Impaired hypoglycaemia awareness and employment in people with Type 1 diabetes

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Background Impaired awareness of hypoglycaemia (IAH) is common in adults with Type 1 diabetes mellitus (T1DM) and is a major risk factor for severe hypoglycaemia. Little is known about its effect on employment status.

Aims To examine the effect that IAH has on the employment status or employability of people with T1DM.

Methods A randomly selected cohort of adults of employment age with T1DM completed a questionnaire detailing the history of their diabetes, their occupational history (including job and industry type) and assessing both their hypoglycaemia awareness status and whether in their view their ability to obtain or retain employment had been adversely affected by having diabetes.

Results A total of 252 patients participated, with the following characteristics: 135 males, mean HbA1c 8.5% (standard deviation (SD) 1.4), mean age 43.3 years (SD 13.2), mean duration of diabetes 21.3 years (SD 12.8) and prevalence of IAH 23.4%. The employment rate was comparable between those with preserved awareness (73%) and the IAH group (66%) (not significant). People with IAH were older (P < 0.05) and also more commonly felt that having diabetes affected their ability to work (P < 0.05).

Conclusions This study is the first to demonstrate that those with T1DM and IAH remain as economically active as those with normal awareness of hypoglycaemia, although subjects with IAH were significantly more likely to feel that having diabetes had adversely affected their capacity for employment.

Key words Employment; hypoglycaemia; impaired awareness of hypoglycaemia; Type 1 diabetes mellitus.

Introduction

Diabetes mellitus, one of the commonest chronic diseases today, has a worldwide prevalence of >180 million people [1]. In the UK, >2 million people have diabetes [2]. Type 1 diabetes mellitus (T1DM) accounts for 5–15% of all diagnosed cases [3]. Longevity and increasing levels of obesity are significant contributors to the rising prevalence of diabetes.

Hypoglycaemia is a common side-effect of insulin treatment normally characterized by a cluster of symptoms peculiar to each individual [4]. Recognizing its cardinal symptoms at their onset is a fundamental prerequisite for timely self-treatment preventing progression to severe hypoglycaemia (SH) [5,6]. Hypoglycaemia is classified as severe whenever external assistance is required for its treatment. The ability to recognize premonitory warning symptoms constitutes ‘awareness’ of hypoglycaemia [7]. However, with increasing duration of T1DM, many people experience a change in their symptomatic awareness of hypoglycaemia, which may comprise a reduction in symptom intensity, a change in symptom profile or both [7–10]. Neuroglycopenic symptoms such as confusion, drowsiness and an inability to concentrate generally become predominant, while typical autonomic symptoms such as sweating, tremor and a pounding heart diminish in prevalence and intensity. This leads to the development of ‘impaired awareness of hypoglycaemia’ (IAH), an acquired syndrome associated with cerebral adaptation resulting from recurrent exposure to low blood glucose [7]. In T1DM, IAH is a major risk factor for SH and is associated with a 3- to 6-fold higher frequency of SH [11–12]. This could therefore pose a risk to efficiency and safety at work.

Chronic health conditions, diabetes included, have the potential to adversely affect the ability of individuals to gain employment and achieve both career progression...
within desired fields and horizontal mobility between jobs. Reasons for this include episodic incapacity resulting in sickness absence, impaired work performance and the need for regular engagement with health providers. In patients with T1DM, this may be evidenced by their daily requirement for insulin as well as periodically scheduled follow-up sessions with health practitioners. Previous research has demonstrated that the presence of diabetes and its possible complications affect economic activity and productivity, quality of life and sickness absence levels and result in health-related work limitations [13–16].

In recent years, legislation relating to disability and employment, intended to deter overt discrimination against people with chronic disorders has either been introduced or strengthened in most developed countries. This has made it incumbent on employers to consider making reasonable adjustments and modifications to job content and working practices to improve employment opportunities for people with disabilities, including insulin-treated diabetes [17,18]. The employers’ responsibility to ensure safety in the workplace remains paramount. Consequently, in some occupations hypoglycaemia remains unacceptable.

In a previous prospective study in our centre [19] in which frequency and severity of hypoglycaemia in the workplace were examined, only 3% of people in employment had evidence of IAH, compared with a recognized prevalence of ~20–25% in unselected adult populations of T1DM [20–22]. In the present study, the prevalence of IAH was examined in a cohort of randomly selected individuals of employment age with T1DM, to investigate whether IAH influenced employability or resulted in difficulties at work.

Methods

A group of adults of working age with T1DM attending the outpatient diabetes clinic in a teaching hospital was selected at random over a period of 12 months. Participants completed a questionnaire designed and administered by an occupational physician, which allowed for an explanation of the terminology to ensure full understanding. Diabetes history included year of diagnosis, history of treatment with insulin, current insulin regimen and dose schedule and a self-assessment of their symptomatic awareness of the onset of hypoglycaemia using an established and validated scoring system [11]. An occupational history, including job and industry type, hours worked, shift patterns, self-reported exposure to episodes of SH within the past year and participants’ views on whether diabetes had had a negative impact on their ability to work, was obtained. For those not actively employed at the time of the study, the reasons for this, including whether they stopped working due to diabetes related ill-health, were explored. The number of participants receiving state benefits, either in the form of Incapacity Benefit or Disability Living Allowance, was also recorded. Occupations were classified using the standard occupational classification 2000 used in the UK, and the industry type was classified using the standard industrial classification 2003 [23]. Participants’ occupations are shown in Table 1, both by job and industry category.

Approval for the study was obtained from the Lothian Research Ethics Committee, and all participants gave written consent.

HbA1c was measured by ion-exchange high-performance liquid chromatography and the results were aligned to the assay used in the Diabetes Control and Complications Trial [24]. The local non-diabetic range for HbA1c is 5.0–6.05%.

All analyses were performed using SPSS version 14.0 for Windows. The Kolmogorov–Smirnov test was applied to check the normality of the variables. Depending on this, differences between the two groups were analysed using either the two-sample t-test or Mann–Whitney test. Categorical variables between the groups were analysed using a chi-squared test. A P value <0.05 was considered to be significant. All results are reported as mean (SD) unless otherwise stated.

Results

A total of 252 people with T1DM participated in the survey. Baseline characteristics were 135 males, HbA1c [mean (SD)] 8.5% (1.4), age 43.3 years (13.2) and duration of diabetes 21.3 (12.8) years. A total of 171 participants (71%) were in active employment at the time of the study. Rates of employment were similar in those with normal awareness and those with IAH. Of those with preserved awareness, 79% reported that they did not consider that having diabetes had made it difficult for them to obtain or maintain active employment compared to 64% of those with IAH (P < 0.05). Although participants were employed in a wide range of occupations, fewer than 5% were employed in jobs involving the use of heavy machinery, working at heights or in occupations considered to be safety critical and therefore hypoglycaemia-sensitive. Most subjects worked in the health care, wholesale, retail and finance employment sectors (Table 1). A total of 59 participants (23%) were identified as having IAH, of whom 39 (66%) were in employment and 11 (19%) had either previously undertaken or currently undertook shift work.

The clinical characteristics of those with IAH compared to those with preserved awareness of hypoglycaemia are shown in Table 2. Table 3 provides a summary of other results. In the IAH group, 20 (34%) of the group reported perceiving that having diabetes had exerted an adverse effect on their employment. Some qualitative reasons offered for this are shown in Table 4. Of the 20 (34%) in this group who were not employed at the time of the study, eight had stopped working because of health problems and five of these reported that this was related to
complications of diabetes. Four of those with IAH who were unemployed were actively seeking work. Ten participants (50% of those who were unemployed) with IAH were receiving state benefits, either in the form of Incapacity Benefit or Disability Living Allowance. A total of 193 (77%) participants had preserved awareness of hypoglycaemia. In this group, 140 (73%) were employed and of these 44 (23%) had either previously undertaken or were currently working shifts. Of this group, 37 (19%) considered that diabetes had influenced their employment prospects adversely. Of the 52 (27%) who were not in employment, 21 (40%) had stopped working because of medical problems and nine of these thought that this was directly related to their diabetes. Two who were unemployed were actively seeking work while 19 (36% of those who were unemployed) were receiving welfare benefits. Between the two groups (preserved awareness and IAH), 40% of the unemployed patients were receiving welfare benefits.

The difference in rates of employment between the IAH group (66%) and the group with preserved awareness (73%) was not statistically significant. Those with IAH had suffered more episodes of SH in the preceding 12 months compared to those with preserved awareness [1.34 (2.5) versus 0.21 (0.87), \( P < 0.01 \)] and more frequently considered that diabetes had adversely affected their ability to work (34 versus 19%, \( P < 0.05 \)). Various reasons for this perception are detailed in Table 4.
The study group was homogenous with respect to the underlying diagnosis of T1DM. Participants with IAH were identified through a validated scoring system [11] that explored the alteration in a patient's usual symptoms of hypoglycaemia over time. The administration of a structured questionnaire generated both quantitative and qualitative data.

A limitation of the study is that some of the responses might have been subject to recall bias. However, the study method adopted could represent a more valid reflection of 'real-life' situations in contrast to experimentally inducing symptoms of hypoglycaemia in a laboratory setting.

In this study, >70% of the randomly selected participants with T1DM were in active employment. Although this is comparable to the employment rate for all people of working age in the UK [25] at the time of the study, the specific range of occupations within the area of Scotland in which most of the participants in this study reside may have a bearing on this. In Edinburgh, the capital city, many jobs are in the service sector, including financial, banking and insurance services, government, education and health professions, while manufacturing industries are not well represented. These service and professional jobs are less demanding of physical fitness and are not in most cases 'safety critical' or hypoglycaemia sensitive to the degree that many forms of industrial employment tend to be [13,26]. This may have made it easier for patients to obtain employment locally, since most were employed in jobs where the occurrence of hypoglycaemia at work was unlikely to pose a significant risk either to themselves or colleagues.

The reasons offered by participants for feeling that having diabetes had an adverse effect on their employability included the need to alter career paths after developing T1DM, restriction of work duties and the delay or obstruction of career progression (Table 4). Those with IAH also reported experiencing significantly more episodes of SH in the preceding 12 months compared with those with normal awareness. Some participants with IAH reported that they were restricted from shift work, although those who were undertaking shift work had not encountered any direct problems as a consequence. Among those who were unemployed, reasons given by subjects included mental health problems, other co-morbid illnesses, the need to act as care providers for dependent relatives and diabetes-related complications.

A previous study from our centre that examined the frequency and severity of hypoglycaemia in the workplace reported a very low prevalence of IAH (3%) in a group of 243 employed people with insulin-treated diabetes [19]. The present study found the prevalence of IAH in a group of unselected adults of employable age with T1DM to be 23.4% that is very similar to surveys of unselected populations of adults with T1DM (20–25%) [20–22]. This disparity between the two studies may be related to a degree of self-selection among those participating in the previous study, which was undertaken prospectively, as well as the fact that 11% of the previous study's participants had insulin-treated Type 2 diabetes. Although the age range of participants in both studies was similar, the mean HbA1c was higher than that recorded in the present study. This could suggest that workers with insulin-treated diabetes may prefer to avoid strict glycaemic control to reduce their risk of developing SH that might adversely influence their employment prospects. The present study suggests that IAH is present in people with

### Table 4. Reasons given for perceiving insulin-treated diabetes as having an adverse effect on employment

<table>
<thead>
<tr>
<th>Themes</th>
<th>Actual responses</th>
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<tbody>
<tr>
<td>Major job changes</td>
<td>‘Unable to drive buses despite holding group 2 licence prior to 1991’</td>
</tr>
<tr>
<td>Restricted duties</td>
<td>‘Development of visual problems affected my ability to continue in my post’</td>
</tr>
<tr>
<td>Perception of managers</td>
<td>‘Longest serving mechanic but unable to be promoted to top spot as unable to drive HGV’</td>
</tr>
<tr>
<td>Effect of DM</td>
<td>‘Previously worked in supervisory role, but now cleans up after everybody else as cannot be left in charge due to concerns about hypoglycaemia’</td>
</tr>
<tr>
<td>Altered career path</td>
<td>‘Had to give up job as forklift driver’</td>
</tr>
<tr>
<td>Concerns about future</td>
<td>‘I feel that the manager believes that I am not as capable as other colleagues’</td>
</tr>
</tbody>
</table>
The results of this study suggest that among a randomly selected cohort of participants of working age with T1DM attending a specialist clinic in secondary care, the employment rate is equivalent to that observed in the non-diabetic population and no significant difference was observed in employment rates between those with preserved and IAH. The percentage of those with IAH in active employment was higher than had been reported in a previous study [19]. Our findings suggest that people with IAH are able to remain as economically active as those with preserved awareness, although this group reported having experienced more episodes of SH in the preceding 12-month period and a significantly higher proportion felt that having diabetes had adversely affected their capacity for employment. This suggests that the presence of IAH and the higher risk of hypoglycaemia that accompanies it may lead to some difficulties in the workplace.

Due to the cross-sectional nature of this study, we cannot imply causality. However, the findings of this study suggest that the presence of IAH should not in itself be viewed as a barrier to employment. The aim should be to facilitate appropriate liaison between occupational physicians, clinical services, the employee and employer with a view to achieving optimal control of the diabetes and concurrent review of risk assessments in the workplace. This will ensure that, at all times, an appropriate balance exists between available opportunities for work and the need to ensure safety in the workplace [17,26].

Key points

- Impairment in the ability of an individual with diabetes to recognize the onset of hypoglycaemia could have potentially serious complications; however, the results of this study show that individuals with this syndrome are able to remain as economically active as people who retain normal awareness.
- Despite comparable employment rates noted in the study, some participants’ self-reported perception was that having diabetes adversely affected both their capacity for and prospects within employment.
- The findings of this study can serve as a point of reference for occupational physicians when providing support and advice to both employers and employees in relation to impaired awareness of hypoglycaemia in people with Type 1 diabetes.

Conflicts of interest

None declared.

References

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