Barriers to Physical Activity Among Patients With Type 1 Diabetes

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OBJECTIVE — To determine, in an adult population with type 1 diabetes, barriers to regular physical activity using a diabetes-specific barriers measure (the Barriers to Physical Activity in Diabetes [type 1] [BAPAD1] scale) and factors associated with these barriers.

RESEARCH DESIGN AND METHODS — One hundred adults with type 1 diabetes answered a questionnaire assessing perceived barriers to physical activity and related factors. A1C was obtained from the medical chart of each individual.

RESULTS — Fear of hypoglycemia was identified as being the strongest barrier to physical activity. Greater knowledge about insulin pharmacokinetics and using appropriate approaches to minimize exercise-induced hypoglycemia were factors associated with fewer perceived barriers. Greater barriers were positively correlated with A1C levels ($r = 0.203$; $P = 0.042$) and negatively with well-being ($r = -0.45$; $P < 0.001$).

CONCLUSIONS — Fear of hypoglycemia is the strongest barrier to regular physical activity in adults with type 1 diabetes, who should therefore be informed and supported in hypoglycemia management.

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Regular physical activity is associated with numerous benefits such as improved quality of life (1) and decreased cardiovascular risk factors (2) and mortality (3). Despite this evidence, >60% of patients with type 1 diabetes remain sedentary (4,5). To our knowledge, there has been only one report that specifically addresses barriers for the practice of physical activity among individuals with type 1 diabetes (6). The authors of this report developed the Barriers to Physical Activity in Diabetes (type1) (BAPAD1) scale, a 12-item self-administered questionnaire (6). The objectives of the present study were to determine the most salient barriers using the BAPAD1 scale and to determine the factors associated with these barriers.

RESEARCH DESIGN AND METHODS

— A 44-item questionnaire was answered by 103 type 1 diabetic patients when attending their regular appointment at the University of Montreal Hospital Center or the Montreal Institute of Clinical Research outpatient clinics. The project was approved by the ethics and research committee at each institution.

The questionnaire included sociodemographic characteristics and diabetes treatment. For the BAPAD1 scale, participants rated 12 barriers to physical activity on a scale from 1 to 7 (whether the item would keep them from engaging in regular physical activity over the next 6 months: 1, extremely unlikely, and 7, extremely likely). In addition, social support for physical activity was assessed by three questions adapted from the questionnaire by Sallis et al. (7); participants indicated on a scale from 1 (never) to 5 (very often) how often family or friends encouraged them to do physical activity, proposed to do physical activity with them, or did physical activity with them. Patients were asked to report the number of hypoglycemic episodes in the previous 2 weeks and the number of severe hypoglycemic episodes in the last year. For management of exercise-induced hypoglycemia, patients were asked what actions they took to prevent such episodes (insulin dose reduction and/or snacks for exercise or at bedtime). Knowledge of insulin pharmacokinetics was assessed by asking patients to state the time of onset and peak action of their insulin prescription (correct/incorrect). The World Health Organization-5 Well-Being Index, a validated scale of five questions developed to assess quality of life, was included in the questionnaire (8). The most recent value (within 3 months) of A1C was obtained from the patient's medical chart. This value was missing for three patients, who were excluded from the study.

Data were analyzed with SPSS software (version 15.0). Pearson's correlations and Student's *t* tests for independent sample were performed to determine the relation between various factors and perceived barriers. Internal consistency reliability (Cronbach's α-coefficient) for the BAPAD1 scale, social support measure, and the World Health Organization-5 Well-Being Index was 0.82, 0.77, and 0.84, respectively.

RESULTS

— The final sample consisted of 100 adults with type 1 diabetes (50% women). Ninety-two percent of the participants were Caucasian. Mean ± SD age was 43.5 ± 11.6 years, duration of diabetes 23.3 ± 13.2 years, and BMI 25.9 ± 4.9 kg/m². Glucose control was suboptimal with a mean A1C of 7.7 ± 1.1% and a mean number of hypoglycemic episodes in the previous 2 weeks of 7.47 ± 7.25; 25% of the participants experienced severe hypoglycemia in the previous year. One-third of the cohort had a low income (≤20,000 USD per year) and/or a low level of education (secondary education or less), while one-fifth reported active smoking.

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Table 1—*Factors associated with barriers to physical activity*

	Association with the mean total BAPAD1 score	
Knowledge of insulin pharmacokinetics	$t = 1.99$	$P = 0.051$
Strategies to prevent exercise-induced hypoglycemia	$r = -0.20$	$P = 0.047$
Perceived social support to engage in physical activity from friends and family	$r = -0.23$	$P = 0.022$
Perceived well-being	$r = -0.45$	$P = 0.000$
Number of severe hypoglycemic episodes in the previous year	$r = 0.17$	$P = 0.087$
Number of mild hypoglycemic episodes in the previous 2 weeks	$r = 0.04$	$P = 0.667$
A1C	$r = 0.20$	$P = 0.042$
Male sex	$t = 1.91$	$P = 0.059$
Age	$r = 0.01$	$P = 0.908$
Active smoking	$t = -3.35$	$P = 0.001$

The mean BAPAD1 total score was 2.51 ± 1.00. The highest barrier scores were fear of hypoglycemia (3.58 ± 2.02), work schedule (3.05 ± 1.98), loss of control over diabetes (2.83 ± 1.80), and low levels of fitness (2.83 ± 1.95). Factors associated with barriers are summarized in Table 1. Perceived well-being, knowledge of insulin pharmacokinetics, implementation of strategies to reduce the probability of exercise-induced hypoglycemia, and greater social support were associated with fewer barriers. Moreover, having someone with whom to perform physical activity was also associated with fewer barriers ($r = -0.36$; $P < 0.001$). Glycemic control, as assessed by A1C, was positively correlated with BAPAD1 total score. The frequency of mild or severe hypoglycemia was not associated with the level of perceived barriers.

As fear of hypoglycemia was the strongest barrier, we investigated factors associated with this specific item of the BAPAD1 scale. The number of severe hypoglycemic episodes in the previous year was significantly associated ($r = 0.26$; $P = 0.009$) with fear of hypoglycemia. The number of strategies used to prevent hypoglycemic episodes related to physical activity was not associated with perceived fear of hypoglycemia, but some subitems, such as eating an evening snack after physical activity to prevent nocturnal hypoglycemia, were associated with less fear of hypoglycemia ($t = 3.00$; $P = 0.007$). Knowledge of insulin pharmacokinetics, demonstrated by only 52% of participants, was also associated with less fear of hypoglycemia ($t = 2.34$; $P = 0.021$).

CONCLUSIONS — The four main barriers to physical activity identified among type 1 diabetic patients attending university hospital outpatient clinics were fear of hypoglycemia, work schedule, loss of control over diabetes, and low fitness level. Factors associated with barriers to physical activity included basic knowledge about insulin pharmacokinetics and implementation of strategies to prevent hypoglycemia. Half of the participants were not knowledgeable about these fundamental elements, suggesting that there is a major gap in information and support required by individuals with type 1 diabetes in this field. Thus, programs intended to increase physical activity in adults with type 1 diabetes should incorporate diabetes-specific actions to prevent hypoglycemia. Furthermore, the striking inverse relationship between social support, a powerful motivator to help initiate and then maintain a physically active lifestyle (9), and perceived barriers suggests that this factor should also be considered in programs to enhance physical activity participation.

Finally, we found that individuals with greater perceived barriers to physical activity had poorer glycemic control as measured by A1C. The association between A1C and barriers suggests that the BAPAD1 scale probably captures general aspects related to type 1 diabetes care. It is possible that patients able to manage barriers for physical exercise are also the ones able to cope with other problems. With regard to limitations, our study design does not allow us to establish the causal direction of the associations found; further research is needed using a prospective controlled design.

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