



بسم الله الرحمن الرحيم

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**5 Years Analysis of Therapeutic Hypothermia
for HIE Neonates in NICUs of
Ain Shams University**

A Thesis

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بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

قَالَ

لَسْبَحَانَكَ لَا عِلْمَ لَنَا
إِلَّا مَا عَلَّمْتَنَا إِنَّكَ أَنْتَ
الْعَلِيمُ الْعَظِيمُ

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*✍ **Alaa Amir El dawla Abd El fattah Attia***

List of Contents

<i>Subject</i>	<i>Page No.</i>
List of Abbreviations.....	i
List of Tables.....	iii
List of Figures	vi
Introduction	1
Aim of the Study	3
Review of Literature	
Hypoxic Ischemic Encephalopathy (HIE)	4
Therapeutic Hypothermia	33
Therapeutic hypothermia in a low-resource environment	47
Patients and Methods.....	55
Results.....	62
Discussion	91
Summary	107
Conclusions	111
Recommendations	114
References	113
Arabic Summary	—

List of Abbreviations

<i>Abbr.</i>	<i>Full-term</i>
AAP	: American Academy of Pediatrics
ACA RI	: Resistive index of anterior cerebral artery
ACOG	: American College of Obstetrics and Gynecology
aEEG	: Amplitude-integrated Electroencephalography
AKI	: Acute kidney injury
CBV	: Cerebral blood volume
CKBB	: Creatine kinase brain band
CT	: Computed tomography
DIC	: Disseminated intravascular coagulopathy
EAA	: Excitatory amino acids
EEG	: Electroencephalography
FFP	: Fresh frozen plasma
FTOE	: Fractional tissue oxygen extraction
GFAP	: Glial fibrillary acidic protein
HbD	: Hemoglobin difference
HbO₂	: Oxygenated hemoglobin
HHb	: De-oxygenated hemoglobin
HI	: Hypoxia ischemia
HIC	: High-income countries
HIE	: Hypoxic-ischemic encephalopathy
HR	: Heart rate

LFTs	: Liver function tests
LMIC	: Low-middle income countries
MCA RI	: Resistive index of middle cerebral artery
MRI	: Magnetic resonance imaging
MRS	: Magnetic resonance spectroscopy
NE	: Neonatal encephalopathy
NIRS	: Near infrared spectroscopy
NSE	: Neuron-specific enolase
PCM	: Phase change material
RCTs	: Randomized controlled trials
rScO₂	: Regional cerebral oxygen saturation
S100B	: S100 calcium-binding protein B
SCFN	: Skin subcutaneous fat necrosis
SD	: Standard deviation
SIADH	: Syndrome of inappropriate antidiuretic hormone secretion
SPSS	: Statistical package for social science
TCUS	: Trans-Cranial ultrasonography
TH	: Therapeutic hypothermia
UCH-L1	: Ubiquitin carboxyl-terminal hydrolase L1
UK	: United Kingdom

List of Tables

Table No.	Title	Page No.
Table (1):	Effect of asphyxia on various organs in the newborn:	10
Table (2):	Sarnat and Sarnat's 3 Clinical stages of perinatal hypoxic ischemic brain injury	11
Table (3):	HIE score of Thompson et al. for neonatal hypoxic ischemic encephalopathy	12
Table (4):	Characteristics of the study population	64
Table (5):	Gestational age and weight at delivery	65
Table (6):	Early neonatal assessment	66
Table (7):	Applied method of cooling	67
Table (8):	Timeline for start of passive and active cooling and achievement of target temperature	68
Table (9):	Timeline for start and total duration of cooling (passive + active)	69
Table (10):	Completion of full duration of cooling and reasons of early discontinuation	71
Table (11):	Starting and complications of rewarming	72
Table (12):	Time to achieve target temperature of rewarming	73
Table (13):	Kaplan-Meier analysis for time to achieve target temperature of rewarming	73

Table (14):	Time from birth for development of 1 st seizure.....	75
Table (15):	Antiepileptic usage in the study population.....	75
Table (16):	Number of antiepileptics used in the study population.....	76
Table (17):	Age at performing TCUS	77
Table (18):	ACA RI and MCA RI measures in the study population	77
Table (19):	Abnormalities in echocardiography finding.....	78
Table (20):	Initial Laboratory results and the worst results during 1 st week.....	79
Table (21):	Cardio-respiratory support during 1 st week.....	80
Table (22):	Age at starting enteral feeding (days)	78
Table (23):	Causes of death.....	82
Table (24):	Comparison of survivors and non-survivors as regard time to achieve target temperature: Numerical variables	83
Table (25):	Comparison of survivors and non-survivors as regard temperature swings: Numerical variables.....	84
Table (26):	Comparison of survivors and non-survivors as regard CRP, coagulation profile, degree of encephalopathy and severity of PPHTN: Categorical variables.....	85

Table (27):	Multivariable backward binary logistic regression analysis for prediction of mortality	86
Table (28):	Cox proportional hazards regression analysis for prediction of mortality	88
Table (29):	Follow-up of survived cases.....	89
Table (30):	Results of Bayley-III scale	90

List of Figures

<i>Figure No.</i>	<i>Title</i>	<i>Page No.</i>
Figure (1):	Schematic overview of pathophysiological features of HIE	8
Figure (2):	Classifications of 5 examples traces by using the pattern recognition method and voltage method to assess the aEEG background at 3 to 6 hours of age	15
Figure (3):	(A), Patient at 6 hours. EEG recordings show markedly suppressed amplitude of 10 V and continuous discontinuity, with no sleep wake cycling (SWC). (B), at 24 hours. EEG findings have recovered, with an increase in background amplitude to 50 V, discontinuity seen only during quiet sleep, and the return of disorganized SWC	16
Figure (4):	Ultrasound examinations of the brain in three different neonates with hypoxic-ischemic encephalopathy (HIE). Color Doppler ultrasound shows decreased blood flow velocity meanwhile the resistance index decreases among (a) mild, (b) moderate and (c) severe HIE.....	18
Figure (5):	Severe basal ganglia–thalamus pattern of HII in a 5-day-old infant	20
Figure (6):	Peripheral (parasagittal, watershed, and borderzone) pattern of HII in a term infant.....	20

Figure (7):	Application of NIRS probe for cerebral oxygen monitoring in neonates	23
Figure (8):	Patterns of rScO ₂ (black and red lines) and central temperature (light red line) in two term infants with HIE after severe perinatal asphyxia treated with moderate total-body cooling (33.5°C) during the first 72 postnatal hours.....	24
Figure (9):	Cincinnati Sub-Zero's Blanketrol® III and the Kool-Kit® used for whole-body hypothermia provides accurate and safe temperature management for the patient.....	37
Figure (10):	A neonate with Skin Subcutaneous fat necrosis after cooling.	44
Figure (11):	Manual low-technology cooling devices.	54
Figure (12):	Flow chart of the studied neonates.....	63
Figure (13):	Kaplan-Meier curve for the median time to achieve target temperature of active cooling. By 6 hours, almost 78% of patients achieved target temperature.....	69
Figure (14):	Box plot illustrating frequency of temperature swings during cooling.....	70
Figure (15):	Box plot illustrating relative frequency of temperature swings during cooling.....	70
Figure (16):	Proportion of patients undergoing rewarming.....	72
Figure (17):	Kaplan-Meier curve for the median time to achieve target temperature of rewarming with 50% of patients predicted to reach target temperature by 5 hours.	74

Figure (18):	Incidence of seizures	74
Figure (19):	Antiepileptics used in the study population where phenytoin was the most commonly used.	76
Figure (20):	Enteral Feeding during cooling.....	80
Figure (21):	Kaplan-Meier curve for median time to start enteral feeding where about 58% of predicted to start enteral feeding in 1 st 3 days of life (during cooling).....	81
Figure (22):	Outcome of studied neonates: 17 survived and 20 died.	82
Figure (23):	Kaplan Meier survival curve for the relation between overall survival (days) and PT/PTT during cooling where the survival probability more decreased with increased PT & PTT.....	87
Figure (24):	Kaplan Meier survival curve for the relation between overall survival (days) and degree of encephalopathy.....	89

ABSTRACT

Background: Therapeutic hypothermia (TH) is a standard of care for neonatal hypoxic ischemic encephalopathy (HIE) in developed countries. Most data come from high income countries (HIC). Recently, experts suggest that the safety and efficacy data on cooling from HIC should not be extrapolated to low and middle income countries (LMIC). Although a number of pilot studies have been reported from LMIC, none of these studies had statistical power to detect significant effects of hypothermia after stratification by country income.

Aim of the Work: Evaluate the practice of TH as a treatment for neonates with HIE admitted to NICUs of Ain Shams University Hospitals from 1/2016 to 12/2020 in a retrospective manner.

Patients and Methods: All HIE babies who were treated with TH were included. Retrospectively, patients' medical records of included babies were reviewed and analyzed. Survived neonates were approached by telephone interview regarding parental views on their neurodevelopment and were offered a formal neurodevelopmental assessment for their babies using Bayley Scale III.

Results: A total of 37 neonates (17 survived and 20 died) were included: 2 mild HIE (survived), 13 severe HIE (all died) and 22 moderate HIE (15 survived and 7 died) (mortality 54.1%). The higher the degree of encephalopathy is associated with decreased survival rate and has highly statistical significance with P-value < 0.005. The most common causes of death are pulmonary hemorrhage (24.3%) and shock (24.3%). Of the 17 survivors, 6 patients couldn't be reached while 9 patients had satisfactory neurodevelopmental progression as per their parents' views while 2 patients had poor outcome. Bayley III scale was done for only 3 babies because the rest of parents refused to comeback to do this scale for their babies. The ages of the 3 babies when Bayley-III done were: 13 months old, 13.5 months old & 14.5 months old. All had normal cognitive and language development. Two of them had normal motor development while one patient had mild to moderate motor delay.

Conclusion: TH might not improve outcome of sever HIE but of great value on outcome of moderate HIE. Prospective future studies are recommended to assess the role of TH as a neuroprotective agent for neonates with HIE in a low resource setting.

Keywords: Therapeutic Hypothermia, HIE Neonates, NICUs.

Introduction

Hypoxic ischemic encephalopathy (HIE) is a neurological complication from the inability to establish and sustain respiration at birth in a newborn. It is the commonest cause of neonatal encephalopathy (*Wiswill, 2020*) and a major cause of neonatal morbidity and mortality globally (*Gebregziabher et al., 2020*).

Approximately 20% to 40% of infants who survive, the brain injury develop significant neurological and developmental impairments. The resulting impact on the child, family and society presents a formidable challenge to healthcare professionals (*Badr and Purdy, 2006*).

Perinatal asphyxia is the most important cause of hypoxic-ischemic encephalopathy (HIE) which may occur either intrauterine or postnatally. Intrauterine asphyxia results due to maternal hemodynamic compromise (amniotic fluid embolus), uterine conditions (uterine rupture), or placenta and umbilical cord (placental abruption, umbilical cord knot or compression) and infection. Postnatal asphyxia results from conditions causing neonatal pulmonary failure such as pneumonia or congenital cardiac disease (*Viaroli et al., 2018*).

The goals of management of a newborn infant who has sustained hypoxic-ischemic insult being at risk for evolving