



# The importance of the cultural dimension of food in understanding the lack of adherence to diet regimens among Mayan people with diabetes

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## Abstract

**Objective:** To understand non-adherence to medically recommended diets among Mayans with diabetes.

**Design:** Using partially sequential mixed methods, questionnaires, semi-structured brief and in-depth interviews were applied. Questionnaire data were analysed with Pearson's  $\chi^2$  and Student's *t* tests and qualitative interviews with grounded theory microanalysis.

**Setting:** Rural, predominantly Mayan communities in Chiapas, Quintana Roo and Yucatan, Mexico, 2008–2012.

**Participants:** Purposive sample of Mayans with type 2 diabetes; using public health care; 168 women and twenty-seven men; age 21–50+ years.

**Results:** Participants understood diabetes as caused by negative emotions, divine punishment, revenge via spells, chemicals in food and high sugar/fat consumption. Eliminating corn, pork, sugary beverages and inexpensive industrialized foods was perceived as difficult or impossible. More Mayans reporting not understanding physician instructions (30 *v.* 18 %) reported difficulty reducing red meat consumption ( $P=0.051$ ). Non-adherence was influenced by lack of patient–provider shared knowledge and medical recommendations misaligned with local culture. Men whose wives prepared their meals, women who liked vegetables and young adults whose mothers prepared their meals reported greater adherence to dietary recommendations. Partial adherents said it made life tolerable and those making no physician-recommended dietary changes considered them too restrictive (they meant ‘starving to death’). Over half (57 %) of participants reported non-adherence; the two principal reasons were dislike of recommended foods (52.5 %) and high cost (26.2 %).

**Conclusions:** Adherence to dietary regimens in diabetes treatment is largely related to social and cultural issues. Taking cultural diversity, food preferences, local food availability and poverty into consideration is essential when developing health-promotion activities related to diabetes.

**Keywords**  
Indigenous population  
Type 2 diabetes  
Elective behaviours  
Food preferences  
Dietary regimens

The 2016 Global Report on Diabetes<sup>(1)</sup> brought attention to diabetes as a problem that health systems face across the world and stated that the number of diabetes cases in the world has doubled over the past 30 years. More than

80 % of deaths from diabetes occur in low- and middle-income countries. Due to high costs of care, among other factors, carrying out preventive interventions to stem the disease presents difficulties for health systems in these

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countries. The WHO points out that public policies focusing on health promotion related to treatment of chronic diseases such as diabetes have not had the desired effect<sup>(2)</sup>. One possible explanation is that health programmes generally fail to consider the impact of socio-economic status and vulnerable social environments as well as the influence of these factors on behaviours, including dietary changes promoted by health-care systems. Some studies show higher diabetes prevalence among the poorest and most socially excluded strata of populations, but other studies report lower risk among patients at lower socio-economic levels living in their places of origin, because of more limited access to a hyper-energetic diet and higher levels of physical activity<sup>(3,4)</sup>. This evidence generated from around the world points to the complexity of intersecting situations that affect patients' adoption of healthy lifestyles promoted as a central part of the treatment of diabetes and to the fact that individual responses to treatment are influenced by social determinants that shape behaviours<sup>(5)</sup>.

The development of diabetes is related to unhealthy lifestyles including poor eating habits and a sedentary lifestyle, as well as genetic factors. Diabetes can lead to serious complications due to co-morbidities (obesity, dyslipidaemia and hypertension, among others) and associated consequences (blindness, kidney disease and limb amputation) at advanced stages. Diabetes has no cure but it can be controlled by following prescribed treatment and lifestyle change; the goal is for the patient to be able to self-manage the disease<sup>(6,7)</sup>. Furthermore, one of the risk factors for developing diabetes is eating foods with little nutritional value and high energy and fat content<sup>(8)</sup>. Thus, a central component of treatment is promotion of changes in eating habits, basically by incorporating foods with higher nutritional value into the daily diet. However, only a relatively small percentage of patients comply with dietary recommendations; for example, in Mexico recent data show that only 26.8% of persons with diabetes diagnosis changed their eating habits<sup>(9)</sup>.

On the other hand, regarding the Mexican population with diabetes, data on indigenous ethnicity are not available, as is true for other countries such as Guatemala<sup>(10,11)</sup>. Although literature exists on the lived experience of diabetes among indigenous groups in Mexico<sup>(12–15)</sup>, few publications focus mainly on food and diet. Recent exceptions are a study among the Chontal in Tabasco<sup>(16)</sup> and a study by Montesi in the Ikojts in Oaxaca<sup>(17)</sup>, which discuss ambivalent food experiences among indigenous people with diabetes. Results from studies on native, indigenous or aboriginal groups in countries such as Australia, Canada, the USA and New Zealand<sup>(3)</sup> show that these populations also have difficulties in incorporating and sustaining changes in food practices to adhere to dietary regimens related to diabetes treatment<sup>(3,18–20)</sup>.

From the perspective of the anthropology of food, the function of food is 'the satisfaction of an indispensable life

need combining cultural, psychological and biological domains'<sup>(21,22)</sup>. Food is linked with non-material aspects such as social origin, ethnicity, familial organization, religious beliefs, values, taste, affectivity and the dietary rules of different human groups (i.e. social norms on forbidden and allowed foods, the way food can be eaten)<sup>(23)</sup>. On the other hand, the current era is marked by what one author has called a 'new food order'<sup>(24)</sup>, characterized by the rapid development of the food industry and transnational companies that produce and distribute industrialized foods globally. One consequence of this is the increased homogenization of food habits worldwide. And indigenous populations have not been immune to this globalization process.

An important part of the cultural ethos of all human groups is anchored in the foods one eats, with whom one consumes them and in which situations specific foods represent social facts that produce meaning in daily life<sup>(23,25–27)</sup>. The present paper is based on a cross-cultural approach<sup>(28,29)</sup> that alludes to the importance of understanding culture and other aspects of the specific context of different population groups. In the paper we also attempt to show how Mexican Mayans with diabetes respond to the clinical care processes that are focused on controlling the disease through diet, which is commonly recommended for type 2 diabetes management<sup>(30)</sup>. We analyse as well changes in food habits to understand the way culture shapes people's responses to these processes. Our main research questions are: (i) How do Mayan people with diabetes change their eating habits in response to medical recommendations? (ii) How do sociocultural aspects influence this change of behaviour or lack thereof? Our questions stem from the hypothesis that the lack of adherence to dietary changes in this population is influenced by the cultural gap between hegemonic modern medical care and indigenous culture, which in turn leads to rejection and incomprehension (not mainly cognitive but cultural) of dietary recommendations among indigenous people.

## Methods

The present paper is part of a larger research project; full details of the entire methodological design can be consulted elsewhere<sup>(31)</sup>.

### *Study design and integration of mixed methods*

High levels of morbidity and mortality due to type 2 diabetes was the principal criterion for selecting indigenous communities for study. We thus chose the states of Chiapas, Quintana Roo and Yucatan. We identified all primary health-care clinics in each of the selected states and we reviewed the relevant statistics on indigenous people with type 2 diabetes treated in these health facilities. The resulting sample included six primary health-care clinics in six different communities. The sample of Mayan (indigenous) participants was purposive. People were considered



indigenous if they spoke a native (Mayan) language. These people often belong to the lowest socio-economic strata in the Mexican population. The inclusion criteria were: (i) being a patient at the primary health-care clinic; (ii) having been diagnosed with type 2 diabetes at least 1 year prior to the study year; (iii) being an active member of a mutual support group organized by the health-care clinic, which indicated that the person was actively engaged in medical treatment; (iv) being at least 18 years old at the time of the study; and (v) having other family members with type 2 diabetes.

We used a partially<sup>(32)</sup> sequential mixed methods<sup>(33,34)</sup> where each completed phase guides the subsequent steps in the inductive investigation. According to Leech and Onwuegbuzie, 'with partially mixed methods, the quantitative and qualitative phases are not mixed within or across stages'<sup>(32)</sup>.

The first, exploratory, phase aimed to understand the context of the study setting, identifying the principal issues related to diabetes among Mayan persons with this health condition. Through ethnographic observation (in six communities) we generated information on access to health care, food and religious practices. For this we used mixed methods with a focus on development<sup>(35)</sup> of the further study; that is, as indicated by Greene *et al.*<sup>(35)</sup>, we sought to use the results from the ethnographic observation to develop the questionnaire and the interview guide of the second phase.

The second phase aimed at exploring the experience of living with diabetes among Mayan individuals by qualitative and quantitative research conducted simultaneously. The eighty-nine-item questionnaire sought to generate quantitative information on personal characteristics (e.g. socio-economic profile, housing, family composition) and experience with diabetes (e.g. evolution of the disease, adherence to medical treatment) of Mayan patients receiving care at primary health-care clinics. Through the medical staff we invited Mayans patients who participated in the mutual support group to answer the questionnaire and 195 accepted. For the present paper, in addition to socio-demographic data, we analysed the difficulty of abstaining from certain foods.

Both brief and in-depth interviews sought to further explore Mayans' experience of diabetes. A sub-sample was selected for the brief qualitative interviews and we interviewed 103 out of the 195 people selected through the questionnaire. Subsequently, on the basis of longer health-care trajectory or more severe diabetes-related complications and ability to narrate the experience, we selected a smaller group of individuals ( $n = 20$ ) to do in-depth interviews.

The interview guide topics explored in the present paper are: disease onset; diabetes knowledge; quality of care; disease management; health services utilization; family and social support network (see online supplementary material).

### **Data collection**

To ensure the validity of the collected data all team members received training to standardize their knowledge about project objectives, data collection techniques and fieldwork procedures. Additionally, three anthropology students of indigenous origin who spoke the local language were hired as translators and data collectors. Special emphasis was placed on training them in the meaning of the questionnaire and interview guide questions, so that the information was appropriately translated into Spanish after collection and before entry in the database. They were also instructed about asking questions considering local culture. This training was especially important given the frequent illiteracy among the indigenous people that were interviewed.

All research team members had previous data collection experience. None of the interviewers had a previous relationship with the interviewees. The team received training on ethical issues for working with indigenous populations. The principal researchers were trained on ethics with the University of Miami's online Collaborative Institutional Training Initiative (CITI Program) course. To prevent biased responses of the indigenous participants, the primary-care staff had no influence on selection of respondents and were not present during the interviews.

With illiterate respondents, the interviewers filled in the questionnaires directly. Qualitative interviews with indigenous participants were conducted in their native language (either Maya or Tzotzil). As an extra measure of quality control, some of the interviews conducted in Maya and Tzotzil were chosen at random and translated by other local residents. The brief interviews lasted approximately 30 min and the in-depth interviews lasted approximately 150 min and were carried out over two or three sessions. The saturation point of each category explored was discussed with the entire research team.

Previous to data collection, we pre-tested the questionnaire and interview guide to assess whether questions in both tools were clear to Mayan informants.

We carried out the fieldwork from 2008 to 2012, with multiple visits to the different communities included in the research.

### **Data analysis**

From the project's data set, we selected qualitative and quantitative data linked to the management of diabetes. Quantitative data collected with the questionnaires were data entered and explored using the statistical software package PASW Statistics for Windows, version 18.0. We used Student's *t* test to estimate significant differences in mean age and Pearson's  $\chi^2$  test for independence to analyse relationships between categorical variables. We did micro-analysis of the qualitative data within the Grounded Theory framework<sup>(36)</sup>. Qualitative interviews were audio-recorded and transcribed literally. We then selected in-depth



interviews to manually develop the main categories and codes<sup>(31)</sup>. Subsequently we used the previously identified manually developed codes in Atlas.ti version 6 to code the rest of the interviews (please see description in the online supplementary material, Supplemental Fig. S1, for the definition of each category). The current paper presents the results for the category Disease Management, defined empirically as any mention by participants of activities and changes made since their diagnosis of diabetes, including dietary habits, exercise and medication to manage the disease. From the previous central category, we identified three sub-codes: (i) Effect on diet, defined as any mention made or reasons given by respondents in relation to how they changed their diet, how changes affected them and what eating habits they did not change; (ii) Medications, defined as any references that interviewees made to actions taken to follow medication regimens or not follow them as prescribed; and (iii) Food meanings, defined as how interviewees understood dietary recommendations and what these changes meant in their cultural and economic context (please see description in the online supplementary material, Supplemental Fig. S2, to understand how the information was analysed).

The results were interpreted and organized into the following themes: (i) Poverty-based food culture; (ii) Cultural beliefs on origins of diabetes and their relationship to food practices and low adherence to dietary regimes; (iii) Misunderstood cultural practices from the perspective of interviewees: meaningless health talk; and (iv) Diet adjustments in a socially vulnerable context.

#### **Ethics approval and consent to participate**

The Declaration of Helsinki Ethical Principles for Medical Research Involving Human Subjects were considered for the present study. The participants provided verbal informed consent.

#### **Results**

The results are divided into three sections: characteristics and context of the study population; elements that shaped the participants' food-related experiences; and a typology of responses to dietary recommendations made by the medical staff.

#### **Characteristics and context of the study population**

Medical care consisted of routine assessments that aimed to achieve metabolic control and prevent diabetes-related complications. Nevertheless, some participants had already experienced complications including lower-extremity amputation, retinopathy and kidney damage. The principal technique used by the medical staff to achieve metabolic control of Mayan people was group educational sessions focused on lifestyle changes within mutual support groups.

Among other topics, group participants were given health education on how to change or improve their eating habits. Despite living in a context of extreme economic difficulty, interviewees mentioned that they made an effort to adhere to restrictive dietary recommendations. Below we describe the most relevant related points.

Of the 195 people surveyed (recruited at health-care clinics), 86% were women, 75% were over the age of 50 years and 39% had no schooling. Comparison of Mayan people who said they fully understood the doctor's explanations about their disease with those who said they did not shows that those who answered affirmatively were more likely to be housewives (86.7 *v.* 72.0%,  $P = 0.048$ ). No significant differences were observed by sex, marital status, schooling or family composition (Table 1).

With regard to disease-related characteristics, 36% had been diagnosed with diabetes 3 years or less before time of the interview, 52% had family history of diabetes and 30% had experienced a chronic complication related to diabetes (Table 2).

#### **Cultural beliefs on the origin of diabetes and their relationship to food practices and low adherence to dietary treatment**

We grouped the experiences of the interviewees into five cultural explanations of their acquiring the disease, which mix elements of the information learned in the health education sessions (with medical staff) with their ancestral indigenous beliefs about the origin of the disease. Both aspects are related to foods that can or cannot be consumed. We identified five explanations for the disease. (i) Suffering from extreme emotions caused by violence, tension or precarious conditions: anger, fear, sadness, pain. (ii) Individual suffering as a punishment from God for having committed a deplorable act (disease as moral reparation). (iii) Magical beliefs related to being the object of revenge via a spell: 'the evil eye', 'negative energy' or 'bad air'. (iv) Contamination of everyday foods due to farming with chemicals. (v) Consumption of foods high in sugar or fat (Table 3).

The informants' narratives convey meanings and explanations of the origin of the disease from their cultural perspective, which in turn defines how the treatment process is understood. From the point of view of most Mayan people, the disease is rooted in emotional aspects; the food factor did not emerge in these explanations (Table 3).

#### **Misunderstood cultural practices: meaningless health talk**

The interviewees referred to the eating guidelines provided by the medical staff as a diet. This diet was seen as based on prohibiting or limiting the intake of beverages with high sugar content, foods with high fat content and carbohydrates. As shown by the narratives in Table 4, corn products

**Table 1** Sociodemographic characteristics of the study population according to their understanding of the doctor's recommendations: sample of adult Mayans with type 2 diabetes from Chiapas, Quintana Roo and Yucatan, Mexico, 2008–2012

		Do you fully understand the doctor's explanations about your disease?						P value*
		No		Yes		Total		
		n or mean	% or SD	n or mean	% or SD	n or mean	% or SD	
Gender	Total	112	57.4	83	42.6	195	100.0	
	Men	18	16.1	9	10.8	27	13.8	
	Women	94	83.9	74	89.2	168	86.2	0.296
Age (years)	Mean and SD <sup>(49)</sup>	57.2	11.3	55.4	10.5	56.5	11.0	0.3004
Age group†	21–49 years	23	23.0	19	28.4	42	25.1	0.434
	50+ years	77	77.0	48	71.6	125	74.9	
Marital status‡	Single	4	3.6	7	8.4	11	5.7	0.336
	Separated/divorced/widowed	23	20.7	18	21.7	41	21.2	
	Married/cohabitation	84	75.7	58	69.9	142	73.2	
Occupation	Housewife	77	72.0	72	86.7	149	78.4	0.09
	Farmer or trader	15	14.0	7	8.4	22	11.6	
	Manual labourer	6	5.6	1	1.2	7	3.7	
	Professional or other	9	8.4	3	3.6	12	6.3	
Level of education	Illiterate (no schooling)	43	38.4	33	39.8	76	39.0	0.847
	Elementary or higher	69	61.6	50	60.2	119	61.0	
Family composition	Lives alone	9	8.0	5	6.2	14	7.3	0.622
	Lives with at least one family member§	103	92.0	76	93.8	179	92.7	

\*Pearson's  $\chi^2$  test, Fisher's exact test or Student's *t* test (to estimate a significant difference in mean age).

†Twenty-eight Mayan people who did not specify age, five Mayan people who did not specify occupation and five Mayan people who did not specify education level were excluded.

‡Includes participants who lived with their parents, siblings, grandparents, spouse, children or some other relative.

§Includes people who said they lived with their parents, siblings, grandparents, spouse, children or some other relative.

(e.g. tortillas), sweets (e.g. soft drinks and pastries) and foods containing pork have a special value in community festivities and religious holidays, because most of these convivial get-togethers involve offering and consuming these types of foods. In Chiapas in particular, the informants mentioned the use of soft drinks in acts of religious syncretism and healing ceremonies. The habit of eating these foods, their association with culturally important holidays and the pleasure of eating them for their emotional symbolic value were important reasons for not following dietary recommendations.

Of all restrictions, the most controversial were corn, pork and sugar-based foods. The consumption of these foods, even in economically marginalized populations, is not only the norm but also gives meaning to daily food practices. Across all three states, testimonies reflected a wide predilection for industrialized foods consumed on a daily basis, ranging from ingredients for meal preparation and salty snacks to multiple kinds of inexpensive sweet snacks and soft drinks. The ban on consuming these foods led to feelings of frustration and stress, and was perceived as 'not being allowed to eat anything' while being deprived of the ingredients they needed to prepare foods seen as traditional. In addition, these types of foods provide high satiety and have an important function in the real and everyday context of poverty.

Food restrictions from medical staff were accompanied by recommendations, the most common being about eating a lot of vegetables, having three meals per day along with two light meals or snacks, and stopping frying food in oil and/or lard (Table 4). Interviewees said they commonly

used vegetables in small quantities to make different types of salsas, but they were not used to eating them alone. Furthermore, participants did not usually eat dinner, as recommended in the medical staff guidelines. Eating a 'snack' between meals was also a foreign, 'medical' concept; for indigenous participants, snacking was an unknown habit so this suggestion made no sense to them.

During the ethnographic observation we found that the medical staff provided contradictory information, especially about certain types of foods such as meat, because some doctors recommended eating meat and others did not. When Mayans said they did not understand medical recommendations this seemed to be multifactorial. Sometimes it happened due to lack of shared knowledge between Mayan people and providers, other times medical recommendations were misaligned with local cultural norms, and in other cases medical staff lacked cultural competence or the level of formal education was dissimilar between Mayan people and health-care providers. The questionnaire data show that individuals who did not understand the doctor's instructions (30% *v.* only 18% who did understand) reported having problems reducing red meat consumption ( $P=0.051$ , Table 5). Furthermore, a statistically significant association occurred between Mayans' report on 'fully understanding the doctor's explanations about their disease' and their report on adherence to treatment and changes in exercise or diet ( $P=0.009$ , Table 2).

**Table 2** Illness-related characteristics of the study population according to their understanding of the doctor's recommendations: sample of adult Mayans with type 2 diabetes from Chiapas, Quintana Roo and Yucatan, Mexico, 2008–2012

		Do you fully understand the doctor's explanations about your disease?				Total		P value*
		No		Yes				
		n	%	n	%	n	%	
	Total	112	57.4	83	42.6	195	100.0	
Years living with diabetes†	3 years or less	41	39.0	26	32.5	67	36.2	
	4–12 years	44	41.9	40	50.0	84	45.4	
	More than 12 years	20	19.0	14	17.5	34	18.4	0.535
Family history of diabetes	No	54	48.2	40	48.2	94	48.2	
	Yes	58	51.8	43	51.8	101	51.8	0.998
Complications‡	No	73	65.2	64	77.1	137	70.3	
	Yes	39	34.8	19	22.9	58	29.7	0.072
Current medical treatment	Oral hypoglycaemic agents	96	89.7	76	92.7	172	91.0	
	Insulin	2	1.9	2	2.4	4	2.1	
	Oral hypoglycaemic agents and insulin	5	4.7	1	1.2	6	3.2	
	None	4	3.7	3	3.7	7	3.7	0.675
Pharmacological treatment	No	22	19.6	11	13.3	33	16.9	
	Yes	90	80.4	72	86.7	162	83.1	0.239
Non-pharmacological treatment	Exercise	51	45.5	53	63.9	104	53.3	0.011
	Diet	53	47.3	56	67.5	109	55.9	0.005
	Neither	19	17.0	9	10.8	28	14.4	0.228
Complementary therapy	Homeopathy	1	0.9	0	0.0	1	0.5	
	Herbalist	21	18.8	7	8.4	28	14.4	0.042
Compliance with intake of prescribed medication and changes in exercise or diet	No	53	47.3	24	28.9	77	39.5	
	Yes	59	52.7	59	71.1	118	60.5	0.009
Reasons for non-adherence to diet	Dislike	23	50.0	9	60.0	32	52.5	0.501
	High cost of food	11	23.9	5	33.3	16	26.2	0.471
	Other	4	6.8	0	0.0	4	4.7	0.166

\*Pearson's  $\chi^2$  test or Fisher's exact test.

†Ten Mayan people who did not specify number of years living with diabetes and four Mayan people who did not answer the question about compliance with medical recommendations were excluded.

‡Complications included ulcers, kidney damage, visual impairment and diabetic coma.

### Poverty-based food culture

Poverty, ethnicity/cultural identity and gender arose as important limitations for the interviewees to adhere to a diet regimen. In contradiction to the medical recommendation to consume fruits, vegetables, and white and lean meats and to restrict red meat, sugars, carbohydrates and fats, most participants depended on beans and corn as the main sources of daily nutrients. People referred to the doctor's recommendations or restrictions as 'dieting'. Most of the interviewees were self-sufficient in terms of food production. They produced their own food on small farms or in their gardens – a form of self-sufficiency described as 'food for poor people'. They considered that medical dietary recommendations were feasible only with money to buy foods different from those they normally ate. Some said that to 'follow the diet' one had to 'be rich'. The capacity to select and purchase specific foods and products to 'follow the diet' did not seem 'achievable'. Also, most of them had their own interpretations regarding the origin of diabetes and the way to cure it, which contradicted the information received at health education sessions.

### Diet adjustments in a socially vulnerable context

Questionnaire data show that Mayan people had difficulties reducing the consumption of certain foods such as fats, carbohydrates, red meat and sugary drinks (when recommended by their doctor). They reported difficulties cutting sweetened beverages (74%), commercially processed bread (47%), corn (28%), sweet snacks (26%) and red meat (25%). Women reported greater difficulty in reducing the consumption of corn compared with men (31 v. 7%,  $P=0.011$ ). Participants with less education had greater problems reducing red meat compared with those with higher education (37 v. 18%,  $P=0.003$ ). The same pattern was observed for intake of salty snacks (11 and 0%, respectively,  $P < 0.001$ ). As for time from diabetes diagnosis, there was a borderline difference in the reduction of sugary beverages between those with time from diagnosis less than 12 years and those with time greater than 12 years (76 v. 56%,  $P=0.054$ , Table 5).

The qualitative interview data and the questionnaire provided evidence of three profiles of patients in terms of management of dietary restrictions: (i) those who strictly adhered to medical dietary recommendations; (ii) those

**Table 3** Mayan people's cultural beliefs about diabetes origin and their relationship with food habits and adherence to dietary treatment, Chiapas, Quintana Roo and Yucatan, Mexico, 2008–2012

Mayan people's cultural beliefs of diabetes origin	Narratives from Mayan people about diabetes origin	Interpretation of Mayan people's cultural beliefs about diabetes origin
Diabetes as consequence of extreme emotions	'My mother died, and then my father and I got obsessed about it. Now I regret it and think I shouldn't have to get obsessed, I mean they weren't ever going to come back, they were dead ... That's why I got it <sup>(46–48,50,51)</sup> from obsessing over it; my nerves got stirred up with my sugar, my doctors says they mixed together.' (Woman, Yucatan. Lines: 27–30)	'Strong emotions' can cause the body and soul to become ill
Suffering as punishment related to religious beliefs	'Oh dear Lord, because I'm Catholic I go to Mass. I always pray to God for my children who are poor like me. I mean I no longer really have bills to pay, but they do, they're young and have children to support. I pray to God that they don't inherit this disease that I have.' (Woman, Chiapas. Lines: 84–93)	'Behaving badly' with relatives or neighbours results in punishment from God
Magical beliefs	'[A healer] told me that someone had cast a spell on me so my vision would go cloudy and I would lose my eye.' (Man, Chiapas. Lines: 163–168)	Some people possess 'powers that can do damage'. They will send disease to others if someone requests it or if they have a personal grudge. There are also 'natural forces' that cause disease (such as becoming ill due to 'mal aire' or 'evil air')
Food contamination	'I got this disease because of bad diet ... the same reason we don't take care of ourselves anymore; if we plant something we use pure [chemical] fertilizer. Our ancestors weren't like that; they used pure manure, ash, organic garbage as pure compost. Now, not anymore. When you use fertilizer [the seed] grows quicker but it's all chemicals we're using just like with animals, cattle, chickens ... unlike before, now people are getting sick with diabetes.' (Man, Chiapas. Lines: 37–54)	The use of fertilizers and pesticides in agriculture and cattle/chicken farming causes diseases such as diabetes
Changes in food consumption in the context of globalization	'It's different now than before. Now I know how to drink soda ... before I drank coke 3 times a day, [the size] before, because now it's not like before, 2 or 3 litres, only in bottles ... they say that's why I got it, because I drank coke every day ... [After that] the foot pain started, the headaches started, that's that state I was in when I got diabetes.' (Woman, Yucatan. Lines: 73–80)	The introduction of processed foods high in sugar (i.e. soft drinks), sodium and fat (i.e. potato chips)

who made some changes but allowed themselves some margin in their adherence to dietary changes; and (iii) those who did not follow the dietary recommendations at all (Table 6).

#### *People who adhered to dietary recommendations*

The majority of these people were male heads of household whose wives prepared diet foods and excluded unhealthy foods. Women fond of vegetables and young adults still living at parents' home – and whose mother prepared the food – also fell into this category. In most of these cases, redefining food practices to adhere to recommendations was considered as beneficial to the entire family. Wives in families of more financial resources tended to prepare two meals: one for the person with diabetes and another for the rest of the family.

#### *People who adhered to some dietary recommendations*

These Mayan people did not adhere strictly to dietary recommendations as a strategy to make life tolerable and to protect themselves against the emotional suffering caused

by dietary restrictions. The most common means of adaptation was to consume less sugar and use artificial sweeteners instead; others continued to drink sodas but mixed with water, and some others replaced colas with other flavours of soda (thinking that cola contains more sugar than other types of sodas due to its colour). Some participants continued to eat the same amount of corn but substituted handmade for store-bought tortillas (believing the former were 'less fattening'), whereas others took non-prescription medications as a pre-meal prophylactic.

#### *People who did not follow dietary recommendations at all*

People who reported not making any doctor-recommended dietary changes considered the diet too restrictive. For example, they thought that 'adhering to recommendations meant not eating at all or starving to death'. They mentioned the importance of eating and drinking the same things as before their diagnosis. Some justified eating particular foods and beverages that either were their favourites or were necessary to perform their daily activities. They were willing to 'pay the

**Table 4** Medical recommendations about change of food habits according to Mayan people's narratives, Chiapas, Quintana Roo and Yucatan, Mexico, 2008–2012

Medical recommendations to change food habits	Narratives from Mayan people about disagreement with medical recommendations	Interpretations from Mayan people's narratives
Restriction of carbohydrates: Corn (i.e. tortillas) Wheat (i.e. bread) Legumes (i.e. beans)	'I can't get around, I don't even have the strength because they won't let me have tortillas, but [the doctor] from before told me "if you're not going to stop eating tortillas, tell them to just go ahead and get your casket ready because that'll be the death for you". I told him "no, I don't feel good, I feel sick, I used to eat 4 tortillas a night, up to 6 tortillas in the mornings, and at lunchtime up to 8".' (Woman, Quintana Roo. Lines: 254–274)	Corn is the main source of energy for everyday activities. From their point of view, corn is 'the food of the poor'
Restriction of fats: Red meats (i.e. pork) Lard (i.e. pork) Oil (used for frying foods)	'Well, at parties it's mainly <i>cochinita</i> [braised pork], <i>chile relleno</i> [stuffed fried chilli], <i>escabeche</i> [pickled dishes], <i>poc-chuc</i> [barbecued pork]; these are the most common dishes here in Yucatan at any gathering ... wherever you go. But I really can't eat a lot of <i>cochinita</i> because it's really high in fat.' (Man, Yucatan. Lines: 162–179)	Pork is the main ingredient in meals prepared for religious festivities and family celebrations
Restriction of sugar-sweetened foods and beverages: Junk food (i.e. chips) Soft drinks (i.e. sodas) Pastries	'... My life has changed a bit since I got diabetes because I can't eat just anything ... it's sad, yes ... when I go to parties I'm just looking around because I can't drink or eat anything.' (Woman, Yucatan. Lines: 317–328)	These foods and beverages are used in family and community celebrations. Sodas are used in religious and healing rituals too
Increase of vegetable consumption	'I don't know what to do, I don't get full, I'll still be hungry, they told me to eat leafy greens, they said when you get hungry eat an apple, a banana ... Even if I eat it, what I really want is to eat tortillas!' (Woman, Yucatan. Lines: 8–15)	Vegetables are considered as herbs; for them they have no nutritional value, do not provide energy/calories, and do not satisfy hunger
Having three meals a day: breakfast, lunch and dinner Addition of two light meals or snacks	'I can't afford having two snacks.' (Man, Yucatan. Lines: 1129–1143)	They do not know the concept and meaning of 'snack'

price' and in some cases even experienced diabetic complications. For other persons, not having any diabetes-related complications so far meant that their food practices were fine, so changing them was unnecessary.

The questionnaire data complemented the above qualitative descriptions. Over half (57%) of the study participants reported not adhering to doctor-recommended diabetes treatment (including medication, diet or exercise). The two principal reasons were dislike of recommended foods (52.5%) and high cost of foods (26.2%, Table 2).

## Discussion

The findings of the present study highlight the gap between biomedical modern culture and Mayan culture, which leads to low compliance with medical staff's recommendations on the part of Mayans with diabetes because of lack of understanding and existence of issues related to the social construction of taste. In this respect, Bourdieu maintains that taste is socially and historically constructed and is tied to certain contexts such as social class (class-specific tastes) and poverty or economic disadvantage, in which case there is a 'taste of necessity'<sup>(37,38)</sup>.

In addition, historians<sup>(39)</sup> and anthropologists<sup>(40,41)</sup> have emphasized the central place that corn occupies in Mesoamerican indigenous cultures up to the present day. A fundamental part of socially constructed taste among Mayans is the symbolic importance assigned to corn. This, in combination with economic reasons, account in good part for the difficulty that Mayans have in reducing or excluding tortillas (made from corn) from their diet. In many cases, the foods or dietary restrictions proposed by the doctor do not correspond to the Mayans' culturally constructed taste. Nevertheless, the social construction of taste is not monolithic, as shown by our finding of different profiles of more or less adherence to biomedical dietary (and other) recommendations among Mayans with diabetes.

### **Interrelationships between food practices, culture and social context**

Our results show that although medical staff define adherence to treatment as an individual process, the ability to follow treatment was limited by poverty and by social and cultural characteristics of the Mayan patients interviewed in the present study. The historic and sociocultural context shapes gender roles in kinship interactions, including who



**Table 5** Elimination of specific foods from the diet according to Mayan people's understanding of doctor's recommendations, gender, education and years with diabetes diagnosis, Chiapas, Quintana Roo and Yucatan, Mexico, 2008–2012

Eliminated food	Do you fully understand the doctor's explanations about your disease?		Gender		Education			Years with diagnosis		P value*
	No	Yes	Men	Women	Illiterate	Elementary or higher	12 years or less	More than 12 years		
	n	n	n	n	n	n	n	n		
Sweet snacks	25	25	8	42	16	34	24	4	0.969	
	22.3	30.1	29.6	25.0	21.1	28.6	21.8	22.2		
Salty snacks	6	2	27	8	8	0	6	1	0.986	
	5.4	2.4	50.0	4.8	10.5	0.0	5.5	5.6		
Sugar-sweetened beverages	78	66	19	125	57	87	84	10	0.054	
	69.6	79.5	70.4	74.4	75.0	73.1	76.4	55.6		
Red meat	34	15	6	43	28	21	25	3	0.564	
	30.4	18.1	22.2	25.6	36.8	17.6	22.7	16.7		
Processed breads	47	45	10	82	38	54	60	6	0.095	
	42.0	54.2	37.0	48.8	50.0	45.4	54.5	33.3		
Tortilla and corn products	28	26	2	52	23	31	37	5	0.624	
	25.0	31.3	7.4	31.0	30.3	26.1	33.6	27.8		

\*Pearson's  $\chi^2$  test.

is in charge of food preparation. This explains in part why men have an easier time adhering to dietary recommendations, because on the basis of prescribed gender roles women have to accommodate their dietary preferences and needs to those of all members of the family (diabetic and non-diabetic), whereas men usually have their meals prepared for them.

Another finding has to do with the struggle between socioculturally constructed taste for food and cultural values *v.* nutrition as defined by health-care guidelines and institutions, with dietary recommendations that seemingly value only macronutrients and energy: that is, a battle against fat and sugar. This trend among modern societies is called 'lipofobia', as Fischler points out<sup>(42)</sup>, which implies a view of food consumption as an isolated practice. On the contrary, our findings confirm the observations of other authors that the experience of eating and food practices are both social and cultural activities, encompassing the social and family environment as well as community religious and cultural holidays<sup>(43)</sup>. Furthermore, another theme that emerged from Mayans' narratives was the enjoyment of certain foods (restricted according to medical recommendations) and dislike of doctor-recommended foods, which was often seen as a valid justification for not adhering to treatment. In this regard, taste, defined as a set of preferences and aversions, is not an individual choice, but is developed instead through interactions with one's social group of origin, as several authors have previously documented<sup>(37,44,45)</sup>. Also, the qualitative and quantitative data revealed that poverty as a contextual factor imposes practical and taste-related ('taste of necessity') barriers to adherence to dietary recommendations made by medical staff that are not culturally competent and do not take into account the extreme economic limitations of many Mayans with diabetes.

**The political dimension of disease**

Some authors agree that the increased consumption of processed foods and beverages with high fat, sodium and sugar content, coupled with the reduction of physical activity, has negatively impacted the health of the global population during the last century. Historically, international political events have played a role in transforming the availability of food, as discussed by Mintz in the case of the production, distribution and consumption of sugar, a product that was democratized and whose consumption increased as a result of the colonization process in the Americas<sup>(26)</sup>.

In the case of Mayan people with diabetes, the social and environmental conditions in which they live hinder lifestyle changes to improve health. Any preventive health interventions compete with excessive media advertising promoting the consumption of beverages with high sugar content, of snacks with high salt and energy content, and of other foods with low nutrient density. The transnational companies that produce industrialized foods employ

**Table 6** Mayan people's cultural adaptations to medical dietary recommendations, Chiapas, Quintana Roo and Yucatan, Mexico, 2008–2012

Type of Mayan people with diabetes	Who in the family adapted culturally?
People who adhered to dietary recommendations	Mothers/wives cooked for the patient Had more financial resources than other participants Reported liking vegetables
People who partially adhered to dietary recommendations	Made changes to home cooked meals, for example: Made soups/broths without fat Cooked with oil, but not with pork fat/lard Mixed soda with water Substituted other flavours of soda for cola Substituted artificial sweeteners for sugar Took over-the-counter medicine as a preventive measure But continued eating the same number of corn tortillas
People who did not follow dietary recommendations	Had a gloomy understanding of disease aetiology (were certain they would die from diabetes) Thought they might as well eat what they liked while they were alive Had less financial resources than other participants

modern images and values as a dissemination strategy, selling the idea that modernity can be achieved through the consumption of their products<sup>(46)</sup>. Moreover, these industrialized items with low nutritional value are widely distributed and are non-perishable, which make them highly available. All the above affects people's food practices and is especially harmful in a context of scarce nutrient sources (i.e. individual and community poverty). Thus, asking people to change their eating habits without changing the obesogenic environment that surrounds them perpetuates the myth that keeping a disease in people's 'control' depends solely on their willpower. This way of thinking transfers all responsibility to the individual, leaving out the political sphere of influence on food practices.

### ***The importance of culture in health behaviours***

The qualitative results of the present study point to cultural beliefs about the disease origin that do not align with medically defined causes. These beliefs reflect aspects of moral, emotional and natural–supernatural forces and the social violence of poverty and gender. For the interviewees, a proper treatment has more to do with their beliefs about the origin of the disease. In contrast, the medical perspective calls for changing and regulating food practices from an individualized logic that does not make sense within the explanatory framework or the socio-economic context of Mayans' daily life.

The indigenous cultural horizon (including food habits), the ways of talking about diabetes and the meanings associated with the disease shaped the interviewees' experience and understanding of disease care and management. Experiences of frustration because of food restrictions were also documented among Ikojts, another Mexican indigenous group<sup>(17)</sup>.

Medical staff asked people to change their food habits without considering what food meant to some populations both symbolically and in practical terms (financial

resources, time needed to prepare two meal options). These types of barriers have also been documented among First Nation youth in Canada and in indigenous populations in other countries<sup>(18,47)</sup>.

Previous anthropological research on Mexican Mayans with diabetes explores how people explain diabetes and especially the central place of food in the causation of the disease<sup>(12–14)</sup>. Page-Pliego, for example, describes an array of explanatory models of diabetes, including biomedical understandings and traditional models that are based on Mayan traditions and cultural beliefs<sup>(13,14)</sup>. Some authors also note how the adoption of lifestyle changes recommended by medical staff, in particular diet, interacts with gender. For instance, similar to our data, these authors found that women with diabetes face greater barriers to diet change given their workload because of gender norms<sup>(12)</sup>.

This research also shows how poverty, cultural marginalization, and the processed food and sugary beverage industries converge in complex ways to contribute to the development of diabetes among indigenous peoples, including Mexican Mayans, and to create multiple barriers to the adoption of doctor-recommended dietary changes<sup>(12)</sup>. Page-Pliego specifically investigates the increased consumption of sugary beverages in culturally marginalized groups living in poverty, such as many Mexican Mayans, and its ties with taste but also with political and socio-economic processes that lead to easy availability of these drinks and make them socially desirable<sup>(13,48)</sup>. Finally, other authors have found, as we did, that another contributing socio-economic process is the displacement of traditional foods (such as fish among indigenous groups in Tabasco, Mexico) by ultra-processed foods, the consumption of which we noted to be extremely common in our study populations<sup>(16,17)</sup>.

### ***Strengths and limitations***

Several epidemiological studies have shown the impact of diabetes in vulnerable populations and the consequences of health-care inequalities. Less research has delved into

the way decisions on food occur in daily life and how they relate to adherence to diabetes treatment. This is the main strength of the present study.

Because the present study is mainly qualitative–ethnographic in nature, the evidence revealed by the data cannot be generalized to other contexts. We finished collecting data in 2012; however, the team continued working with indigenous people and diabetes, and we testified that those people still live today in the same conditions in their communities.

## Conclusion

To date, the models of diabetes treatment have largely focused on lifestyle changes and adherence to medical recommendations, with diet having a central role. The main contributions of the present study are the need to recognize the cultural and socio-economic vulnerabilities of Mayans with diabetes; the need for medical staff to promote strategies of behaviour change according to the specific cultural, social (including gender) and economic context<sup>(22,47)</sup>; and the necessity of countering the influence of an obesogenic social environment. The qualitative and quantitative results support the centrality of both the sociocultural construction of taste and the explanatory models of health and disease (including disease origin) in people with diabetes, in this case, Mexican Mayans.

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## Supplementary material

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