

COST-EFFECTIVENESS CONSEQUENCES OF OBESITY IN T2DM BY INSULIN ANALOGUE THERAPY



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Background

Long-acting insulin analogue therapies (insulin detemir and glargine) offer improved pharmacokinetic and pharmacodynamic properties compared to regular human insulin. Insulin therapies at T2DM (Type 2 Diabetes Mellitus) attend with weight gain, which could have various effects on the disease outcomes. Weight gain could worsen the long term outcome of insulin therapy (increased risk of insulin resistance, hypertension, dyslipidemia), which influences the total treatment cost.

Weight gain differences were demonstrated between the analogues by a meta-analysis¹. Insulin detemir caused significant lower weight gain than glargine (-2,04 kg after 6 months therapy).

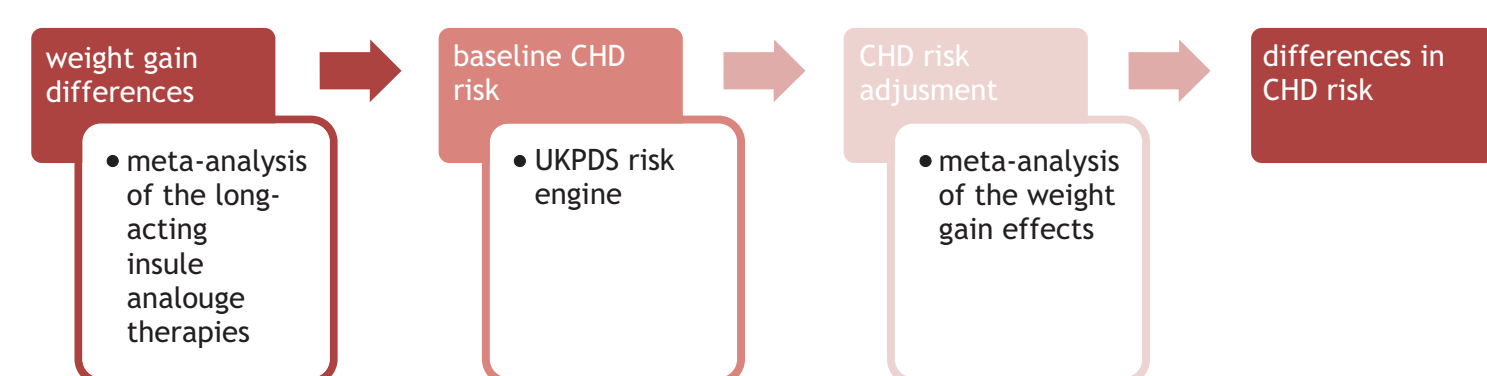
Objective

Our research aimed to clarify the effects of weight gain on health status and costs. On this basis we could compare the differences under the analyzed therapies. Hypothetical scenario analysis was performed to identify the benefits of the detemir therapy instead of glargine for the currently treated patients in Hungary. As our research primarily aimed to identify hard endpoint related differences, the results of our comparison is the number of avoided events (i.e. naturally outcomes). Using data of a recent burden of disease study (based on real world data of the National Health Fund) the differences became comparable in monetary unit as well.

Methods

A comparative meta-analysis¹ of long-acting insulin analogues presented significant differences in favour of detemir insulin at weight gain (-2,04 kg (SE: 0,39, CI 95% [1,27-2,80] p=0,05) after 6 month long therapy vs glargine.

Figure 1. Flow chart of the calculation



Cardiovascular risk is increased in T2DM, in which the coronary affected diseases are the most prevalent. Systematic literature review was implemented to determine the effect of weight gain to CHD risk. The identified sources are affirmed that weight gain increase CHD risk. One kilogram weight gain increase the CHD risk by 3,1%-5,7%.³

For the comparison of the insulin analogue therapies we determined the baseline CHD risk for diabetic patients in 10 year horizon with the UKPDS risk engine⁴. The UKPDS risk engine is recommended by the NICE for the estimation of cardiovascular risk in diabetes population. Baseline population characteristic of the studies were included into the comparative meta-analysis¹, to determine the baseline CHD risk. The 10 years CHD risk was found 20,02% (25,10% for men and 14,10 for women), and 68% of these events expected to be fatal.

As a result of a systematic literature research the baseline risk was adjusted with the weight-gain related risk increase for each therapy on the basis of meta-analysis by Anderson⁵. Table 1. is presented the expected risk increase for the different therapies on the basis of their effect on weight. Results showed 9% higher CHD risk changes for glargine therapy.

Table 1. Weight-gain related risk increase with different therapies

	Weight gain	CHD risk increase
detemir	0,75	3,35%
glargine	2,79	12,46%

Results

The adjusted risks and the absolute differences are interpreted in Table 2. Our calculation resulted 1,6% higher risk for CHD events next to glargine therapy in 10 years time horizon.

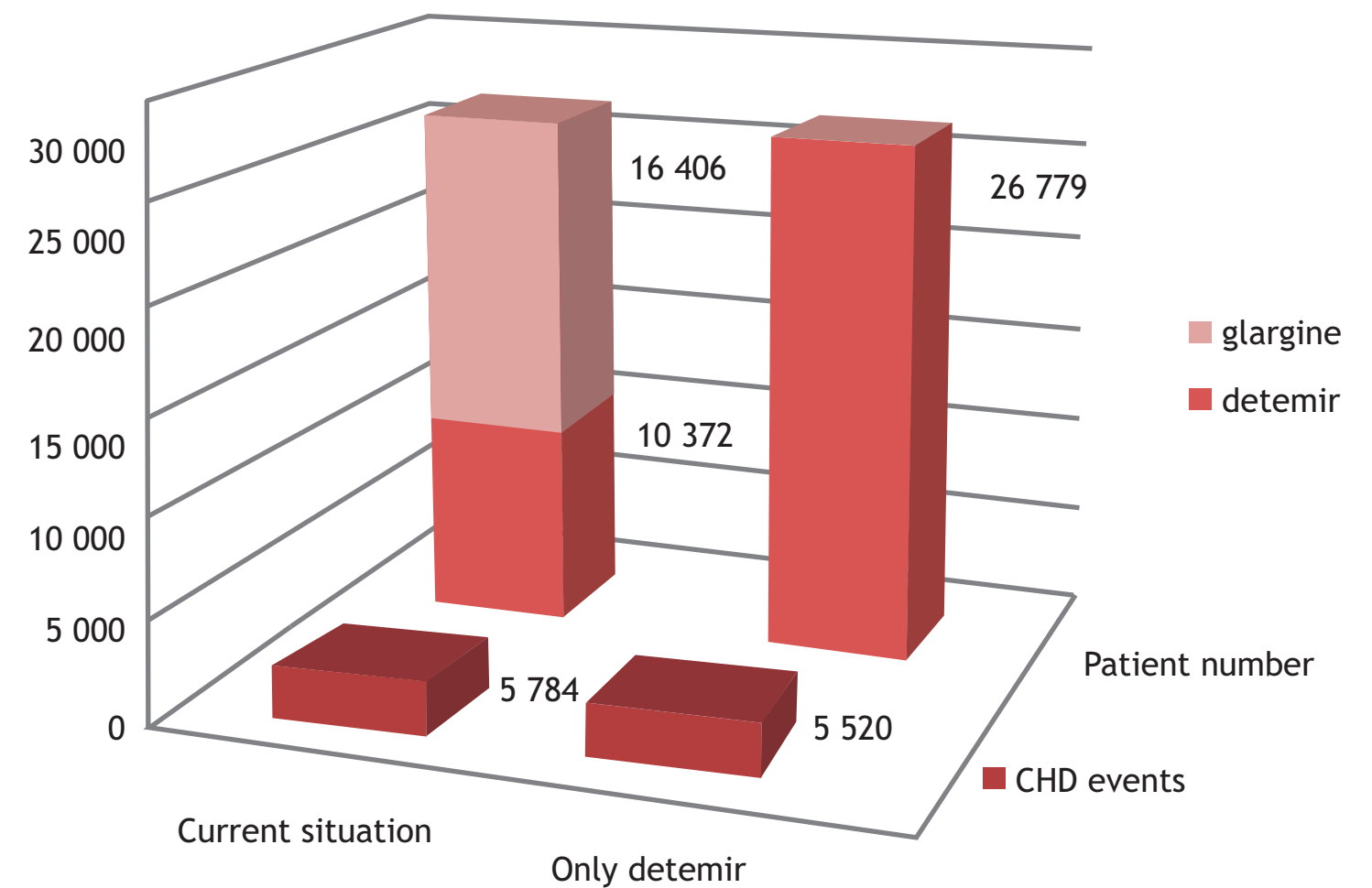
Table 2. Calculated 10 years CHD risks after analogue therapy

	men	women
Baseline CHD risk*	25,10%	14,10%
CHD risk after detemir therapy	25,68%	14,70%
CHD risk after glargine therapy	27,27%	16,34%
Difference	1,59%	1,64%

The determined risk differences were extrapolated to avoided events for Hungary on the basis of the long-acting insulin analogues' market size⁶. Patient number (DDD=40 IU) was clarified on last 12 months (200908-

201007) turnover, and CHD event was calculated on the basis of this population size. Afterwards an alternative scenario was conducted to compare the current situation with, i.e. all the glargine patients are treated by detemir. In the current situation approximately 5 784 CHD events are expected, while in the alternative scenario 5 520 event were calculated. This could results 265 avoided events if only detemir would be used.

Figure 2. Number of CHD events in the different scenarios



The avoided events could be interpreted in life year gain with the respect of the estimated percentage of the fatal events. Hungarian data for expected life years in the analyzed age-group (average baseline of the meta-analysis: 58,35 yrs) is 20,86 years. Altogether 180 fatal events would be avoidable, which corresponds 3 756 life years gained.

These natural outcomes are expressible in monetary unit in the knowledge of the burden of disease. Hungarian researcher published⁸ the yearly cost of the diabetic complication in 2009. The results were based on real world data of the National Health Fund, and concerned the 2008 expenditures (HUF values of the study were calculated on average exchange rate for 2010Q1-2010Q3; 275,25 HUF/€). These data were used for the determination of the cost differences.

Table 3 Avoided event related costs

	Year 1	Year 2
Cost related to CHD complication	2 949,63 €	559,98 €
Number of avoided events	264	264
Cost savings	778 701,52 €	147 834,79 €

Our calculation showed a 780 000 € savings for the first year, and additional 148 000 € for the second year after the CHD event. As it is applied for 10 years horizon, certainly discounting would be needed. In the absence of the expected occurrence time, we were not able to present this calculation.

Conclusions

Results of our systematic literature review showed significant correspondence under secondary endpoints and primary hard-endpoint, like weight gain and CHD risk. As the therapeutic costs of the analysed medicines are the same on the basis their effectiveness on the hard-endpoints, the secondary end-point related benefits would be clear savings for the social insurance.

Our findings showed that obesity and weight gain related aspects should be prioritised as the main international tendencies showed. It's not only necessary on the policy level, but also in "individual" level in the cost-effectiveness analysis as well.

These findings should be interpreted with limitation, as the analysis was implemented irrespectively from other effects and differences between the two therapies. For this reason further investigation would be needed for comprehensive analysis of the object of our study.

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