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Diabetic distress and work-related stress among individuals with type 2 diabetes mellitus

Surabhi Gupta et al., Work stress and diabetes distress

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ABSTRACT

Background: Work-related diabetes distress was a term introduced in the context of type 1 diabetes mellitus (T1DM). Currently, there are no studies evaluating the contribution of work-related stress to overall diabetes distress among employed persons with type 2 diabetes mellitus (T2DM).

Methods: Adult patients over the age of 21 years with T2DM in full-time employment for over a year were interviewed after informed consent. Diabetes distress was identified with the 17-question diabetes distress scale (DDS) and work-related stress was evaluated using the Siegrist effort-reward imbalance (ERI) questionnaire. DDS scores ≥ 3.0 were considered significant diabetes distress and effort-reward ratio > 1.0 was considered indicative of work stress.

Results: One hundred and thirteen patients consented. 68/133 (51.2%) had clinically significant diabetes distress. Work-related stress was seen in 67/113 (50.3%) of patients. Prevalence of work stress was higher among those with clinically significant diabetes distress (62%) compared to those without diabetes distress (38%) (p-value = 0.007). Spearman’s Rho correlation between diabetic distress and effort-reward imbalance was found to be moderately positively correlated (rs = 0.27 [2 tailed] p =.002).
Conclusions: Increased work stress that manifests as an imbalance between effort and reward is associated with increased diabetes distress among employed persons with T2DM. The measure of diabetes distress needs to include work stress as a component to complete the picture.

Keywords: diabetes distress, type 2 diabetes mellitus, effort-reward imbalance (ERI), work stress, diabetes distress scale (DDS)

Introduction
Diabetes distress encompasses the emotional distress (worries, fears, and concerns) that accompanies living and managing a demanding chronic disease like diabetes mellitus with regards to its therapy, threats of acute and chronic complications, and access to care [1]. The diabetes distress score (DDS) questionnaire has been specifically developed for adults with type 2 diabetes mellitus (T2DM) and is among the three common tools used to quantify and monitor diabetes distress. Clinically significant diabetes distress has been reported in 18% (India) to 42% (United States) among adults with T2DM [2, 3]. A recent metanalysis of 55 studies suggested 36% of patients with T2DM exhibit diabetes distress [4].

Diabetes distress is primarily influenced by age, gender, duration of diabetes, type of diabetes, insulin use, body mass index, glucose control, education levels, and presence of complications like neuropathy and retinopathy [2, 5, 6]. Work-related stress has unfavorable effects on general health but is difficult to quantify. One of the measures used in occupational health to quantify work stress is a tool called effort-reward imbalance (ERI) [7]. Previous studies have suggested workers with higher ERI have more incident new diabetes [8], poor control of hypertension [9], and poor glucose control [10].

We aim to assess the relationship between diabetes distress and work stress among employed patients with T2DM.

Methods

Study design and setting
This was a cross-sectional questionnaire-based study done among patients attending the endocrinology clinics of Christian Medical College and Hospital, Ludhiana which is a tertiary
care hospital in Northern India. The study was approved by the institutional ethics committee of Christian Medical College, Ludhiana prior to any patient enrollment. The protocol was also registered prospectively as a short-term studentship project of the Indian Council of Medical Research (STS -2019-07197) for the first author (http://14.139.60.56:84/Result/STS_2019_Application_Result.pdf). They also provided funding to the first author for the study. Patients were recruited between 1st July 2019 and 31st August 2019.

**Study subjects**

Adult patients (≥ 21 years) with T2DM for over 12 months and who were in full-time employment for at least 1 year prior to the day of the interview were enrolled if they provided informed consent. Patients with unclassified diabetes, type 1 diabetes mellitus (T1DM), secondary diabetes, and gestational diabetes were excluded. Additionally, patients with significant neurological disease, significant hearing impairment, a psychiatric disease requiring treatment, women who were currently pregnant or breastfeeding, and those who did not understand English, Hindi, or Punjabi were also excluded.

**Methods and questionnaires used**

Demography and details about diabetes mellitus were noted from the patient’s charts. Diabetes distress was identified using the 17-question DDS which has been standardized for patients with T2DM. Each of the 17 questions is rated on a 6-point Likert scale, from ‘not a problem’ to ‘a serious problem’. Total scores are calculated using the mean item scores, which are then categorized as little or no distress (< 2.0), moderate distress (≥ 2.0 and ≤ 2.9), and high distress (≥ 3.0) [11]. For our study we considered patients with DDS values of ≥ 3.0 to have clinically significant diabetes distress.

For assessment of work stress, we used the 2012 long version of the Siegrist’s ERI questionnaire [12]. This is a standardized, self-reported measure of ERI, which also has 17 items: 11 measuring reward and 6 measuring effort. Data are collected from participants using four-point Likert scales. To compute the ER-ratio, the effort score is put in the numerator and the reward score in the denominator whereas the latter score is multiplied by a correction factor
(0.5454) to adjust for the unequal numbers. ER-ratio values > 1.0 indicate an imbalance between high effort and low reward and suggests the presence of work-related stress [12].

**Statistical methods**

The data entry was done in the Microsoft EXCEL spreadsheet and the final analysis was done with the use of SPSS software, IBM manufacturer, Chicago, USA, version 21.0. The categorical variables were analyzed using chi-square test and quantitative variables were analyzed using the unpaired student t-test. Spearman rho test was used to find a correlation between two non-parametric variables.

**Results**

One hundred and thirty-three consecutive patients with T2DM who were eligible and consented were recruited. 68/133 (51.2%) of patients had clinically significant diabetes distress. In the group with DDS < 3 (no distress) there were 65 patients with a mean age of 47.5 years, of whom 75% were male, and in the group of DDS > 3 (significant distress) the number of patients was 68 with a mean age of 48.2 years, and 82% were male (p = NS). The body mass index (BMI), duration of diabetes, blue/white-collar job distribution was also similar in both these groups.

However, in group with diabetes distress significantly more patients were on insulin (59% vs. 40%, p-value 0.03), significantly higher HbA1c (7.9% vs. 7.5%, p-value 0.02), significantly higher ER ratios (1.08 vs. 0.95, p-value 0.02), and significantly higher number of patients with effort-reward imbalance (ERI) > 1 (62% vs. 38%, p-value 0.007). More detailed baseline details of patients with and without diabetes distress is given in Table 1.

Work stress defined as a higher level of efforts at work with lower levels of rewards (ER-ratio > 1.0) was present in 67/133 (50.3%) of patients. Prevalence of work stress was higher among those with clinically significant diabetes distress (62%) compared to those without diabetes distress (38%) (p = 0.007)

A Spearman’s Rho correlation between diabetic distress and effort-reward imbalance was also done. Spearman’s Rho rs = 0.27 (2 tailed); p = .002. DDS and ERI were found to be moderately positively correlated. This is depicted in Figure 1.

**Discussion**
Our data suggest that in addition to the use of insulin and poor glycemic control, work-related stress was significantly associated with diabetes distress. Diabetes distress was found in 51% of employed adults with T2DM and work-related stress (defined as an ER-ratio > 1.0) was found in over 50% of these individuals. Work stress was 1.6 fold higher among those who had clinically significant diabetes distress.

The term work-related diabetes distress (WRDD) was first introduced by Hakkarainen et.al from Finland in the context of T1DM [13]. A recent paper suggested that a combination of WRDD and significant diabetes distress among workers with T1DM was associated with intentional work-related hyperglycemia and poor overall glucose control [14].

This is probably the first paper looking at work stress and diabetes distress among patients with T2DM. In its current construct, the diabetes distress scale only includes emotional, regimen burden, interpersonal, and physician-related distress components [14]. A more complete picture of ongoing distress requires assessment of work-related distress to complete the scale and provide better interventions. The primary drawback of this study was the cross-sectional design rather than a cohort design. A cohort would have given a better understanding of the relationship between diabetes distress, work stress, and outcomes in patients with T2DM.

In conclusion, increased work stress that manifests as an imbalance between effort and reward is associated with increased diabetes distress among employed persons with T2DM.

Conflict of interest: None declared

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References


<p>| Table 1. Comparison of baseline data and effort-reward imbalance rations between subjects with clinically not significant diabetes distress (&lt; 3) and those with clinically significant diabetes distress (≥ 3) |
|---------------------------------|---------------------------------|---------------------------------|----------------|
|                                | Subjects with clinically insignificant distress (n = 65) | Clinically significant diabetes distress (n = 68) | P-value |
| Age [years] (mean ± SD)         | 47.5 ± 6.6                   | 48.2 ± 7.7                   | 0.52    |
| Male gender n (%)               | 49 (75)                      | 56 (82)                      | 0.32    |
| Occupation                      |                               |                               | 0.44    |
| 1. Blue collar workers n (%)    | 33 (51)                      | 30 (44)                      |         |
| 2. White collar workers n (%)   | 32 (49)                      | 38 (56)                      |         |
| BMI [kg/m²] (mean ± SD)         | 28.9 ± 3.2                   | 28.6 ± 3.9                   | 0.56    |
| Duration of T2DM [years] (mean ± SD) | 6.7 ± 3.7                  | 7.6 ± 4.2                   | 0.19    |
| Insulin use n (%)               | 26 (40)                      | 40 (59)                      | 0.03    |
| HbA1c [%] (mean ± SD)           | 7.5 ± 1.0                    | 7.9 ± 1.1                    | 0.02    |
| ER-ratio (mean ± SD)            | 0.95 ± 0.21                  | 1.08 ± 0.24                  | 0.001   |
| ERI &lt; 1 n (%)                   | 40 (62)                      | 26 (38)                      | 0.007   |
| ERI &gt; 1                          | 25 (38)                      | 42 (62)                      | 0.007   |</p>
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BMI — body mass index; T2DM — type 2 diabetes mellitus; ERI — effort-reward imbalance; ER ratio — effort-reward ratio

**Figure 1.** Scatter plot showing the relationship between diabetes distress scale (DDS) scores and effort-reward imbalance (ERI) ratio values among employed adult patients with type 2 diabetes mellitus