# Epidemiology and clinical characters of congenital adrenal hyperplasia patients attending Endocrinology Clinic at Cairo University Children's Hospital

# Thesis

Submitted in Partial Fulfillment for the requirements of Master Degree in Pediatrics


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# Abstract

Congenital adrenal hyperplasia (CAH) is one of the most frequent inborn endocrine disorders; it comprises autosomal recessive disorders of cortisol biosynthesis in the adrenal gland caused by various enzyme deficiencies. Because of paucity of epidemiological data of CAH in developing countries, this study aimed to identify clinical characters, laboratory parameters and treatment outcomes of CAH in Egyptian children. This is a retrospective study covering 180 patients attended the Diabetes Endocrine Metabolic Pediatric Unit at Cairo University Children's Hospital being a referral center for all Egyptian governorates. Demographic data, clinical examinations, laboratory and radiological investigations and treatment options are obtained from the files of patients and analyzed. The results of this study showed that deficiency of 21-hydroxylase is by far the most common cause of CAH, corresponding to more than 90% of our cases. However, 3β-hydroxysteroid dehydrogenase deficiency represents 8%. Salt wasting form accounts for more than 80% of cases followed by simple virilizing then non classic form. Parental consanguinity was found in 62% of cases. Genital ambiguity was the most common presentation followed by salt losing symptoms and signs then premature pubarche manifestations. Our study indicates that newborns with developmental anomalies of the external genitalia should be diagnosed as early as possible so that medical, psychological, and social complications are minimized.



***Keywords:*** CAH, Intersex, 21-hydroxylase deficiency.

بسم الله الرحمن الرحيم

# وقل رب زدني علما

*صدق الله العظيم*
*طه ١١٤*

**In the Name of ALLAH, The Most Beneficent, The Most Merciful**

« **And say: My Lord, Increase me in knowledge** »

***Tâ-Hâ 114***

# ACKNOWLEDGEMENT

Praise be to ALLAH, Lord of world, and may HIS blessings & peace be upon Muhammad, HIS servant and HIS messenger.

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*Reham Mohammad Alfergany*

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*To the soul of my father*

*To my devoted mother*

*To my dear husband*

*To my darling kid*

# *Contents*

**Page**

# List of abbreviations

**11OHD** = 11β-Hydroxylase Deficiency
**17OHD** = 17α-hydroxylase deficiency
**17OHP** = 17 Hydroxyprogesterone
**17Preg** = 17-Hydroxypregnenolone
**21OHD** = 21-Hydroxylase Deficiency
**3βHSD** = 3 β-Hydroxysteroid Dehydrogenase
**3βHSDD** = 3 β-Hydroxysteroid Dehydrogenase Deficiency
**ABS** = Antley–Bixler syndrome
**ACTH** = Adrenocorticotrophic hormone
**AMH** = Anti-Mullerian Hormone
**AR** = Androgen Receptor
**ARR** = Aldosterone - Renin Ratio
**BA** = Bone Age
**BMD** = Bone Mineral Density
**BMI** = Body Mass Index
**BP** = Blood pressure
**C4A & C4B** = complement 4 A & B genes
**CAH** = Congenital Adrenal Hyperplasia
**CaM** = Calmodulin dependent protein
**cAMP** = cyclic Adenosine MonoPhosphate
**CPP** = Central Precocious Puberty
**CRH** = Corticotropin Releasing Hormone
**CVS** = Chorionic Villus sampling
**CYP** = Cytochrome P450 enzyme
**DEMPU** = Diabetes Endocrine and Metabolism Pediatric Unit
**DHEA** = Dehydroepiandrosterone
**DHEAS** = Dehydroepiandrosterone Sulphate
**DNA** = Deoxyribonucleic acid
**DOC** = Deoxycorticosterone
**DSD** = Disorder of Sex Development
**DXM** = Dexamethasone
**EIA** = Enzyme-linked Immunosorbent Assays
**FAD** = Flavin Adenine Dinucleotide
**FAH** = Final Adult Height
**FGFR2** = Fibroblast Growth Factor Receptor 2
**FGFR2** = Fibroblast Growth Factor Receptor 2
**FH** = Final Height
**FIA** = Fluoroimmunoassays
**FMN** = Flavin Mono Nucleotide
**FSH** = Follicle Stimulating Hormone
**GA** = Genital Ambiguity

**GC** = Gas Chromatography
**GC** = Glucocorticoid
**GH** = Growth Hormone
**GnRHa** = Gonadotropin Releasing Hormone analogue
**$HbA_{1C}$** = glycosylated hemoglobin A1
**HC** = Hydrocortisne
**HLA** = Human Leucocyte Antigens
**HPA** = Hypothalamic-Pituitary-Adrenal
**HSD3B1&HSD3B2** = Hydroxysteroid Dehydrogenase3B1&2 genes
**ICU** = Intensive Care Unit
**IVF** = In-vitro Fertilization
**LC** = Liquid Chromatography
**LDL** = Low Density Lipoprotein
**LH** = Luteinizing Hormone
**LHRH** = Luteinizing Hormone Releasing Hormone
**MPH** = Mid-Parental Height
**MS** = Mass Spectrometry
**NADPH** = Nicotinamide Adenine Dinucleotide Phosphate
**NC** = Non Classic
**NC21OHD** = Non Classical 21-Hydroxylase Deficiency
**ORD** = Oxidoreductase Deficiency
**PACAP** = Pituitary Adenylate Cyclase-Activating Polypeptide
**PCOS** = Poly cystic Ovarian Syndrome
**PCR** = Polymerase Chain Reaction
**POR** = P450 Oxidoreductase
**Por gene** = P450 Oxidoreductase gene
**PRA** = Plasma Renin Activity
**RIA** = Radioimmunoassay
**RP1 & RP2** = putative nuclear protein 1& 2 genes
**SDS** = Standard Deviation Score
**SRY** = Sex-determining Region on the Y chromosome
**StAR** = Steroidogenic Acute Regulatory protein
**START domain** = StAR-Related Transfer domain
**SV** = Simple Virilising
**SW** = Salt Wasting
**TART** = Testicular Adrenal Rest Tumors
**TH-SD** = Target Height – Standard Deviation
**TNXA & TNXB** = tenascin-X A & B genes
**VIP** = Vasoactive Intestinal Polypeptide
**XA & XB** = tenascin-X A & B genes

# List of tables

# List of figures

# AIM OF THE WORK

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Congenital adrenal hyperplasia (CAH) is one of the most frequent inborn endocrine disorders; it comprises autosomal recessive disorders of cortisol biosynthesis in the adrenal gland caused by various enzyme deficiencies. The consequent compensatory rise of ACTH production causes hyperplastic growth of the adrenal glands. The clinical presentation of patients with CAH is heterogeneous and depends on the type of deficient enzyme as well as on the sex of the patient.

Because of paucity of epidemiological data of CAH in developing countries, this work aimed to identify clinical characters, laboratory parameters and treatment outcomes of CAH in Egyptian children who have attended the Diabetes Endocrine and Metabolism Pediatric Unit (DEMPU) at Cairo University Children's Hospital being a referral center for all Egyptian governorates.

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