			
≥2·99	2	8·7	25	40·3	1·00	Ref		1·00	Ref		8	28·6	20	34·5	1·00	Ref				
Receiving information about GWG from HCP																				
Yes	16	69·6	37	60·7	0·63	0·23, 1·69	0·36	0·39	0·16, 1·12	0·08	14	50·0	39	68·4	1·79	0·75, 4·27	0·19	1·45	0·58, 3·60	0·43
No	7	30·4	24	39·3	1·00	Ref					14	50·0	18	31·6	1·00	Ref				

SASH, Short Acculturation Scale for Hispanics; HCP, healthcare providers.

women classified as having high acculturation levels (SASH ≥ 2·99) (see Table 2). Moreover, women who reported having private health insurance were less likely to use the internet to seek information about exercise (OR = 0·19; 95 % CI 0·05, 0·80) than women who reported having government health insurance (see Table 3). There were no other statistically significant differences by sociodemographics, health insurance type or self-reported weight status for women using the internet to seek information about diet or exercise (see Tables 3 and 4).

Seeking information from family members and friends about gestational weight gain, diet and exercise

The majority of women reported actively seeking information about GWG (67 %, *n* 58), diet (71 %, *n* 61) and exercise (52 %, *n* 45) from family and friends. In the binary logistic regression analysis, women who self-reported being overweight pre-pregnancy were more likely to seek information about GWG (OR = 2·94; 95 % CI 1·07, 8·06) from family members and friends than women who self-reported being normal-weight pre-pregnancy (see Table 2). In contrast, women who self-reported being overweight pre-pregnancy were less likely to seek information about diet (OR = 0·27; 95 % CI 0·09, 0·75) and exercise (OR = 0·30; 95 % CI 0·11, 0·86) from family members and friends than women who self-reported normal-weight pre-pregnancy (see Tables 3 and 4). In the binary logistic regression analysis adjusting for receiving advice from HCP about diet and exercise, women who self-reported being overweight pre-pregnancy were less likely to seek information about diet (OR = 0·32; 95 % CI 0·11, 0·93) and exercise (OR = 0·33; 95 % CI 0·11, 0·96) from family members and friends than women who self-reported being normal-weight pre-pregnancy (see Tables 3 and 4).

Discussion

To our knowledge, this is the first study to assess sources of information that pregnant Brazilian immigrant women living in the USA use to seek information about GWG, diet and exercise during pregnancy. The women in the study were pregnant with their first child, most respondents were young (31·4 % <25 and 61·5 % ≥25–<35 years of age), more than half were classified as having low acculturation levels and almost 26 % self-identified as being overweight pre-pregnancy. Although our study relied on self-reported data for pre-pregnancy weight status, this finding aligns with estimates from a recent nationwide survey that found that about 24 % of mothers reported a pre-pregnancy weight that, given their height, would be classified as overweight[12].

Many women in the current study (72·1 %–79·1 %) turned to the internet for information about GWG, diet and exercise during pregnancy. These findings are concordant with a nationwide survey conducted in the USA that revealed that more than three-quarters of women of childbearing age used the internet for information about pregnancy and birth[12]. Our findings are important and combined with prior research have implications for the development of mobile health (mHealth) interventions to increase pregnant Brazilian immigrant women's access to evidence-based health information during pregnancy. Growing evidence points to the potential of mHealth intervention as a low-cost, easily accessible option to promote healthy GWG among women worldwide[27,28]. For example, a recent meta-analysis found that mHealth interventions involving diet, exercise or both reduced the risk of excess GWG, on average, by 20 % (relative risk 0·80, 95 % CI 0·73, 0·87)[27]. Although additional research is needed, the high percentage of respondents who reported using the internet as source of information about GWG, diet and exercise suggests that pregnant Brazilian immigrant women would likely use mHealth interventions to access health information during pregnancy.

Furthermore, women in the present study classified as having low acculturation levels were approximately 7 times more likely to seek information about GWG using the internet than women classified as having high acculturation levels after adjusting for age and receiving advice from their HCP about GWG. Prior research conducted in the USA has found that women with low acculturation levels face language and cultural barriers in accessing healthcare[18]. Moreover, prior studies also suggest that access to accurate online pregnancy-related information is particularly important for women from socially disadvantage groups (e.g. low-income, immigrant women from underserved racial/ethnic groups) such as those participating in the current study who may face barriers to accessing accurate information during the prenatal care period[18,29]. As previously mentioned, this finding suggests the potential of mHealth interventions to increase pregnant Brazilian immigrant women's access to evidence-based health information during pregnancy, and in particular, women with low acculturation levels[27,28].

In addition to actively seeking information on the internet, more than two-thirds of the women in the current study sought information about GWG, diet and exercise during pregnancy from family members and friends. This finding is notable given that a recent cross-sectional study (*n* 1171) conducted by Souza *et al.* in Canada found that women who sought or received advice from family and friends about weight during pregnancy were more likely to experience GWG below or above the recommended guidelines than those who did not receive this advice[14]. The percentage of women participating in our study who reported seeking advice from family and friends (about 67 %) is greater than that found by Souza *et al.* (34 %)[14]. This difference could be due to the fact that the majority of women in our study were low-income and nearly all were immigrant women with low acculturation levels.

Moreover, the current study found that women who self-identified as being overweight pre-pregnancy were more

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Table 3 OR and 95 % CI from binary logistic regression analysis predicting seeking information about exercise during pregnancy via the internet and from family and friends

	Sought information about exercise via the internet										Sought information about exercise from family and friends									
	No		Yes		Bivariable associations			Multivariable associations			No		Yes		Bivariable associations			Multivariable associations		
	n	%	*n*	%	OR	95 % CI	*P*-value	OR	95 % CI	*P*-value	*n*	%	*n*	%	OR	95 % CI	*P*-value	OR	95 % CI	*P*-value
Maternal age (mean)	28·8	4·0	28·1	4·9	0·97	0·87, 1·08	0·58				28·8	4·3	28·4	5·0	0·98	0·89, 1·08	0·69			
Marital status																				
Married	20	100·0	63	98·4	1·00	Ref					37	98·4	43	97·7	1·00	Ref				
Separated/divorced	0	0·0	1	1·6	–	–					1	2·6	1	2·3	0·84	0·05, 13·90	0·90			
Household annual income																				
<US$ 40 000/year	9	64·3	33	75·0	1·67	0·46, 6·05	0·44				16	61·5	24	80·0	2·50	0·76, 8·25	0·13			
≥US$ 40 000/year	5	35·7	11	25·0	1·00	Ref					10	38·5	6	20·0	1·00	Ref				
Education																				
<High school	5	25·0	23	36·5	1·00	Ref					12	31·6	14	32·6	1·00	Ref				
≥High school	15	75·0	40	63·5	0·53	0·17, 1·65	0·28				26	68·4	29	67·4	0·84	0·33, 2·09	0·70			
Health insurance																				
Government (MassHealth)	15	75·0	61	93·9	1·00	Ref		0·19	0·05, 0·80	0·02	33	86·8	41	91·1	1·00	Ref				
Private	5	25·0	4	6·2	0·20	0·05, 0·82	0·03				5	13·2	4	8·9	0·64	0·16, 2·59	0·54			
Self-reported weight status																				
Normal weight	15	75·0	47	74·6	1·00	Ref					23	62·2	37	84·1	1·00	Ref		1·00	Ref	
Overweight	5	25·0	16	25·4	1·00	0·31, 3·19	1·00				14	37·8	7	15·9	0·30	0·11, 0·86	0·02	0·33	0·11, 0·96	0·04
SASH score																				
<2·99	13	65·0	45	69·2	1·21	0·42, 3·49	0·72				29	76·3	26	57·8	0·42	0·16, 1·10	0·08			
≥2·99	7	35·0	20	30·8	1·00	Ref					9	23·7	19	42·2	1·00	Ref				
Receiving information about exercise from HCP																				
Yes	16	80·0	54	84·4	1·50	0·47, 4·79	0·49	1·63	0·48, 5·55	0·43	29	76·3	40	90·9	3·28	0·98, 11·05	0·05	3·07	0·88, 10·74	0·08
No	4	20·0	10	15·6	1·00	Ref					9	23·7	4	9·1	1·00	Ref				

SASH, Short Acculturation Scale for Hispanics; HCP, healthcare providers.

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Table 4 OR and 95 % CI from binary logistic regression analysis predicting seeking information about diet during pregnancy via the internet and from family and friends

	Sought information about diet via the internet							Sought information about diet from family and friends									
	No		Yes		Bivariable associations			No		Yes		Bivariable associations			Multivariable associations		
	n	%	*n*	%	OR	95 % CI	*P*-value	*n*	%	*n*	%	OR	95 % CI	*P*-value	OR	95 % CI	*P*-value
Maternal age (mean)	28·3	4·2	28·4	4·9	1·00	0·89, 1·13	0·95	28·6	3·5	28·4	5·1	0·99	0·89, 1·09	0·82			
Marital status																	
Married	15	100·0	67	97·1	1·00	Ref		24	100·0	58	96·7	1·00	Ref	–			
Separated/divorced	0	0·0	2	2·9	–	–		1	2·6	1	2·3	–	–				
Household annual income																	
<US$ 40 000/year	10	90·9	31	67·4	0·21	0·02, 1·77	0·15	12	70·6	29	72·5	1·10	0·31, 3·85	0·88			
≥US$ 40 000/year	1	9·1	15	32·6	1·00	Ref		5	29·4	11	27·5	1·00	Ref				
Education																	
<High school	7	46·7	21	30·9	1·00	Ref		7	29·2	20	33·9	1·00	Ref				
≥High school	8	53·3	47	69·1	1·79	0·58, 5·54	0·31	17	70·8	39	66·1	0·73	0·26, 2·03	0·55			
Health insurance																	
Government (MassHealth)	13	86·7	63	90·0	1·00	Ref		19	79·2	57	93·4	1·00	Ref				
Private	2	13·3	7	10·0	0·72	0·13, 3·88	0·70	5	20·8	4	6·6	0·27	0·06, 1·10	0·07			
Self-reported weight status																	
Normal weight	9	60·0	52	76·5	1·00	Ref		13	54·2	48	81·4	1·00	Ref		1·00	Ref	0·04
Overweight	6	40·0	16	23·5	0·45	0·14, 1·47	0·19	11	45·8	11	18·6	0·27	0·09, 0·75	0·01	0·32	0·11, 0·93	
SASH score																	
<2·99	12	80·0	46	65·7	0·48	0·12, 1·86	0·29	18	75·0	39	63·9	0·59	0·20, 1·71	0·33			
≥2·99	3	20·0	24	34·3	1·00	Ref		6	25·0	22	36·1	1·00	Ref				
Receiving information about diet from HCP																	
Yes	7	46·7	62	89·9	10·13	2·82, 36·41	<0·001	16	66·7	53	83·3	3·85	1·23, 12·02	0·02	3·06	0·94, 10·02	0·06
No	8	53·3	7	10·1	1·00	Ref		8	33·3	7	11·7	1·00	Ref		1·00	Ref	

SASH, Short Acculturation Scale for Hispanics; HCP, healthcare providers.

likely to report seeking information about GWG from family members and friends than women who self-identified being normal-weight pre-pregnancy after adjusting for receiving information from HCP and other covariates. This finding is important and should be considered when designing interventions to meet the needs of pregnant Brazilian immigrant women[19,30–32]. Finally, future studies should consider assessing Brazilian immigrant women's digital literacy and perceptions of features for mHealth interventions, which will be important for the development of mHealth intervention designed to meet the specific needs of this growing immigrant population in the USA.

Study findings should be considered in light of several limitations. First, pre-pregnancy weight status was based on self-report. Although previous studies show that self-reported or measured pre-pregnancy weight used to determine pre-pregnancy BMI and weight classification result in identical categorisation for the majority of women, self-reporting of pre-pregnancy weight may underestimate pre-pregnancy weight status and thus bias the findings in unknown ways[33]. Furthermore, although data were collected during pregnancy, data on the study's outcome variables (sources of information about GWG, diet and exercise) also were based on women's self-report and thus prone to recall bias. Also, the survey instrument was translated into Portuguese and pilot-tested with a sample of Brazilian women (n 4) prior to use in this study, but it was not validated and did not undergo cultural adaptation. In addition, the cross-sectional design, the lack of *a priori* sample size calculation and the relatively small sample size may have limited the ability to assess the association of covariates (e.g. maternal age, education level, etc.) that have been previously reported to be associated with racial and ethnic minority women's report of receipt of information on GWG, diet, exercise and physical activity from HCP[1,9,30]. The setting and the small and unique study sample also limit the generalisability of study findings[17].

Study strengths include an understudied ethnic sample of Brazilian immigrant women and the use of an acculturation measure (i.e. SASH). This is important for the design of interventions tailored to meet the sociocultural needs of ethnic minority immigrant populations[18,19,29]. Furthermore, although the purpose of the study is not entirely novel, this is the first study to focus on Brazilian pregnant immigrant women living in the USA. Future studies with a larger sample size are needed to further investigate the association between sociocultural variables and pre-pregnancy weight status and HCP's advice on GWG, diet and exercise/physical activity.

Conclusions

This is the first study to assess sources of information about GWG, diet and exercise among pregnant Brazilian immigrants living in the USA. Findings showed that about two-thirds (72·1 %–81·3 %) of respondents turned to the internet for information about GWG, diet and exercise during pregnancy. Moreover, women classified as having low acculturation levels were approximately 7 times more likely to actively seek information about GWG on the internet than women who were classified as having high acculturation levels controlling for age and receiving advice from HCP about GWG. To our knowledge, currently, no mHealth interventions are available in the USA for pregnant Brazilian immigrant women. Study findings have important implications for interventions designed to promote healthy GWG and suggest the potential for mHealth interventions to deliver culturally and linguistically tailored evidence-based information about GWG incorporating behavioural change practices through low-cost, easy access method to Brazilian immigrant women living in the USA. Nevertheless, additional research is needed to identify and understand the critical features of mHealth interventions to promote healthy GWG among Brazilian pregnant immigrant women. For example, mHealth interventions designed to meet the specific needs of Brazilian pregnant immigrant women should consider health literacy and income levels, interpersonal influences, as well as language as factors influencing access and understanding of prenatal healthcare information.

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Supplementary material

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