Is there relation between health locus of control and clinical outcomes in diabetes mellitus type 2 patients in Croatian general practice?

Postoji li povezanost između zdravstvenog lokusa kontrole i kliničkih ishoda u bolesnika sa šećernom bolešću tip 2 u općoj medicini Hrvatske?

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Summary

Background: The aim of this study was to explore correlation between health locus of control (HLOC) and clinical outcomes in patients with diabetes mellitus type 2 (DMT2).

Subject and methods: Cross-sectional study. A multistage, stratified proportional sampling was used to draw a random sample of 46 GPs and, systematic sampling of the first 6 DMT2 patients visiting the chosen GPs with recently registered blood pressure, lipid and glycaemic profile. The patients completed Croatian version of HLOC (ZKL-90-2) and socio-demographic data questionnaires after signing informed consent.

Results: DMT2 patients mostly displayed internal HLOC, followed by circumstances, powerful others and chance. Almost all observed objective clinical outcomes, except fasting blood glucose and LDL cholesterol, are in correlation with internal HLOC scale. Correlations were mostly negative. The patients considering themselves to be in command over diabetes obtained the lower scores at total cholesterol (p=0.014), triglycerides (p=0.037), systolic (p=0.003) and diastolic blood pressure (p=0.025). Positive correlation with Es and Eo scales measuring external HLOC was found regarding levels of LDL cholesterol (p=0.032), triglycerides (p=0.009) and systolic (p=0.001) blood pressure. HbA1c (p=0.001). Fasting blood glucose (p=0.002) was higher in patients believing in external circumstances.

Conclusion: DMT2 patients who believed they had control over their disease obtained better disease outcomes than those believing in external circumstances.

Key words: Diabetes mellitus type 2, Health locus of control, clinical outcomes, General Practice

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Sažetak

Pozadina: Cilj ovog istraživanja bio je istražiti postoji li povezanost između zdravstvenog lokusa kontrole (ZLK) i kliničkih ishoda u bolesnika sa šećernom bolešću tip 2 (ŠBT2).

Ispitanici i metode: Presječno istraživanje. Stratificiranim reprezentativnim slučajnim uzorkovanjem odabrano je 46 liječnika opće/obiteljske medicine koji su potom odabrali prvih 6 bolesnika koji su ih posjetili tijekom perioda istraživanja, a koji su imali nedavno zabilježenu vrijednost arterijskog tlaka, lipidni profil te kratkoročnu i dugoročnu vrijednost vrijednost glukoze. Po davanju informiranog pristanka bolesnici sa ŠBT2 ispunili su hrvatsku verziju upitnika za procjenu zdravstvenog lokusa kontrole (ZKL-90-2) i upitnik o sociodemografskim podacima.

Rezultati: U bolesnika sa ŠBT2 većinom je bio izražen unutarnji lokus kontrole, potom je slijedila vjera u okolnosti, moćne druge i utjecaj slučaja. Većina proučavanih objektivnih kliničkih ishoda DMT2, osim glukoze na tašte i LDL kolesterola u korelaciji su sa skalom koja mjeri unutarnji ZLK. Korelacije su većinom negativne, bolesnici koji su imali izražen unutarnji ZLK imali su niže vrijednosti ukupnog kolesterola (p=0.014), triglicerida (p=0.037), sistoličkog (p=0,003) i dijastoličkog (p=0,025) arterijskog tlaka. Utvrđene su pozitivne korelacije skala Es i Eo (koje mjere vanjski ZLK) s razinama: LDL kolesterola (p=0,032), triglicerida (p=0,009) i sistoličkog arterijskog tlaka (p=0,001). Utvrđene su više vrijednosti HbA1c (p=0,001) i glukoze na tašte (p=0,002) u bolesnika koji su imali izreženo vjerovanje u utjecaj okolnosti (vanjski ZLK).

Zaključak: Bolesnici sa ŠBT2 koji su imali izražen unutarnji lokus kontrole imali postignute bolje vrijednosti kliničkih ishoda liječenja ŠBT2 u odnosu na bolesnike koji su imali izražen vanjski lokus kontrole.

Ključne riječi: šećerna bolest tip 2, zdravstveni lokus kontrole, klinički ishodi, opća/obiteljska medicina

Introduction

Prevalence of diabetes mellitus (DM) continues to increase worldwide reaching epidemic status and costing healthcare services significant amount of money. The number of diagnoses of DM registered in Croatian Family Practice (FP) shows an increased trend, from 95 857 diagnoses registered in 1995 to 256 038 diagnoses in 2012[1]. From the patient's perspective, DM is a lifelong and twenty-four hour a day condition. "Glucose control is almost entirely in the hands of the person who lives with this condition. His/her motivation to eat, exercise, take medication, test glucose levels, and maintain a normal body weight, all vie with life's other motivations"[2]. One of the biggest challenges for health care providers today is how to address the continued needs, demands and motivation of individuals with DM related to their self-management behavior.

A significant correlation between attitude and knowledge for people with DM suggests that positive attitudes and more knowledge is associated with self-care[3,4]. Examining health-related behavior from a theoretical context may further describe the DM self-care decision making process. The concept of health locus of control (HLOC) is derived from social learning theory and has been adapted for predicting health behavior[5]. The concept of HLOC has been described as amount of individual believe that he/she possess the control over the health and diseases[6]. People with an internal" HLOC are believed that their health is mostly in their hands and determined by their own behavior. Those who believe that their health is determined by factors outside their realm of control (i.e. fate, chance, powerful others, or circumstances) are considered to have an external HLOC[7].

A large body of literature has been devoted to the investigation of the role of health-related control beliefs in determining a number of aspects of health and illness. Researches are also linked to the various chronic diseases[8], the adherence with treatment regimens[9] and the adjustment to chronic

diseases[10]. HLOC was widely explored within the context of diabetes[11,12,13] but not so much in relation to the disease outcomes and the study results are somehow controversial[14,15]. Therefore, the aim of this study was to explore if there are any correlation between HLOC in patients with diabetes mellitus Type 2 (DMT2) and clinical outcomes, measured by the objective parameters of disease status: blood pressure, lipid profile and glycemic status, including HBA1c level in DMT2 patients in Croatian family practice.

Participants and methods

Study design

This cross-sectional study was conducted as a part of the scientific project „Life with a chronic disease: patients experience"; comprehensive mix-methods study sponsored by the Croatian Ministry of Science, Education and Sports (Project number 108-1080317-0280). The Ethical Board of the Medical School, University of Zagreb, approved the study.

Sampling

The sampling procedures were described elsewhere, therefore it is shortly described here[16]. The target population for this study were the first 6 patients with diabetes mellitus type 2 (DMT2) who visited their general practitioners (GP) in the first month of the study period. Enlisting of the participants was done in two phases. In the first phase, a multistage, stratified proportional sample design was used to draw a random sample of 46 GPs. The five stratification criteria were used: physicians' sex, finished speciality training, having contract with Croatian Institute of Health Insurance, informativity (physicians with sufficient number of patients with DM), and geographical distribution of the practices (6 Croatian regions). In the second stage, the first 6 patients with DMT2 who visited their GPs, aged 18 years and more, with recently registered (< 6 months) objective measures of disease status (blood pressure, lipid profile and glycemia control measures) in their medical records, were asked if they would be willing to participate in the study. All the participating patients received written and oral information and gave written informed consent. Immediately after signing the consent, the patients were asked to complete the Socio-demographic data and HLOC questionnaires and leave them in the surgery in a sealed box at the reception area. At the same time, GPs collected objective measures of disease status from the patient's medical records.

The survey instrument

Patients completed a Croatian version of Health Locus of Control scale (ZKL-90-2) as an instrument for measurement of patients' beliefs who or what has a control over his/her health[17]. Croatian version HLOC questionnaire was based on the Wallston Multidimensional Health Locus of Control (MHLC) scale[7] and adapted to the Croatian situation, adding some new items. It was validated on healthy and ill participants and the correlation to the original MHLC was also performed. The obtained results indicated the acceptable levels of validity and reliability of the HLOC questionnaire[18-20]. It is consisting of 32 questions, divided into the four scales: I scale measuring patients beliefs in internal HLOC, and three scale measuring patients beliefs in external HLOC: Evd scale – beliefs in powerful others, Es scale - beliefs in chance, luck or destiny and Eo scale – beliefs in external circumstances. Each scale consists of 8 questions with 4 potential answers indicating different degree of the beliefs (4 – completely believe, 3 – mostly believe, 2 – mostly not believe, 1 – completely not believe). Maximum number of points in each scale is 32 and minimum 8 points. The higher number of points in each scale means the higher degree of beliefs; for instance, a higher number of points in I scale means a higher internal HLOC.

By the another questionnaire designed for the purpose of the study, patient's socio-demographic data were collected: age (years), gender, educational

level (primary school, secondary school, university), living in family or alone, self-perceived economic status in comparison with average economic status (worse than average, average, better than average). In addition, participant's life style behavior such as: smoking habits, adherence to dietary and physical activity recommendations, were collected, but the results will not be presented in this article.

Due to the study design, the objective parameters of disease status were chosen as a measure of clinical outcomes. Therefore, the data of the blood pressure level, lipid profile (total cholesterol, LDL cholesterol, HDL cholesterol, triglycerides) and of glycemic status (fasting blood glucose, HbA1c) were collected from the patient's medical records by GPs, immediately after the consultation. The closest regular measurement to the date of questionnaire completion was chosen for each patient.

The first author contacted all physicians by phone, followed by sending all questionnaires to physicians by mail together with a cover letter, prepaid and addressed envelopes. No financial or educational incentives were provided to participating GPs.

Statistical analysis

Descriptive statistics were computed. Nonparametric statistical procedures were used due to the fact that distributions of all relevant quantitative variables showed statistically significant decline from normal distribution (Kolmogorov-Smirnov test). Mean, standard deviation (SD), median and mode for HLOC scales scores were calculated. In order to explore co-relation between objective measures of disease status and subjective perception of health control, Pearson and Spearman correlation coefficient was calculated. BMI, HbA1c, fasting blood glucose, total cholesterol, HDL cholesterol, LDL cholesterol and blood pressure were used as criterion (dependent) variables, and the four scales of HLOC as explanatory variables. Data were analyzed using Software Statistics, version 7.1. And P value < 0.05 was considered statistically significant.

Results

Of the 46 sampled GPs, 43 returned completed patient's questionnaires. A total of 258 patients were approached. Questionnaires from 8 patients were not returned or were returned uncompleted; responses from 250 patients (response rate 96.9%) were available and used for statistical analysis.

Patients' characteristics

Among 250 patients included in the analysis, there were 128 (51.2%) women and 122 (48.8%) men. Mean age of the patients was 63.0 (SD ± 10.9) years. Most of the patients completed secondary school education (N=126, 50.4%), were retired (N=184, 73.6%) and perceived their own economic status as "average" (N=122, 84.4%). Mean duration of diabetes was 9.3 ± 7.8 years. Most of the patients (N=234, 93.6%) treated diabetes with diet and oral hypoglycaemic drugs. Beside type 2 diabetes, the majority of patients reported having two (N=138, 55.2%) or three or more chronic disease (N=111, 44.4%), among them mostly hypertension (N=235, 94.0%), hyperlipidemia (N=222, 88.8%), musculoskeletal disorders (N=67, 26.8%), psychological disorders (N=34, 13.6%) and coronary heart disease (N=24, 9.6%) Therefore, beside antidiabetic treatment, most of the patients were treated with antihypertensive (N=180, 72.0%) and hypolypemic drugs (N=118, 47.2%).

Patients' health locus of control

Descriptive statistics for the four scales of the HLOC questionnaire is presented in Table 1. In general, the highest score was obtained on the scale measuring internal HLOC (24.87±4.79), Among the scales measuring the external HLOC, the highest score was obtained on the Eo scale, measuring influence of the external circumstances, (22.12±4.23), than on Evd scale, measuring the beliefs in powerful others (19.83±2.97), and Es scale, measuring the beliefs in luck, chance or destiny (18.29±4.38).

Table 1. Means, standard deviations, and standard error mean of DMT2 patients responses to the scales of perceived locus of control, N=250

Tablica 1. *Opisna statistika za skalu percipiranog lokusa kontrole, N = 250*

Group Statistics	N	Mean	SD	SEM*
Scale I	250	24.8680	4.78058	0.30235
Scale Evd	250	19.8320	2.97307	0.18803
Scale Es	250	18.2920	4.38219	0.27715
Scale Eo	250	21.1240	4.23181	0.26764

Maximum number of points in each scale is 32 and minimum 8 points

*Std. Error Mean

Objective measures of clinical outcomes

Descriptive statistics for the objective measures of disease status in group of patients with DMT2 showed that the majority of the patients did not reach recommended treatment targets of glycaemic control, lipid status, blood pressure and BMI (Table 2).

Correlation of clinical outcomes and HLOC scales

Correlation between clinical outcomes and HLOC scales in DM patients are shown in Table 3. Almost all observed objective clinical outcomes, except

Table 2. Descriptive statistics for the objective measures of disease status in DMT2 patients

Tablica 2. *Vrijednosti promatranih parametara kod bolesnika s DMT2*

	Median	IQR*Percentile 25-75	Minimum	Maximum
HbA1C (%)	7.0	6.5-7.6	4.9	38.3
Fasting blood glucose (mmol/L)	7.1	6.4-7.8	4.8	14.8
Triglyceride (mmol/L)	2.0	1.6-2.2	0.7	9.4
Total cholesterol (mmol/L)	5.2	4.9-6.2	3.8	8.9
HDL cholesterol (mmol/L)	0.8	0.8-0.9	0.1	1.8
LDL cholesterol (mmol/L)	3.2	2.5-3.5	1.2	5.0
Systolic blood pressure (mm Hg)	140	130-150	110	180
Diastolic blood pressure (mm Hg)	80	70-90	60	110

*Intequartile range

Table 3. Correlation between clinical outcomes and HLOC scales in DMT2 patients

Tablica 3. *Odnos kliničkog ishoda i HLOC*

Clinical outcomes	HLOC scales			
	I Spearman rho (p value)	**Evd** Spearman rho (p value)	**Es** Spearman rho (p value)	**Eo** Spearman rho (p value)
HBA1c	0.215(**) (0.001)	0.084 (0.188)	0.046 (0.473)	0.219(**)(0.001)
Fasting BG	0.101 (0.112)	0.009 (0.888)	0.056 (0.379)	0.195(**) (0.002)
Cholesterol	-0.156(*) (0.014)	-0.039 (0.542)	0.058 (0.364)	0.012 (0.856)
HDL	0.166(**) (0.008)	-0.019 (0.765)	,018 (,781	-,010 (,880
LDL	-0.079 (0.213)	0.026 (0.687)	0.136(*) (0.032)	0.194(**) (0.002)
Triglicerides	-0.132(*) (0.037)	-0.005 (0.931)	0.164(**) (0.009)	0.047 (0.463)
Sistolic BP	-0.189(**) (0.003)	0.015 (0.813)	0.208(**) (0.001)	0.014 (0.825)
Diastolic BP	-0.142(*) (0.025)	-0.003 (0.965)	0.059 (0.354)	-0.010 (0.881)

**Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed).

fasting blood glucose and LDL cholesterol, are in correlation with I scale. The correlations are mostly negative, meaning that the higher internal HLOC scale score indicating the lower scores at total cholesterol, triglycerides, systolic and diastolic blood pressure. Except total and HDL cholesterol, those clinical outcomes are in some correlation with scales measuring external HLOC. Systolic blood pressure statistically significantly positively correlates with Es and Eo scales, meaning that the higher scores on external HLOC scales indicate the higher systolic blood pressure. Diastolic blood pressure positively correlates with Es and Eo scale, again high scale scores indicated the higher diastolic blood pressure. Cholesterol is not in correlation with Evd scale, but it is in positive correlation with Es and Eo scales. There are no correlations between any clinical outcomes and Evd scale measuring the belivement in others. HBA1c is in positive correlations with internal locus and external - circumstances scales, while fasting blood glucose is in positive correlation only with external-circumstances scale.

Discussion

This study evaluated correlation of health locus of control (HLOC) of diabetic patients type 2 (DMT2) and clinical outcomes, measured by the objective parameters of disease status: blood pressure, lipid profile and glycemic status, including HBA1c as the most often used parameter of metabolic control in Croatian family practice (FP).

Patients mostly displayed internal HLOC, followed by circumstances, powerful others and chance HLOC. These findings indicate that the participants considered themselves to be mostly responsible for and in command over his/her DMT2. The findings are similar to some studies in other countries[21,22]. The study results also demonstrated a correlation between HLOC and objective clinical outcomes. Almost all observed objective clinical outcomes, except fasting blood glucose and LDL cholesterol, are in correlation with internal HLOC scale. The correlations are mostly negative, meaning that the patients considered themselves to be mostly responsible for and in command over his/her diabetes (higher internal HLOC) obtained the better outcomes, i.e. lower scores at total cholesterol, triglycerides, systolic and diastolic blood pressure. Positive correlation with Es and Eo scales measuring external HLOC is also found in regard to the levels of triglycerides, systolic and diastolic blood pressure. The higher external HLOC is in correlations with higher level of those clinical parameters. Similar to our results, negative correlation with internal and positive correlation with external HLOC were found in other studies regarding to the various outcomes in chronic diseases[23-25].

The results regarding glycemic status are somehow unexpected. A level of HBA1c is found to be in positive correlations with internal HLOC, meaning that the patients who believe that DMT2 is under their personal control obtained pore results; a higher level of HBA1c. Similar to our results, O'Hea and colleagues also found that higher scores on internal locus of control were related to poorer HbA1c levels[26]. Quite opposite results were found in some other studies. In study done by Bradly and colleagues, using modified multidimensional HLOC, the correlations with medical and other psychological variables indicated that stronger perceptions of personal control were associated with lower HbA1c levels[27]. Surgenor and colleagues also found that optimal metabolic control is significantly associated with overall sense of control, while poor metabolic control was significantly associated with experiences of loss of personal control[28]. It is obvious, that these, somehow, controversial results should be clarified in the future.

Although our results support the hypothesis of the influence of HLOC, at least on some of the observed clinical outcomes in patients with DMT2, the study has its weakness. The sample size is small compared with the DMT2 patient's population in Croatia. Furthermore, reliability of the results of this study

should be questioned, because it is retrospective and cross-sectional and many variables could not be standardized and controlled. Although HLOC is expected to be quite stable over time and not easy to change, and supposed to be similar in a variety of health-related situations, it may also be sensitive enough to change as a function of one's health-related experiences[29]. We are not sure if living a life with DMT2 or medical interventions during that experience brings any changes in HLOC, because we do not have a baseline data on the patients HLOC. We are not also sure if the obtained results are specific for Croatia, being aware that many differences were found in relation to the culturally different patients groups[30,31]. Furthermore, it is also known the validity HLOC scale could be dependent of the particular disease and several HLOC instruments are developed and applied within specific diseases context[32]. The instrument applied in our study is general and not specific for DMT2 patients, which also could be a study limitation. Moreover, due to the correlation nature of the study, the reader is also cautioned that no causal inferences are drawn. Therefore, further, much larger, prospective and longitudinal studies, applying validated HLOC instrument specific for the patients with DMT2 are needed.

Besides the study limitations and having in mind all controversies seen in the literature, we are sure that it might be worthy to take into the consideration the different personality traits in the GP's everyday work with DMT2 patients. Therefore, it might be possible that the interventional programs to enhance diabetes self-care will be more successful if patient's HLOC is addressed[33,34]. Moreover, it might be even necessary to address the aspects of HLOC within the theoretical framework of bio-psycho-social model of illnesses and diseases. Finally, a patient-centered consultation and bio-psycho-social model have a special importance in family practice where a good patient-doctor's relationships and continuity of care play the important roles[35].

Conclusions

The study results indicate that there were correlations between HLOC in patients with DMT2 and certain disease outcomes; internal HLOC are mostly correlated with better clinical outcomes. Therefore, it might be worthy to take into the consideration the different personality traits in the everyday work with DMT2 patients, especially in family medicine where a continuity of care and patient-doctor relationship are important.

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Conflict of interest: None

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