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RESEARCH ARTICLE

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Contacting dropouts from type 2 diabetes care in public primary health care: description of the patient population

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ABSTRACT

Objective: To characterize dropouts from type-2 diabetes (T2D) care in communal primary health care.

Design: An observational study.

Setting: In a Finnish city, patients with T2D who had not contacted the public primary health care system during the past 12 months were identified with a computer based search and contacted by a trained diabetes nurse.

Subjects: Dropouts from T2D treatment.

Main outcome measures: Demographic factors, laboratory parameters, examinations, medications, and comorbidities.

Results: Of the patients with T2D, 10% ($n = 356$) were dropouts and 60% of them were men. Median HbA_{1c} was 6.5 (QR for 25% and 75%: 6.0, 7.7) %, (45 [42,61] mmol/mol). Of the dropouts, 14% had $HbA_{1c} \geq 9.0\%$ (75 mmol/mol), and these patients were younger than the other dropouts (mean age 54.4 [SD 10.8] years vs. 60.6 [9.4] years, $p < 0.001$). Median low-density lipoprotein (LDL) cholesterol level was 2.8 (QR 2.1, 3.4) mmol/l. Median systolic blood pressure (BP) was 142 (QR 130, 160) mm Hg. Median diastolic BP was 86 (78, 94) mm Hg. Of the dropouts, 83% had comorbidities and 62% were prescribed metformin as a treatment.

Conclusions: Ten percent of T2D patients were dropouts of whom those with a poor glycaemic control were younger than the other dropouts. BP and LDL cholesterol concentrations were non-optimal among the majority of the dropouts. Metformin was prescribed less frequently to the dropouts than is usual for T2D patients. The comorbidities were equally common among the dropouts as among the other T2D patients.

KEY POINTS

Which kinds of patients are dropouts from type-2 diabetes care is not known.

- One-tenth of the patients with T2D were dropouts and they generally had good glycaemic control.
- Blood pressure and LDL cholesterol concentrations were non-optimal among the majority of the dropouts.
- Fourteen percent of these dropouts had $HbA_{1c} > 9\%$ (75 mmol/mol) and they were more often younger than the other dropouts.

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Characteristics; comorbidities; dropout; Finland; general practice; type 2 diabetes

Introduction

In Finland, primary health care is mainly funded through taxation, while public health care is a non-profit system. Consequently, most patients with type-2 diabetes (T2D) are treated within the public health care system by their general practitioners (GPs). For the public health care system, treating T2D and especially diabetic complications is expensive.[1,2] As a complementary profit-driven system, there is a private health care system, which is, however, rather expensive to use for private persons. Private patients with T2D using private health care are in a minority and they cover the expenses by private money or by insurances. As an exception to this rule, there are those patients whose occupational health is organized via the private sector. In these cases, the employers are responsible for the costs.

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It is a well-known fact that some of the diabetic patients do not attend their regular controls. Underlying reasons for withdrawing from diabetes health care are numerous including working status, distance to the clinic, and type of diabetes management.[3–5] However, data and information on explanatory factors are inconsistent.[4] In previous studies, the dropout rates vary widely from one percent to 57%.[4,5] Unfortunately, these estimates of dropout rates come, with two exceptions, from different intervention studies and this variation is mainly explained by factors like different study populations, interventions, sample size, and study design.[4] A German study concerning both primary and secondary care T2D patients describes a dropout rate of 5.5% during two years of follow-up from normal clinical treatment, for example, a local T2D disease management program.[5] In a purely primary care-driven treatment system, the dropout rate was 6.3%, but it varied between 2.8% and 10.8% depending on the ethnic origin of the T2D patients.[6] Neither of these studies gives a lot of information about factors concerning demographics, laboratory parameters, examinations, medication, and comorbidities of these patients. Furthermore, knowledge of what kind of individuals compose this group of dropouts is vague and does not provide a comprehensive picture. As far as we know, there are no studies where such factors as quality of treatment, demographic factors or medications are systemically described.

Theoretically, these dropouts should be brought back to the health care system in order to prevent diabetic complications and to improve diabetes care. To get these dropouts back into health care, they should first be identified and brought back within the system. Whether re-contacting and recruiting would be worthwhile is unknown.

In the City of Vantaa, Finland, the public health authorities started an intervention to reach the dropouts with T2D in the public primary health care. The aim of this study was to characterize these dropouts. Here, we present the demographic data and characteristics of the dropout patients with T2D.

Research design and methods

Setting

This retrospective observational cohort study was performed in the public primary health care of the eastern districts of the City of Vantaa. At the time of the study, Vantaa had a population of 195,397 inhabitants, and in the eastern districts, there were 118,802 inhabitants. Of the inhabitants, 49% were males.

Data extraction

In the eastern districts of Vantaa, we identified all patients aged 18–80 years who had an ICD-10 code containing an E11 code in the patient charts or who were prescribed specific hyperglycaemic drugs for T2D from 1 January 2005 to 31 December 2009. A computer-based search was made from Finstar (Logica, Helsinki, Finland) patient chart system with a specific report generator.

Patients who fulfilled the described T2D criteria but had not contacted the public health care system during the past 12 months (year 2009) were entered into the data base. To detect whether these patients were true dropouts or whether they were receiving alternative treatment (e.g., having the treatment arranged in another system, private, or secondary care), the nurses of the public health care system contacted them by phone. A trained diabetes nurse contacted all these putative dropouts in order to improve their diabetes treatment and to bring them back within the public primary diabetes care system.

The investigators "*per se*" did not contact the dropouts. We recorded the effects of the work performed by the community primary health care nurses and GPs. Ethical permission for the study was granted by the Ethical committee of the Hospital District of Helsinki and Uusimaa and health authority of the Vantaa City.

Primary and secondary outcomes

We recorded the dropouts' gender, marital status, immigration status, and occupation from the patient charts. The dropouts were grouped into social classes according to a classification originally described by Statistics Finland (http://www.stat.fi/meta/luokitukset/ammatti/001-2010/index.html). We also recorded dropouts' height, weight, duration of diabetes, HbA_{1c}, blood pressure (BP), blood lipids (cholesterol, low-density lipoprotein [LDL] cholesterol, high-density lipoprotein [HDL] cholesterol, triglycerides), haemoglobin, alanine transaminase, creatinine, prevalence of proteinuria and retinopathy, and described use of hyperglycaemic drugs from patient charts. Recorded comorbidities with International Classification of Diseases 10 (ICD-10) diagnoses were collected and reported in main diagnostic groups.

The dropouts were divided into three groups based on their HbA_{1c} ($<7.0\%$ [53 mmol/mol] 7.0% [53 mmol/mol] to 9.0% [75 mmol/mol], and $>9.0\%$

[75 mmol/mol]) for further assessments of the level of diabetes care. A similar division was previously used in a Finnish nationwide report on the quality of diabetes care.[7,8] The dropouts were assessed to have proteinuria, if the level of albuminuria was 20 μg/min or more. Some patient charts had insufficient data, and therefore, we do not have complete data on all parameters studied.

Statistics

Data were expressed as means and standard deviations (SD) or medians and quartile ranges (QR for 25% and 75%) depending on the test used. Comparisons of frequencies were performed with χ^2 test. Comparisons between the sexes were performed by using Student's *t*-test or Mann–Whitney *U*-test when appropriate. Two-way analysis of variance (ANOVA) was used to analyse the effects of the quality of the diabetes care as determined by the studied parameters. Statistical analyses were carried out using SigmaPlot 10.0 (Systat Software INC, San Jose, CA).

Results

Demographics

In the eastern districts of Vantaa, 3459 people fulfilled the criteria of having T2D. Of those, 10% ($n = 356$) were dropouts from the public primary health care. Of the contacted dropouts, 83% came to the laboratory tests prescribed by a trained diabetes nurse. The rest did not come because they were unwilling to participate, had their diabetes care arranged elsewhere in the private sector, or did not respond to any contact efforts. The majority of the dropouts (60%) were men. Table 1 shows the demographics of the dropouts. Most (91%) of the dropouts were cohabiting. Living alone was more frequent among women than among men ($p < 0.05$). Men were more frequently highly educated (management and professionals) or blue collar workers, and women white collar workers. Only three of the dropouts were characterized as immigrants.

Mean age of the dropouts was 59.4 (9.9) years and no statistically significant differences were observed between men and women. Mean duration of T2D was 6.3 (4.6) years. Table 2 shows the characteristics of the dropouts. Women were statistically significantly more obese than men ($p < 0.01$).

Laboratory parameters and examinations

Table 3 shows the results of the laboratory tests, examinations of the eye fundus and BP among the dropouts. Median HbA_{1c} was 6.5 (QR 6.0, 7.7) %, for example, 48 (QR 42, 61) mmol/mol. Median LDL cholesterol was 2.8 (QR 2.1, 3.4) mmol/l; women had a higher concentration than men ($p < 0.01$). Mean systolic BP was 147 (23) mmHg and median was 142 (QR 130, 160) mmHg. Mean diastolic BP was 87 (12) mmHg and median was 86 (78, 94) mmHg. No BP differences were observed between men and women. Men had proteinuria more often than women (24% vs. 12%, $p < 0.05$). There was no statistically significant difference in the prevalence of retinopathy between men and women.

Medications

Table 4 shows hyperglycaemic drugs prescribed to the dropouts. Of the dropouts, 62% were prescribed metformin as a treatment for T2D and the mean daily

Table 2. Characteristics of the dropouts.

	Males (214)		Females (142)	
	mean	SD	mean	SD
Age, y	59.8	9.1	58.8	10.9
Weight, kg	96.6	20.5	87.6***	20.1
Height, cm	175.9	6.3	162.1***	6.7
Body mass index, kg/m^2	30.8	6.4	33.2**	7.1
Duration of diabetes, y	6.6	4.9	5.9	4.1

males versus females
**$p < 0.01$,
***$p < 0.001$, *t*-test

Table 1. Demographic data of the dropouts ($N = 356$).

	Males, *n* (%)	Females, *n* (%)
Sex	214 (60.1%)	142 (39.9%)
Married and cohabiting	116 (94.3%)	64 (84.2%)
Single, widows and divorced	7 (5.6%)	12 (15.8%)
Social group (according to Finnish Statistics, based on occupation)		
class 1 highly educated (management and professionals)	28 (13.1%)	6 (4.2%)**
class 2 white collar workers (experts, office workers and clerks)	58 (27.1%)	62 (43.7%)***
class 3 blue collar workers (service, sales, construction, repair, manufacturing, process and transport workers)	82 (38.3%)	35 (24.6%)**
class 4 others[a]	46 (21.5%)	39 (27.5%)

**$p \leq 0.01$,
***$p < 0.001$, χ^2 test
[a]31 persons (10.7%) were retired, but we found former occupations of 13 of these persons. These persons are placed into the social group respecting their former occupation.

Table 3. Findings of the laboratory tests, examinations of the eye fundus, and blood pressure among the dropouts.

	Males (214)	Females (142)
HbA1c, % (mmol/mol)	6.3 (5.7, 7.4) (48 [42, 59])	6,3 (5.8, 7.4) (46 [41, 63])
Cholesterol, mmol/l	4.7 (3.9, 5.4)	5.0** (4.1, 5.9)
LDL Cholesterol, mmol/l	2.7 (2.0, 3.3)	3.0** (2.3, 3.7)
HDL Cholesterol, mmol/l	1.2 (1, 1.4)	1,3** (1.1, 1.5)
Triglycerides, mmol/l	1.6 (1.1, 2.3)	1.7 (1.3, 2.3)
Haemoglobin, g/l	148.0 (139.0, 156.0)	141.0*** (131.3, 149.0)
Alanine transaminase, U/l	32.0 (20.3, 49.6)	29.0 (18.0, 46.0)
Creatinine, µmol/l	74 (64, 85)	59*** (50, 66)
Systolic blood pressure (mm Hg)[a]	145.1 (20.8)	147.1 (24.5)
Diastolic blood pressure (mm Hg)[a]	86.3 (11.5)	86.8 (12.3)
Retinopathy[b]	27.0 (34)	28.4 (21)

Results are presented as median (QR for 25% and 75%) unless otherwise stated as
[a]mean (SD),
[b]% (*n*)
Males versus females
**$p < 0.01$,
***$p < 0.001$, Mann–Whitney *U*-test

Table 4. Prescriptions of hyperglycaemia drugs among the dropouts.

	Males ($n = 214$)	Females ($n = 142$)
Metformin, % (*n*)	62.6 (134)	62.0 (88)
Detemir or glargine insulins, % (*n*)	7.5 (16)	4.9 (47)
NPH-insulins, % (*n*)	4.7 (10)	5.6 (8)
Mixed insulins (rapid and slow acting), % (*n*)	0.5 (1)	0
Rapid insulins, % (*n*)	1.9 (4)	2.8 (4)
Glitazones, % (*n*)	9.8 (21)	2.1 (3)**
DPP4-inhibitors, % (*n*)	2.8 (6)	2.1 (3)
Sulphonylureas or glinides, % (*n*)	20.1 (43)	15.5 (22)

Males versus females
**$p < 0.01$, χ^2 test.
DPP4: dipeptidyl peptidase 4.

dose was 1986 (839) milligrams. Insulin was prescribed to 12% of dropouts. Mean daily doses for long-acting insulin analogues were 71 (56) international units (IU), for NPH-insulins 93 (141) IU and for rapid-acting insulins 38 (29) IU. Glitazones were prescribed more often to men than to women.

Comorbidities

A majority of the dropouts (83%) had comorbidities. The number of comorbidities varied greatly: 17% had none, 24% one, 22% two, and 37% had three or more. Women had more comorbidities (2.5 [2.0]) than men (2.0 [1.7], $p < 0.05$). The most common comorbidities were cardiovascular disease (67%), primarily hypertension. Other endocrinopathies than diabetes (39%), primarily dyslipidaemia, were also common. The prevalence of comorbidities among the dropouts is presented in Figure 1.

Quality of T2D treatment

Figure 2 shows the distribution of dropouts in different HbA_{1c} groups. Of the dropouts, 14% had $HbA_{1c} \geq 9.0\%$

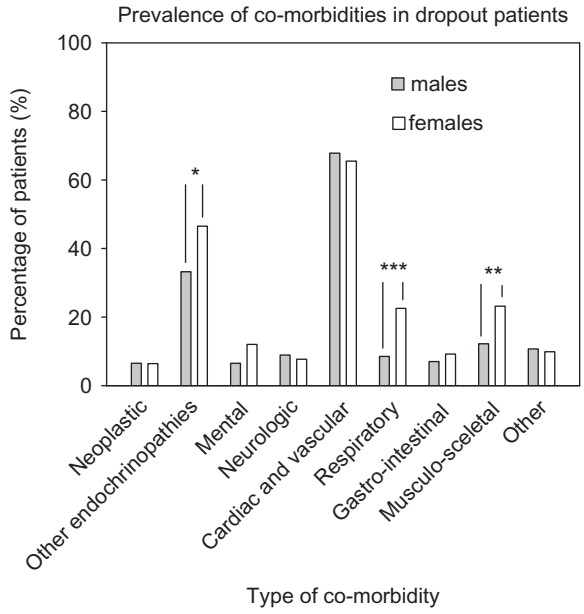

Figure 1. Prevalence of comorbidities among dropouts with T2D. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$, χ^2 test.

(75 mmol/mol); they were younger than the other dropouts (mean age 54.4 [10.8] years vs. 60.6 [9.4] years, $p < 0.001$) and they were more often prescribed insulin than the other dropouts (33% vs. 10%, $p < 0.001$), but no differences were observed in sex, duration of diabetes, BMI, number of comorbidities or social class.

Discussion

Among public primary health care patients with T2D, about 10% were dropouts and the majority of them were men. The glycaemic control among dropouts reflected well the general level of glycaemic control among T2D patients (median 6.7% [50 mmol/mol]) in Finland at the time of the study quite closely.[8]

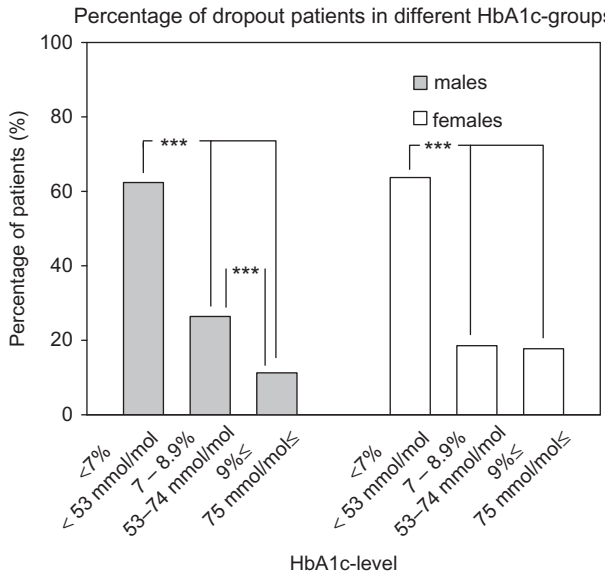

Figure 2. Distribution of dropouts in different HbA1c –groups. ***$p < 0.001$, χ^2 test.

However, levels of diastolic BP and LDL cholesterol were on average higher than among Finnish patients with T2D. At the time of the study median, BP level was 142/81 mmHg and median LDL cholesterol level 2.4 mmol/l in Finnish T2D.[8] Metformin was prescribed to over 60% of the dropouts.

According to our study findings, the dropout rate among public primary health care patients with T2D was 10%, which was almost twice as high as in a previous community-based study from Germany [5] and 60% higher than the mean dropout rate reported from New Zealand.[6] Furthermore, 17% of the dropouts did not return to the communal diabetes care system after the contact of a trained diabetes nurse. We found that a majority of dropouts were men, which is in line with most previous observations.[5,9] Our study findings showed that over 60% of dropouts had well-controlled glucose levels, being similar to the general level of glycaemic control in Finnish patients with T2D at the time of the study.[8] On the other hand, almost 15% of dropouts had poor glycaemic control, which is more than commonly observed among Finnish patients with T2D.[7,8] The dropouts with poorly controlled glycaemia were significantly younger than the other dropouts. Insulin was prescribed to these dropouts three times as often as to the other dropouts. Furthermore, according to our study findings, the public primary care dropouts, both men and women, had non-optimal levels of diastolic BP and LDL cholesterol. Previous study findings in relation to HbA_{1c}, BP, and lipids are partially inconsistent, which may be explained by different study designs.[4,5,9] Yet, presently observed sex differences, for example, higher total,[10] LDL- [10–13] and HDL cholesterol [10] concentrations, and BMI [11,12] in women, and higher incidence of proteinuria in men,[14] have been reported in different non-dropout T2D patient populations by others as well.

Metformin was prescribed to over 60% of the dropouts in the present study, being the most commonly used hyperglycaemic drug among them. Current guidelines for diabetes recommend metformin as first-line therapy unless contraindicated.[2] Generally, in Finland, at the time of the study, metformin was prescribed to almost 90% of the patients with T2D.[15] Insulin was prescribed to about 12% of the dropouts, which is about half of the general rate of insulin prescriptions among Finnish patients with T2D at the time of the study.[10] In the year 2009, incretin-based drugs were rarely used in Finland. Previous study findings in relation to the correlation between a dropout with a T2D diagnosis and the type of diabetes medication being used are inconsistent.[4,5]

According to our study findings, most of the T2D dropouts in the public primary health care had some comorbidities. Typically, patients with T2D have comorbidities and it has been shown that half of the patients have three or more chronic comorbidities.[16] In our study, the most common comorbidities among the dropouts were hypertension and dyslipidaemia. Findings in previous studies have shown that about 75% of the patients with T2D have hypertension and/or dyslipidaemia.[16–18] The previous studies concerning diabetic dropouts have reported inconsistent results in relation to comorbidities.[4]

Because diabetes is one of the most important diseases globally increasing the risk for disability,[19] it is important for primary health care to find and identify T2D dropouts and to try to optimize the treatment. At present, the guidelines for T2D treatment emphasize a holistic care and individually tailored treatment targets for the patient with the disease.[2] With an optimal treatment strategy, including treatment of glycaemia, BP, lipids, and lifestyle factors, it is possible to reduce the risk of both micro- and macrovascular complications.[20]

There are some limitations to our study. Unfortunately, we did not have data on dropouts' lifestyle factors, including sedentary behaviour or physical activity, dietary or sleeping patterns, and smoking and alcohol consumption. Further, we did not have information on the underlying reasons for withdrawing from diabetes care. Data on other medication than diabetes medication were not available. All study participants except three were of European ancestry. We did not have a possibility to form a control group of non-dropouts in the present study. Above all, those

dropouts who should have had their T2D treatment in the private sector or in occupational health care setting were missing. Furthermore, if a T2D dropout was originally diagnosed and totally treated outside the public health care system, for example, he received no diabetes care from health centres, we would have no information on this kind of person. Therefore, the present data do not reflect all primary care T2D dropouts. These factors may have an influence on the results and this should be kept in mind when interpreting the study findings.

Conclusions

Overall, we report a dropout rate of 10% among T2D patients and the majority of them were men. Most of the dropouts in the public primary health care had a good glycaemic control but 14% had HbA_{1c} level $\geq$9.0% (75 mmol/mol). The poorly controlled dropouts were typically younger than the other dropouts. The levels of BP and LDL cholesterol were non-optimal among the majority of the dropouts. Only 60% of the dropouts were prescribed metformin. The comorbidities were common and similar to those typically seen in T2D patients.

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Ethical approval

Ethical permission for the study was granted by the Ethical committee of the Hospital District of Helsinki and Uusimaa and health authority of the Vantaa City.

Disclosure statement

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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