

## ABSTRACT

We analyzed the impact of structured diabetes education on clinical problems in people with diabetes and CSII-therapy. In this analysis, baseline data of 278 people with diabetes and CSII-therapy were included (age  $43.7 \pm 14.3$  yrs., diabetes duration  $23.0 \pm 12.4$  yrs., HbA1c  $8.3 \pm 0.9\%$ ; duration of CSII-therapy 9.6 yrs.  $\pm 7.3$  yrs.;  $4.4 \pm 3.3$  structured diabetes education courses) who participated in the INPUT study. From these 278 participants, 90% had an A1c higher than 7.5%, 12.6% reported the occurrence of ketoacidosis in the last year, 9% reported severe hypoglycemia during the last year, 50.5% reported elevated diabetes-related distress (DDS score  $> 2.0$ ) and 10% reported low well-being which could be indicative for likely depression (WHO score  $< 28$ ). The following table shows the number of previous structured diabetes education courses in people with and without clinical problems.

	Elevated HbA1c	Keto-acidosis	Hypoglycemia	Diabetes Distress	Likely depression
No	$3.3 \pm 2.1$	$4.4 \pm 3.3$	$4.4 \pm 3.4$	$3.9 \pm 2.7$	$4.3 \pm 3.2$
Yes	$4.5 \pm 3.4$	$4.4 \pm 3.8$	$4.2 \pm 3.3$	$4.8 \pm 3.8$	$5.2 \pm 4.2$
p	0.016	0.917	0.750	0.024	0.230

People with elevated HbA1c and elevated diabetes distress were previously more likely referred to structured diabetes education. Participation in structured diabetes education was not different in people with acute complications like hypoglycemia or ketoacidosis. Current structured diabetes education programs may not be optimally suited for ameliorating clinical or psychosocial problems in people with diabetes and CSII Treatment. There might be a need for more CSII specific diabetes education programs.

## INTRODUCTION

Structured diabetes education is a cornerstone of diabetes therapy. Via diabetes education, not only knowledge and skills necessary for the treatment of diabetes can be trained but also psychosocial aspects of living with diabetes and integrating diabetes therapy into daily life can be discussed. For patients on insulin pump therapy (CSII-therapy), diabetes education is especially necessary in order to acquire the proper skills to effectively use CSII-therapy. In this analysis, we evaluated how often CSII-patients participated in a structured diabetes education course and whether there were associations with common clinical problems.

## METHODS

We used the baseline data of the INPUT-study (NCT 02868931) in which 278 patients on CSII-therapy participated.

Clinical problems were defined as follows:

- **A1c problems:** A1c  $\geq 7.5\%$
- **Hyperglycemia problems:** severe hyperglycemia with ketosis or ketoacidosis in the past year
- **Hypoglycemia problems:** severe hypoglycemia that required help from other or resulted in unconsciousness

- **Distress problems:** elevated score on the Diabetes Distress Scale (DDS)  $> 2.0$
- **Depression problems:** reduced WHO-5 score  $< 28$

CSII-patients with and without these problems were compared with regard to the number of diabetes education courses they have previously participated in.

## RESULTS

- Sample characteristics can be seen in table 1. CSII-patients had a rather long history of diabetes ( $22.9 \pm 12.4$ ) and performed CSII-therapy for almost 10 years. A1c was suboptimal ( $8.3 \pm 0.9\%$ ) and nearly half of patients had at least one late complication. Interestingly, 99% of all patients had previously participated in a structured diabetes education course with a mean number of  $4.4 (\pm 3.3)$  education courses per patient.
- Figure 1 shows that 89.9% of CSII-patients had an elevated A1c  $\geq 7.5\%$ . Almost 20% had an A1c  $\geq 9\%$ .
- 12.6% of all patients experienced severe hyperglycemia in the past year, while 9% experienced at least one severe hypo that required the help of others and 5.8% experienced a severe hypo that resulted in unconsciousness (figure 2).
- The prevalence of severe hyperglycemia was 0.35 events per year while the prevalence for severe hypoglycemia was substantially lower (figure 2).
- Mean DDS scores revealed that over 50% of the sample experienced elevated distress at baseline (figure 3).
- CSII-patients with an elevated A1c received significantly more diabetes education than patients without this clinical problem (figure 4a).
- CSII-patients with elevated diabetes distress (DDS  $> 2.0$ ) also received significantly more diabetes education than participants without this psychosocial problem (figure 4a).
- Having a likely depression, experiencing severe hyper- or hypoglycemia was not associated with the number of diabetes education courses (figure 4a+b).

## DISCUSSION

CSII-patients with current A1c- or distress problems received more structured diabetes education in the past, but this seemed not to help these patients achieve better glycemic control or psychosocial well-being. Current structured diabetes education programs may not be optimally suited for ameliorating clinical or psychosocial problems in people with diabetes and CSII-treatment. There might be a need for more CSII-specific diabetes education programs.

### Contact Information

FIDAM - Research Institute Diabetes Academy Mergentheim  
**Bernhard Kulzer**  
97980 Bad Mergentheim  
Germany  
Phone: +49 7931 594-151  
kulzer@fidam.de



Table 1: Sample Characteristics

N = 278	M $\pm$ SD / %
Age (in years)	$43.7 \pm 14.3$
Gender	60% weiblich
BMI (in kg/m <sup>2</sup> )	$28.0 \pm 5.5$
Diabetes duration (in years)	$22.9 \pm 12.4$
Duration of CSII-therapy (in years)	$9.6 \pm 7.4$
A1c (in %)	$8.3 \pm 0.9\%$
Late complications (at least 1)	43 %
Number of complications	0.76
SMBG per day	$5.4 \pm 2.1$
Participation in a diabetes education course	99 %
Number of diabetes education courses	$4.4 \pm 3.3$

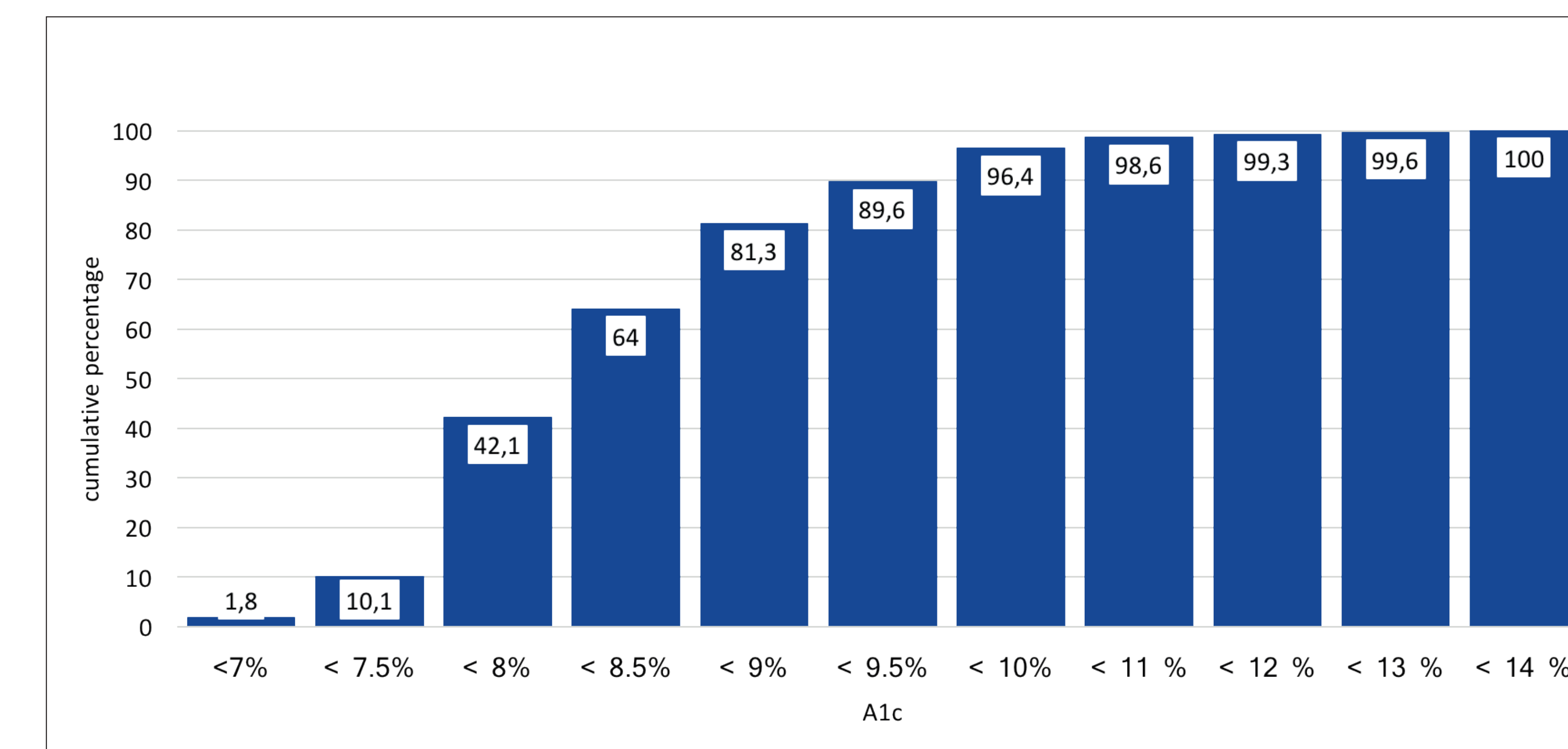


Figure 1: Distribution of A1c-values

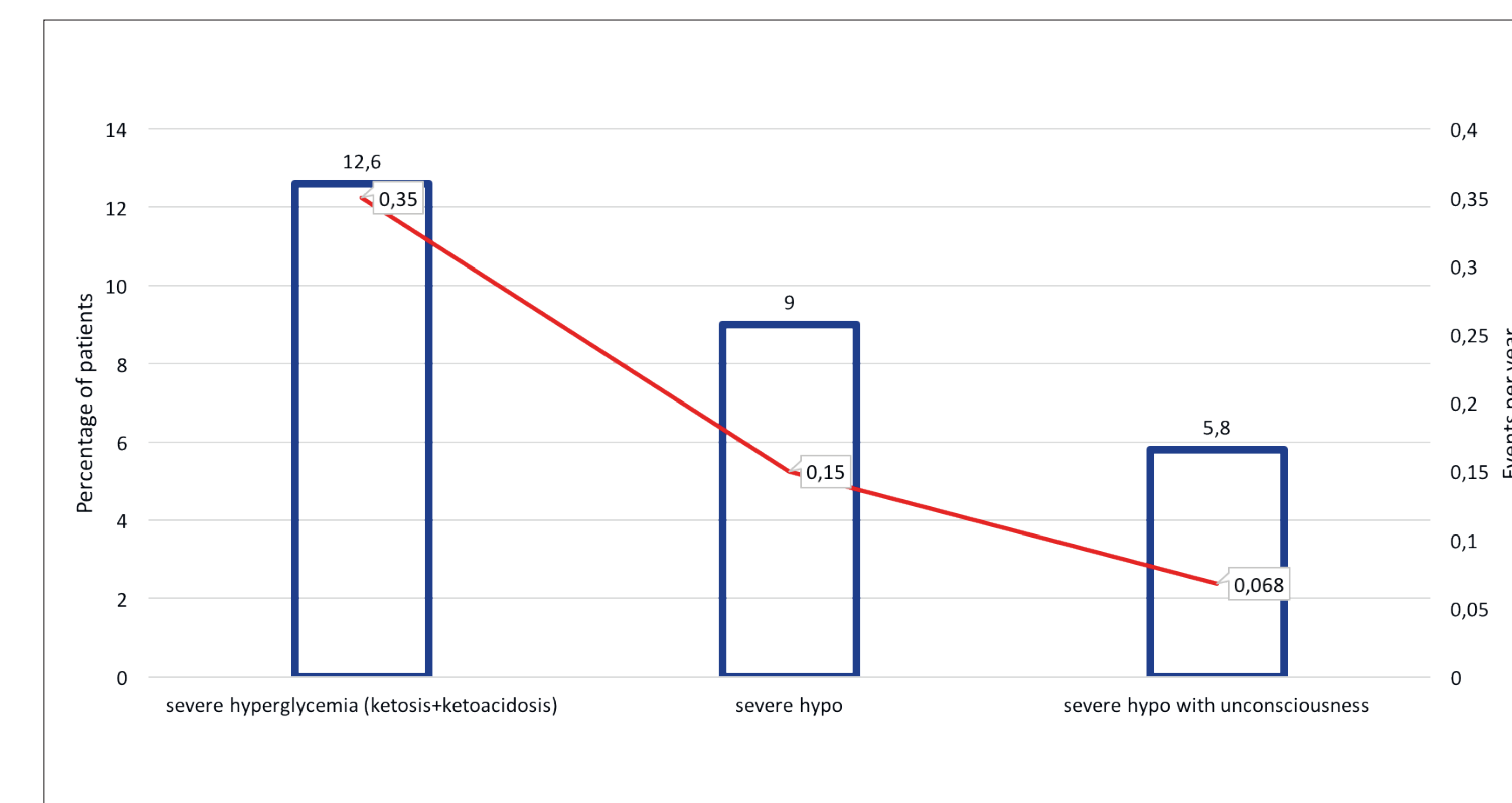


Figure 2: Percentage of patients who experienced a hyper- or hypoglycemic event in the past year and the prevalence of these events for the complete sample

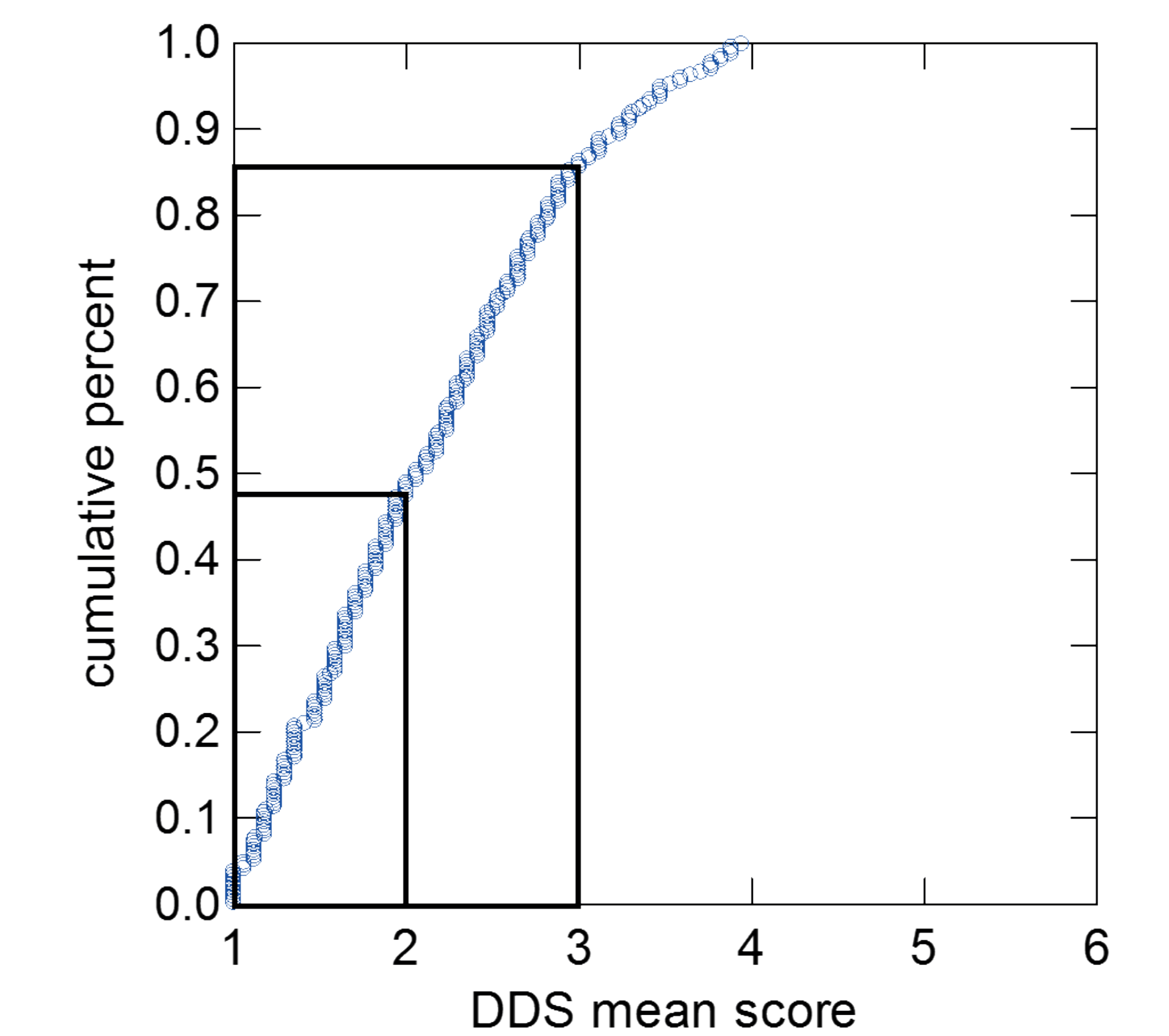


Figure 3: Distribution of mean DDS scores (range 1-6)

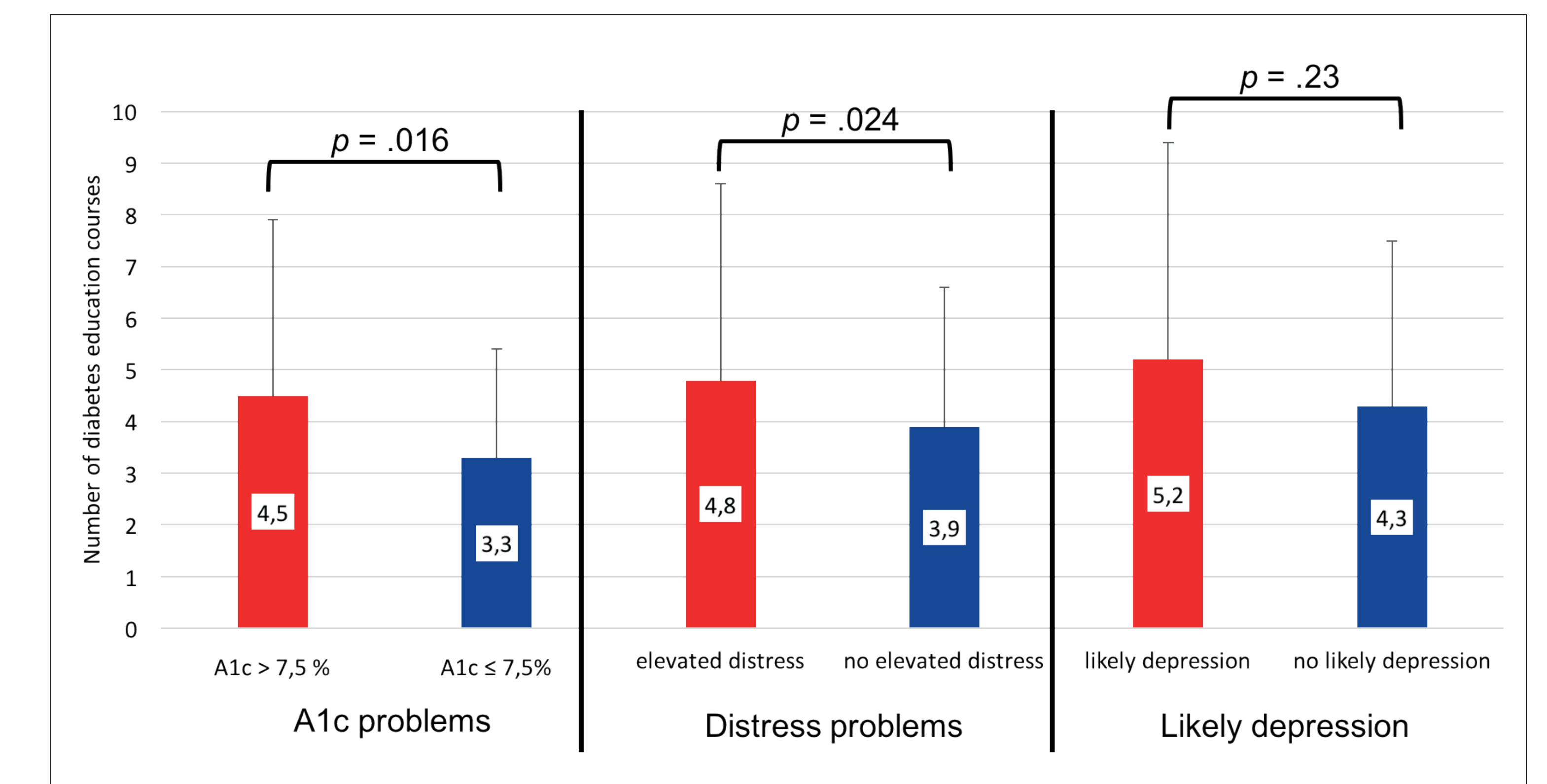


Figure 4a: Difference in the number of education courses between patients with different problems

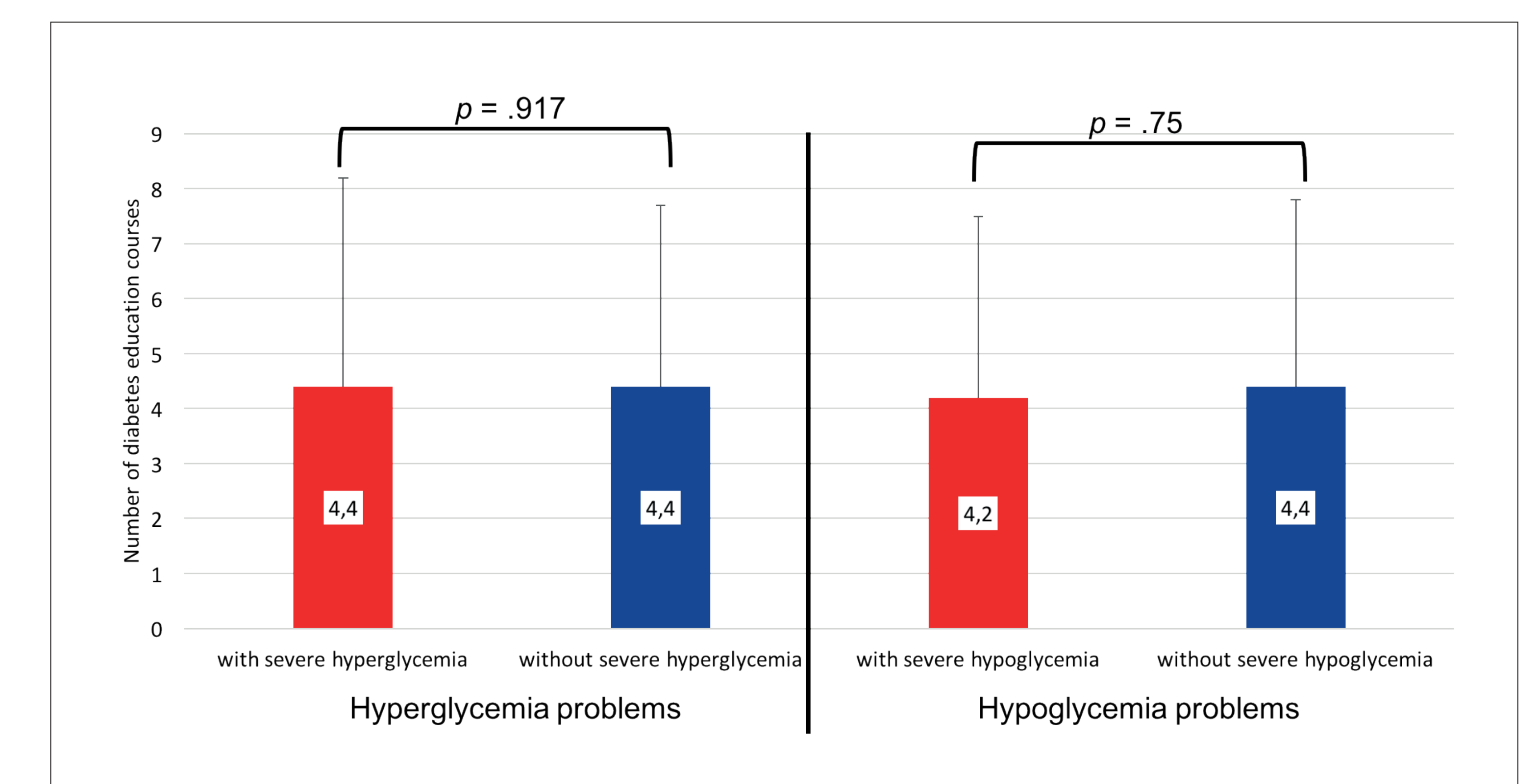


Figure 4b: Difference in the number of education courses between patients with different problems