108 - EFFECTS OF THE GLYCEMIA BEHAVIOR WITHIN PERSONS WITH TYPE 2 DIABETES MELLITUS (DM) ON A WALKING PROGRAM

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INTRODUCTION

The incidence and prevalence of type 2 diabetes mellitus (DM) is increasing considerably in the last years, turning into a serious problem for public health in practically all countries, independently of socioeconomic development level. The epidemic and demographic transition from last century with modifications of the everyday lifestyle determined a risk profile for the development of chronic diseases, like the diabetes[1,2,3,4].

Type 2 DM is responsible for about 90% of diabetes cases and has been pointed as one of the ten main causes, direct or indirectly, of death in the world. The increase of the overweight taxes and obesity associated to lifestyle alterations (inadequate feeding and reduction of physical activity) and the aging population, are the main factors that explain the growth of type 2 DM prevalence[5].

The main goal of the type 2 DM treatment is the control of the blood glycemia, because this way it is possible to avoid sharp and chronic complications of diabetes, such as diabetic ketoacidosis, hyperglycemic nonketotic syndrome, hypoglycemia, the alterations in the microcirculation and macro circulation and also neuropathy alterations[6].

The treatment of type 2 DM consists of different stages, among them stands out the stage I that includes the dietary treatment, a exercise program, lifestyle changes and self-monitoring training[7]. However, it is observed that besides the physical exercise is suggested to be in stage I of the diabetes treatment, statistic data demonstrated that in Brazil, in the age group of 30-69, 23% of the diabetics didn't make any treatment; 29% only diet; 41% used oral glucagons and 7% insulin[8].

Many years physical exercise is a part of the basic treatment for diabetes, due to the great advantages presented on the metabolism of the disease, such as: glycemia fall, reduction of the fat percentile, increase in of insulin action and oral glucagons[9,10]. However, in the last decades, researches[11,12,13,14,15,16] have been accomplished to identify relationship between exercise prescription with metabolic effects in diabetes. To minimize risks, to increase the benefits of exercise for diabetic individual, to avoid current chronic complications of this disease and to guarantee quality of life for this population has been the major purpose of these studies.

In spite of the different proposals by modality, frequency, volume and intensity in the exercise prescription for the diabetics, there is a unanimity about the importance of cares and necessary precautions for the diabetic's safety. In this way, the glucose levels monitoring is constituted of a essential procedure, as well as the diet adjustments. Although the indication of located muscular resistance exercises, the aerobic exercises are more extolled. As for the frequency a minimum of 3-4 days for week[17], the advisable volume for the diabetic is from 15 to 60 minutos[11,12,13,17] and the extolled intensity varies from 50% to 80% FC resting[17] and 50%-80% VO2máx.[18].

In assumption of these matters, the importance of the physical exercise in the treatment of type 2 DM, The objective of this research was to verify the effects of the glycemia behavior from persons with type 2 Diabetes Mellitus (DM) on a walking program.

METHODOLOGICAL PROCEDURES

Population and Sample

The population was constituted of diabetics of type 2, that didn't make use of insulin and frequented the Diabetics Association of Três de Maio - RS. The association counted with 80 participants, however there was no frequency on the monthly meetings which was more prestige by the retired.

The sample, intentionally selected, was composed by 12 individuals (10 female and 2 male), who agreed in being part of the research and signed a responsibility term. The age group was from 55 to 76 years (medium age of 64,6 years old). All of the women of the sample (n=10) presented systemic arterial hypertension diagnosis (SAH) and used medicines for their control. And the men (n=2) presented normal blood pressure. Besides the SAH, they presented other chronic complications: heart inadequacy (n=2), heart arrhythmia (n=1), diabetic nefropathytic (n=1) and diabetic nephropathy (n=1).

MATERIAL AND METHODS

After medical evaluation through clinical exam and laboratorial exams (urea, glucose and hemoglobin glucose) an alimentary anamnesis was accomplished by the nutritionist which tried to adjust and give general orientations for the development of the walking program. A semi-structured questionnaire was applied to identify the participants' physical activity habits. It is pointed out, that the involvement of a multidisciplinary team composed by doctor, nurse, nutritionist and professional of Physical Education was fundamental for the development of this research.

The evaluation of the dependent variables in this study were: capillary glycemia (GC), hemoglobin glucose (Hba) and Body Mass Index (IMC), the walking program was the independent variable.

For the verification of the capillary glycemia (GC) it was used a glucometer Bayer S.A.®, the *glucometer elite*, sticks and ribbons compatible reagents. For cutback, GC was verified in 20 walking sessions.

The hemoglobin glucose (Hba) was discovered by laboratorial test with the subject in a period without eating, at least, twelve hours in the beginning and after the end of the walking program. This laboratorial method is excellent for evaluation of the diabetic's metabolic control, because the life time from red globules is, approximately, 120 days. The chromatography method was used in personal resin computer-columns and the values used referred were 4,2% to 6,2% of the total hemoglobin.

For BMI, the protocol of Alvarez & Pavan[19](corporal mass and stature) was used, with the individuals wearing light clothes, through Filizola scale with interval measure of 100 grams with stadiometer. BMI (Quetelet formula) was used considering parameters suggested by the World Organization of Health[20].

The evaluation of the aptitude cardiorespiratory (VO2 max) was accomplished through the walking a mile test (ACSM)[21].

The exercise prescription obeyed the scientific beginnings of sport training. With the medical information it was obtained data about the treatment and the disease stage, used medication and chronic complications were considered for the walking program prescription.

The walking program was prescribed with a weekly frequency of three days (Mondays, Wednesdays and Fridays); initial duration of 30 minutes, after two weeks 35 minutes, and when completing three weeks the volume passed to 40 minutes; after the fourth week it was altered to 45 minutes and when completing six weeks it went to 50 minutes and it was maintained until the end of the three months of intervention; the intensity was 40%-65% of FC resting, monitored through heart frequency

two to three times during the walking, through hearing radial artery for 15 seconds. It was also used, the scale of Borg[17], for diabetics that used medicines to reduce FC. The determination of the intensity always respected the physical limitations, taking care of complications of the diabetes and the age of the sample.

The walk sessions began and ended with prolongations. In each session individual records of control were filled out, containing the data of capillary glycemia, blood pressure (verified before and after the session by a technician nurse) and other pertinent observations from each individual, seeking a larger safety on the program. The intervention happened during three months and 36 walking sessions were accomplished.

Statistical Treatment

For the statistical treatment the Excel program 97 version was used. The significant level adopted was 5%. Before choosing by parametric or no-parametric statistics the normality of data was verified. Therefore, the capillary glycemia was analyzed through binomial distribution - Tests of Signs and the hemoglobin glucose was analyzed equally through binomial distribution- Tests of Signs and Wilcoxon test. BMI was analyzed by Student "t" test for dependent samples.

RESULTS AND DISCUSSIONS

The participants of the research were designated by letters from "A" to "L" to possibility the individual results comprehension.

It was able to verify, according to table 1, that each individual (except one) presented a significant statistical reduction (p=0,05) of Capillary Glycemia. This result is according with the literature[11,18] confirming that exercise program, including aerobic activities (walking) can result in a significant reduction of the sanguine glucose levels. Therefore, the levels of GC can demonstrate the a major effect of walking on the decrease of glycemic levels after each session done[22,23].

Table 1 Comparinson of the results from Capillary Glycemia.

Subject	N° of Session	Freq. Absol. Pre-test (+1)	Freq.Absol. Aft-test (-1)	Freq. Relat. Pre-test (+1)	Freq. Relat. Aft-test (-1)	p
A	20	1	19	5,0%	95%	0,000*
B	17	1	16	5,9%	94,1%	0,000*
C	20	8	12	40%	60%	0,251
D	20	2	18	10%	90%	0,001*
E	15	1	14	6,7%	93,3%	0,004*
F	20	1	19	5,0%	95%	0,002*
G	19	1	18	5,3%	94,7%	0.004*
H	20	5	15	25%	75%	0,020*
I	20	3	17	15%	85%	0,001*
J	20	2	18	10%	90%	0,000*
K	19	0	19	0%	100%	0,000*
L	16	0	16	0%	100%	0,000*

*p=0,05, sign test.

36 walking sessions were accomplished, however the capillary glycemia test was accomplished in 20 sessions.

For the presentation of the temporary series of GC values, it was opted to accomplish a draw among the analyzed individual analyses, "A" and "C" were accomplished. Thus, in the illustrations 1 and 2 are presented to temporary series of the values from these individuals' capillary glycemia.

The analysis of the Illustration 1 related with GC shows that the Individual "A" presented a great variation in the values of the pre-test and the after-test, observing a highly significant reduction(p=0,001) between the values of GC before and after the walking.

The analysis of the Illustration 2, related to "C" subject demonstrates that when the values of GC of the pre-test were high the after-test values were lower and, when the values of the pre-test was lower the after-test values presented a smaller decrease. In an isolated point the value of the pre-test was higher and after-test also. It is also observed through the values of GC that this Individual is with a good glycemic control (=140 mg/dl), (MINISTÉRIO DA SAÚDE, 2001)[8]. These results did not present significant statistical differences (p=0,25) between the pre and the after-test.

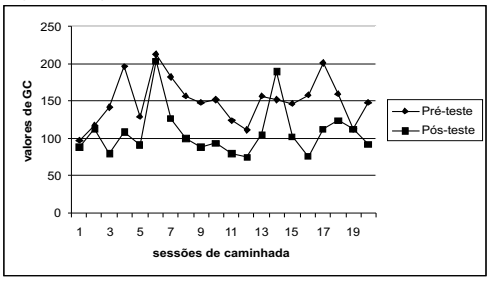

Illustration 1 Temporary series from the values of GC pre-test and after-test from “A” subject.

The capillary glycemia behavior on the exercise (illustrations 1 and 2) are in agree with Gordon[16] verifications, that the width of the decline in the amount of glucose in the blood is related with the value of the glycemia obtained before the exercise, therefore, as larger the value of GC before the exercise a larger decline can be expected. In other hands, as smaller the levels of GC before the exercise, smaller will be the possible decrease.

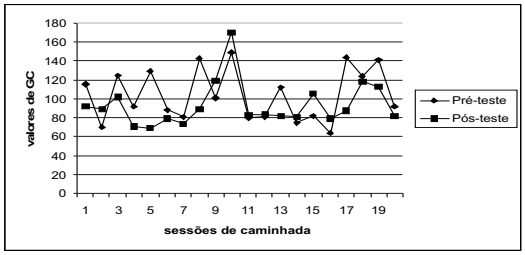

Illustration 2 Temporary series of the values of GC do pre-test and after-test from "C" subject.

The statistics results through the Test of Signs (Table 2) show evidences that walking improved hemoglobin glucose levels (Hba) in the subjects of the sample with significance p=0,02. With these results it can be inferred that diabetics Type 2

can improve the Hba levels through regular walking.

These results were confirmed by the Wilcoxon Test. Therefore, it can stand out that the walking program, accomplished three times a week, with intensity of 40%-65% of FC resting, with a 30 minutes (initial) to 50 minutes volume can improved hemoglobin glucose levels (p=0,025). A meta-analysis accomplished by Boulé et al.[18], related intensity and aerobic exercises volume with alterations in the cardiorespiratory aptitude and Hba evidenced that significant reductions in the Hb_a levels are more associated to the intensity adopted in the program prescription. However the frequency of the exercises are considered a preponderant factor for the glycemic levels control in diabetics type 2 [9]. Thus, in spite of the frequency to be indispensable, the increment of intensity can maximize the decrease of Hba and consequently the glycemic control.

Table 2 Values of pre-test and after-test from hemoglobin glucose(Hb_a), difference and sign test.

Subjects	Pre-test	After-test	Different	Sign
A	6,86	5,80	1,06	+
B	6,37	6,68	-0,31	-
C	5,90	5,78	0,12	+
D	7,52	6,34	1,18	+
E	10,32	8,89	1,43	+
F	5,00	6,84	-1,84	-
G	6,25	5,88	0,37	+
H	8,00	7,36	0,64	+
I	7,70	6,91	0,79	+
J	7,00	6,38	0,62	+
K	11,70	6,11	5,59	+
L	10,10	9,76	0,34	+
x= 2	n=12	Binomial distribution use p = 0,02		

The results regarding BMI (Table 3) demonstrated through the Student "t" test for dependent samples that the program was not effective (p=0,87) to change BMI of the subjects.

Table 3 Values of pre-test and after-test of BMI, difference, average, “t” Test and significance level.

Subject	Pre-test	After-test	Difference	t	p
A	32,7	32,6	0,1	1,454	0,087
B	25,9	25,2	0,7		
C	28,2	27,7	0,5		
D	38,9	33,9	5,0		
E	30,1	28,6	1,5		
F	27,2	27,5	-0,3		
G	31,2	31,0	0,2		
H	24,9	23,4	1,5		
I	25,0	24,5	0,5		
J	25,6	25,4	0,2		
K	21,7	22,1	-0,4		
L	22,2	23,7	-1,5		
Média	27,8	27,1			

According with the results from subjects´ BMI involved in the sample (OMS)[20] it was verified that before the intervention 25% were in healthy weight; 41,7% presented overweight; 25% obesity I and 8,3% obesity II. After the intervention, it went to 33,3% with healthy weight; 41,7% with overweight and 25% with obesity I.

CONCLUSIONS AND RECOMMENDATIONS

After the analysis of the data, considering the limitations of this study as the size of the sample, it can be concluded that:

1 - the walking program accomplished 3 times a week, in an intensity of 40%-65% of FC resting and with 30 to 50 minutes duration, for 3 months (36 sessions) it resulted in the decrease of the capillary glycemia in individuals diabetic type 2. Although discoveries from this research contribute to demonstrate the depressive effect of regular walking on GC, additional investigations are necessary to turn these conclusions more significant;

2 - a regular walking program can improve the plasmatic levels of Hba. This suggests that aerobic exercise can help the diabetic type 2 to improve glycemic control, avoiding major and chronic complications;

3 - although in literature indicates general need of higher levels of intensity in walking, this research with some individuals obtained significant results of glycemic control with 40% of FC resting levels;

4 - the prescribed walking program was not effective to reduce BMI from persons with type 2 DM.

It is suggested the accomplishment of other studies with larger sample, group controls, bigger time of intervention and diet control.

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EFFECTS OF THE GLYCEMIA BEHAVIOR WITHIN PERSONS WITH TYPE 2 DIABETES MELLITUS (DM) ON A WALKING PROGRAM

ABSTRACT

The objective of this research was to verify the effects of the glycemia behavior from persons with type 2 Diabetes Mellitus (DM) on a walking program, and they didn't make use of insulin and participated in the Diabetics Association of Três de Maio, RS. The data was composed by 12 individuals (10 female and 2 male), with ages between 55 and 76 years. The dependent variables studied in this research were: capillary glycemia (GC), hemoglobin glucose (Hba) and Body Mass Index (BMI). GC was verified in 20 walking sessions (before and after); Hba was tested by laboratorial test in the beginning and at the end of the intervention; for BMI it was used OMS norms. The walking program happened during three months (36 sessions) and had a frequency of three times a week, with 30 minutes (at the beginning of the program) to 50 minutes duration and between 40% to 65% of FC resting for intensity. The capillary glycemia and the hemoglobin glucose were analyzed by binomial distribution - Tests of Signs and Test of Wilcoxon. BMI was analyzed by Test "t" of Student for dependent samples. The level of significance was of 5%. The results demonstrated that, by the way the exercise program was made, such GC as Hba presented significant reductions statistically (p=0,05); although the program did not alter the BMI (p=0,87). Therefore, these results shows that the walking program proposed had a great importance to the glycemic control for individuals with type 2 diabetic, reducing Capillary Glycemia (GC) and the Hemoglobin Glucose (Hba). However, it was not able to change the Body Mass Index (IMC) of the diabetics. **KEY-WORDS**: walking program, control glycemic, diabetes mellitus.

EFFETS D'UN PROGRAMME DE MARCHE SUR LE COMPORTEMENT DE LA GLYCÉMIE EN PERSONNES ATTEINT DE DIABÈTE MELLITUS TYPE 2

RESUMÉ

L'objectif de cette étude a été de vérifier les effets d'un programme de marche sur le comportement de la glycémie en personnes atteint de diabète Mellitus type 2 (DM) sans traitement par l'insuline et qui participaient à l'Association des diabétiques de Três Maio, RS. Le groupe a été formé par 12 personnes (dix du sexe féminin et 2 du sexe masculin) âgés entre 55 et 76 ans. Les variables dépendantes analysées dans cette étude ont été : la glycémie capillaire (GC), l'hémoglobine glucosée (Hba) et l'indice de la masse corporelle (IMC). La GC a été vérifié pendant 20 sessions de marche (avant et après) ; la Hba a été vérifié à travers des tests de laboratoire au début et à la fin de l'intervention ; pour l'IMC on a utilisé les normes de l'OMS. Le programme de marche a été fait pendant trois mois (36 sessions), trois fois par semaine, avec une durée de 30 minutes (au début du programme) jusqu'à 50 minutes avec l'intensité entre 40% et 65% de la FC de réserve. La glycémie capillaire et l'hémoglobine glucosé ont été analysées par le moyen de la distribution binomiale - des tests des signaux et le test de Wilcoxon. L'IMC a été analysé par le test « t » de Student pour des échantillons dépendantes. Le niveau de signifiance adopté a été de 5%. Les résultats ont montré que d'une manière générale avec l'application du programme d'exercices, la GC et la HBa ont présenté des réductions statiquement signifiantes (p= 0.0 5) ; le programme n'a pas été efficace pour modifié l'IMC (p=0,87). Ces résultats ont permis de conclure: le programme d'exercices de marche proposé a été d'une grande importance dans le contrôle glycémique de diabétiques type 2 et a réduit la glycémie capillaire (GC) et la hémoglobine glucosé (Hba). Mais, il n'a pas été efficace à modifié l'indice de la masse corporelle (IMC) des diabétiques.
MOTS CLEFS : programme de marche, contrôlez le glycémie, diabétiques Mellitus.

EFECTOS DE UM PROGRAMA DE CAMINADA SOBRE EL COMPORTAMIENTO DE LA GLICEMIA EM PORTADORES DE DIABETES MELLITUS

RESUMEN

El objetivo de este estudio fue verificar los efectos de um programa de caminada sobre el comportamiento de la glicemia em portadores de diabetes mellitus tipo 2 (DM), que no hacian uso de insulina y participavam de la asociación de Diabéticos de Três de Mayo, RS. La amustra fue compuesta por 12 individuos (1º del sexo feminino y 2 del sexo masculino), com edad entre 55 y 76 años. Las variables dependientes avaliadas en este estudio fueron: glicemia capilar (GC) hemoglobina glicosilada (Hba) y Indice de Masa Corporal (IMC). La GC fue verificada en 20seciones de caminada (pre y pos); la Hba fue averiguada por un test laboratorial en el inicio y al termino de la intervención; para el IMC se utilizó normas de OMS. El programa de caminada sucedió durante tres meses (36 seciones) y fue realizado con una frecuencia de tres veces por semana, com duración de 30 minutos y intensidad entre 40% e 65% de la FC de reserva. La glicemia capilar y la hemoglobina glicosada fueran analizadas por medio de distribución binominal Test de las Señas es el test de Wilcoxon. O IMC fue analizado por el test "t" de Student para amustras dependientes. El nivel de significación adoptado fue de 5%. Los resultados evidenciarón que, de modo general com la aplicación del programa de ejercicios tanto la GC quánto la HBa apresentarón redución estatisticamente significativas (p=0,05); el programa no fue eficaz para alterar o IMC (p=0,87). Estes resultados permitierón concluir que el programa de caminada propuesto, fuew de gran importancia nel controle glicemico de individuos diabeticos tipo 2, disminuyendo la erar el indice de Masa Corporal (IMC) de los diabeticos glicemia capilar (GC) í la hemoglobina glicosilada (HBa). Entretanto, no fue eficaz para alt - **PALAVRAS CLAVES**: programa de caminada, control el glicemia, diabetes mellitus.

EFEITOS DE UM PROGRAMA DE CAMINHADA SOBRE O COMPORTAMENTO DA GLICEMIA EM PORTADORES DE DIABETES MELLITUS TIPO 2

RESUMO

O objetivo deste estudo foi verificar os efeitos de um programa de caminhada sobre o comportamento da glicemia em portadores de Diabetes Mellitus tipo 2 (DM), que não faziam uso de insulina e participavam da Associação de Diabéticos de Três de Maio, RS. A amostra foi composta por 12 indivíduos (10 do sexo feminino e 2 do sexo masculino), com idades entre 55 e 76 anos. As variáveis dependentes avaliadas neste estudo foram: glicemia capilar (GC), hemoglobina glicosilada (Hb_a) e Índice de Massa Corporal (IMC). A GC foi verificada em 20 sessões de caminhada (pré e pós); a Hb_a foi averiguada por teste laboratorial no início e ao término da intervenção; para o IMC utilizou-se normas da OMS. O programa de caminhada ocorreu durante três meses (36 sessões) e foi realizado com uma freqüência de três vezes por semana, com duração de 30 minutos (início do programa) à 50 minutos e intensidade entre 40% e 65% da FC de reserva. A glicemia capilar e a hemoglobina glicosilada foram analisadas por meio da distribuição binomial - Teste dos Sinais e o teste de Wilcoxon. O IMC foi analisado pelo teste "t" de Student para amostras dependentes. O nível de significância adotado foi de 5%. Os resultados evidenciaram que, de modo geral com a aplicação do programa de exercícios, tanto a GC quanto a Hb_a apresentaram reduções estatisticamente significativas ($p=0,05$); o programa não foi eficaz para alterar o IMC ($p=0,87$). Estes resultados permitem concluir que o programa de caminhada proposto foi de grande importância no controle glicêmico de indivíduos diabéticos tipo 2, diminuindo a Glicemia Capilar (GC) e a hemoglobina glicosilada (Hb_a). Entretanto, não foi eficaz para alterar o Índice de Massa Corporal (IMC) dos diabéticos.

PALAVRAS CHAVES: programa de caminhada, controle glicêmico, diabetes mellitus.