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3 **Relationship of the Self-perception of Lifestyle**
4 **with Level of Physical Activity in People with**
5 **and without Type 2 Diabetes**
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11 **ABSTRACT**

Objective: To determine the relationship of the perception of lifestyle with level of physical activity in people with type 2 diabetes and without type 2 diabetes.

Study design: Analytical cross-sectional observational study in Celaya, Guanajuato, Mexico.

Methodology: Sample composed of 100 people with type 2 diabetes and 100 people without type 2 diabetes, the lifestyle questionnaire and IPAQ questionnaire was used. Descriptive statistics were calculated for sociodemographic variables; it was calculated Chi-squared test and Odds Ratio. To demonstrate statistical significance of results, the value of P was set at .05. Statistical analysis was performed in STATA 13.0 ©

Results: In patients with Type 2 Diabetes predominated females, married, with nothing school and elementary and $BMI \geq 25 \text{ kg/m}^2$; among patients without Type 2 Diabetes, predominated males, singles, high school or university, $BMI \geq 25 \text{ kg/m}^2$; it did not relationship was found between lifestyle perception and level of physical activity in adults with type 2 diabetes ($X^2 = 0.0022$ gl 1 $P = .96$) neither it was found a significant relationship between lifestyle perception and level of physical activity in adults without type 2 diabetes ($X^2 = 5.23$ gl 1 $P = .02$ RM = 2.85 95% CI = 0.80 to 10.4)

Conclusion: The results show that self-perception of lifestyle and physical activity is different in people with less age, more schooling, males.

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13 *Keywords: Physical activity; Diabetes; Self-perception of lifestyle.*
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16 **1. INTRODUCTION**

17 Type 2 diabetes mellitus (T2D) is a chronic degenerative disease with a prolonged latency
18 period that represents a burden for health services, for the patient, the family, the community
19 and the country [1]. T2D is a metabolic alteration of carbohydrates, with deficit in the
20 production or release of insulin, increasing blood sugar levels [2]. This chronic disease and
21 its complications are one of the main causes of death in Mexico, only surpassed by
22 cardiovascular diseases for 2017, with a total of 75,637 deaths [3] and with more than
23 331.13 new cases per 100,000 population at year [4].

24 According to the Official Mexican Standard for the prevention, treatment and control of
25 diabetes, people at risk of developing diabetes are considered to be those who are
26 overweight / obese, sedentary, first-degree relatives with diabetes, age equal to or greater

27 than 65 years, women with a history of pregnancies with macrosomic products or with
28 gestational diabetes [5].

29 The lifestyle is defined as the perception that an individual has of his place in existence, in
30 the context of the culture and the value system in which he lives and in relation to his
31 objectives, his expectations, his norms, his concerns [6]. Despite the benefits of a healthy
32 lifestyle for both, the control of T2D or to delay its occurrence in those with risk factors, many
33 of them do not maintain a healthy lifestyle [7]. Health can be affected by lifestyle and living
34 conditions. The lifestyle includes attitudes and values, which are expressed in the behaviour
35 of the individual in different areas of life, including physical activity, food, the use of alcoholic
36 beverages, the use of cigarettes, the excessive alcohol intake and the management of
37 sexuality, as well as the social, physical, cultural, and economic aspects that impact people's
38 lives [8]. Currently, physical activity is any body movement produced by skeletal muscles
39 that requires energy expenditure [9].

40 The limited physical activity that exists in the lifestyles of society has manifested the
41 importance of performing some sport, becoming a social necessity to reduce risks of
42 presenting degenerative chronic diseases such as diabetes, thus having the opportunity to
43 maintain a healthy lifestyle. in people with T2D [8].

44 The offspring of people with T2D, share the same environment, the same culture, maybe the
45 same meals, the same attitude on physical activity, that people with the disease.

46 The main objective of the research was to determine the relationship of the perception of
47 lifestyle with level of physical activity in people with T2D and their offspring without T2D.

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49 2. METHODOLOGY

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51 2.1 Study design

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53 Cross-sectional, observational, analytic.

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55 2.2 Study setting

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57 Mutual Assistance Group (MAG) of Celaya, Guanajuato, Mexico, with registered people with
58 T2D, and one of their offspring.

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60 2.3 Sampling

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62 Patients with T2D registered in MAG in Celaya were 186 and of them 12 did not attended to
63 the session of the group; from 174 patients were selected using a random number from
64 Epidat 4.2, 2016 (Xunta de Galicia, OPS, OMS, Universidad CES), as simple random
65 sampling. From each patient, we ask number of offspring, and by draw, it was selected one
66 of their offspring.

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68 2.4 Selection of participants

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70 The inclusion criteria for people with T2D were all persons with T2D registered in the MAG of
71 Celaya, Mexico, adults who voluntarily agree to participate in the study, signing the informed
72 consent, whether male or female. The exclusion criteria were subjects with T2D, hospitalized
73 or who do not agree to participate in the study.

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75 The inclusion criteria for people without T2D were offspring for people with T2D registered in
76 the MAG of Celaya, Mexico, with 18 years of age or older, who voluntarily agree to
77 participate in the study, signing the informed consent, whether male or female. The
78 exclusion criteria was offspring of people with T2D who have not agreed to participate.

80 2.4 Variables

82 2.4.1 Sociodemographic

84 Age, gender, civil status, weight, height, Body Mass Index (BMI).

86 2.4.2 Independent

88 Self-perception of lifestyle. Dichotomous categorical variable, which can be called habits in
89 terms of physical activity, food, smoking, alcohol consumption; its unhealthy measurement
90 scale is 0-39 points and healthy 40-78 points measured with the lifestyle perception
91 questionnaire [10]; It is summarized with frequencies and percentages.

93 2.4.3 Dependent

95 Physical activity level. Ordinal categorical variable; It is defined as any body movement
96 produced by skeletal muscles that requires energy expenditure; it is measured with the
97 International Physical Activity Questionnaire (IPAQ) [11], with mild categories with 0 to 599
98 METS / min / week, moderate / vigorous with 600 or more METS / min / week; It is
99 summarized with frequencies and percentages.

101 2.5 Data collection instruments

103 The lifestyle perception questionnaire was used, which consists of 78 items with a
104 dichotomous answer of YES or No; it is dichotomized in unhealthy from 0 to 39 points and
105 healthy from 40 to 78 points; It has a reliability of 0.9 Kappa intraobserver and 0.89 Kappa
106 interobserver. For the physical activity the IPAQ short version in Spanish was used with
107 questions of vigorous, moderate activities and walking as well as sitting in the last seven
108 days; the result is transformed to METS / minute week; It has a Kappa reliability of 0.89 [12].

110 2.6 Procedures

112 Participants were explained the objectives of the study, as well as the advantages and
113 disadvantages of participating. They were asked to sign the informed consent. After doing
114 so, we proceeded to administer the lifestyle perception and the IPAQ questionnaires, and
115 measure anthropometry.

117 2.7 Sample size

119 Assuming that there is a ratio of 9 among those with an unhealthy and healthy lifestyle,
120 expecting 75% to be perceived with an unhealthy lifestyle and 50% with a healthy lifestyle,
121 the minimum sample size is 37 with a perception of Unhealthy lifestyle and 331 with
122 perception of healthy lifestyle, with 95% accuracy and 80% power (Epi Info, 7.1.3.0, 2013,
123 CDC, Atlanta, GA, USA).

125 2.8 Statistical analysis

126 Descriptive statistics were used for the sociodemographic variables. In order to show a
 127 relationship between perception of lifestyle and level of physical activity, a Chi-square test
 128 and P value, Odds Ratio (OR) and 95% confidence intervals (95% CI) were calculated. To
 129 demonstrate statistical significance of the results, the value of P was set at .05. Statistical
 130 analysis was performed in STATA 13.0® (Stata Corp., College Station, TX, USA).

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3. RESULTS AND DISCUSSION

The sample consisted of 100 individuals with type 2 diabetes (T2D) and 100 people without T2D, where they named female persons with T2D (70%) and men without T2D (74%), individuals with marital status married to T2D (67%) and single without T2D (45%), people with no schooling with T2D (28%) and high school-university without T2D (25%), adults with a body mass index (BMI) greater than 25 kg/m² with T2D (81%) and greater than 25 kg/m² without T2D (75%). It was found that people with T2D have a higher BMI with a range of 19.39-58.59 kg / m² and although the BMI range in people without T2D is lower, BMI is still high with a range of 17.44-47.63 kg / m² (Table 1).

Table 1. Distribution of categorical sociodemographic variables by group

Variables	Subjects with T2D		Subjects without T2D	
	f	(%)	f	(%)
Gender				
Female	70	70.00	26	26.00
Male	30	30.00	74	74.00
Civil Status				
Single	13	13.00	45	45.00
Married	67	67.00	38	38.00
Divorced	3	3.00	3	3.00
Separate	4	4.00	1	1.00
Widowed	9	9.00	12	12.00
Free Union	4	4.00	1	1.00
Schooling				
Nothing	28	28.00	16	16.00
Elementary	27	27.00	13	13.00
Secondary	19	19.00	18	18.00
High School	12	12.00	25	25.00
University	12	12.00	25	25.00
Postgrade	2	2.00	3	3.00
Body mass index				
>25 kg/m ²	81	81.00	75	75.00
<25 kg/m ²	19	19.00	25	25.00
Age (years)	Mean ± SD	56.12 ±10.26	34.94 ±12.60	
Weight (kg)	Mean ± SD	74.70 ± 16.60	71.87 ± 16.10	
Height (m)	Mean ± SD	1.60 ± 0.10	1.60 ± 1.00	
Body Mass Index (kg/m²)	Mean ± SD	29.13 ± 5.48	27.96 ± 4.93	

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T2D Type 2 Diabetes

In the MAG the mild level of physical activity predominates in people with T2D (74.00%) and mild in people without T2D (60.00%) and the perception of healthy lifestyle in people with T2D is 96.00% and healthy in people without T2D is 85.00% (Table 3)

Table 3. Distribution of study variables

Variables		With T2D		Without T2D	
		f	%	f	%
Physical activity	Mild	74	74.00	60	60.00
	Moderate/Vigorous	26	26.00	40	40.00
Lifestyle perception	Non-healthy	4	4.00	15	15.00
	Healthy	96	96.00	85	85.00

T2D Type 2 Diabetes

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In adults with T2D of MAG Celaya, there was no relationship between lifestyle perception and physical activity, $P = 0.96$ (Table 4).

Table 4. Distribution of lifestyle perception and level of physical activity in people with type 2 diabetes

Variables	Physical activity level			
	Mild		Moderate/Vigorous	
Lifestyle perception	f	%	f	%
Non-healthy	3	75.00	1	25.00
Healthy	71	73.96	25	26.04

$\chi^2 = 0.0022$ $df = 1$ $P = .96$

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In the MAG there is a significant relationship between the perception of lifestyle and level of physical activity in adults without T2D obtaining a P -value less than 0.05, marking that people who have a level of mild physical activity, have 2.85 times more likely to have non-healthy lifestyle (OR = 2.85), although the 95% CI include 1 and it is not sigficative (Table 5).

Table 5. Distribution of lifestyle perception and level of physical activity in people without type 2 diabetes

Variables	Physical activity level			
	Mild		Moderate/Vigorous	
Lifestyle perception	f	%	f	%

Non-healthy	13	86.67	2	13.33
Healthy	47	55.29	38	44.71
$X^2= 5.23$ $df 1$ $P=.02$ $OR= 2.85$ $95\%CI = 0.80$ a 10.4				

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172 The sociodemographic characteristics from our samples, are different; in subjects with T2D
 173 predominated the females, married, with nothing or elementary school; in their offspring,
 174 without T2D, predominated the males, with high school, singles (Table 1). In our sample, we
 175 found there is not relationship between the self-perception of lifestyle and level of physical
 176 activity among patients with T2D but there is a relationship between these variables in
 177 people without T2D.

178 In the investigation, by Cantú Martínez, the population with T2D had a prevalence of female
 179 gender (72.3%), marital status, married (69.2%), with primary schooling completed (49.2);
 180 being similar to the sample data in the MAG Celaya [13]. Piñón et al., in their research with
 181 people without T2D obtained a prevalence of the female gender (71.9%), with a finished high
 182 school education (64.5%); being similar to the results obtained in the MAG Celaya [14].

183 Piñón et al., agree with the data obtained in the MAG since in their study a low level of
 184 physical activity predominates with 48.8% in people without T2D [14].

185 According to Cantú Martínez, in his study conducted in 2015 in various Urban Health
 186 Centers of the Metropolitan Area of Monterrey, México, with a sample of 65 people with T2D,
 187 he tells us that 29.23% considered having a "good lifestyle", percentage which corresponded
 188 to a "healthy" classification, while the highest concentration has an inadequate lifestyle
 189 (70.77%), with two classifications of the participants; then, 56.92% is characterized by
 190 "moderately healthy" behaviour and only 13.85% of these were classified as "unhealthy". A
 191 significant correlation was detected between the evaluated lifestyle and the dimensions
 192 considered, except with the emotional state [13].

193 Regarding the physical activity carried out by the patients in the study, the inquiries showed
 194 that 20% have a "good lifestyle" and a "healthy" classification, however, 80% show an
 195 "inappropriate lifestyle" ", Which is reflected in 47.6%, "moderately healthy "; 20% is
 196 "unhealthy" and 12.3% "unhealthy". There is an average of 53 and a variation of 25, in the
 197 average lifestyle considered "moderately healthy" for this population [13]. Considering
 198 different results with the research in Celaya, Mexico, since there is no relationship between
 199 perception of lifestyle and level of physical activity in adults with T2D.

200 Piñón et al., in their study conducted in 2015 with participants of a program of healthy habits
 201 and lifestyles in the municipality of Popayán Colombia, with a sample of 217 participants
 202 without T2D, with respect to the level of physical activity measured with IPAQ , the study
 203 reports a general prevalence of 3.22% around the performance of vigorous physical activity;
 204 with an average of 181 minutes / week, in terms of moderate physical activity the prevalence
 205 was 15.1%, 223 minutes / week; the general prevalence of low physical activity was 70.3%
 206 in which subjects who performed less than three days of moderate activity were classified,
 207 having a significant relationship between the perception of lifestyle and level of physical
 208 activity [14], Therefore, this study yielded the same results to this research, marking a
 209 relationship between lifestyle perception and level of physical activity in adults without T2D.

210 In a study with 150 people with T2D, in India, 60% had BMI greater than 25 kg / m² and
211 reported that only 8% did some type of exercise or walked at least 4 days a week; 58% ate
212 more than 3 times a day but only once a week [15], which is considered a healthy measure,
213 eat five times a day but in smaller quantities. The population of Celaya with T2D, reported
214 74% of the participants doing mild physical activity. Yuing et al., In a meta-analysis show that
215 physical activity, with monitoring and surveillance of patients with T2D, improves
216 glycosylated hemoglobin levels [16]. It would be desirable that our patients with T2D perform
217 more exercise with monitoring to improve their biochemical parameters and that their
218 children who do not yet develop the disease, the exercise will probably cause their
219 appearance to be delayed.

220 A disadvantage of the study, is that groups are not comparable, because the basal
221 characteristics are different, but the data show differences in self-perception of lifestyle
222 among the people with T2D and their offspring, without T2D.

223 224 **4. CONCLUSION**

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226 In the study carried out it was found that there is no relationship between the self-perception
227 of lifestyle and the level of physical activity, in people with T2D, neither in their offspring. The
228 differences could be because more schooling or more awareness about the needed to live
229 with a healthy lifestyle in people more younger. It is needed increase the sample size to
230 obtain a significative relationship.

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233 **COMPETING INTERESTS**

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235 Authors have declared that no competing interests exist.

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238 **CONSENT**

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240 All authors declare that 'written informed consent was obtained from of the study participants
241 for publication of this investigation. A copy of the written consent is available for review by
242 the Editorial office/Chief Editor/Editorial Board members of this journal.

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245 **ETHICAL APPROVAL**

246 The protocol was reviewed and approved by the Bioethics Committee of the Division of
247 Health Sciences and Engineering of the Celaya-Salvatierra Campus of the University of
248 Guanajuato, with registration number CIBCSIC-1381310

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