# Short and long-term cost-effectiveness of switching therapy from insulin glargine to biphasic insulin aspart 30 in people with type-2 diabetes in Saudi Arabia and India


1. **Philip Home**
Newcastle University, Newcastle, England

2. **Pradana Soewondo**
University of Indonesia, Jakarta, Indonesia

3. **Asrul Akmal Shafie**
Universiti Sains Malaysia, Penang, Malaysia

4. **Khaled AlRaddady**
King Saud Medical City, Riyadh, Saudi Arabia

5. **Ranya Baadbad**
Pharmacoeconomics Center of KSMC, Riyadh, Saudi Arabia

6. **Eva Hammerby**
Novo Nordisk A/S, Copenhagen, Denmark

7. **Annie Nikolajsen**
Novo Nordisk A/S, Copenhagen, Denmark

8. **Frederikke Bruun Andersen**
Last Mile P/S, Copenhagen, Denmark

9. **Ole Henriksen**
Last Mile P/S, Copenhagen, Denmark


## Objective

- To assess the cost-effectiveness (CE) of switching therapy from insulin glargine ± oral glucose-lowering drugs (OGLDs) to biphasic insulin aspart 30 ± OGLDs in people with type 2 diabetes (T2DM) in Saudi Arabia and India based on the $A_1$chieve® study - an observational study evaluating adverse events and effectiveness of Novo Nordisk insulin analogs in routine clinical practice.

## Methods

- The $A_1$chieve® study is a non-interventional 24 week study including more than 66,000 people with T2DM from 28 countries starting either biphasic insulin aspart 30, insulin detemir and/or insulin aspart.
- The CE analyses included data for people switching to biphasic insulin aspart 30 in India (n=191), as well as in seven Arabian Gulf* countries (n=103) using Saudi Arabia health costs. Data were collected on clinical effectiveness and adverse events, and health-related quality of life using the EQ-5D questionnaire.
- Short-term incremental costs-effectiveness ratios (ICERs) were computed based on incremental cost of treatment and the EQ-5D incremental effect in the first year after switching to biphasic insulin aspart 30.
- Long-term ICERs were simulated using the IMS CORE Diabetes Model† with 30-year time horizon including country-specific costs for complications and therapies and background mortality rates.
- ICERs are expressed as cost per QALY in local currencies, USD and in fractions of local GDP per capita. CE was pre-defined using the WHO Choice programme threshold based on GDP per capita‡.
- The robustness of the estimated ICERs were tested in a series of sensitivity analyses including; expansion of the simulation time horizon from 30 to 50-years, assuming no deterioration of glucose control with time, assuming median and first quartile distribution of treatment effects on $HbA_{1c}$, including the costs of self-monitoring blood glucose (SMBG) strips and including the costs of 1 and 2 additional general practitioner (GP) visits in the first year after switching to biphasic insulin aspart 30.

**Figure 1** Treatment effect on $HbA_{1c}$ at baseline and at week 24.

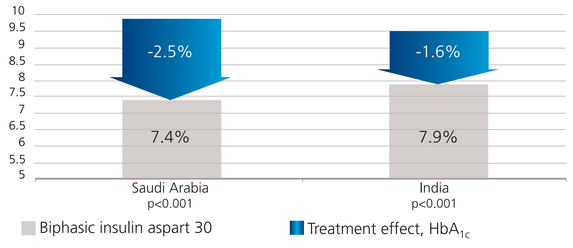
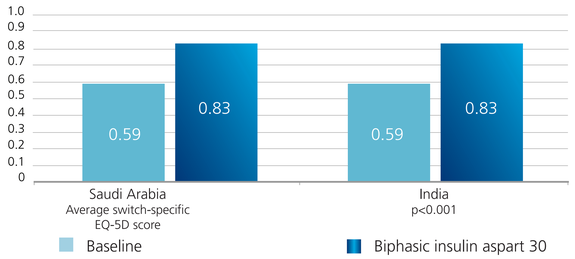



**Figure 2** Improvements in patient reported outcomes using the EQ-5D questionnaire when switching to biphasic insulin aspart 30.




## Results

- Across all country settings, 100% of the 2000 bootstrap replications of ICERs were dominant based on a 30-year time horizon (*see figure 2*).
- Predicted life-expectancy increased in both Saudi Arabia (1.79) and India (0.89) (*see figure 3*).
- The relative risk of developing selected complications was reduced substantially in both countries (*see figure 4*).

**Figure 3** ICER scatterplot displaying 2000 bootstrap replications (1000 per country) of incremental costs as GDP per capita and incremental quality-adjusted life expectancy (Incremental QALE)†.

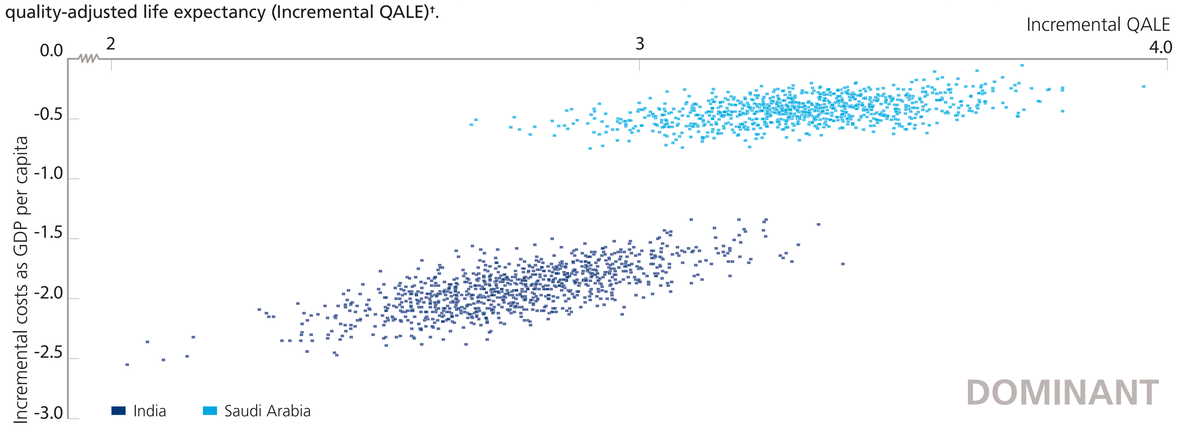



**Table 1** 1-year and 30-year ICERs (base case) per QALY gained.

| Country | 1-year ICER | | | 30-year ICER (base case) | | |
|---|---|---|---|---|---|---|
| | Local currency | USD | Fraction of GDP | Local currency | USD | Fraction of GDP |
| Saudi Arabia | SAR -8,958 | -2,388 | -0.12 | SAR -14,242 | -3,798 | -0.19 |
| India | INR -60,194 | -1,086 | -0.73 | INR -55,914 | -1,008 | -0.68 |

**Table 2** Sensitivity analyses presented as fraction of GDP per capita per QALY gained.

| Country | 50-year time horizon | No $HbA_{1c}$ deterioration | Median treatment effect ($HbA_{1c}$) | Quarter 1 treatment effect ($HbA_{1c}$) | Including costs of SMBG strips | 1 additional GP visit in the first year after switch | 2 additional GP visits in the first year after switch |
|---|---|---|---|---|---|---|---|
| Saudi Arabia | -0.13 | -0.13 | -0.13 | -0.11 | -0.11 | -0.13 | -0.13 |
| India | -0.68 | -0.69 | -0.68 | -0.69 | -0.38 | -0.67 | -0.67 |

**Figure 4** Current life expectancy in the general population and simulated life expectancy at baseline and in people switching to biphasic insulin aspart 30.

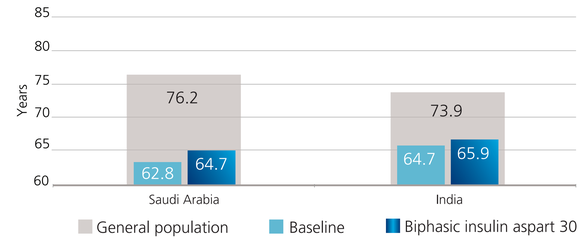
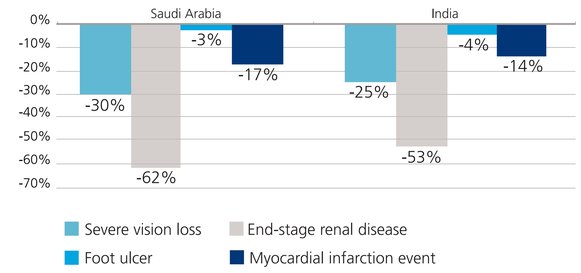



**Figure 5** Relative risk reduction in selected complications over 30 years simulated in the IMS CORE Diabetes Model.




## Conclusions

- Switching therapy from insulin glargine to biphasic insulin aspart 30 in T2DM as performed in the $A_1$chieve® study was found to be dominant across both country settings based on a 1 and 30-year time horizon.
- Sensitivity analyses showed the long-term cost-effectiveness to be robust.
- Predicted life-expectancy increased and the relative risk of complications was reduced across all country settings based on a 30-year time horizon.

*Saudi Arabia, Kuwait, Oman, Qatar, Bahrain, United Arab Emirates and Yemen

†The IMS Core Diabetes Model[1] (CDM) is an interactive computer simulation model of diabetes (type 1 and type 2), comprising of 15 inter-dependent sub-models accounting for the complications related to diabetes. Each Markov sub-model uses time-, state-, and diabetes type-dependent probabilities derived from published sources to obtain projected outcomes relevant to specific patient groups and country settings of interest. Patient cohorts are defined in terms of age, gender, baseline risk factors and pre-existing complications. Local disease management components, costs as well as background mortality rates for causes of death not determined by the CDM are loaded into the CDM.

‡The World Health Organization (WHO) Choice programme[2] recommends a threshold based on GDP per capita. A health technology is labelled:
- "Not cost-effective" – if costs ≥ 3 times GDP per capita
- "Cost-effective" – if costs ≥ 1 and ≤ 3 times GDP per capita
- "Highly cost-effective" – if it costs ≤ GDP per capita

The health technology is referred to as "Dominant" if the costs per life year gained are below 0


1. Palmer AJ, et al. The CORE Diabetes Model: projecting long-term clinical outcomes, costs and cost-effectiveness of interventions in diabetes mellitus (types 1 and 2) to support clinical and reimbursement decision-making. Curr Med Res Opin. 2004;20(8):5-26
2. WHO Choice Programme. Available online at: http://www.who.int/choice/costs/CER_thresholds/en/index.html