COMPARISON OF QUALITY OF LIFE AND SLEEP OF ADOLESCENTS WITH AND WITHOUT TYPE 1 DIABETES MELLITUS

COMPARAÇÃO DA QUALIDADE DE VIDA E SONO DE ADOLESCENTES PORTADORES E NÃO PORTADORES DE DIABETES MELLITUS TIPO 1

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RESUMO

A Diabetes Mellitus Tipo 1 (DM1) é uma doença autoimune que afeta milhares de pessoas atualmente, com maior concentração de casos na adolescência. O tratamento implica alterações no estilo de vida que podem apresentar influência negativa sobre a qualidade do sono (QS) e qualidade de vida (QV). O propósito do estudo foi comparar a QS e QV entre adolescentes portadores e não portadores de DM1. Participaram do estudo 74 adolescentes divididos por grupos e sexo: GDM1-F (n=19), GDM1-M (n=18), GC-F (n=21) e GC-M (n=16). Os instrumentos utilizados foram o Índice de Qualidade do Sono de Pittsburgh e WHOQOL-bref. Para comparar os grupos foi utilizado Análise de Covariância, ajustada pela idade, com Post Hoc de Bonferroni. Os resultados sinalizam que os participantes do GDM1-F e GDM1-M, portadores de DM1, apresentaram maiores escores em todas as avaliações, com diferença significativa com o CG-F nas variáveis: QS global, Domínios Físico, Psicológico e Relações Sociais e QV total. Portanto, foi possível observar que os adolescentes portadores de DM1 apresentaram melhor avaliação da QS e QV em comparação as meninas sem DM1, independentemente da idade.
Palavras-chave: Diabetes Mellitus Tipo 1. Adolescência. Qualidade de vida. Sono.

ABSTRACT

Type 1 Diabetes Mellitus (DM1) is an autoimmune disease that affects thousands of people today, with a higher concentration of cases in adolescence. Treatment involves lifestyle changes that can have a negative influence on quality of sleep (QS) and quality of life (QL). The purpose of the study was to compare QS and QL among adolescents with and without DM1. Seventy-four adolescents participated in the study divided by groups and sex: GDM1-F (n=19), GDM1-M (n=18), GC-F (n=21) and GC-M (n=16). The instruments used were the Pittsburgh Sleep Quality Index and WHOQOL-bref. Age-adjusted Covariance Analysis with Bonferroni Post Hoc was used to compare the groups. The results show that the participants of GDM1-F and GDM1-M, with DM1, had higher scores in all evaluations, with significant difference with CG-F in the variables: global QS, Physical, Psychological and Social Relationships and total QL. Therefore, it was possible to observe that adolescents with DM1 had better QS and QL evaluations than girls without DM1, regardless of age.
Keywords: Type 1 Diabetes Mellitus. Adolescence. Quality of life. Sleep.

Introduction

Type 1 Diabetes Mellitus (T1DM) is a disease that has affected thousands of people in Brazil and worldwide with an increasing incidence of about 3% each year. Currently, the worldwide number of new cases of T1DM is 132.600, which includes young people under the age of 19[1]. Brazil is one of the 10 countries with the highest number of patients with T1DM (88.300)[2]. In this context, the International Diabetes Federation lists Brazil as the third country with the highest number of cases per year (9.600)[1].

Usually developed during childhood or early adulthood, T1DM is an autoimmune disease characterized by the destruction of pancreatic beta cells, which causes partial or complete deficiency in insulin production[3]. According to Mascarenhas et al.[4], the treatment of T1DM should include insulin therapy, food planning and regular physical exercises.

Adolescence is the period with the highest concentration of patients with T1DM[5]. In this phase, innumerable hormonal, psychological and physical changes occur, which can

hinder the disease control[6]. The negative reflex of T1DM is related to the glycemic control, quality of life (QOL) and depressive symptoms[7].

Having a good QOL is a challenge for patients with T1DM due to the stressors they are exposed to[8]. The World Health Organization defines QOL as being "the individual's subjective perception of his position in life with regard to the cultural context and value system he lives in, besides his goals, standards and precautions". This concept includes domains influenced by physical and psychological health, independence level, social relationships, religious aspects and relationship with the environment[9].

The lack of glycemic control caused by T1DM is an important factor to be considered in the treatment. In this context, the quality of sleep (QOS) is directly influenced, since the imbalance in any of the elements of treatment can induce changes in glucose concentrations during the night and cause situations of nocturnal hypoglycemia, which makes the patients with T1DM to wake up to measure blood glucose. This can impair the QOS and performance concerning the activities of the next day[10]. According to Reimer and Fleamons[11], poor QOS can negatively influence the QOL.

Results of studies have shown the importance of assessing the QOS and QOL in adolescents with T1DM. Martins et al.[12] analyzed the QOL of adolescents with T1DM; 71% had good QOL. The authors showed the relevance of evaluating the QOL of this population to comprehensively improve health and treatment. Perez et al.[13] emphasized that sleep is a critical factor in the management of Diabetes, however, there is still a need to understand the influence of sleep in patients with T1DM, such as the patterns related to duration, consistency and satisfactory assessments.

In view of these elements and the need for studies on the theme, a hypothesis is raised, that is, QOS and QOL of patients with T1DM are more difficult to be evaluated due to the disease. Therefore, the purpose of the present study was to compare the QOS and QOL between adolescents with and without T1DM.

Methods

The study design
This is a cross-sectional study that included descriptive and analytical analyzes[14]. It was carried out with patients from a multiprofessional pediatric endocrinology clinic and with students from a state school in the city of Curitiba, Paraná, Brazil.

Participants
This study included seventy four 10-16-year-old adolescents sampled at convenience. The participants were previously asked if they accepted to participate in the study; the authorization from parents or guardians was obtained by signing the Free Informed Consent Form (FICF), according to Resolution 196/96 of the National Health Council. The minimum number of participants (n = 74) was calculated using the GPower® software, with a strength of 0.80 for the methodology proposed. This investigation is part of a project approved by the Brazilian National Council for Scientific and Technological Development (CNPq) under resolution CAAE 44748015.4.1001.0106.

Four groups were assigned: two groups composed of subjects with T1DM, that is, the T1DM-FG that included female adolescents undergoing continuous treatment with multidisciplinary monitoring (n = 19) and T1DM-MG with male participants (n = 18), in addition to two other groups that embraced adolescents without a diagnosis of T1DM, that is, the Female Control Group (FCG) (n = 21) and the Male Control Group (MCG) (n = 16). For being included in the study, the participants should have 10-16 years of age, in addition to

having been diagnosed with T1DM for at least two years. Participants who did not deliver the Free Informed Consent Form signed by parents or guardians were excluded from the study.

Procedures

The forms were applied through an interview, which was explained to the participants by the previously trained interviewers. Anthropometric measures were measured after filling out the forms.

Data collection took place at the pediatric endocrinology clinic on a scheduled activity day, as well as at the state school during Physical Education class. The Free Informed Consent Form was previously sent for the authorization and signature of the parents or guardians. After the delivery of the FICF signed, the forms were filled in. The participants were free to decide whether or not to participate in the study all the time.

Instruments

The Pittsbugh Sleep Quality Index (PSQI) was used to assess QOS. This instrument evaluates sleep in relation to the last month; it includes 10 questions related to the individual's normal sleep habits: bedtime, minutes to sleep, time to wake up, hours of sleep per night, causes of sleep problems, subjective classification on sleep quality, sleeping medication, and problems for staying awake[15]. The PSQI has Brazilian validation with tested reproducibility; the score ranges from 0 to 21, classified as follows: 0 to 4 - good QOS; 5 to 10 - poor QOS; and e > 10 - presence of sleep disorder[16].

In order to assess the QOL perception, the short form on quality of life was used - WHOQOL-bref. Developed by the WHO, it consists of 26 questions, 24 of which represent four domains (physical and psychological health, social relationships and environment), and two questions about self-perceived health and total QOL[9]. This instrument was validated in Brazil, showing internal consistency and test-retest reliability[17].

The WHOQOL-bref tabulation was performed by using an Excel spreadsheet, following the correction syntax proposed by Pedroso et al.[18] The results were classified per decimal scale, defined as follows: 0 to 25 - very bad; 25.01 to 50 - bad; 50.01 to 75 - good and 75.01 to 100 - very good[19].

Anthropometric variables, height and body mass were measured by using a portable stadiometer and an anthropometric scale. The calculation of the Body Mass Index (BMI) and z score was performed with WHO AnthroPlus software - version 2009. Glycated Hemoglobin (HbA1c) was collected following the clinical protocols of the general practice.

Statistical analysis

The data were analyzed by using IBM® SPSS® software - version 25. The description was performed according to frequency (gross and relative) and measures that included central tendency (mean) and variability (standard deviation). Normality was performed by applying Shapiro-Wilk test, and homogeneity of variances with the Levene test. Analysis of variance (ANOVA) was used to compare the characterization data of the participants among the groups, followed by Bonferroni's Post Hoc and independent Student's t test. The Covariance Analysis (ANCOVA) was used to compare the effects among groups when assessing QOS and QOL, adjusted by the covariate chronological age. All the tests were performed considering an alpha error of 5%[20].

Results

The results with regard to the characterization of the four groups participating in the study, considering the anthropometric and clinical variables related to T1DM, are shown in Table 1.

Table 1. Characterization of the general variables and T1DM among the groups divided per sex.

Variables	T1DM-FG	T1DM-MG	FCG	MCG	F	p
Age (years)	12.9± 1.8^{cd}	13.1±2.1^{cd}	15.1±0.7^{ab}	15.6±0.5^{ab}	15.838	0.0001*
Body Mass (kg)	49.3±12.8^{d}	46.0±13.6^{cd}	55.2±4.9^{b}	61.4±4.0^{ab}	7.889	0.0001*
Height (cm)	154.3±11.2^{d}	153.4±15.5^{d}	160.2±4.5^{d}	170.7±4.6^{abc}	10.685	0.0001*
BMI	20.1±2.9	19.1±2.4^{c}	21.5±2.0^{b}	21.0±0.9	4.156	0.009*
BMI - z score	0.4±0.8	0.1±0.8	0.3±0.6	0.2±0.3	0.776	0.511
T1DM Variables					**t**	**p**
Diagnosis (years)	6.3±3.8	5.7±3.3	-	-	0.553	0.584
HbA1c (%)	9.6±1.3	9.8±1.6	-	-	-0475	0.638

Note: a – different from T1DM-FG; b – different from T1DM-MG; c – different from FCG; d – different from MCG; F:ANOVA; t – independent Student t test; *p<0.05
Source: The authors

Table 2 describes the results of QOS evaluation obtained through PSQI and the comparison of QOS among groups with regard to the variables of sleep habits.

Table 2. Comparision of sleep habits and global QOS among the groups divided per sex

Sleep habits	T1DM-FG	T1DM-MG	FCG	MCG	F	p
Sleep duration (h)	8.1±1.3	7.5±1.2	6.8±1.5	6.8±1.6	2.528	0.065
Sleep efficiency (%)	88.8±7.1	91.7±3.8	85.4±13.3	80.4±8.2	1.546	0.211
Global QOS	4.9±2.2^{c}	3.9±2.3^{c}	8.7±3.8^{abd}	5.5±2.1^{c}	8.839	0.0001*

Note: a – different from T1DM-FG; b – different from T1DM-MG; c – different from FCG; d – different from MCG; F:ANCOVA adjusted per age; *p<0.05
Source: The authors

Table 3 shows the QOL scores obtained by using the WHOQOL-bref, and comparison among the groups.

Table 3. Comparison of the domains and total QOL among the groups divided per sex

Domains	T1DM-FG	T1DM-MG	FCG	MCG	F	p
Physical	72.6±10.4^{c}	80.0±8.3^{c}	59.5±10.7^{abd}	73.9±11.4^{c}	11.536	0.0001*
Psychological	75.6±12.9^{c}	81.3±10.2^{cd}	51.7±13.6^{abd}	63.7±13.8^{bc}	13.900	0.0001*
Social Relationships	74.2±15.2^{c}	78.1±14^{c}	57.7±12^{ab}	63.5±20.6	4.548	0.006*
Environment	66.9±13.1	73.9±11.1	63.2±10.3	64.9±12.9	2.112	0.107
Total QOL	70.6±9.9^{c}	75.1±10.5^{c}	60.2±7.7^{abd}	69.3±8.9^{c}	7.088	0.0001*

Note: a – different from T1DM-FG; b – different from T1DM-MG; c – different from FCG; d – different from MCG; F:ANCOVA adjusted per age; *p<0,05
Source: The authors

Discussion

The hypothesis raised in the present study was not confirmed. The participants with T1DM (FG and MG) showed better results in most parameters related to QOS and QOL, especially in relation to girls without T1DM. According to Table 1, participants with diabetes had lack of control concerning the glycemic target, since the HbA1C value should be less than 7.5%[3]; however, high values of 9.6±1.3 and 9.8±1,6 were found. This result shows that even not meeting the glycemic target, the QOS and QOL of adolescents with T1DM showed better values than the girls without T1DM.

All the groups showed high sleep efficiency; PSQI evaluation classified T1DM-FG and T1DM-MG with good QOS, and FCG and MCG with bad QOS. Sleep duration was not different among the groups. The National Sleep Foundation recommends adolescents to having 8 to 10 hours of sleep per night, so that the physiological sleep benefits are achieved[21]. In this context, only T1DM-FG fitted the recommendation.

The literature has shown different results from the ones obtained in the present study. Meta-analysis on the subject showed that there are significant differences in sleep habits between people with and without T1DM. Thus, adolescents with T1DM have shorter sleep duration, and adults have a worse QOS related to glycemic control[22]. Therefore, despite having the adolescents with a positive assessment with regard to QOS, glycemic control should receive attention, since complications in the QOS are likely to be manifested later.

The study by Wilson et al.[23] showed that diabetic patients with HbA1c values above 6.5% had significantly fewer cases of nocturnal hypoglycemia. This result may explain the better assessment of the QOS in patients with T1DM in the present study, since the high level of HbA1c can reduce nocturnal hypoglycemia and, thus, improve self-perceived QOS. However, high levels of HbA1c can lead to complications in adulthood; according to Pettus et al.[24] 18-25-year-old young adults with poor glycemic control have a higher risk of diabetic ketoacidosis and severe hypoglycemia.

Chronological age can negatively interfere with the assessment of QOS. With advanced age, the hours of sleep tend to decrease, thus, poor self-perceived QOS can be seen[25,26]. The age of the participants in the control group was slightly higher than the participants with T1DM (Table 1), however, when correcting the analysis according to age, only the girls in the control group remained with QOS in lower class parameters.

The four groups had total QOL classified with good scores (Table 3), thus, the T1DM-FG and T1DM-MG had better scores compared with FCG. Studies indicate that there are no major differences in QOL between sexes regarding T1DM, which corroborates with the findings of the present study[27,28]. The FCG had the worst scores when assessing QOL in all the domains. Two European studies have found similar results, that is, female adolescents (without T1DM) had a decreased self-perceived QOL and domains in relation to males and this difference increases with advanced age.[29,30]

The positive perception of adolescents with T1DM about QOL is corroborated by other investigations. Santana et al.[31] assessed 22 adolescents with T1DM and showed that the participants had a good self-perceived QOL. In a prospective analysis, the perception of QOL of adolescents with T1DM was not negative, even with the variability of metabolic control when adherence to treatment occurs in childhood[32]. The study by Greco-Soares and Dell'Aglio[27] that included 122 adolescents with T1DM also signaled good QOL. The authors emphasized the importance of adherence to treatment and self-care as being preponderant to obtain positive findings.

Under this same perspective, the results of the present study suggest a positive QOL and QOS of adolescents with T1DM. It is worth mentioning that these adolescents attend a clinic that intensively controls the disease, and they are monitored by a multiprofessional

team at all stages from childhood to adolescence. Under this perspective, even with high HbA1c results, adherence to treatment and mandatory care to control T1DM may justify a better evaluation of the parameters assessed in the study.

Some limitations have been identified, for example, the cross-sectional design with only one data collection, which may represent an acute response of the variables assessed. Finally, the lack of control over the biological maturation of adolescents could represent an influence on the results of this investigation. Further longitudinal studies that address these limitations shall provide more consistent information on this subject.

Conclusion

The results of the present study showed that adolescents with T1DM had better self-perceived QOS and QOL compared to girls without T1DM, regardless of age.

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