DIABETES AND EATING DISORDERS
-prevalence, psychological correlates, and metabolic control

Line Wisting (PhD)
Regional Department for Eating Disorders
Oslo University Hospital
Norway
Agenda

- Background type 1 diabetes (T1D) and eating disorders (ED)
- Diabetes psychology
- Research at Oslo University Hospital
  - Adolescents
  - Adults
- Treatment of T1D and ED at Oslo University Hospital
- Conclusions
Acknowledgements

- Professor Øyvind Rø (MD, PhD)
- Dr. Torild Skrivarhaug (MD, PhD)
- Professor Knut Dahl-Jørgensen (MD, PhD)
Conflict of interest

We declare no conflict of interest
Norway

5.2 million inhabitants
Capital: Oslo
Eating Disorders (ED)

- DSM-5 (1)
  i. Anorexia Nervosa
  ii. Bulimia Nervosa
  iii. Binge Eating Disorder
  iv. Other Specified Feeding and Eating Disorder (OSFED)
- Disturbed Eating Behavior

1- American Psychiatric Association (2013)
Anorexia Nervosa (AN)

- Restrictive food intake
- Low body weight
- Intense fear of weight gain or becoming fat
- Compulsive exercise
- Distorted body image
- Over evaluation of weight and shape
- Two sub types
  - i. Restrictive
  - ii. Binge/purge
- Lifetime prevalence 0.8%

1- American Psychiatric Association (2013); 2- Stice et al (2013)
Bulimia Nervosa (BN)

- Recurrent episodes of binge eating (loss of control), with subsequent compensatory behavior
- Normal body weight for age and gender
- Over evaluation of weight and shape
- Distorted body image
- Lifetime prevalence 2.6%
Binge Eating Disorder (BED)

- Recurrent episodes of binge eating (loss of control), without subsequent compensatory behaviors
- Overweight and obesity
- Lifetime prevalence 3%

1- American Psychiatric Association (2013); 2- Stice et al (2013)
Subthreshold ED

- OSFED
- Disturbed Eating Behavior (DEB)
- Chaotic eating pattern
- Restrictive eating
- Binge eating
- Compensatory behaviors
  - T1D-specific: insulin omission
- Do not qualify for at formal ED diagnosis
- Significant somatic and psychological consequences
- Prevalence 10-25%

BACKGROUND
Type 1 Diabetes (T1D)

- Chronic condition characterized by lack of insulin
- Elevated blood glucose levels
- Onset usually during child- and adolescence
- Uncertain etiology
- Norway and other Nordic countries have the highest incidence worldwide

- Treatment: insulin
- Treatment aims
  - HbA1c
    - Children and adolescents < 7.5% (2)
    - Adults: <7% (3,4)
  - Good quality of life

1- Norwegian Diabetes Childhood Registry; 2- ISPAD guidelines T1D; 3- ADA; 4- The Norwegian directory of Health guidelines
T1D-specific risk factors

- Weight loss associated with T1D onset
- Weight gain T1D diagnosis and initiation of insulin treatment
- T1D in ages 7-18 years in girls \(^{(1)}\)
- Appearance based low self esteem, depression, BMI \(^{(2)}\)
- Girls with T1D on average 7 kg heavier \(^{(3)}\)
- Focus on diet
- Insulin omission (30-40%) \(^{(4, 5, 6)}\)

1- Takii et al. (2011); 2- Olmsted et al. (2008); 3- Engstrøm et al. (1999); 4- Peveler et al. (2005); 5- Goebel-Fabbri et al. (2011); 6- Wisting et al. (2013)
Prevalence

- Prevalence of ED/DEB in T1D varies between 10-60% across studies
- Meta-analyses report 2-3 fold prevalence of ED in T1D compared to healthy controls (1-3)
- Prevalence of DEB reported in up to 60% of young females with T1D (4)
- Prevalence in Norway unclear (5,6)
T1D & ED

Bulimia Nervosa
Insulin omission
EDNOS / OSFED
DEB

No increased prevalence of AN in T1D (1-3)

1- Nielsen (2002); 2- Mannucci et al. (2005); 3- Young et al. (2012)
Poor prognosis

- DEB persistent and worsen over time in T1D (1)
- Poor metabolic control (1)
- Advanced onset of serious somatic complications (2-4)
- Increased mortality rates (2-4)

1- Colton et al. (2015); 2- Young et al. (2012); 3- Mannucci et al. (2005); Nielsen (2002)
Mortality

Mortality 10-year follow-up (1)

- AN: 6.5%
- T1D: 2.5%
- AN + T1D: 34.6%

Insulin omission

30% increased mortality associated with insulin omission at 11-year follow-up (2)

1- Nielsen et al. (2002); 2- Goebel-Fabbri et al. (2011)
Prevention and treatment
T1D psychology

- What should treatment be focused on?
- T1D treatment is largely focused on somatic aspects
- Body and mind by many viewed as two separate things
- Health psychology
T1D psychology

- Psychological aspects of T1D
- «Psychopathology» versus «normal psychology»

↓

- Depression
- Anxiety
- Eating Disorders

↓

- Coping
- Illness perceptions
- Insulin beliefs
Adolescents

PhD study funded by the Research Council of Norway

Collaboration with the Norwegian Childhood Diabetes Registry
The Norwegian Childhood Diabetes Registry

- Quality register including all 27 pediatric outpatient clinics in Norway
- Annual somatic assessment
- > 98% of the Norwegian T1D population < 18 years
- A psychological questionnaire package added in 2011, including a new diabetes-specific screening measure for disturbed eating
  - The Diabetes Eating Problem Survey – Revised (DEPS-R)
Psychometric Properties, Norms, and Factor Structure of the Diabetes Eating Problem Survey–Revised in a Large Sample of Children and Adolescents With Type 1 Diabetes

Line Wisting, MA, Dag Helge Froisland, MD, Torild SkrivHarhaug, PhD, Knut Dahl-Jørgensen, MD, PhD, Øyvind Rø, PhD

OBJECTIVE—The purpose of this study was to examine the psychometric properties of the Diabetes Eating Problem Survey–Revised (DEPS-R) in a large sample of young patients with type 1 diabetes, to establish norms, and to validate it against the Eating Attitudes Test–12 (EAT-12).

RESEARCH DESIGN AND METHODS—A total of 770 children and adolescents aged 11–19 years with type 1 diabetes completed the DEPS-R and the EAT-12. In addition, age- and sex-standardized BMI and Hba1c data were obtained from the Norwegian Childhood Diabetes Registry. In addition to tests of validity, principal axis factoring was conducted to investigate the factor structure of the 16-item DEPS-R.

RESULTS—The DEPS-R demonstrated satisfactory Cronbach α (0.89) and was significantly correlated with the EAT-12 (0.65; P < 0.01), indicating convergent validity. The mean (SD) DEPS-R scores were 11.0 (10.7) for the total sample and 7.7 (7.4) and 14.2 (2.4) for males and females, respectively.

CONCLUSIONS—This study replicates and extends previous research demonstrating the psychometric properties of the abbreviated 16-item DEPS-R. Findings support the utility of this important screening tool to identify disturbed eating in young patients with type 1 diabetes.

Diabetes Care 36:2198–2202, 2013
### DIABETES EATING PROBLEM SURVEY – REVISED (DEPS-R)

Living with diabetes can sometimes be difficult, particularly regarding eating and diabetes management. Listed below are a variety of attitudes and behaviors regarding diabetes management. For each statement, choose the ONE answer that indicates how often this is true for you during the PAST MONTH.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Usually</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Losing weight is an important goal to me.</td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2. I skip meals and/or snacks.</td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3. Other people have told me that my eating is out of control.</td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4. After I overeat, I don’t take enough insulin to cover the food.</td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5. I eat more when I am alone than when I am with others.</td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6. I feel that it’s difficult to lose weight and control my diabetes at the same time.</td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7. I avoid checking my blood sugar when I feel like it is out of range.</td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8. I make myself vomit.</td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9. I try to keep my blood sugar high so that I will lose weight.</td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10. I try to eat to the point of spilling ketones in my urine.</td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11. I feel fat when I take all of my insulin.</td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12. Other people tell me to take better care of my diabetes.</td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13. After I overeat, I skip my next insulin dose.</td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14. I feel that my eating is out of control.</td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15. I alternate between eating very little and eating huge amounts.</td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16. I would rather be thin than have good control of my diabetes.</td>
<td></td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
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</table>
Methods

- 770 adolescent males and females with T1D aged 11-19 years (380 males, 390 females)
- T1D clinical diabetes data from the Norwegian Childhood Diabetes Registry
Results

The psychometric properties of the DEPS-R are good, and the questionnaire can be recommended for clinical use.
Disturbed Eating Behavior and Omission of Insulin in Adolescents Receiving Intensified Insulin Treatment

A nationwide population-based study

OBJECTIVE—To establish the prevalence of disturbed eating behavior (DEB) and insulin omission among adolescents with type 1 diabetes using intensive insulin treatment in a nationwide population-based study.

RESEARCH DESIGN AND METHODS—The Diabetes Eating Problem Survey–Revised (DEPS-R) is a diabetes-specific screening tool for DEB. Clinical data and HbA1c were obtained from the Norwegian Childhood Diabetes Registry.

RESULTS—A total of 770 children and adolescents 11–19 years of age with type 1 diabetes completed the DEPS-R. A total of 27.7% of the females and 8.6% of the males scored above the DEPS-R cutoff. Participants scoring above the cutoff had significantly higher HbA1c (9.2% [77 mmol/mol]; SD, 1.6) than participants scoring below the cutoff (8.4% [68 mmol/mol]; SD, 1.3; P < 0.001). The prevalence of DEB increased significantly with age and weight, from 7.2% in the underweight group to 32.7% in the obese group, and from 8.1% in the youngest age-group (11–13 years) to 38.1% in the oldest age-group (17–19 years). A total of 31.6% of the participants reported insulin restriction and 6.9% reported insulin omission after overeating. Patients reporting insulin restriction had significantly higher HbA1c (9.0% [75 mmol/mol]; SD, 1.7) than non-restrictors (8.3% [67 mmol/mol]; SD, 1.2; P < 0.001).

Although different terminology complicates the interpretation of prevalence rates across studies, the findings are sufficiently robust to indicate that there is a higher prevalence of DEB in type 1 diabetes compared with healthy controls. A meta-analysis reported a three-fold increase of bulimia nervosa, a two-fold increase of eating disorders not otherwise specified, and a two-fold increase of subclinical eating disorders in patients with type 1 diabetes compared with controls (2). No elevated rates of anorexia nervosa were found. DEBs have been found to be associated with higher weight and older adolescence (5,6). Although most studies focus on females, some research suggests that males with type 1 diabetes also may have an increased risk of development of DEB (7). However, the bulk of research investigating the prevalence of DEB in males with type 1 diabetes remains scarce.
Research Question

i. What is the prevalence of DEB and frequency of insulin omission in adolescents with T1D in a nationwide, population-based sample?

ii. Are DEB and insulin omission associated with poorer metabolic control?
### Results (prevalence DEB)

<table>
<thead>
<tr>
<th></th>
<th>All</th>
<th>Males</th>
<th>Females</th>
<th>Chi-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole sample</td>
<td>18.3%</td>
<td>8.6%</td>
<td>27.7%</td>
<td>&lt; .001</td>
</tr>
<tr>
<td>11-13 years</td>
<td>7.2%</td>
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<td>9.4%</td>
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<td>14-16 years</td>
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<td>Underweight</td>
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<td>Normal weight</td>
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<td>53.3%</td>
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</tr>
</tbody>
</table>
Results (insulin omission)

31.6% of participants reduce their insulin dose, sometimes or more often after over eating

6.9% of participants omit their insulin dose, sometimes or more often after over eating
## Results (metabolic control)

<table>
<thead>
<tr>
<th></th>
<th>DEB +</th>
<th>DEB -</th>
<th>Sig.</th>
<th>Insulin omission +</th>
<th>Insulin omission -</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>HbA1c</td>
<td>9.2 (1.6)</td>
<td>8.4 (1.3)</td>
<td>&lt; .001</td>
<td>9.0 (1.7)</td>
<td>8.3 (1.2)</td>
<td>&lt; .001</td>
</tr>
</tbody>
</table>

**Note**: mean (SD)
## Results (metabolic control)

<table>
<thead>
<tr>
<th></th>
<th>DEB +</th>
<th>DEB -</th>
<th>Sig.</th>
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</tr>
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</table>

**Note:** mean (SD)
Research Article

Metabolic Control and Illness Perceptions in Adolescents with Type 1 Diabetes

Line Wisting, Lasse Bang, Henrik Natvig, Torild Skrivarhaug, Knut Dahl-Jørgensen, Bryan Lask, and Øyvind Ro

1 Regional Department for Eating Disorders, Division of Mental Health and Addiction, Oslo University Hospital, P.O. Box 4956, Nydalen, 0424 Oslo, Norway
2 Department of Psychology, University of Oslo, Forskningsveien 3A, 0373 Oslo, Norway
3 The Norwegian Childhood Diabetes Registry, Department of Pediatric Medicine, Oslo University Hospital, P.O. Box 4956, Nydalen, 0424 Oslo, Norway
4 Department of Pediatric Medicine, Oslo University Hospital, P.O. Box 4956, Nydalen, 0424 Oslo, Norway
5 Faculty of Medicine, University of Oslo, P.O. Box 1078, Blindern, 0316 Oslo, Norway
Research Question

Is ED psychopathology associated with psychological correlates and metabolic control?
Methods

A subset of 105 adolescent males and females with T1D aged 12-20 years (44 males, 61 females)
## Measures

<table>
<thead>
<tr>
<th>Domain</th>
<th>Measure</th>
<th>Short</th>
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<tr>
<td>Disturbed eating</td>
<td>Child Eating Disorder Examination</td>
<td>ChEDE</td>
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<tr>
<td>Coping strategies</td>
<td>Adolescent Coping Orientation for Adolescents</td>
<td>ACOPE</td>
</tr>
<tr>
<td>Illness perceptions</td>
<td>Brief Illness Perception Questionnaire</td>
<td>BIPQ</td>
</tr>
<tr>
<td>Insulin beliefs</td>
<td>Beliefs about Medicines Questionnaire</td>
<td>BMQ</td>
</tr>
<tr>
<td>Metabolic control</td>
<td>Hemoglobin A1c</td>
<td>HbA1c</td>
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<td>T1D clinical variables</td>
<td>Clinical assessment</td>
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</table>
## Results (associations HbA1c)

<table>
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<th></th>
<th>All</th>
<th>Males</th>
<th>Females</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BIPQ consequences</td>
<td>.277**</td>
<td>ns</td>
<td>.355**</td>
<td></td>
</tr>
<tr>
<td>BIPQ personal control</td>
<td>.365**</td>
<td>ns</td>
<td>.484**</td>
<td></td>
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<tr>
<td>BIPQ coherence</td>
<td>.155</td>
<td>ns</td>
<td>.328**</td>
<td></td>
</tr>
<tr>
<td>BIPQ concern</td>
<td>.198*</td>
<td>ns</td>
<td>.340**</td>
<td></td>
</tr>
<tr>
<td>Eating restraint</td>
<td>.265**</td>
<td>ns</td>
<td>.287*</td>
<td></td>
</tr>
<tr>
<td>COPE emotion-focused</td>
<td>-.163</td>
<td>ns</td>
<td>-.260*</td>
<td></td>
</tr>
</tbody>
</table>

BIPQ = Brief Illness Perception Questionnaire; ChEDE = Child Eating Disorder Examination; ACOPE = Adolescent Coping Orientation for Problem Experiences
## Results (associations HbA1c)

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</tr>
<tr>
<td>COPE emotion-focused</td>
<td>-0.163</td>
<td>ns</td>
<td>-0.260*</td>
</tr>
</tbody>
</table>

BIPQ = Brief Illness Perception Questionnaire; ChEDE = Child Eating Disorder Examination; ACOPE = Adolescent Coping Orientation for Problem Experiences
Results (associations HbA1c)

- Included the significant correlations among the girls in a regression analysis
- The whole model explained 30% of the variance in HbA1c
- Personal control (illness perception) alone explained 23% of the variance in HbA1c
Adults

Postdoctoral study funded by the Norwegian South-East Regional Health Authority
Methods

- Norwegian Diabetes Centre
- N= 282 males and females with T1D (60% females)
- Age 18-79 years
- Self-report questionnaire package
# Participants

<table>
<thead>
<tr>
<th></th>
<th>All N= 282</th>
<th>Males N= 112 (40%)</th>
<th>Females N= 170 (60%)</th>
<th>Sig.level</th>
<th>Effect size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>42.11 (15.19)</td>
<td>44.57 (15.92)</td>
<td>40.47 (14.49)</td>
<td>.05</td>
<td>.27</td>
</tr>
<tr>
<td>Age T1D onset</td>
<td>15.14 (11.18)</td>
<td>15.43 (10.92)</td>
<td>14.94 (11.38)</td>
<td>ns</td>
<td>---</td>
</tr>
<tr>
<td>HbA1c %</td>
<td>7.75 (.91)</td>
<td>7.61 (.89)</td>
<td>7.85 (.91)</td>
<td>ns</td>
<td>---</td>
</tr>
<tr>
<td>T1D duration (yrs)</td>
<td>27.09 (14.44)</td>
<td>29.14 (14.82)</td>
<td>25.71 (14.05)</td>
<td>ns</td>
<td>---</td>
</tr>
<tr>
<td>BMI</td>
<td>25.96 (4.13)</td>
<td>26.47 (3.82)</td>
<td>25.63 (4.30)</td>
<td>ns</td>
<td>---</td>
</tr>
<tr>
<td>Insulin admin</td>
<td>56.3% pen 43.3% pump</td>
<td>60.9% pen 38.0% pump</td>
<td>53.4% pen 46.6% pump</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Data: mean (standard deviation). Significance level (p< .001, .01 og .05). Effect size (Cohen’s d) calculated for significant differences; ns= non-sign.
## Measures

<table>
<thead>
<tr>
<th>Domain</th>
<th>Measure</th>
<th>Short</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disturbed eating</td>
<td>Diabetes Eating Problem Survey – Revised</td>
<td>DEPS-R</td>
</tr>
<tr>
<td>Anxiety and depression</td>
<td>The Hospital Anxiety and Depression Scale</td>
<td>HAD</td>
</tr>
<tr>
<td>Coping strategies</td>
<td>Coping Orientation for Problem Experience</td>
<td>COPE</td>
</tr>
<tr>
<td>Illness perceptions</td>
<td>Brief Illness Perception Questionnaire</td>
<td>BIPQ</td>
</tr>
<tr>
<td>Insulin beliefs</td>
<td>Beliefs about Medicines Questionnaire</td>
<td>BMQ</td>
</tr>
<tr>
<td>T1D clinical variables</td>
<td>Norwegian Quality Register for adults</td>
<td>NOKLUS</td>
</tr>
</tbody>
</table>
Prevalence of disturbed eating behavior and associated symptoms of anxiety and depression among adult males and females with type 1 diabetes

Line Wisting\textsuperscript{1,2*}, Torild Skrivarhaug\textsuperscript{2,4,5}, Knut Dahl-Jørgensen\textsuperscript{2,3,4,5} and Øyvind Rø\textsuperscript{1,6}

Abstract

**Background:** The increased prevalence of disturbed eating behaviors (DEB), depression, and anxiety in type 1 diabetes (T1D) is generally well established; however the majority of existing research to date has focused on female adolescents and young adults. Data on males and older females is scarce. The aim of this study was to assess prevalence of DEB and symptoms of depression and anxiety among adult males and females with type 1 diabetes, to investigate differences between individuals scoring below and above the cut-off on psychopathology, and to examine patterns of eating disorder psychopathology by age and weight.

**Methods:** A total of 282 adults with type 1 diabetes aged 18–79 years participated in the study. Measures included the Diabetes Eating Problem Survey – Revised (DEPS-R), the Hospital Anxiety and Depression Scale (HADS), and clinical data from the Norwegian Quality Improvement of Laboratory Examinations (NOKLUS) system.

**Results:** A total of 20.3% of the whole sample (13.3% among males and 24.8% among females) scored above the DEPS-R cut-off score for DEB. As for depression and anxiety, the prevalence in the whole sample was 6.2% and 19.0%, respectively. The prevalence was generally higher in females than males across all psychopathology measures. HbA1c was significantly associated with the DEPS-R total score ($p < 0.01$) among females, but not with depression and anxiety.
Research Questions

i. What is the prevalence of DEB and symptoms of depression and anxiety among adult males and females with T1D?

ii. Does level of ED psychopathology vary with age and weight?
Results (prevalence)

DEPS-R cut-off score
- 8: mild-moderate symptoms
- 20: DEB, at risk of ED

HAD cut-off score
- 8: mild-moderate symptoms
- 11: moderate-severe (case)
# Results (prevalence)

<table>
<thead>
<tr>
<th>T1D Norway</th>
<th>All</th>
<th>Males</th>
<th>Females</th>
<th>Sig.level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEB</td>
<td>20.3%</td>
<td>13.3%</td>
<td>24.8%</td>
<td>.05</td>
</tr>
<tr>
<td>Depression</td>
<td>6.2%</td>
<td>3.6%</td>
<td>7.8%</td>
<td>ns</td>
</tr>
<tr>
<td>Anxiety</td>
<td>19%</td>
<td>8.1%</td>
<td>26.4%</td>
<td>.001</td>
</tr>
</tbody>
</table>

**DEPS-R cut-off score**
- 8: mild-moderate symptoms
- 11: moderate-severe (case)

**HAD cut-off score**
- 8: mild-moderate symptoms
- 11: moderate-severe (case)

**Cut-off score** 11
## Results (prevalence)

- **DEPS-R cut-off score**
  - 8: mild-moderate symptoms
  - 11: moderate-severe (case)

- **HAD cut-off score**
  - 8: mild-moderate symptoms
  - 11: moderate-severe (case)

### Cut-off score 11

<table>
<thead>
<tr>
<th>T1D Norway</th>
<th>All</th>
<th>Males</th>
<th>Females</th>
<th>Sig level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEB</td>
<td>20.3%</td>
<td>13.3%</td>
<td>24.8%</td>
<td>.05</td>
</tr>
<tr>
<td>Depression</td>
<td>6.2%</td>
<td>3.6%</td>
<td>7.8%</td>
<td>ns</td>
</tr>
<tr>
<td>Anxiety</td>
<td>19%</td>
<td>8.1%</td>
<td>26.4%</td>
<td>.001</td>
</tr>
</tbody>
</table>
# Results (prevalence)

<table>
<thead>
<tr>
<th>T1D Norway</th>
<th>All</th>
<th>Males</th>
<th>Females</th>
<th>Sig.level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEB</td>
<td>20.3%</td>
<td>13.3%</td>
<td>24.8%</td>
<td>.05</td>
</tr>
<tr>
<td>Depression</td>
<td>6.2%</td>
<td>3.6%</td>
<td>7.8%</td>
<td>ns</td>
</tr>
<tr>
<td>Anxiety</td>
<td>19%</td>
<td>8.1%</td>
<td>26.4%</td>
<td>.001</td>
</tr>
</tbody>
</table>

**Cut-off score 11**

- DEPS-R cut-off score 20: DEB, at risk of ED
- HAD cut-off score 8: mild-moderate symptoms 11: moderate-severe (case)
## Results (prevalence)

### Cut-off score 11

<table>
<thead>
<tr>
<th>T1D Norway</th>
<th>All</th>
<th>Males</th>
<th>Females</th>
<th>Sig.level</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEB</td>
<td>20.3%</td>
<td>13.3%</td>
<td>24.8%</td>
<td>.05</td>
</tr>
<tr>
<td>Depression</td>
<td>6.2%</td>
<td>3.6%</td>
<td>7.8%</td>
<td>ns</td>
</tr>
<tr>
<td>Anxiety</td>
<td>19%</td>
<td>8.1%</td>
<td>26.4%</td>
<td>.001</td>
</tr>
</tbody>
</table>

### Cut-off score 8

<table>
<thead>
<tr>
<th>Norwegian T1D</th>
<th>Norwegian comparison (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAD-D: 13.8%</td>
<td>HAD-D: 4.9%</td>
</tr>
<tr>
<td>HAD-A: 35.4%</td>
<td>HAD-A: 9.6%</td>
</tr>
</tbody>
</table>

---

1- The Norwegian HUNT 2 study, Bjelland et al. (2009)
Results (weight trends)

- Mean total DEPS-R

- Males
- Females

- Underweight
- Normal weight
- Overweight
- Obesity
Results (age trends)
Results (age trends)

![Graph showing age trends in DEPS-R scores for different age groups and genders.](image)
Results (age trends)

Mean total DEPS-R

- Adolescent males
- Adolescent females
- Adult males
- Adult females

11-13 years 14-16 years 17-19 years 18-24 years 25-34 years 35-44 years 45-54 years =>55 years
Research Question

i. What are the psychometric properties of the Norwegian version of the DEPS-R among adult males and females with T1D?
## Results

**DIABETES EATING PROBLEM SURVEY – REVISED (DEPS-R)**

Living with diabetes can sometimes be difficult, particularly regarding eating and diabetes management. Listed below are a variety of attitudes and behaviors regarding diabetes management. For each statement, choose the **ONE** answer that indicates how often this is true for you during the **PAST MONTH**.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>Never</th>
<th>Rarely</th>
<th>Sometimes</th>
<th>Often</th>
<th>Usually</th>
<th>Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Losing weight is an important goal to me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2.</td>
<td>I skip meals and/or snacks.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3.</td>
<td>Other people have told me that my eating is out of control.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4.</td>
<td>After I overeat, I don’t take enough insulin to cover the food.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5.</td>
<td>I eat more when I am alone than when I am with others.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6.</td>
<td>I feel that it’s difficult to lose weight at the same time.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td>I avoid checking my blood sugar very often.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8.</td>
<td>I make myself vomit.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9.</td>
<td>I try to keep my blood sugar high so that I will lose weight.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10.</td>
<td>I try to eat to the point of spilling ketones in my urine.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11.</td>
<td>I feel fat when I take all of my insulin.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12.</td>
<td>Other people tell me to take better care of my diabetes.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>13.</td>
<td>After I overeat, I skip my next insulin dose.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>14.</td>
<td>I feel that my eating is out of control.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>15.</td>
<td>I alternate between eating very little and eating huge amounts.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>16.</td>
<td>I would rather be thin than have good control of my diabetes.</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
Research Question

i. Are psychological aspects associated with HbA1c and ED psychopathology?

ii. Are there any gender differences in these associations?
Results (association with HbA1c)

Regression analysis females
  • BIPQ personal control
  • COPE emotional support

Explained 23.2% of the variance

Regression analysis males
  • BIPQ personal control

Explained 13.9% of the variance
Results (association with ED psychopathology)

Regression analysis females
- BIPQ personal control
- Age
- BMI
- Anxiety

Regression analysis males
- BIPQ personal control
- BMI
- Anxiety

Explained 50.8% of the variance

Explained 47.4% of the variance
Illness Perceptions

<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>absolutely no control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>extreme amount of control</td>
</tr>
</tbody>
</table>

How much control do you feel you have over your illness?
**Discussion**

**Strengths**
- Large, representative adolescent sample
- Including a wide age range
- Both genders included

**Limitations**
- Modest adult sample size from one clinic only = questionable generalizability
- Self-report measures
- Causality
Summary of our research

- DEB is common in T1D, especially among young females
- Poorer metabolic control
- Psychological aspects are associated with ED psychopathology and HbA1c
  - Illness perceptions
    - Personal control
Oslo University Hospital
Regional Department for ED

- Tertiary service in the Norwegian Health Region South-East (includes half of Norway)
- Three inpatient units
  i. Child- and adolescent unit (long term)
  ii. Adult unit (long term)
  iii. Short term unit > 16 years (4-6 weeks)
- One outpatient unit (all ages)
- Competence unit including a research team
T1D and ED at our unit

- All units admit patients with T1D and ED
- Multidisciplinary team
- Daily contact with a nurse and weekly contact with psychiatrist
- Psychoeducation about T1D and insulin
- Flexibility in terms of meal plan in case of hypoglycemia (low blood glucose which requires immediate extra food intake)
- Not a separate meal plan for patients with T1D, but this is an ongoing discussion
Challenges during treatment

- Fear of weight gain
- Reluctancy to administer insulin when blood glucose levels are high (hyperglycemia)
- Self-induced vomiting
- Hiding hypoglycemia from staff to avoid having to eat/drink
- Creates anxiety among staff
- Temporary control of T1D regulation by clinicians?
Clinical challenges in general

- Identification
- Special treatment services do not achieve «volume competence»
- No evidence-based agreed-upon treatment approach
- Individuals in need of help «fall between two chairs»
Eating Disorders in Girls and Women With Type 1 Diabetes: A Longitudinal Study of Prevalence, Onset, Remission, and Recurrence

Diabetes Care 2015;38:1212–1217 | DOI: 10.2337/dc14-2646

OBJECTIVE

Girls and women with type 1 diabetes are at increased risk for developing eating disorders (EDs), and these disorders are associated with serious diabetes-related medical complications. This study describes the longitudinal course of disturbed eating behavior (DEB) and EDs in a cohort with type 1 diabetes.
Colton et al. (2015)

- 14-year follow-up study of young girls with T1D (N=126) (1)
- 7 assessment points
- Eating Disorder Examination (EDE)
- Mean age
  - Baseline: 11.8 years (2)
  - Follow-up: 23.7 years
- HbA1c
  - Baseline: 8.3%
  - Follow-up: 8.5%

1- Colton et al. (2015); 2) Colton et al. (2008)
Colton et al. (2015)

Prevalence DEB
- Baseline: 14% (2)
- Follow-up: 59% (1)

Prevalence ED
- Baseline: 0
- Follow-up: 32.4%

Frequency of insulin omission for weight control
- Baseline: 1%
- Follow-up: 26.8%

Mean age onset
- DEB: 18.3 years
- ED: 22.6 years

1- Colton et al. (2015); 2) Colton et al. (2008)
CONCLUSIONS

In this longitudinal study, EDs were common and persistent, and new onset of ED was documented well into adulthood. Further research regarding prevention and treatment for this vulnerable group is urgently needed.
To end on a positive note...
Thank you

- Diabulimia helpline (Erin Akers)
- Oslo University Hospital
  - The Regional Department for Eating Disorders
  - The Norwegian Childhood Diabetes Registry
- Norwegian Diabetes Centre
- Participants and participating clinicians
- Co-authors
- Funding agencies
  - Research Council of Norway
  - Norwegian Health Region South-East

line.wisting@ous-hf.no