



شبكة المعلومات الجامعية  
التوثيق الإلكتروني والميكرو فيلم

# بسم الله الرحمن الرحيم



**MONA MAGHRABY**



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التوثيق الإلكتروني والميكروفيلم



# شبكة المعلومات الجامعية التوثيق الإلكتروني والميكروفيلم



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# جامعة عين شمس

## التوثيق الإلكتروني والميكروفيلم

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**MONA MAGHRABY**



# **Comparative Study of the Effectiveness of Long- and Intermediate-Acting Insulins in Children with Type 1 Diabetes Mellitus**

Thesis

*Submitted for Partial Fulfillment of  
Master Degree in **Pediatrics***

By

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قالوا

سبحانك لا علم لنا  
إلا ما علمتنا إنك أنت  
العليم العظيم

صدق الله العظيم

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**Eman Mohammed Ali Sakr**

## رسالة الكلية

تقوم كلية طب جامعة عين شمس بإعداد طبيب مدرب ذو مهارة تنافسية على المستوى المحلي والإقليمي، وقادر على التعليم والتعلم والتدريب مدى الحياة وملتزم بمعايير الخدمة الطبية والأخلاق المهنية، وتدعم الكلية التطوير المستمر للبرامج والمقررات والبحث العلم مع الحرص على التوسع في الأبحاث العلمية التطبيقية وبرامج الرعاية الصحية لخدمة احتياجات المجتمع وتنمية البيئة .

## Faculty Mission

The Faculty of Medicine of Ain Shams University prepares a trained doctor with competitive skill at the local and regional level, capable of teaching, learning and training for life and is committed to standards of medical service and professional ethics, and the college supports the continuous development of programs, courses and scientific research while keen to expand applied scientific research and health care programs To serve the needs of society and develop the environment.

## Abstract

**Background:** Achieving glycemic control without risking hypoglycemia imposes a major challenge among young children with type 1 diabetes (T1D). **Objectives:** To compare the effectiveness of insulin degludec to insulin glargine and NPH insulin among toddlers and preschoolers with T1D in terms of glycosylated hemoglobin (HbA1c) and frequency of hypoglycemic episodes. **Methods:** This randomized-controlled trial included 60 toddlers and preschoolers with T1D aged 2-6 years, with disease-duration 0.07-6 months. They were 27 males (45%), 33 females (55%). According to basal insulin, they were randomly assigned into three groups; Group-A received insulin degludec, group-B insulin glargine and group-C NPH insulin. The three groups were followed-up for 6 months with assessment of insulin daily-dose (IDD), frequency of hypoglycemia and severe hypoglycemia/week and HbA1c. **Results:** The three groups were well-matched regarding baseline clinical and laboratory parameters ( $p>0.05$ ). After 6 months, the insulin degludec group had significantly lower IDD ( $p=0.015$ ), frequency of hypoglycemia ( $p=0.006$ ) and severe hypoglycemia ( $p=0.029$ ), and HbA1c ( $p=0.002$ ) than the other two groups. The frequency of hospital admissions was significantly higher in the NPH group than the other two groups



( $p=0.034$ ). Insulin degludec and insulin glargine resulted in significant decrease of HbA1c than baseline ( $p=0.001$  and  $p=0.024$ , respectively). Moreover, insulin degludec resulted in significant decrease in the frequency of hypoglycemia ( $p=0.003$ ) and severe hypoglycemia ( $p=0.017$ ). The insulin glargine group showed significantly lower IDD at the end of the study than baseline ( $P=0.032$ ). No significant difference was found between toddlers and preschoolers as regards IDD, frequency of hypoglycemia and HbA1c. **Conclusion:** The use of insulin degludec and insulin glargine significantly improves glycemic control and reduces the risk of hypoglycemia with a lower insulin dosage among toddlers and preschoolers with T1D.

**Keywords:** Insulin glargine; insulin degludec; NPH insulin; toddlers; preschool children; type 1 diabetes.

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# List of Abbreviations

Abb.	Full term
Arg .....	Arginine
Asn .....	Asparagine
ATG .....	Anti-thymocyte globulin
AHSCT .....	Autologous hematopoietic stem cell transplant
BG.....	Blood Glucose
BI.....	Basal insulin
BMI.....	Body mass index
Bp .....	Blood pressure
CD3.....	Cluster of differentiation 3
CGM .....	Continuous glucose monitoring
CTLA-4 .....	Cytotoxic T-lymphocyte-associated protein 4
DCCT.....	Diabetes Control and Complications Trial
DKA .....	Diabetic ketoacidosis
ENDIT.....	European Nicotinamide Diabetes Intervention Trial
Fiasp .....	Faster-acting insulin aspart
GAD65 .....	Glutamic acid decarboxylase 65
GCSF .....	Granulocyte colony stimulation factor
GLP-1 .....	Glucagon-like peptide-1
Gly .....	Glycine
HbA1c .....	Hemoglobin A1c (glycosylated hemoglobin)
HLA .....	Human leukocyte antigen
IA-2.....	Insulinoma-associated 2
IAA.....	Antibodies to insulin
ICA.....	Islet cell cytoplasmic antibodies
IDD .....	Insulin daily dose
IDeg .....	Insulin Degludec
IDF.....	International Diabetes Federation
IGlar .....	Insulin Glargine
INIT II.....	Australian intranasal insulin trial II
JDRF.....	Juvenile Diabetes Research Foundation
MDI.....	Multiple daily injections



# List of Abbreviations cont...

Abb.	Full term
MODY.....	Maturity onset diabetes of the young
NDM.....	Neonatal diabetes mellitus
NGSP.....	National Glycohemoglobin Standardization Program
NPH .....	Neutral protamine Hagedorn insulin
OGTT.....	Oral glucose tolerance test
PADU .....	Pediatric and adolescents diabetes unit
PD.....	Pharmacodynamics
PG.....	Plasma glucose
Ph.....	Negative logarithm of the hydrogen ion concentration
PK.....	Pharmacokinetic
RCTs.....	Randomized controlled trials
SC .....	Subcutaneous
SMBG .....	Self-monitoring blood glucose
T1D.....	Type one diabetes
T2D.....	Type two diabetes
TINIA .....	Turbidimetric inhibition immunoassay
ZnT8 .....	Zinc transporter8