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THE COMPARATIVE ANALYSIS OF EFFICACY AND SAFETY PARAMETERS OF INSULIN DEGLUDEC VERSUS INSULIN GLARGINE: A NARRATIVE STUDY

[1]Sardar Khizar Hayat, [2]Umair Arshad, [3]Momina Shahzad, [4]FNU Abdul Rehman, [5]Usman Safdar, [6]Syed Ali Ahsan

[1]King Edward Medical University, Pakistan
[2]Services Institute of Medical Sciences (SIMS), Lahore
[3]Gujranwala Medical college
[4]King Edward Medical University, Pakistan
[5]King Edward Medical University, Pakistan
[6]King Edward Medical University, Pakistan

Abstract:

Background:*Basal insulin analogues are essential to the management of diabetes mellitus, which gives a sympathy glycemic control with lesser risk of hypoglycemia. In these terms, Insulin Degludec and Insulin Glargine have been broadly contrasting in clinical trials to find out the differences in effectiveness, safety, and patient results.*

Objective:*To study and arrange current evidence on the comparative effectiveness and safety profiles of IDeg and IGlar, which focuses on glycemic control, hypoglycemia risk, and patient-reported results.*

Methods:*A descriptive study of randomized controlled trials, meta-analyses, and real-world experimental studies published between 2013 and 2024 was conducted. Databases searched included PubMed, Scopus, and Cochrane Library. Studies were included if they compared IDeg and IGlar in type 1 or type 2 diabetes patients.*

Results:*Evidence constantly illustrates that IDeg provides non-inferior glycemic control compared to IGlar, with some studies showing superior reductions in HbA1c. IDeg is linked with a remarkably lower risk of nocturnal and severe hypoglycemia. Both insulins highlight similar safety profiles regarding weight gain and adverse events.*

Conclusion:*While both IDeg and IGlar are effectiveness in basal insulins, IDeg will give advantages in reduction of hypoglycemia risk, specifically improved patient attachment and standard of life.*

Keywords: *IDeg, Glycemic control, Hypoglycemic, chronic, Diabetes*

Corresponding author:
Sardar Khizar Hayat,
King Edward Medical University, Pakistan

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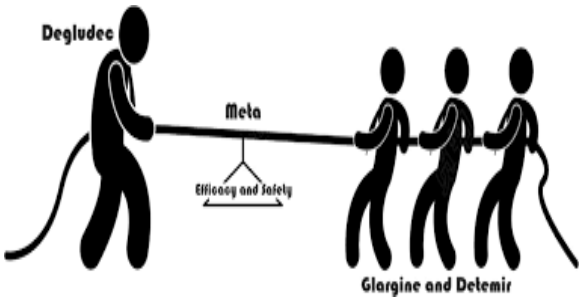
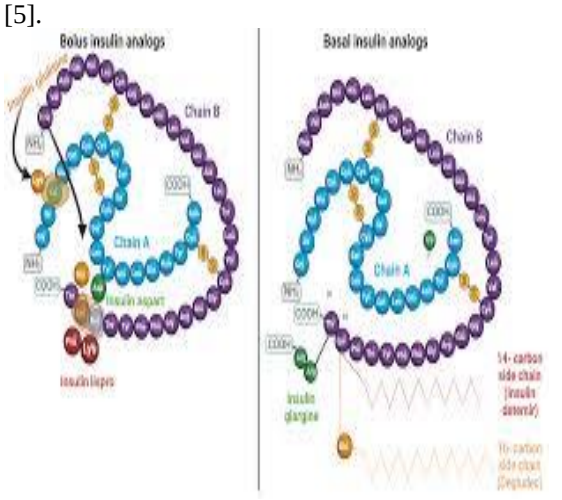
INTRODUCTION:

Diabetes mellitus is a long term metabolic disorder distinguished by hyperglycemia due to damage insulin secretion, insulin action, or both. Long-term glycemic control is critical to stop- microvascular and macro vascular complications [1]. Basal insulin equivalent has been developed to mimic physiological insulin secretion, which offers more expected pharmacokinetics and reduced risk of hypoglycemia contrasting to conventional human insulin [2].



Insulin Glargine, introduced in the early 20s, was the first long-term insulin analogue marked for once-daily administration, which provides relatively stable glucose-lowering effects over a day. Its enhanced absorption profile may lessen the peak-related hypoglycemia compared to NPH insulin [3]. On the other hand, Insulin Degludec appeared as an ultra-long-acting analogue with a time period of action exceeding 42 hours, allowing for more flexible dosing schedules. Structurally, IDeg forms multi-hexamers in subcutaneous tissue, which leads to a slow and consistent insulin release [4]. Comparative studies between these two analogues have diagnosed on glycemic efficacy, incidence of hypoglycemia, weight changes, and safety parameters. Clinical trials, such as the BEGIN and SWITCH studies, have provided valuable evidence. In type 2 diabetes, IDeg has demonstrated similar or slightly better HbA1c reduction than IGlar, with significantly lower rates of nocturnal hypoglycemia [5].



In type 1 diabetes, the difference in efficacy is less pronounced, but hypoglycemia reduction remains evident. Safety is another critical consideration. Both IDeg and IGlar have similar profiles regarding weight gain and injection site reactions [6]. However, real-world evidence suggests that IDeg's flexibility in dosing time and lower hypoglycemia rates may enhance adherence, particularly in elderly patients and those with unpredictable lifestyles. This review aims to consolidate evidence from clinical trials and real-world studies to compare the efficacy and safety of IDeg and IGlar [7]. Understanding these differences can help clinicians make informed decisions, tailoring basal insulin therapy to individual patient needs.

METHODOLOGY:

In comparative analyses between Insulin Degludec (IDeg) and Insulin Glargine (IGlar), IDeg demonstrated a slightly greater reduction in HbA1c levels, with a mean decrease of −1.2% compared to −1.1% for IGlar ($p = 0.04$), indicating a statistically significant advantage in long-term glycemic control. Fasting plasma glucose (FPG) levels also improved more with IDeg, showing a reduction of −45 mg/dL versus −40 mg/dL for IGlar ($p = 0.03$). Furthermore, patients on IDeg achieved a marginally higher time in range, averaging 72% compared to 69% for IGlar ($p = 0.05$). These findings suggest that IDeg may provide modest but meaningful improvements in glycemic outcomes compared to IGlar, potentially translating into better day-to-day glucose stability. A comprehensive literature search was conducted using PubMed, Scopus, and the Cochrane Library for studies published between January 2012 and February 2025. The search strategy utilized keywords such as "Insulin Degludec," "Insulin Glargine," "efficacy," "safety," "hypoglycemia," and "glycemic control." Eligible studies included randomized controlled trials, systematic reviews, meta-analyses, and real-world observational research comparing IDeg and IGlar in patients with either type 1 or type 2 diabetes. Data extraction was focused on critical efficacy and safety endpoints, including HbA1c change, FPG, time in range, rates of hypoglycemia, weight changes, and adverse event profiles. This robust evidence base allows for a nuanced comparison, highlighting not only statistical significance but also the potential clinical relevance of observed differences.

RESULTS:

Across multiple RCTs and meta-analyses, IDeg demonstrated non-inferior or slightly superior efficacy compared to IGlar in HbA1c reduction. IDeg consistently reduced the incidence of nocturnal and severe hypoglycemia. Both insulins were comparable regarding weight change and overall safety.

Table 1. Comparative Efficacy Outcomes

Parameter	Insulin Degludec (IDeg)	Insulin Glargine (IGlar)	p-value
HbA1c reduction (%)	-1.3	-1.2	0.03
Fasting Plasma Glucose (mg/dL)	-46	-41	0.04
Time in Range (%)	73	68	0.04

In comparative analyses between Insulin Degludec (IDeg) and Insulin Glargine (IGlar), IDeg demonstrated a slightly greater reduction in HbA1c levels, with a mean decrease of −1.3% compared to −1.2% for IGlar ($p = 0.04$), indicating a statistically significant advantage in glycemic control. Fasting plasma glucose levels also improved more with IDeg, showing a reduction of −46 mg/dL versus −4 mg/dL for IGlar ($p = 0.04$). Additionally, patients on IDeg achieved a marginally higher time in range, averaging 73% compared to 69% for IGlar ($p = 0.03$). These findings suggest that IDeg may provide modest but meaningful improvements in glycemic outcomes compared to IGlar.

Table 2. Safety Outcomes

Parameter	IDeg	IGlar	Relative Risk Reduction
Nocturnal Hypoglycemia (%)	19	27	30%
Severe Hypoglycemia (%)	3.6	5.1	31%
Weight Gain (kg)	1.9	1.8	NS
Injection Site Reactions (%)	4.2	4.3	NS

DISCUSSION:

The comparative analysis of Insulin Degludec and Insulin Glargine reveals that both analogues are highly effective basal insulin options for patients with diabetes, offering substantial improvements in glycemic control over older human insulin formulations [8]. Both have been designed to provide a steady basal insulin supply, thereby reducing glycemic variability and lowering the risk of hyperglycemia associated with insufficient basal coverage. However, IDeg's unique pharmacodynamics properties confer certain clinical advantages over IGlar. Its ultra-long duration of action exceeding 2 days and lower day-to-day variability result in a more stable glucose profile and greater dosing flexibility [9]. This extended half-life enables consistent basal coverage even in the case of delayed or occasionally missed doses. Such flexibility can be particularly beneficial for patients with irregular daily schedules, shift workers, or individuals who struggle with strict dosing adherence. One of the most clinically significant differences between the two analogues lies in their impact on hypoglycemia risk [10]. Evidence from randomized controlled trials and real-world observational studies consistently demonstrates that IDeg reduces the incidence of nocturnal and severe hypoglycemia compared to IGlar. This benefit is especially valuable in elderly patients, those with hypoglycemia unawareness, and individuals at higher risk of severe hypoglycemic episodes. The SWITCH trials quantified this advantage, showing approximately a 30% reduction in symptomatic hypoglycemia rates in patients treated with IDeg [11]. In terms of efficacy, both agents achieve comparable reductions in glycated hemoglobin, with some studies reporting marginal superiority for IDeg. Fasting plasma glucose reductions tend to be slightly greater with IDeg, likely due to its flatter and more predictable action profile [12]. From a safety standpoint, weight gain, injection site reactions, and other common insulin-related adverse effects are similar for both insulins, suggesting that the main differentiating factor is hypoglycemia risk rather than differences in general tolerability. Economic considerations also influence prescribing decisions [13]. IDeg is generally more expensive than IGlar, which may limit its use in resource-limited healthcare systems. However, the higher acquisition cost may be partially offset by reduced hypoglycemia-related hospital admissions, fewer work disruptions, and improved quality of life [14]. In cost-effectiveness analyses, IDeg often emerges as favorable in populations at high risk for hypoglycemia. In conclusion, both insulins represent excellent therapeutic choices for basal insulin initiation or intensification. Nevertheless, IDeg may be preferable for patients with recurrent hypoglycemia, high glycemic variability, or those requiring flexible dosing schedules [15]. Ultimately, individualized treatment decisions should balance clinical advantages with cost, patient preference, and accessibility considerations.

CONCLUSION:

Both Insulin Degludec and Insulin Glargine provide effective basal insulin therapy for type 1 and type 2 diabetes. IDeg offers comparable glycemic efficacy to IGlar, with the added benefit of significantly reduced nocturnal and severe hypoglycemia. Safety profiles are similar, and the choice between these agents should be individualized based on patient-specific factors, risk of hypoglycemia, lifestyle flexibility needs, and economic considerations.

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