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Attitude of patients with type 2 diabetes towards the disease versus chosen sociodemographic and medical factors – psychometric properties of the DAS-3 scale in the Polish version

Postawa wobec choroby osób chorych na cukrzycę typu 2 a wybrane czynniki socjodemograficzne i medyczne – właściwości psychometryczne skali DAS-3 w wersji polskiej

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Abstrakt

Wstęp: Celem badania była wstępna ocena właściwości psychometrycznych skali Badania Postawy wobec Cukrzycy (DAS-3P) w wersji polskiej w grupie osób chorych na cukrzycę typu 2 oraz określenie wpływu wybranych czynników socjodemograficznych i medycznych na postawę wobec choroby.

Materiał and Metody: Badania przeprowadzono w grupie 227 osób chorych na cukrzycę typu 2, które były leczone w Poradni Diabetologicznej i w Klinice Endokrynologii w Samodzielnym Publicznym Szpitalu nr 4 w Lublinie. Oceniono trafność teoretyczną za pomocą confirmacyjnej i eksploracyjnej analizy czynnikowej metodą osi głównych skali DAS-3. Rzetelność skali DAS-3 określono poprzez zbadanie wewnętrznej spójności testu i analizę wartości współczynnika alpha Cronbacha. Do oceny różnic między średnimi wykorzystano test *t* i jednoczynnikową analizę wariancji.

Wyniki: Po weryfikacji współczynnik zgodności wewnętrznej alfa Cronbacha, dla całej skali DAS-3P osiągnął $\alpha = 0,79$. Normalność rozkładu skali DAS-3P nie odbiega znacząco od rozkładu symetrycznego. Wykazano różnicę statystycznie istotną ($p < 0,05$) pomiędzy płcią, miejscem zamieszkania, poziomem wykształcenia, zapotrzebowaniem na wsparcie rzeczowe

oraz udziałem w szkoleniach a wynikiem średniej skali DAS-3P. Natomiast wiek, obecność partnera życiowego, aktywność zawodowa, BMI, czas trwania choroby metoda leczenia, poziom stężenia HbA_{1C} nie różnicowały statystycznie istotnie ($p > 0,05$) wyników skali DAS-3P.

Wnioski: 1. Występuje konieczność kontynuowania prac nad właściwościami psychometrycznymi skali DAS-3 w wersji polskiej na dużej próbie osób chorych na cukrzycę typu 2; 2. Badaną grupę chorych na cukrzycę typu 2 ogólnie cechuje pozytywna postawa wobec choroby oceniana skalą DAS-3P; 3. Wyższe wartości na skali Badania Postawy wobec Cukrzycy (DAS-3P) osiągnęły osoby płci męskiej, mieszkające w mieście, legitymujące się wykształceniem wyższym, oczekujące wsparcia rzeczowego oraz biorące udział w szkoleniach na temat cukrzycy.

Słowa kluczowe: cukrzyca typu 2, postawa, czynniki socjodemograficzne, czynniki kliniczne, właściwości psychometryczne

Abstract

Background: The objective of the study was to develop the initial assessment of psychometric properties in the Polish version of the Diabetes Attitude Scale (DAS-3P) for a group of people with type 2 diabetes and to determine the impact of the selected sociodemographic and medical factors on the patients' attitude towards the disease.

Materials and Methods: The study was conducted on a group of 227 people with type 2 diabetes who were treated at the Diabetes Outpatient Clinic and the Endocrinology Clinic of the Independent Public Clinical Hospital No 4 in Lublin. The theoretical accuracy was assessed by means of confirmatory and exploratory factor analysis and the method of scale DAS-3 major axis. The accuracy of the DAS-3 scale was determined by examining the internal test congruity and analysing the value of Cronbach's alpha coefficient. The differences between the mean values was determined by the t test and the single factor analysis of variance.

Results: Following the revision, Cronbach's alpha internal congruence coefficient reached $\alpha = 0.79$ for the whole DAS-3P and the normality of the DAS-3P distribution does not deviate significantly from the symmetrical distribution. However, the study showed a statistically important difference ($p < 0.05$) between gender, place of residence, level of education, need for material support, participation in training and the mean DAS-3P score. The age, the presence of a domestic partner, job activity, BMI, duration of the disease, the treatment method, the concentration level of HbA_{1C} were not of statistical importance ($p > 0.05$) for the DAS-3P scores.

Conclusions: 1. There is a need to continue with the study into the psychometric properties of the DAS-3 scale in the Polish version on a large study population with type 2 diabetes, 2. The survey group of patients with type 2 diabetes shows a positive attitude towards their disease assessed by the DAS-3P, 3. Higher scores in the Diabetes Attitude Scale (DAS-3P) were obtained by males living in the city, with higher education background, in need of material support and participating in training on diabetes.

Keywords: type 2 diabetes, attitude, sociodemographic factors, clinical factors, psychometric properties.

Introduction

According to the latest epidemiological reports, the spread of diabetes in the world is estimated to comprise 8.8% of the population. This means that one in eleven adults suffers from diabetes [22]. In 2013 in Poland on the basis of the data from the national social insurance system 7.6% of the total population was diagnosed with diabetes [11]. The growing occurrence of diabetes increases not only the work overload of the diabetes personnel but also patients' suffering in various dimensions [35]. Therefore, professional assistance of diabetes personnel, apart from relatives' care, consists in providing effective social support to the patients [20]. Those providing medical assistance to people with diabetes should play the role of guides and counsellors. The involvement of patients themselves in „disease-management” and their conscious responsibility for their own health are most essential. Facing the amplitude of problems and suffering resulting from diabetes chronicity may lead to a change in patients' attitude and behaviour. It is important to recognize their attitude towards the disease both at the very moment of the diagnosis and in disease development [9, 40, 41]. Within nursing assistance there is a need for a specific tool allowing the evaluation of the attitude towards diabetes as this group of patients constitutes a substantial percentage of our society.

An example of a tool used for evaluating patients' attitude towards diabetes is an American survey The Diabetes Attitude Survey (DAS-3) by R. M. Anderson [3]. The tool can be used to conduct research among type 2 diabetic patients and medical personnel. The DAS-3 validation was conducted by the University of Michigan Diabetes Research and Training Center (MDRTC) and Diabetes Control and Complications Research Group (DCCT) [4]. Currently the DAS-3 survey is available in an electronic format on the webpage of the Diabetes Research and Training Centre (MDRTC) [37].

The survey contains 33 items allowing for the evaluation of the attitude towards diabetes on the general scale. A response to particular items is evaluated on a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neither agree nor disagree, 4 = agree, 5 = strongly agree). Values above or below 3 point at the agreement or disagreement on a particular item.

A similar evaluation for certain areas of diabetes included in 5 subscales concerns: (I) the importance of specialist training to ensure diabetes care; (II) perception of seriousness of type 2 diabetes; (III) importance of tight glycaemia control; (IV) psychosocial influence of diabetes; (V) patient autonomy. Before adding up the scores, for questions no. 2, 3, 7, 11, 13, 15, 16, 23, 26 and 28 the scores are reversed. The scores, both on the general scale and on subscales, becomes positive, i.e. a higher score means a better attitude towards diabetes [4, 37].

As in the Polish medical literature on the subject no resources were found which used this type of survey for the population with type 2 diabetes, an attempt was made to conduct introductory study in the research area.

AIM OF THE STUDY

The aim of the study was the introductory evaluation and psychometric assessment of the Polish version of The Diabetes Attitude Scale (DAS-3). Additionally, the correlations between the general DAS-3 score and selected sociodemographic and medical factors were assessed.

MATERIAL AND RESEARCH METHOD

The research was conducted on a group of 227 patients with type 2 diabetes between 40-88 years of age. Respondents were treated at the Diabetics Outpatient Clinic and the Endocrinology Clinic of the Independent Public Clinical Hospital No 4 in Lublin. Patients gave their permission to participate in the study. Information on selected sociodemographic properties (gender, age, level of education, place of residence, presence of a domestic partner,

job activity, a kind of social support) and medical information (Body Mass Index, duration of diabetes, method of treatment, HbA_{1C} value, participation in training) was collected. The research proposal received a positive opinion of the Bioethical Commission at the Council of Ministers. The resolution of the Bioethical Commission No. KE-0254/111/2011.

Statistical methods

For quantity position measures, variability measures, asymmetry and concentration measures were calculated. For categorical variables percentage comparisons were defined. To check the strength of correlation between the variables, correlation coefficients were used.

The *t*-test was used to evaluate the difference between the mean values in two groups within the area of quantity variable. One-way analysis of variance ANOVA was used to compare mean values from a larger number of groups within the range of the quantity variable.

The factor analysis was used to verify factorial accuracy. The internal consistency reliability of the questionnaire was assessed by calculating Cronbach's alpha coefficient. The analysis was carried out using IBM SPSS 21.0.0.0. and Statistical10.0. program.

DAS-3 translation procedures

According to the guidelines of the World Health Organisation [42] the linguistic adaptation of a study instrument comprises:

- translation from the original language of the survey instrument into the target language;
- summary of the panel of experts' recommendations;
- back translation;
- summary of problems encountered during translation;
- obtainment of the final version of the instrument

The original DAS-3 version was translated into Polish by two translators with a professional command of English, including that of medical terms. The Polish version of the survey was delegated to 39 experts specialised in diabetology and providing daily care to diabetic patients[8, 24].

The experts' task was to substantively evaluate and understand particular items of the questionnaire (0-unintelligible item; 1-intelligible item). Items numbered 2, 5 10, 11, 13, 14, 15, 18, 20, 26, 29, 30, 31 were acknowledged by over 90% competent judges. According to 80% of experts, a change was necessary in item 16 "I believe body reactions to low blood glucose result in the fact that maintaining tight glycaemia control is too dangerous for the majority of patients with diabetes". The remaining 19 items were accepted by 100% experts. Substantive and stylistic faults as pointed out by the experts were taken into consideration in the second revision of the survey items.

After the back-translation of the DAS-3 from Polish into English, the survey was accepted by the author of the original instrument. What followed was the pilot study revising the psychometric properties of the Polish version on a group of patients with type 2 diabetes.

RESULTS

Description of study sample

The average age of the sample population was 61.10 ± 8.27 . Most of the study subjects (57.7%) were women. Over a half of the survey population (69.6%) lived in a city. The highest percentage of the research sample (39.6%) demonstrated higher education. The research subjects were mainly (73%) in domestic partnerships and were retired (42.3%). Those surveyed mostly (44.9%) expected informative support. Excess weight and obesity were observed in 88.5% of patients participating in study. The average duration of the disease was 11.33 ± 7.54 (years). Patients on antidiabetic oral medications constituted the largest percentage (37%). For 65.2% of patients the value of glycated haemoglobin was over 7%. Over a half of the survey sample (58.6%) declared to have participated in diabetes training.

Psychometric properties of the DAS-3 survey in the Polish version before revision

Standard deviation in several survey items (items no. 1, 6, 8, 9, 10, 12, 20, 21, 24) was below $SD < 1$, which indicates low variety of responses in survey items. The asymmetry coefficient for items fluctuated between $As = -2.44$ and $As = +1.23$. The obtained values significantly diverge from optimal values, which indicates left-skewed asymmetry. The kurtosis fluctuated between $K = 1.44$ and $K = 7.08$. This means that the population curve is represented by the leptokurtic distribution and the obtained result is unsatisfactory. On the other hand, all the points on the estimation scale were used – values from 1 to 5 points. The value of Cronbach's alpha coefficient of particular items in the DAS-3 for the total score was $\alpha = 0.71$ ($r = 0.09$). The reliability for the positions included in 5 subscales of the survey before the revision was between $\alpha = 0.43$ (patient's autonomy) and $\alpha = 0.64$ (importance of specialist training). The obtained reliability of the surveyed subscales is lower than that obtained in the original version of the DAS-3 [4]. Subsequently, the parameters of descriptive statistics and reliability were not satisfactory in terms of psychometric standards.

Revision of factor structure of the DAS-3 survey in the Polish language version

An attempt was made to extract the DAS-3 subscales in the Polish version. In order to address the problem, two approaches of factor analysis were applied: the confirmatory and exploratory ones. On the basis of the model proposed by the authors of the original instrument confirmatory factor analysis was applied. The obtained congruence coefficients were unsatisfactory ($\chi^2 = 4068.62$; $p < 0.001$; $\chi^2/df = 8.39$; RMSEA = 0.090). The factor structure of the survey items was explored by means of exploratory factor analysis. Due to the fact that in the original version it was acceptable to obtain the general score, it was checked if a single-factor model would fit the obtained data. Again, the confirmatory factor analysis was applied with the assumption that the DAS-3 survey has a single-factor structure. Congruence coefficients of the theoretical model versus the obtained scores were as follows: $\chi^2 = 1162.65$; $df = 495$; $p < 0.001$; $\chi^2/df = 2.349$; RMSEA = 0.077. The analysis of the modification factors suggested introducing correlations between the measurement errors of the following pairs of items: 26 and 29; 26 and 28; 23 and 28; 15 and 28; 15 and 26; 11 and 14; 3 and 14. After applying additional assumptions for the theoretical model, subsequent congruence results were obtained: $\chi^2 = 1029.66$; $df = 488$; $p < 0.001$; $\chi^2/df = 2.11$; RMSEA = 0.070. The congruence coefficient in the presented model fulfilled the minimal requirements for theoretical models. Again the exploratory factor structure was employed in order to confirm the single-factor model.

The revision of the factor structure of the examined instrument was based on the factor analysis calculated by the major axis method. To check whether the survey items were correlated between one another and to be able to look for common factors, Kaise-Mayer-Olkin's tests (0.766), Bartlett's test ($\chi^2 = 1740.13$, $df = 5e8$, $p < 0.001$) and the matrix determinant (lower than 0.0001) were calculated. The results indicate that there is a reason for hidden variables responsible for the variance of the observable coefficients (survey items). The proportion of the number of variables (33) versus the number of cases ($N = 227$) should also be considered as satisfactory as it guarantees the stability of the factor structure. As a criterion of extracting the optimal number of factors there was adopted Keiser's criterion (self-value of the factor is at least 1) the Cattell criterion (flattening point of the scree plot). The flattening of the curve appears in position 5 so the optimal number of factors is four.

As in the process of devising the original DAS version [2], the method of extracting factors (major axis method) and rotation method (orthogonal Varimax) were used. As a result of applying the above methods, it was observed that the first four groups of factors account

for 27.78% of variance included in the input data. It is worth noting that in the case of extracting a possibly maximal number of factors according to Keiser's criterion – 10, the percentage of the explained variance (40.37%) should be considered unsatisfactory for an instrument that is meant to be used for clinical purposes.

The obtained reliability of four subscales (from $\alpha = 0.58$ to $\alpha = 0.75$) is comparable to the original version. However, the semantic analysis of the most strongly correlated positions in the four main groups shows that they do not constitute a coherent entity.

The final Polish version of Diabetes Attitude Scale (DAS-3P)

Due to the above arguments in favour of discontinuing the calculations of scores on the subscales of the DAS-3 survey in the Polish version, there was restored the model of calculating the score on the general scale of the survey which contained 31 items.

In order to improve the psychometric properties of the instrument on the general scale the weakest survey items were rejected: no. 2 “ I believe that diabetic patients who do not need insulin treatment have mild disease symptoms”; no. 16 “I believe that body reactions to too low blood glucose levels cause that it is too dangerous for diabetic patients to maintain tight glycaemic control”. The estimation scale was also recoded (contrary to the assumptions) for items: no. 14: “I think that diabetic patients should have the final say when estimating individual target values of glycaemia”; no. 29 “I think that diabetes self-management is frustrating for the patients”; no. 23 “I think that people with diabetes have the right not to manage their disease.”

After the exclusion of two items, on the whole scale Cronbach's alpha internal congruence coefficient was $\alpha = 0.79$, which helped to achieve the satisfactory reliability DAS-3 in the Polish version. The evaluation of normality distribution does not deviate substantially from the symmetrical distribution ($M = 4.02$; $SD = 0.34$; $As = -0.13$; $K = 0.17$). The results of Shapiro-Wilk's and Kolomogorov- Smirnov's tests with Lillieforse's amendment showed that the distribution of the general DAS-3 survey score of the survey sample does not differ significantly ($p > 0.05$) from the normal distribution.

The final Polish version of the DAS-3P was obtained. It corresponds to the minimal psychometric standards and is the most adequate to the method of response to the items contained in this scale of the studied group (patients with diabetes).

Sociodemographic and medical factors versus Diabetes Attitude Scale -3 in the Polish version

An attempt was made to verify the influence of selected sociodemographic and medical variables on the results of the DAS-3P scale.

The t test analysis showed statistically significant differences ($p < 0.05$) between gender and the obtained mean values on the DAS-3P scale. Women indicated lower DAS-3P scores than men ($t = 1.97$, $df = 225$, $p = 0.048$).

To check whether there existed a correlation between the age of the survey participants and the DAS-3P scores, ANOVA (statistics F) was applied. A statistically significant correlation ($p > 0.05$) was not observed between the mean DAS-3P score and the age of the survey group with type 2 diabetes.

To verify if in the survey sample there existed a correlation between DAS-3P scores and the place of residence, t test was used (Table 1).

Table1. Place of residence versus DAS-3P scores ($N = 227$)

Variable	N	Diabetes Attitude Scale-3 (DAS-3P)					
		Group	M	SD	T test		
					T	df	p<
Place of residence	158	Urban areas	4.06	0.33	3.07	225	0.002**
	69	Rural areas	3.91	0.35			

Footnote: M –mean; SD-standard deviation; ** $p < 0.01$. **Source:**Original content.

There was a statistically considerable difference ($p < 0.01$) in the mean DAS-3P scores between those living in urban areas and those living in rural areas. Diabetic patients living in the city obtained higher scores than respondents from rural areas.

In order to assess if there is a correlation between the respondents' education and the DAS-3P scores, the single-factor analysis of variance ANOVA was applied (Table 2).

Table2. Education versus DAS-3P scores ($N = 227$)

Variable	Group	N	Diabetes Attitude Scale-3(DAS-3P)		1 – ANOVA		
			M	SD	F	df	p<
Education	Primary	25	3.83	0.33	2.97	3.223	0.033 *
	Vocational	58	4.02	0.39			
	Secondary	90	4.04	0.32			
	Higher	54	4.06	0.32			

Footnote: M –mean; SD-standard deviation; ** $p < 0.05$. **Source:** Original content.

It was shown that the level of education of the survey population with diabetes significantly ($p < 0.05$) influenced the mean DAS-3P scores. Respondents with higher education obtained the highest DAS-3P scores.

To answer the question whether the presence of a domestic partners substantially influences the DAS-3P scores of respondents with diabetes, the point-biserial correlation coefficient was adopted. No statistically significant ($p > 0.05$) difference between the surveyed variables was identified.

On the basis of the single-factor analysis of variance ANOVA no statistically significant ($p > 0.05$) difference between job activity of the respondents and the mean DAS-3P scores was observed.

In order to evaluate the correlation between the need for a particular kind of social support and the DAS-3P scores, the point-biserial correlation coefficient was adopted (Table 3).

Table 3. Need for a kind of social support versus DAS-3P scores ($N = 227$).

Need for support	Diabetes Attitude Scale-3 (DAS-3P)	
	Global score	
Emotional	0.00 _(a)	
Informative	0.00 _(a)	
Material	0.17* _(a)	
Spiritual	0.07 _(a)	

Footnote: (a)-point-biserial correlation coefficient (r_{p-b}), (b)-the Pearson correlation coefficient (the Pearson's r); * $p < 0.05$; ** $p < 0.01$; Source: Original content

It was shown that there existed a correlation at the level of significance $p < 0.05$ between the need for material support and the mean DAS-3P score in the sample survey. In terms of strength, the observed correlation was poor ($r_{p-b} = 0.17$). The respondents in need for material support obtained higher mean DAS-3P scores.

By means of the single-factor analysis of variance ANOVA, no statistically substantial ($p > 0.05$) difference between the Body Mass Index (BMI) and the DAS-3P score was found. Similarly, no significant ($p > 0.05$) correlation between the time of the disease duration and the DAS-3P scores was identified.

Likewise, the impact of the method of treatment on the DAS-3P scores was revised. There were no statistically substantial ($p > 0.05$) correlations between the variables concerned.

In order to examine if there was a correlation between the HbA_{1C} value and the DAS-3P scores the t test was applied. No statistically substantial difference was observed ($p > 0.05$) between the HbA_{1C} value and the DAS-3P scores .

A t test was used in order to verify whether there was a correlation between the diabetic respondents' declaration to participate in special training and the DAS-3P scores. (Table 4).

Table 4. Participation in training versus the DAS-3P scores($N = 227$)

Variable	Group	n	Diabetes Attitude Scale 3 (DAS-3)		T test		
			M	SD	T	Df	$p <$
Participation in training	YES	133	4.07	0.32	2.62	225	0.010*
	NO	94	3.95	0.37			

*Footnote:** $p < 0.05$; ** $p < 0.01$; Source: Original content.

The results indicate that the respondents keen to participate in training obtained statistically significant ($p < 0.05$) higher mean DAS-3P scores than those who did not participate in special diabetes training.

DISCUSSION

The DAS-3P as applied in the survey is slightly different from its original version. In this case, what mattered was not only to ensure the greatest translation accuracy possible but also to gain psychometric balance. A more informal linguistic modification and form of the initial version of the survey were adopted until its fairly satisfactory psychometric parameters were obtained [8]. Cronbach's α score in the DAS-3P was $\alpha = 0.79$ and pointed to the acceptable internal congruence of items included in this instrument. It must be observed that according to

psychometric standards, the minimum Cronbach's α coefficient is acceptable at $\alpha = 0.70$ [28, 32, 38, 43]. The conducted factorial analysis confirmed the validity of the application of the single-factor structure of the DAS-3P scale.

The reasons for difficulties connected with obtaining similar psychometric parameters in the process of the DAS-3 survey revision lie with cultural differences and the timescale within which it was created. Since then the scope of diabetes treatment methods has increased and considerable technological progress has been made. As a result, diabetic patients have to demonstrate broader knowledge and skills whereas the DAS-3 items in the original version do not sufficiently reflect the range of diabetic patient responsibility and autonomy [29,39].

Another argument in favour of the modification of the original version DAS-3 survey concerns the reliability in the subscale, which is indicative of the test inaccuracy. Cronbach's α score in two subscales of the American version reached values much below $\alpha = 0.70$. However, the correlations between subscales were on the average and high levels. It must be noted that in American research the validation of the original DAS-3 instrument was conducted on a very large sample comprising 1814 (doctors, nurses, dieticians, diabetic patients) [4].

The review of foreign papers concerning the results of the original DAS-3 survey revision in several countries in the world in a vast majority also indicated the average and low reliability of the DAS-3. In Catalonia the reliability on the general scale for the DAS-3 survey on a group of 67 type 2 diabetic patients was $\alpha = 0.68$, and on the subscales the internal congruence was within the range of $\alpha = 0.47$ and $\alpha = 0.74$ [19].

In Ireland Cronbach's α internal congruence coefficient calculated for the general DAS-3 survey score was $\alpha = 0.66$. the study sample comprised 168 diabetic patients [10]. In the Turkish research conducted on a group of 80 diabetic patients the DAS-3 survey reliability was $\alpha = 0.66$ [6] while in Argentina Cronbach's α score was on a high level and reached $\alpha = 0.98$. The study comprised 542 respondents, 279 of whom were diagnosed with type 1 and type 2 diabetes [13]. Surprising results were obtained in the Chinese study, where a revision of the DAS-3 survey was carried out on a group of 5961 patients with type 2 diabetes. The reliability of subscales on the basis of Cronbach's α coefficient ranged from $\alpha = 0.65$ for subscale V (patient autonomy) to $\alpha = 0.85$ for subscale IV (psychosocial impact of diabetes). In the general DAS-3 it was $\alpha = 0.81$ [34]. The obtained psychometric scores were very similar to those in the original DAS-3 survey version, and in 3 out of 4 subscales they reached even higher values. It is important to note that the sample size in the aforementioned studies was diverse. The DAS-3 psychometric parameters reached very good scores on a very large sample. Thereby, it is a determinant of the further course of the revision research into the DAS-3P scale.

In conclusion, the implemented modifications and obtained psychometric DAS-3 scale properties in the Polish version did not differ from the introduced changes to the DAS-3 scale in the presented studies, especially in Western Europe. The above arguments were the basis for acknowledging the general DAS-3 scale score as a fairly accurate index in the study into patients' attitude towards diabetes and further analysis of scores.

The evaluation of individual properties of the population, demographic or social variables is recommended for planning diabetes training programmes. Educational strategies should be devised in such a way that they are useful for patients and, concurrently, strengthen their positive attitude towards disease self-management [40].

In the original research material the obtained mean DAS-3P scale scores showed the positive attitude of respondents towards their disease. In the study by Ku and Kegels [31] the mean general DAS-3 scale score for 549 diabetic patients was lower than in the original research.

Also Clarke [10] for a group of 168 patients obtained a score much lower ($p < 0.0001$) than the score obtained in the original research.

It is worth taking a closer look at the results of research by Lou [34], in which the mean scores on the general DAS-3 scale were significantly ($p < 0.0001$) lower than in the original research.

It seems that diabetic patients participating in the original research had a better attitude towards their disease. They were also aware of greater independence of diabetic patients in terms of their daily diabetes self-management than the respondents in the aforementioned studies.

A number of studies showed that women scored higher in terms of knowledge and thus obtained higher scores than men on the Diabetic Attitude Scale [33,40].

Different attitudes of men and women towards the disease were presented in the original research. In this case, men's DAS-3P scale scores were significantly ($p < 0.05$) higher than women's. Unlike in women, this translates to a better attitude towards diabetes among men. Similar conclusions were presented by Clark [10]. Men showed a better attitude towards the disease than women and obtained mean higher scores on the general DAS-3 scale. However, the difference was not statistically substantial ($p > 0.05$). In another study, in which the DAS-3 survey was revised, the obtained men's mean DAS-3 scores were lower ($p < 0.05$) than those of women [7]. In this case women demonstrated a better attitude towards diabetes than men.

The original research showed a considerable ($p < 0.01$) impact of the place of residence on the attitude toward diabetes. Diabetic patients living in urban areas obtained higher mean DAS-3P scale scores than those from rural areas.

Some study results show that educated people apply their health knowledge and the possibility of its acquisition more efficiently. In contrast, a lower education level may have a negative influence on diabetes self-management [1, 41]. The results in the original research indicated that a high level of respondents' education markedly ($p < 0.05$) affected the attitude towards diabetes. The study by Lou [34] confirms a clear ($p = 0.000$) correlation between education and the DAS scale scores. A similar conclusion was drawn in the study by Kamimura [25]. A negative attitude towards diabetes evaluated by the DAS-3 survey was connected with a lower education level.

Literature on the subject confirmed a significant correlation between life without a partner and low diabetes control for both sexes. [23]. The original research showed that the presence of domestic partner does not influence the general mean DAS-3P scale score.

The results of the original research indicated no substantial ($p > 0.05$) correlation between job activity of respondents and the DAS-3P scale score. Literature on the subject contains papers on other aspects of diabetes indicating that pensioners with diabetes were considerably ($p < 0.0086$) less knowledgeable about the disease in comparison to working diabetic patients [5].

According to some researchers, informative and emotional support is of great importance to diabetic patients regarding their disease management [12, 21]. Gender and duration of the disease influence the need for social support. Hjelm and Bertero showed that women more often face limited support and its lack regardless of the duration of the disease. On the other hand, men claim that the amount of the information provided by the personnel at the moment of being diagnosed with diabetes is sufficient [21]. The original research findings showed a substantial ($p < 0.05$) correlation between the respondents' need for material support and a positive general DAS-3P scale score. There is evidence that having self-monitoring equipment and insulin delivery devices have a positive impact on the assessment of life quality by type 1 diabetic patients [18].

Research papers show that unlike non-obese diabetic patients, obese patients, who are diagnosed with diabetes, more frequently are extremely determined to change their lifestyle. However, their success rate in changing their lifestyle is low [16]. Original research results indicate that nutritional condition evaluated by means of the Body Mass Index (BMI) did not influence the mean DAS-3P scale score. Similar conclusions were presented by Lou [34] regarding a group of diabetic respondents in Chinese population ($p > 0.05$).

A longer duration of diabetes and not respecting/ the rules connected with diabetes self-management are not uncommon reasons for bad glycaemic control [26, 27]. The original research scores have shown that the DAS- 3P score is not dependent on the duration of diabetes ($p > 0.05$). According to Mahjouri [36], longer duration of the disease had a positive impact on the attitude towards diabetes ($p < 0.01$). There was another study which also showed that duration of diabetes resulted in positive changes to the attitude towards diabetes ($p = 0.0000$) [34].

The original research results suggest that the treatment method of diabetes does not translate considerably to the mean DAS-3P scale score ($p > 0.05$). In Lou's study [34] insulin treatment was not connected with a significant ($p > 0.05$) influence on the diabetes attitude evaluated through DAS-3.

As results from the original research, HbA1c value did not cause a considerable change of the attitude towards diabetes ($p > 0.05$) as measured by the DAS-3P scale. Different conclusions were drawn by Mahjouri [36], who found that there was a negative correlation between the level of HbA_{1c} concentration and the mean DAS-3 scale score. According to many researchers, a positive attitude towards diabetes influences the improvement of metabolic control coefficients [15, 34, 40].

The analysis of the original research results indicates that participation in special training is a variable which quite significantly ($p < 0.05$) positively influences the survey patients' attitude towards diabetes. The study conducted by Clark [10] and Haltiwanger [15] confirm the positive impact of diabetes education on changes in the attitude towards diabetes as measured by the DAS-3 scale. According to the researches, diabetes education has an enormous influence on the positive approach towards the disease [14,30, 31, 34]. In practice, there are diabetic patients demonstrating above-average knowledge. The knowledge as such, however, is not mirrored in their attitude towards diabetes. [17].

CONCLUSIONS

1. There is a need to continue studies into psychometric properties of the DAS-3 scale in the Polish version on a large sample of type 2 diabetic patients.
2. The study population of type 2 diabetic patients generally have a positive attitude towards the disease as evaluated by the DAS-3P scale.
3. Higher scores on the Diabetes Attitude Scale (DAS-3P) were reached by males living in urban areas, with higher education background, in need of material support and participating in special diabetes training.

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