Differences in Emotional Distress among Inpatients with Type 1, Obese Type 2, and Non-Obese Type 2 Diabetes Mellitus

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Abstract

Objective The purpose of this study was to determine the differences in emotional distress among three groups of inpatients with type 1, obese type 2, and non-obese type 2 diabetes during hospitalization.

Methods The 42 participating inpatients were divided into three groups: type 1 diabetes (n=11), obese type 2 diabetes [body mass index (BMI) ≥25 kg/m²; n=24], and non-obese type 2 diabetes (BMI <25 kg/m²; n=7). The Problem Areas in Diabetes (PAID) scale, which is a self-administered questionnaire to assess emotional distress in the patients with diabetes, was performed at admission and discharge.

Results The total PAID score was similar and tended to improve during hospitalization in all three groups, although there were differences among the groups in the scores of particular questions. At admission, the score of the question “worrying about low blood sugar reactions?” was significantly different among the three groups and highest in the patients with type 1 diabetes. At discharge, the score of “not accepting diabetes?” was significantly different among the three groups and highest in the patients with non-obese type 2 diabetes, while that of “feeling unsatisfied with your diabetes physician?” was significantly different among the three groups and highest in the patients with obese type 2 diabetes. The score of “feelings of deprivation regarding food and meals?” significantly worsened in the patients with obese type 2 diabetes during hospitalization compared with the patients in with non-obese type 2 diabetes.

Conclusion The characteristics of emotional distress during hospitalization varied among the patients with the three types of diabetes, thus emphasizing the importance of tailoring support according to the type of diabetes.

Key words: emotional distress, education program, type 1 diabetes, type 2 diabetes

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Introduction

Patients with diabetes mellitus need to adhere to a regular self-management program that includes diet, exercise and pharmacotherapy. In most patients, such self-management is a burden and can cause emotional distress, thus leading to a reduced quality of life. In addition, there is increasing evidence of the importance of good mental health in relation to diabetes care from the perspective of the individual diabetes prognosis, including the disease severity, complications, and mortality (1). Therefore, it is important for the medical staff to evaluate and design programs to manage such distress.

The Problem Areas in Diabetes (PAID) scale is used to measure diabetes-specific emotional distress. Several studies have used this scale to analyze emotional distress in the patients with diabetes during hospitalization (2-5). To the best of our knowledge, however, there is currently no information on the difference in distress assessed using the PAID scale among the patients with various forms of diabetes, including type 1 diabetes, obese type 2 diabetes and non-obese type 2 diabetes. Because the self-management varies...
among these types of diabetes, the characteristics of distress in these patients may also differ, and specific support may be needed in each group. The present study evaluates the emotional distress related to diabetes in inpatients with type 1 diabetes, obese type 2 diabetes, and non-obese type 2 diabetes.

Table 1. Characteristics and Total PAID Scores of Participants.

|                  | total     | type 1 diabetes | obese type 2 diabetes | non-obese type 2 diabetes | p value |
|------------------|-----------|-----------------|-----------------------|---------------------------|---------|
| n                | 42        | 11              | 24                    | 7                         | n.s.    |
| Age (years)      | 55.1±14.1 | 47.0±17.3       | 56.5±11.2             | 63.2±12.9                 | n.s.    |
| Sex (males/females) | 23/19   | 7/4             | 11/13                 | 5/2                       | n.s.    |
| Body mass index (kg/m²) | 26.7±5.0 | 23.6±4.1       | 29.2±4.5              | 22.9±2.4                  | <0.01*  |
| Duration of diabetes (years) | 12.8±10.4 | 17.1±13.2  | 10.2±8.60             | 15.1±9.65                 | n.s.    |
| HbA1c (%) at admission | 8.8±1.7  | 8.3±1.1        | 8.4±1.0               | 9.2±2.0                   | n.s.    |
| HbA1c (%) after discharge | 7.4±0.7  | 7.5±0.67       | 7.7±0.9               | 7.2±0.8                   | n.s.    |
| Therapy for diabetes (%) |         |                 |                       |                           |         |
| (at admission / at discharge) |         |                 |                       |                           |         |
| Non drug         | 23(54.8)/22(52.4) | 11(100)/11(100) | 11(45.8)/9(37.5)    | 1(14.3)/2(28.6)           | <0.05*/<0.05* |
| Oral medication  | 15(35.7)/12(28.6) | 0(0)/0(0)      | 9(37.5)/8(33.3)     | 6(58.7)/4(57.1)           | <0.05*/<0.05* |
| Insulin          | 23(54.8)/22(52.4) | 11(100)/11(100) | 11(45.8)/9(37.5)    | 1(14.3)/2(28.6)           | <0.05*/<0.05* |
| GLP-1            | 23(54.8)/22(52.4) | 11(100)/11(100) | 11(45.8)/9(37.5)    | 1(14.3)/2(28.6)           | <0.05*/<0.05* |
| Total PAID score at admission | 53±15.3 | 52.8±13.1       | 54.6±15.4             | 50.2±19.9                 | n.s.    |
| Total PAID score at discharge | 46.2±14.3 | 42.2±13.88     | 49.3±15.2             | 42.1±9.9                  | n.s.    |

Data are mean ±SD.

*group differences, by Kruskal-Wallis test or χ² test
†, ††, ††† p<0.05 vs. HbA1c at admission by Wilcoxon signed rank test
‡, ‡‡, ‡‡‡ p<0.05 vs. total PAID score at admission by Wilcoxon signed rank test

Materials and Methods

Patients and data collection

The study subjects consisted of 65 patients with diabetes (men: 37, women: 28) who were admitted to Osaka University Hospital between August 2010 and March 2012 for poor glycaemic control and who consented with this study. The patients received the following education program: several diabetes classes, self-monitoring of blood glucose seven times a day, nutrition guidance by a dietician, treatment during hospitalization. They had never been diagnosed with depression or treated with psychotropic medicines. The patients with types of diabetes other than type 1 diabetes, obese type 2 diabetes, and non-obese type 2 diabetes were excluded from this study. The study protocol was approved by the Human Ethics Review Committee of Osaka University and conducted according to the Declaration of Helsinki. A signed consent form was obtained from each participant.

Emotional distress in the diabetes patients was measured by the Japanese version of the PAID scale at admission (within a few days after admission) and at discharge (within a few days before discharge). The PAID scale is a 20-item, self-report questionnaire of diabetes-related emotional distress with a high internal reliability and clinical utility originally developed by Polonsky et al. (6) and translated into Japanese by Ishii et al. (7). The Japanese version of the PAID scale additionally has a good internal consistency and validity (8) and comprises a 20-item questionnaire, each of which is rated on a five-point scale ranging from 1 (no problem) to 5 (serious problem). Thus, the total score ranges from 20 to 100. A high score indicates a lower quality of life. In addition, the patients’ characteristics, such as height and body weight, were obtained from the medical records. We excluded 23 participants who could not complete the PAID scale at both admission and discharge; ultimately, 42 patients with diabetes, who were classified into type 1 diabetes, obese type 2 diabetes [body mass index (BMI) ≥25 kg/m²], and non-obese type 2 diabetes (BMI <25 kg/m²) were included in the present study. A BMI of greater than 25 kg/m² is the criterion for obesity in Japan (9). The BMI data were collected at admission. When we examined the characteristics of the excluded 23 patients and compared them with those of the 42 patients, we found that there was no significant difference in the characteristics between the two groups of patients (data not shown).

In Table 1, neuropathy was diagnosed based on the symptoms and physical exams (e.g., tendon reflexes and sensitivity to vibration). “Nephropathy” includes the patients who were diagnosed with stage 4 or 5 of diabetic nephropathy. “Retinopathy” includes the patients with proliferative diabetic retinopathy or the patients who received laser photocoagulation treatment. Coronary heart disease was diagnosed...
by the identification of significant stenosis of the coronary arteries. The HbA1c indicates the National Glycohemoglobin Standardization Program (NGSP) value, which was converted from Japan Diabetes Society (JDS) to the NGSP value (10).

Statistics analysis

The data were analyzed by the Wilcoxon signed-rank test, the χ² test, the Kruskal-Wallis test, and the Bonferroni test using the Statistical Package for Social Sciences software program (SPSS Inc., Chicago, USA). Statistical significance was considered to exist at a p value less than 5% in the Wilcoxon signed-rank test, the χ² test, and the Kruskal-Wallis test and a p value less than 1.7% (0.05/3) in the Bonferroni test. The validity of the present study was evaluated by using a statistical power analysis with the G*Power 3.1 software program. The statistical power analysis assessed the risk of Type II errors (11).

Results

Characteristics of the participants and total PAID scores

Table 1 summarizes the characteristics of the 42 participants, including the patients with type 1 diabetes (n=11), obese type 2 diabetes (n=24), and non-obese type 2 diabetes (n=7). The body mass index was significantly different among the three groups (p<0.01, the Kruskal-Wallis test), as well as between the patients with type 1 diabetes and obese type 2 diabetes (p<0.01, the Bonferroni test). The HbA1c at admission and at first time after discharge (36.3 days in the type 1 diabetes group, 34.3 days in the obese type 2 diabetes group, and 22.0 days in the non-obese type 2 diabetes group, on average) were not different among the three groups. Meanwhile, the HbA1c significantly improved during hospitalization in all the patients, as well as in the patients with type 1 diabetes and obese type 2 diabetes. The number of patients receiving no medication and the number of patients receiving glucagon-like peptide (GLP)-1 receptor agonists treatment did not differ among the three groups. However, the number of patients receiving oral medication was significantly different among the three groups at admission and at discharge (p<0.05, the χ² test). A further analysis showed a significant difference in the number of patients receiving oral medication between the type 1 diabetes and obese type 2 diabetes groups at admission and at discharge (p<0.05, the χ² test) and between the type 1 diabetes and non-obese type 2 diabetes groups at admission and at discharge (p<0.05, the χ² test), and between the obese type 2 diabetes and non-obese type 2 diabetes groups at admission (p<0.05, the χ² test). The number of patients receiving insulin treatment was significantly different among the three groups at admission and at discharge (p<0.05, the χ² test). A further analysis showed significant differences in the number of patients receiving insulin treatment between the type 1 diabetes and obese type 2 diabetes groups at admission and at discharge (p<0.05, the χ² test) and between the type 1 diabetes and non-obese type 2 diabetes groups at admission and at discharge (p<0.05, the χ² test). The incidence rates of microangiopathies and coronary heart disease did not differ among the three groups. Furthermore, the total PAID scores did not differ among the three groups at both admission and discharge, significantly improved in the patients with type 1 diabetes, and tended to improve in the patients with obese type 2 diabetes and non-obese type 2 diabetes during hospitalization. There was no significant difference in the time interval between the two tests at admission and at discharge among the three groups [type 1 diabetes: 18.8 days (±14.6), obese type 2 diabetes: 15.5 days (±6.5), and non-obese type 2 diabetes: 16.9 days (±9.8)].

The PAID score of each question for the patients with type 1 diabetes, obese type 2 diabetes and non-obese type 2 diabetes

Figs. 1a and 2a indicate the mean scores of each question of the PAID scale for the patients in the type 1 diabetes group. At admission, the questions with the highest scores (up to the 5th highest mean score) were P12, the 12th question (worrying about the future and the possibility of serious complications?), P9 (worrying about low blood sugar reactions?), P3 (feeling scared when you think about living with diabetes?), P6 (feeling depressed when you think about living with diabetes?), and P13 (feelings of guilt or anxiety when you get off track with your diabetes management?). At discharge, the questions with the highest scores were P12, P9, P13, P11 (feeling constantly concerned about food and eating?), and P3. The items with the highest scores were similar at admission and discharge. No score of any question worsened at discharge. Conversely, the scores of the following six items improved significantly at discharge (p<0.05, the Wilcoxon signed-rank test): P2 (feeling discouraged with your diabetes treatment plan?), P10 (feeling angry when you think about living with diabetes?), P14 (not “accepting” your diabetes?), P18 (feeling that your friends and family are not supportive of your diabetes management efforts?), P19 (coping with the complications of diabetes?), and P20 (feeling “burned out” by the constant effort needed to manage diabetes?) (Fig. 3a).

Figs. 1b and 2b summarize the mean scores for each question of the PAID scale in the patients with obese type 2 diabetes. At admission, the questions with the highest scores were P12, P11, P6, P3, and P13, four of which were similar to those of the patients with type 1 diabetes. At discharge, the questions with the highest scores were P5 (feelings of deprivation regarding food and meals?), P12, P11, P13, and P3, four of which were similar to those of the patients with type 1 diabetes. The scores of P5 and P9 tended to worsen during hospitalization, although not significantly. In contrast, the scores of P1 (not having clear and concrete goals for your diabetes care?), P6, and P16 (feeling that diabetes is taking up too much of your mental and physical energy
The PAID scores for each question in the patients in the (a) type 1 diabetes, (b) type 2 diabetes with a BMI≥25 kg/m², and (c) type 2 diabetes with a BMI<25 kg/m² groups at admission. Stripped bars indicate the questions with the highest score. The box-and-whisker plot indicates the standard deviation.

Figure 1. The PAID scores for each question in the patients in the (a) type 1 diabetes, (b) type 2 diabetes with a BMI≥25 kg/m², and (c) type 2 diabetes with a BMI<25 kg/m² groups at admission. Stripped bars indicate the questions with the highest score. The box-and-whisker plot indicates the standard deviation.

Comparison of the score of individual questions among the three groups

At admission, there were significant differences in the score for P9 among the three groups (p<0.05, the Kruskal-Wallis test), as well as between the patients with type 1 diabetes and obese type 2 diabetes (p<0.017, the Bonferroni test) (Table 2). However, hypoglycemia was the main problem in the patients with type 1 diabetes. At discharge, there were significant differences in the scores for P14 and P15 (feeling unsatisfied with your diabetes physician?) among the three groups (p<0.05, the Kruskal-Wallis test). A further analysis showed a tendency for differences in the score for every day?) improved significantly (Fig. 3b).

Figs. 1c and 2c summarize the mean scores for each question of the PAID scale in the patients with non-obese type 2 diabetes. At admission, the questions with the highest scores were P12, P5, P1 (not having clear and concrete goals for your diabetes care?), P6, and P9. At discharge, the questions with the highest scores were P12, P3, P9, P11, and P14 (not “accepting” your diabetes?). The characteristic of this group was the relatively high score of P1 at admission. The score of P14 tended to be worse at discharge, although not significantly, while the score of P5 significantly improved, in contrast to the patients with obese type 2 diabetes (Fig. 3c).

The statistical power of the comparison of the PAID scores at admission and discharge in each group was 0.58.
groups according to the type of diabetes (type 1 diabetes, obese type 2 diabetes (p=0.088, the Bonferroni test) and be-
P14 between the patients with type 1 diabetes and non-
obese type 2 diabetes (p=0.088, the Bonferroni test) and be-
tween the patients with type 1 diabetes and obese type 2
diabetes (p=0.065, the Bonferroni test); additionally, there
was a difference in the score for P15 between the patients
with type 1 diabetes and obese type 2 diabetes (p=0.046, the
Bonferroni test) (Table 2).
The change in P5 score during hospitalization was signifi-
cantly different among the three groups (p<0.05, the
Kruskal-Wallis test). Furthermore, the score also tended to
differ between the patients with obese type 2 diabetes and
non-obese type 2 diabetes (p=0.044, the Bonferroni test)
(Table 2).
The statistical power of the following results (comparing
the PAID score at admission among the three groups, com-
paring the PAID score at discharge among the three groups,
and comparing the changes in the PAID scores during hos-
pitalization among the three groups) was 0.73.

Discussion

In the present study, we evaluated emotional distress in
the inpatients with diabetes after categorizing them into
groups according to the type of diabetes (type 1 diabetes,
obese type 2 diabetes and non-obese type 2 diabetes) and
identified the main features in each group and the differ-
ences among the groups. Although differences in emotional
distress have been examined between the patients with type
1 diabetes and type 2 diabetes (12), there is currently no in-
formation available on the differences between the patients
with obese and non-obese type 2 diabetes. Furthermore, to
the best of our knowledge, this is the first study to analyze
the scores of each question of the PAID scale.

Welch et al. reported that the total score of the PAID
scale was higher in the patients with type 1 diabetes than
those with type 2 diabetes (12). Conversely, Jaya et al. re-
ported that there were no significant differences in the total
PAID scores related to the DM type. In the present study,
the total PAID scores were similar and tended to improve
during hospitalization in all three groups, however, only the
patients in the type 1 diabetes group showed a significant
improvement in the total PAID score, in addition to the
scores of many items. These results may suggest that the
benefits of admission would be very substantial, especially
for the patients with type 1 diabetes. Indeed, most of the pa-

tients in the type 1 diabetes group were admitted to our hos-
pital to introduce carbohydrate counting to the diabetes
treatment or to change their insulin regime. Thus, the pa-
tients were likely to feel the benefits of re-considering their
treatment during hospitalization. At admission, most of the
patients in the type 1 diabetes group had worries about hy-
poglycemia, which was similar reported in the study by Jaya
et al. (13). When we compared the score of P9 (worrying
about hypoglycemia?) in the type 1 diabetes group and the
type 2 diabetes patients treated with insulin at admission in
the present study, the mean score of the type 1 diabetes
group was significantly higher than that of the insulin-
treated type 2 diabetes patients. Thus, we speculate that spe-
cific factors may exist in the pathophysiology of type 1 dia-
betes, e.g., the failure of alpha cell function, thereby leading
to the increased worry of hypoglycemia. Although this issue
improved during hospitalization, it was still unresolved even
discharge. Accordingly, it is important for the medical
staff members to understand this issue and prepare strategies
to prevent hypoglycemia in individual patients with type 1
diabetes.

The patients with obese type 2 diabetes may be character-
ized by the worsening of “feelings of deprivation regarding
food and meals” during hospitalization. This is most likely
due to the main problem of obesity and lifestyle in this
group, and calorie restriction and a change in lifestyle are
the essential parts of the treatment. In addition, the diabetes
specialist may urge the patients to follow strict calorie re-
striction and a change of lifestyle without sympathy for the
difficulties in achieving this goal. This could in turn make
the patients unhappy and unsatisfied with their physicians.
Thus, physicians need to understand the distress and diffi-
culties related to this issue and sympathize with the patients
undergoing diet adjustments. Furthermore, the medical staff
members should recognize the patient’s meal preference and
present diet plans that support their habits and are accept-
able to the patients.

In the present study, the obese type 2 diabetes group
had a relatively high score of P1 (not having clear and con-
crete goals for your diabetes care?) at admission and ap-
peared to be unable to accept their diabetes care even at dis-
charge. Lifestyle interventions, such as weight reduction and
calorie restriction, are not major problems in the majority of

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**Table 2.** Comparison of Scores of Questions P9, P14, P15, and P5 among the Three Groups.

| Question item | T1D  | OT2D  | NT2D | p value   |
|---------------|------|-------|------|-----------|
| At admission  |      |       |      |           |
| P9: Worrying about low blood sugar reactions? | 3.9±1.2 | 2.3±1.3 | 2.9±1.6 | <0.05*    |
| At discharge  |      |       |      |           |
| P14: Not "accepting" your diabetes? | 1.4±1.0 | 2.4±1.2 | 2.6±1.3 | <0.05*    |
| P15: Feeling unsatisfied with your diabetes physician? | 1.0±0.7 | 1.5±0.7 | 1.3±0.5 | <0.05*    |
| Changes during hospitalization |      |       |      |           |
| P5: Feelings of deprivation regarding food and meals? | +0.36 | -1.00 | +1.29 | <0.05*    |

Data are mean ±SD. BMI: body mass index, T1D: type 1 diabetes, OT2D: type 2 diabetes with a BMI ≥25 kg/m², NT2D: type 2 diabetes with BMI <25 kg/m². Changes during hospitalization were calculated from “(the score at admission) – (the score at discharge)” for each question. Positive changes are supposed to mean improved quality of life.

*p=0.017, †p=0.088, ‡p=0.046, compared with the T1D group (Bonferroni test).

*p=0.044, compared with the NT2D group (Bonferroni test).
patients in the non-obese type 2 diabetes group, thus clear goals for the treatment of diabetes are often not provided to the patients in this group. In addition, having diabetes despite being a healthy weight is not easily accepted by some of these patients. The attending physician should explain various causes of diabetes, such as genetic factors, and provide clear and concrete goals of each treatment modality on a one-to-one basis. In contrast to the patients in the obese type 2 diabetes group, “feelings of deprivation regarding food and meals” improved after hospitalization in this group. Such improvement is probably due to the similarities between the meals provided in the hospital and those prepared at home, thereby allowing these patients to feel that diet therapy is not difficult. In the previous report by Jaya et al., it was similarly described that the most important issues for the patients with type 2 diabetes were “a lack of DM goals” and “feelings of food deprivation” (13). The findings in the present study were in agreement with this previous study and add new information about the differences between the obese and non-obese patients with type 2 diabetes.

Lastly, worrying about the complications and negative feelings about living with diabetes were common and main distresses across all the groups. Furthermore, when we compared the PAID scores of the patients with complications (n=21) to those without complications (n=21), the score of P19 (coping with the complications of diabetes?) at both admission and discharge was significantly higher (data not shown). While such feelings may be, to some extent, important and essential for the continuation of treatment, the medical staff members should try and avoid the augmentation of these distresses. In general, physicians should explain to the patients that complications may be prevented by suitable treatments.

However, among the 42 patients, 3 patients with type 1 diabetes, 1 patient with obese type 2 diabetes, and 1 patient with non-obese type 2 diabetes required readmission to the hospital within one year of discharge. In the three readmitted patients with type 1 diabetes, the score of P9 at both admission (4.3 vs. 2.8) and discharge (4.0 vs. 2.7), and the score of P20 (feeling “burned out” by the constant effort needed to manage diabetes?) at admission (3.3 vs. 2.1) were relatively higher compared with all the other patients. These question items may be risk markers for difficult treatment cases. It is crucial to consider that the patients in this group may find it difficult to achieve proper blood sugar control and that they are under pressure and constantly worrying about hypoglycemia and its management. Thus, we should pay careful attention to the distress of potential hypoglycemia in the patients with type 1 diabetes even after discharge.

There are some limitations associated with the present study. The main limitation of the present study is the small sample size. In fact, the statistical power values were 0.58 in comparing the scores at admission between those at discharge in each group and 0.73 in comparing the scores among the groups, indicating a relatively high probability of type II errors. This indicates that the background data, which were not statistically significant among the three groups (as shown in Table 1), may in fact differ between the three groups and affect the PAID scores in each group. Indeed, age, sex, the duration of diabetes, HbA1c, and therapy for diabetes have been reported to be correlated with total PAID scores (14). Furthermore, a self-reported measure, such as the PAID scale, may not be independent of the change of treatment during hospitalization. Thus, the true changes or differences in the PAID scores should be analyzed in a multivariate manner. However, multivariate analyses were not feasible in the present study due to the small sample size. Another limitation is that the data were collected from the patients in one hospital. Therefore, it may be difficult to generalize the results in the present study to the patients in other hospitals. Similar studies in other hospitals and on a larger scale are necessary. However, this is the first study which attempted to clarify the characteristics of emotional distress during hospitalization among the patients with the three types of diabetes and proposed the features of diabetes care tailored to each of the three groups, which may be beneficial for improving both the health services delivery and self-care. Hence, at the very least, the present study has demonstrated the importance of reconsidering the current support system according to the three types of diabetes at each hospital, after evaluating emotional distress by the PAID scale.

In conclusion, the characteristics of emotional distress during hospitalization varied among the patients with the three types of diabetes, thus the medical staff needs to understand the features of emotional distress and try to alleviate the patients’ concerns, thus emphasizing the importance of tailoring support according to the type of diabetes. The current support system at each hospital should be reassessed after evaluating emotional stress in the patients with different types of diabetes.

All the procedures were in accordance with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1964 and later revision. Informed consent or the substitute for informed consent was obtained from all the patients included in the present study.

The authors state that they have no Conflict of Interest (COI).

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