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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 the 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 were used. Descriptive statistics were calculated for sociodemographic variables; it was calculated Chi-square test and Odds Ratio. To demonstrate the 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, who never went school and elementary and BMI ≥ 25 kg/m²; among patients without Type 2 Diabetes, predominant males, singles, went school or university, BMI ≥ 25 kg/m²; no 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
30 PLACE IN EXISTENCE, IN THE CONTEXT OF THE CULTURE AND THE VALUE SYSTEM
31 IN WHICH HE LIVES AND concerning HIS OBJECTIVES, HIS EXPECTATIONS, HIS
32 NORMS, HIS CONCERNS [6]. Despite the benefits of a healthy lifestyle for both, the control
33 of T2D or to delay its occurrence in those with risk factors, many of them do not maintain a
34 healthy lifestyle [7]. Health can be affected by lifestyle and living conditions. The lifestyle
35 includes attitudes and values, which are expressed in the behaviour of the individual in
36 different areas of life, including physical activity, food, the use of alcoholic beverages, the
37 use of cigarettes, the excessive alcohol intake and the management of sexuality, as well as
38 the social, physical, cultural, and economic aspects that impact people's lives [8]. Currently,
39 physical activity is ANYBODY MOVEMENT PRODUCED BY SKELETAL MUSCLES THAT
40 REQUIRES ENERGY EXPENDITURE [9].

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

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

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

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50 2. METHODOLOGY

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52 2.1 Study design

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54 Cross-sectional, observational, analytic.

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56 2.2 Study setting

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

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61 2.3 Sampling

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

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69 2.4 Selection of participants

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

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

2.4 Variables

2.4.1 Sociodemographic

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

2.4.2 Independent

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

2.4.3 Dependent

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

2.5 Data collection instruments

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

2.6 Procedures

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

2.7 Sample size

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

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2.8 Statistical analysis

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

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3. RESULTS AND DISCUSSION

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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
Postgraduate	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/m ²)	Mean ± SD	29.13 ± 5.48	27.96 ± 4.93
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T2D Type 2 Diabetes

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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 a healthy lifestyle in people with T2D is 96.00% and healthy in people without T2D is 85.00% (Table 2)

Table 2. 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 3).

Table 3. 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 includes 1 and it is not significant (Table 4).

Table 4. 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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175 THE SOCIODEMOGRAPHIC CHARACTERISTICS FROM OUR SAMPLES ARE
 176 DIFFERENT; IN SUBJECTS WITH T2D PREDOMINATED THE FEMALES, MARRIED,
 177 WITH NOTHING OR ELEMENTARY SCHOOL; IN THEIR OFFSPRING, WITHOUT T2D,
 178 PREDOMINATED THE MALES, WITH HIGH SCHOOL, SINGLES (TABLE 1). In our
 179 sample, we found there is not relationship between the self-perception of lifestyle and level
 180 of physical activity among patients with T2D but there is a relationship between these
 181 variables in people without T2D.

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

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

189 According to Cantú Martínez, in his study conducted in 2015 in various Urban Health
 190 Centers of the Metropolitan Area of Monterrey, México, with a sample of 65 people with T2D,
 191 he tells us that 29.23% considered having a "good lifestyle", percentage which corresponded
 192 to a "healthy" classification, while the highest concentration has an inadequate lifestyle
 193 (70.77%), with two classifications of the participants; then, 56.92% is characterized by
 194 "moderately healthy" behaviour and only 13.85% of these were classified as "unhealthy". A
 195 significant correlation was detected between the evaluated lifestyle and the dimensions
 196 considered, except with the emotional state [13].

197 REGARDING THE PHYSICAL ACTIVITY CARRIED OUT BY THE PATIENTS IN THE
 198 STUDY, THE INQUIRIES SHOWED THAT 20% HAVE A "GOOD LIFESTYLE" AND A
 199 "HEALTHY" CLASSIFICATION, HOWEVER, 80% SHOW AN "INAPPROPRIATE
 200 LIFESTYLE" , WHICH IS REFLECTED IN 47.6%," MODERATELY HEALTHY "; 20% IS
 201 "UNHEALTHY" AND 12.3% "UNHEALTHY". THERE IS AN AVERAGE OF 53 AND A
 202 VARIATION OF 25, IN THE AVERAGE LIFESTYLE, CONSIDERED "MODERATELY
 203 HEALTHY" FOR THIS POPULATION [13]. CONSIDERING DIFFERENT RESULTS WITH
 204 THE RESEARCH IN CELAYA, MEXICO, SINCE THERE IS NO RELATIONSHIP BETWEEN
 205 PERCEPTION OF LIFESTYLE AND LEVEL OF PHYSICAL ACTIVITY IN ADULTS WITH
 206 T2D.

207 Piñón et al., in THEIR STUDY, CONDUCTED IN 2015 WITH PARTICIPANTS OF A
 208 PROGRAM OF HEALTHY HABITS AND LIFESTYLES IN THE MUNICIPALITY OF
 209 POPAYÁN COLOMBIA, WITH A SAMPLE OF 217 PARTICIPANTS WITHOUT T2D, WITH
 210 RESPECT TO THE LEVEL OF PHYSICAL ACTIVITY MEASURED WITH IPAQ , THE

211 STUDY REPORTS A GENERAL PREVALENCE OF 3.22% AROUND THE
212 PERFORMANCE OF VIGOROUS PHYSICAL ACTIVITY; WITH AN AVERAGE OF 181
213 MINUTES / WEEK, IN TERMS OF MODERATE PHYSICAL ACTIVITY THE PREVALENCE
214 WAS 15.1%, 223 MINUTES / WEEK; THE GENERAL PREVALENCE OF LOW PHYSICAL
215 ACTIVITY WAS 70.3% IN WHICH SUBJECTS WHO PERFORMED LESS THAN THREE
216 DAYS OF MODERATE ACTIVITY WERE CLASSIFIED, HAVING A SIGNIFICANT
217 RELATIONSHIP BETWEEN THE PERCEPTION OF LIFESTYLE AND LEVEL OF
218 PHYSICAL ACTIVITY [14], Therefore, this study yielded the same results to this research,
219 marking a relationship between lifestyle perception and level of physical activity in adults
220 without T2D. In a study with 150 people with T2D, in India, 60% had BMI greater than 25 kg /
221 m² and reported that only 8% did some type of exercise or walked at least 4 days a week;
222 58% ate more than 3 times a day but only once a week [15], which is considered a healthy
223 measure, eat five times a day but in smaller quantities. The population of Celaya with T2D,
224 reported 74% of the participants doing mild physical activity. Yuing et al., In a meta-analysis
225 show that physical activity, with monitoring and surveillance of patients with T2D, improves
226 glycosylated hemoglobin levels [16]. It would be desirable that our patients with T2D perform
227 more exercise with monitoring to improve their biochemical parameters and that their
228 children who do not yet develop the disease, the exercise will probably cause their
229 appearance to be delayed.

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

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234 4. CONCLUSION

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

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243 COMPETING INTERESTS

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245 Authors have declared that no competing interests exist.

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248 CONSENT

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

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254 ETHICAL APPROVAL

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

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