ACTA

Correlation between urine cortisol and scores on the Beck Depression inventory in patients with type 2 diabetes*

Correlação entre Inventário de Depressão de Beck e cortisol urinário em diabéticos tipo 2

Correlación entre el inventario de Depresión de Beck y el cortisol urinario en diabeticos tipo 2

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ABSTRACT
Objective: To determine the relationship between urinary cortisol and scores on the Beck Depression Inventory in type 2 diabetics.
Methods: The sample consisted of 40 patients with type 2 diabetes from the diabetes control league of the discipline of endocrinology of the HCFM-USP. Measures consisted of urinary cortisol and depression symptoms using the Beck Depression Inventory. **Results:** The Beck Depression Inventory had a Cronbach´s alpha of 0.92. There was a statistically significant correlation between urinary cortisol and scores on the Beck Depression Inventory (Spearman r = 0.52, p < .001). **Conclusions:** The Beck Depression Inventory was found to be a reliable indicator of depressive symptoms in patients with type 2 diabetes. Urine cortisol is associated with the presence of depressive symptoms.
Keywords: Hydrocortisone/urine; Depression; Diabetes Mellitus, type 2; Neuroendocrinology

RESUMO
Objetivo: Verificar a correlação entre o cortisol urinário e o Inventário de Depressão de Beck em diabéticos do tipo 2. **Métodos**: O cortisol urinário foi avaliado em uma amostra composta por 40 pacientes da Liga de Controle de Diabetes da Disciplina de Endocrinologia do Hospital das Clínicas da Faculdade de Medicina da Universidade de São Paulo e para a avaliação dos sintomas de depressão foi aplicado o Inventário de Depressão de Beck. **Resultados:** Alta confiabilidade para o Inventário de Depressão de Beck(Alfa de Cronbach=0,920)e correlação significativa foi observada entre cortisol urinário e Inventário de Depressão de Beck(Spearman,r=0,523,p<0.001).**Conclusões:** Houve correlação entre cortisol urinário e Inventário de Depressão de Beck, demonstrando que estes indicadores são confiáveis na detecção de sintomas de depressão em diabéticos do tipo 2.
Descritores: Hidrocortisona/urina; Depressão; Diabetes Mellitus tipo 2; Neuroendocrinologia

RESUMEN
Objetivo: Verificar la correlación entre el cortisol urinario y el Inventario de Depresión de Beck en diabéticos del tipo 2. **Métodos**: El cortisol urinario fue evaluado en una muestra compuesta por 40 pacientes de la Liga de Control de Diabetes de la Disciplina de Endocrinología del Hospital de las Clínicas de la Facultad de Medicina de la Universidad de Sao Paulo y para la evaluación de los síntomas de depresión fue aplicado el Inventario de Depresión de Beck. **Resultados:** Alta confiabilidad para el Inventario de Depresión de Beck(Alfa de Cronbach=0,920) y correlación significativa observada entre el cortisol urinario e Inventario de Depresión de Beck (Spearman,r=0,523,p<0.001).**Conclusiones:** Hubo correlación entre el cortisol urinario e Inventario de Depresión de Beck, demostrando que estos indicadores son confiables en la detección de síntomas de depresión en diabéticos del tipo 2.
Descriptores: Hidrocortisona/urina; Depresión; Diabetes Mellitus tipo 2; Neuroendocrinología

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INTRODUCTION

According to the *International Diabetes Federation*, around 140 million people in the world have this disease, and estimations suggest that this projection will grow to 300 million up to 2025[1]. In Brazil, Diabetes Mellitus prevalence among the population ranging from 30 to 69 years old is 7.6%, which represents approximately 10 million people, considering that 90% of them have Diabetes Mellitus type 2 (DM2)[2].

In Brazil, epidemiologic studies related to humor are scarce. The available data are related to mental diseases, mostly when the individuals are inpatients, which generates a sub-estimation of such disorders prevalence, among them, depression, once the treatment occurs, in the majority of cases, in ambulatories, and patients may be released with no treatment[3].

Some studies have pointed out a higher depression prevalence in DM2 patients[4], while others research on the depression physiological aspect[5]. Others even investigate the hypothalamic-pituitary-adrenal axis activity in DM2 patients[6].

As of this scenario, one of the means to track a potential humor relegation is the Beck Depression Inventory (BDI) application[7]. Nevertheless, the self-applicable instruments may contain a bias component, once they depend on those who will answer the questions, which results in a subjective depression indicator.

On the other hand, an objective depression indicator is the urinary cortisol dosage (CORT)[8]. Such circadian hormone interferes in several neuroendocrinological mechanisms, among them, two of which are fundamental for this study when presented in large amounts. With regard to depression, this hormone blocks serotoninergic receptors at the hippocampus level, predisposing the individual to have the disease; and regarding the DM2, the same hormone blocks the glucose receptors at the cellular membrane in muscle and adipose tissues, which evidences the insulin resistance[9-10].

Upon such problematic, the present study aimed to verify the possible correlation between the two indicators, the subjective indicator and the objective indicator, searching for subsidies to healthcare professionals who need a reliable tool to track potentially depression predisposed individuals.

OBJETIVE

Verifying the correlation between CORT and BDI in DM2 patients.

METHODS

This study is a transversal descriptive study, and the data presented in it were collected from DM2 patients who attended the Diabetes Control League Ambulatory of the Endocrinology Subject, Hospital das Clínicas, Medicine College of Universidade de São Paulo.

The mandatory criteria to be included in the study group were: being a DM2 patient, in any of the disease evolution phases; being 18 years old or more, due to the particularities regarding DM2 and depression, and aiming to comply with the research ethical aspects; not taking any antidepressant or tranquillizer medication as of one month prior to the research participation, in order to prevent a possible humor and neurochemical and hormonal processes interference; and accepting to take part in the research, besides signing the "Informed Consent Term" (registered under the number 468/2005, at the Nursing College Research Ethics Committee, Universidade de São Paulo).

The data were collected in the period ranging from 28/09/2005 to 08/03/2006, in a location that ensured each collaborator's privacy – all the participants were oriented, preferably, not to be accompanied by family members or friends when answering the research questions and receiving the CORT dosage orientations.

The amount of subjects who comprised the study group was defined by a sample calculation that admitted an alpha risk equal to or minor than 5%, and a beta risk equal to or minor than 20% of making type 1 or first species errors. A sample of 40 DM2 patients was considered for a null hypothesis, an independent and non-parametrical test.

The instruments applied were:
- Social-demographic data collection questionnaire: elaborated to characterize the research individuals regarding the following criteria: gender, age, marital status, precedence, religion/faith, school level, individual income, family income, *per capita* income, and people responsible for the family income.

- DM2 data collection questionnaire: The data collected through this instrument provided information on the clinical and therapeutical conditions, and covered: anthropometric data (weight, height, body mass index (BMI), waste circumference (WC), and waste/hip ratio (WHR), pharmacological therapy, disease biochemical control (glucolized hemoglobin (A1c)), and CORT dosage.

In order to analyze the anthropometric data, the reference values defined by the Associação Brasileira para o Estudo da Obesidade e da Síndrome Metabólica (Brazilian Association for Obesity Studies and Metabolic Syndrome) were utilized[11].

To analyze A1c, the *High Performance Liquid Chromatography* (HPLC) was used, defined by the A1C

Standardization Interdisciplinary Group of the Federação Nacional das Associações e Entidades de Diabetes (National Federation of Diabetes Associations and Entities), where values beyond 7% were considered altered[12].

The CORT dosage was measured by the 24 hour urine biochemical exam, through an electro immuno testing method[8].

- Beck Depression Inventory[7]: a subjective depression indicator that, according to Costa description[13], refers to a *"(…) a depression self-assessment measurement, which does not have a diagnosis purpose, however possible to be used as a complement of the assessment, is comprised of 21 depression manifestations characteristic symptom categories. Each category consists of a series of manifestation intensity different degrees, so as to reflect the symptom intensity (from neutral to maximum severity), through a numeric scale ranging from 0 to 3 points. (…) The depression symptoms involve the following categories, according to the order they appear in the instrument: sadness, pessimism, failure sensation, lack of satisfaction, guilt feelings, punishment feelings, self-deprecation, self-accusation, suicidal ideas, weeping crisis, irritability, social retraction, indecision, body image distortion, work inhibition, sleep disorders, exhaustion, appetite loss, weight loss, somatic concerns, and libido decrease. In order to assess the score obtained by the inventory application, points from all categories must be summed up, so that the result can be measured afterwards. (…) Studies recommend that the results are classified in three different scoring levels: from 0 to 15 points, absence of depression symptoms; scores above 15 points and below 20 points indicate a dysphoric state; and scores above 20 points indicate a suggestive diagnosis of depression symptoms. (…)".*

First of all, the internal consistency analysis for BDI was performed for this study group through Cronbach's Alpha Analysis. Following this step, the correlation between this scale and the values obtained from CORT was verified, considering that the respective statistical tests utilized will be informed below, along with the results presented.

RESULTS

The sample was comprised of 60% women, 45% elderly (60 years old or more); the age median was 56.5, and minimum and maximum ages were, respectively, 21 and 90 years old; the average was 59.8, with a standard deviation of ± 13.6 years.

The group was comprised of 52.5% individuals with a stable relationship, 22.5% widows, 15% singles, and 10% separated/divorced individuals; 37.5% of the individuals were from São Paulo countryside, 32.5% were from São Paulo Great Area, and 30% were from other states.

All sample patients (100%) stated they had a religion or faith, from which 77.5% stated they practiced it.

The school level median was 8 years of study, and minimum and maximum level were, respectively, 0 and 20 years; the average was 7.6 years, with a standard deviation of ± 4.8 years of study, 2.5% of the sample stated being illiterate.

The individual income ranged from 1 to 20 minimum wages in 85% of the sample, considering the rest of it did not have their own income, and 34% of the sample was comprised of family members. The family income ranged from 1 to 15 minimum wages and the *per capita* income of 0.3 to 5, with a median of 1.6 minimum wages.

Below, the clinical characterization of the group studied (Table 1).

For the internal consistency analysis of BDI, the Cronbach Alpha test was used; the result was 0.920, indicating an optimum reliability index, which remained the same when any of its domains was removed, evidencing minimally a coefficient of 0.915. It is worth highlighting that the domain entitled "Suicidal Ideas" was eliminated from the analysis, once it had zero variability.

Table 1 – Clinical characterization of patient group with a studied DM2. São Paulo, 2007

Variables and Categories	n	%
BMI (Average / ± SD / Median, in kg/m²)	28.3 / ± 4.3 / 28.3	
Altered WC		
Female	19	78.0
Male	10	77.0
Altered WHR		
Female	24	100.0
Male	16	100.0
Medication Usage		
Yes	40	100.0
Number of medicines used a day		
5 or more	35	87.5
4	4	10.0
3	1	2.5
Usage of exogenous insulin		
No	21	52.5
Yes	19	47.5
A1c (Average / ± SD / Median, percentage)	.1 / ± 2.2 / 9.2	

Graph 1 suggests that the correlation is statistically significant and positive between the variables CORT and BDI score, when individually analyzing these variables for each DM2 patient.

Graph 2 points out the statistically significant correlation between CORT variables and BDI scores, that is, as the CORT dosage increased, the BDI score presented the same pattern, and vice-versa.
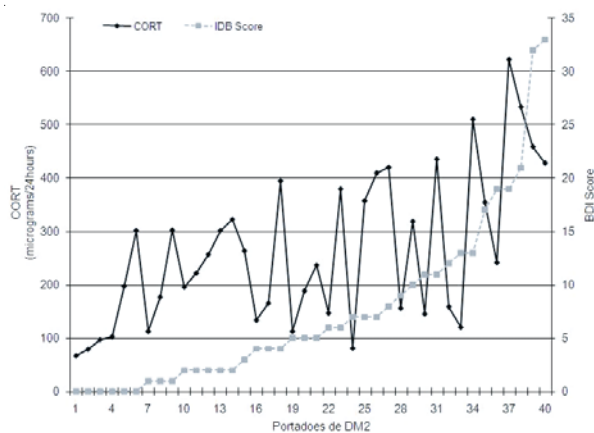
Grahp 1 - DM2 patients distribution according to CORT (micrograms/24 hours) and BDI score. São Paulo, 2007
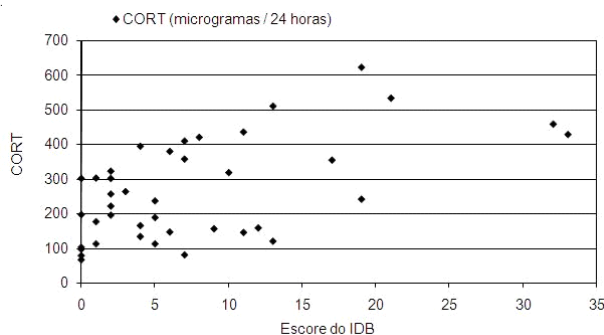
Graph 2 - Correlation between BDI and CORT (micrograms/24 hours) for DM2 patients. São Paulo, 2007 Spearman (r=0.523, p<0.001)

DISCUTION

Few studies tried to investigate the hypothalamic-pituitary-adrenal axis activity in the context of DM2(6). On the other hand, based on theoretical knowledge, it is known that high levels of CORT triggered by a stress agent may cause depression symptoms, according to what is demonstrated by Illustration 1.

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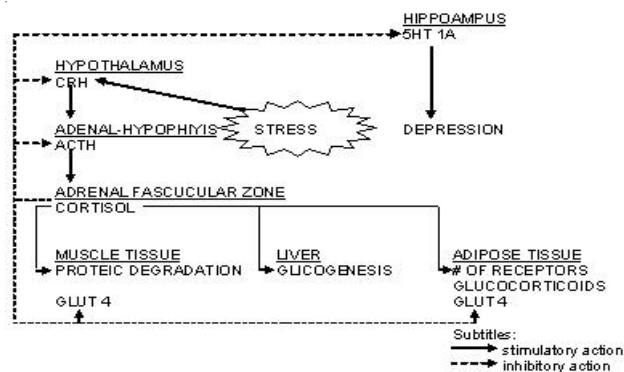4. Moreira RO, Papelbaum M, Appolinário JD et aI. Diabetes

Illustration 1 - The inter-relationship among cortisol, depression and diabetes mellitus type 2

Because of this, the stress depression component seems to be an important factor for DM2 tracking and control. In this aspect, BDI has been an important tool for healthcare professionals that are not specialized in mental health. However, its subjective character may bring uncertainty to professionals upon a client with a more intense deviation.

As of there, the results obtained showed that BDI may be used for a population that is similar to this study, being an available tool for healthcare professionals who need to assess the clients' demands regarding occasional depression symptoms. Moreover, the present study opens various possibilities to several other researches which may want to investigate the hypothesis that depression and DM2 may be related as of the CORT context.

CONCLUSION

In this study, a correlation between CORT and the BDI was verified, demonstrating that the indicators (CORT and BDI) are reliable when aiming to detect depression symptoms in DM2 patients.

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