



Neurodevelopmental Outcomes after Neonatal Mechanical Ventilation

Thesis

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

By

Kareem Salah El Din Fekry Madbouly

M.B, B.Ch, 2013

Faculty of Medicine – Ain Shams University

Under Supervision of

Prof. Dr. Eman Ahmed Mohamed Zaky

Professor of Pediatrics

Faculty of Medicine - Ain Shams University

Dr. Hebatallah Ali Mahmoud Shaaban

Assistant Professor of Pediatrics

Faculty of Medicine - Ain Shams University

Dr. Mohamed Omar Abd El Aal Dawoud

Lecturer of Pediatrics

Faculty of Medicine - Ain Shams University

Faculty of Medicine - Ain Shams University

2019

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

وَأَنْزَلَ اللَّهُ عَلَيْكَ
الْكِتَابَ وَالْحِكْمَةَ
وَعَلَّمَكَ مَا لَمْ
كُنْ تَعْلَمُ وَكَانَ
فَضْلُ اللَّهِ عَلَيْكَ
عَظِيمًا

صدق الله العظيم

سورة النساء آية (١١٣)

Acknowledgments

*First and foremost, I feel always indebted to **Allah** the Most Beneficent and Merciful.*

*I wish to express my deepest thanks, gratitude and appreciation to **Prof. Dr. Eman Ahmed Mohamed Zaky**, Professor of Pediatrics, Faculty of Medicine, Ain Shams University, for her meticulous supervision, kind guidance, valuable instructions and generous help.*

*Special thanks are due to **Assistant Prof. Dr. Hebatallah Ali Mahmoud Shaaban**, Assistant Professor of Pediatrics, Faculty of Medicine, Ain Shams University, for her sincere efforts, fruitful encouragement.*

*I am deeply thankful to **Dr. Mohamed Omar Abd El Aal Dawoud**, Lecturer of Pediatrics, Faculty of Medicine, Ain Shams University, for his great help, outstanding support, active participation and guidance.*

*Last but not least my sincere thanks **Assistant Prof. Dr. Shaymaa Maher Deifalla**, Assistant Professor of Pediatrics for her appreciation to all patients participated in this study.*

I would like to express my hearty thanks to all my family for their support till this work was completed.

Kareem Salah El Din Fekry Madbouly

List of Contents

Title	Page No.
List of Tables	5
List of Figures	7
List of Abbreviations.....	16
Introduction.....	- 1 -
Aim of the Work	20
Review of Literature	
▪ Prematurity	21
▪ Mechanical Ventilation	34
▪ Autism Spectrum Disorder (ASD).....	42
▪ Bayley Scales of Infant Development	55
▪ Assessment of Autism	63
Subjects and Methods	67
Results	75
Discussion.....	113
Summary	126
Conclusion	129
Recommendations	130
References	131
Arabic Summary	

List of Tables

Table No.	Title	Page No.
Table (1):	Causes and risk factors of prematurity.	25
Table (2):	Complications of preterm birth.....	27
Table (3):	Severity levels for autism spectrum disorder	54
Table (4):	Shows comparison between studied Prospective Group and Retrospective Group regarding their demographic data including gestational age, gender, residency, consanguinity and maternal diseases.	75
Table (5):	Shows comparison between studied Prospective Group and Retrospective Group regarding maturity, mode of delivery, respiratory distress, duration of stay in NICU, duration on mechanical ventilation, weight on admission, audiometry and fundus examination.....	78
Table (6):	Shows comparison between studied Prospective Group and Retrospective Group regarding the results of the performed Bayley Scale (First time).....	80
Table (7):	Shows comparison between studied Prospective Group and Retrospective Group regarding Bayley Scale (follow up at the second time).	82
Table (8):	Shows comparison between studied Prospective Group and Retrospective Group regarding CARS Scale (Performed on follow up).	84
Table (9):	Shows comparison in Prospective Group regarding Bayley Scale (First time versus follow up).....	85

List of Tables *cont...*

Table No.	Title	Page No.
Table (10):	Shows comparison in Retrospective Group regarding Bayley Scale (First time versus follow up).....	87
Table (11):	Shows correlation between Scores of CARS and Bayley Scale composite subscores (first time and follow up) in studied Prospective and Retrospective group.....	89
Table (12):	Shows correlation between Scores of CARS and Bayley Scale composite subscores (first time and follow up) and Gestational age, Duration of stay in NICU, Duration on mechanical ventilation and Weight on admission in studied Prospective group	93
Table (13):	Shows correlation between Scores of CARS and Bayley Scale composite subscores (first time and follow up) and Gestational age, Duration of stay in NICU, Duration on mechanical ventilation and Weight on admission in Retrospective group	103

List of Figures

Fig. No.	Title	Page No.
Figure (1):	Premature infant with ventilator.....	21
Figure (2):	Classification of the composite score of Bayley III	71
Figure (3):	Shows diagrammatic representation of the mean value of gestational age of the two studied groups.....	76
Figure (4):	Shows diagrammatic representation of gender distribution in both studied groups.....	76
Figure (5):	Shows diagrammatic representation of consanguinity rate and the frequency of the encountered concomitant maternal diseases of the two studied groups.....	77
Figure (6):	Shows diagrammatic representation of maturity status of the two studied groups.	79
Figure (7):	Shows diagrammatic representation of mode of delivery of the two studied groups.....	79
Figure (8):	Shows diagrammatic representation of age on performing Bayley Scale for the first time in the two groups	81
Figure (9):	Shows diagrammatic representation of Bayley scale by using composite subscores for the first time in the both groups.....	81
Figure (10):	Shows diagrammatic representation of the mean age on performing Bayley Scale on follow up at the second time in the both groups.....	83
Figure (11):	Shows diagrammatic representation of Bayley scale by using composite subscores on follow up at the second time in the both groups.....	83

List of Figures *cont...*

Fig. No.	Title	Page No.
Figure (12):	Shows diagrammatic representation of Score of CARS Scale in the two groups.....	84
Figure (13):	Shows diagrammatic representation of the mean age on performing Bayley Scale for the first time versus follow up in the prospective group.	86
Figure (14):	Shows diagrammatic representation of Bayley Scale by using composite subscores for the first time versus follow up in the prospective group.	86
Figure (15):	Shows diagrammatic representation of the mean age on performing Bayley Scale for the first time versus follow up in the Retrospective group.	88
Figure (16):	Shows diagrammatic representation of Bayley Scale by using composite subcores for the first time versus follow up in the Retrospective group.	88
Figure (17):	Scatter plots chart shows the recorded statistically significant negative correlation between Bayley Scale by using Composite Score (Cognitive) on first assessment in relation to CARS scores in the prospective group.	90
Figure (18):	Scatter plots chart shows the recorded statistically significant negative correlation between Bayley Scale by using Composite Score (Language) on first assessment in relation to CARS scores in the prospective group.	90

List of Figures cont...

Fig. No.	Title	Page No.
Figure (19):	Scatter plots chart shows the recorded statistically significant negative correlation between Bayley Scale by using Composite Score (Motor) on first assessment in relation to CARS scores in the prospective group.....	91
Figure (20):	Scatter plots chart shows the recorded statistically significant negative correlation between Bayley Scale by using Composite Score (Cognitive) on follow up after 6 months in relation to CARS scores in the prospective group.	91
Figure (21):	Scatter plots chart shows the recorded statistically significant negative correlation between Bayley Scale by using Composite Score (Language) on follow up after 6 months in relation to CARS scores in the prospective group.	92
Figure (22):	Scatter plots chart shows the negative correlation between Bayley Scale by using Composite Score (Motor) on follow up after 6 months in relation to CARS scores in the prospective group.	92
Figure (23):	Scatter plots chart shows the recorded statistically significant negative correlation between Gestational age in relation to CARS scores in the prospective group.....	95
Figure (24):	Scatter plots chart shows the positive correlation between Gestational age in relation to Bayley Scale by using Composite Score (Cognitive) on first assessment in the prospective group.	95

List of Figures cont...

Fig. No.	Title	Page No.
Figure (25):	Scatter plots chart shows the positive correlation between Gestational age in relation to Bayley Scale by using Composite Score (Language) on first assessment in the prospective group.	96
Figure (26):	Scatter plots chart shows the positive correlation between Gestational age in relation to Bayley Scale by using Composite Score (Motor) on first assessment in the prospective group.	96
Figure (27):	Scatter plots chart shows the positive correlation between Gestational age in relation to Bayley Scale by using Composite Score (Cognitive) at follow up in the prospective group.	97
Figure (28):	Scatter plots chart shows the positive correlation between Gestational age in relation to Bayley Scale by using Composite Score (Language) at follow up in the prospective group.	97
Figure (29):	Scatter plots chart shows the positive correlation between Duration in NICU in relation to CARS scores in the prospective group.....	98
Figure (30):	Scatter plots chart shows the positive correlation between Duration in NICU in relation to Age on performing Bayley Scale on first assessment in the prospective group.	98

List of Figures *cont...*

Fig. No.	Title	Page No.
Figure (31):	Scatter plots chart shows the negative correlation between Duration in NICU in relation to Bayley Scale by using Composite Score (Congitive) at follow up in the prospective group.	99
Figure (32):	Scatter plots chart shows the positive correlation between Duration on Mechanical Ventilation in relation to CARS scores in the prospective group.	99
Figure (33):	Scatter plots chart shows the positive correlation between Duration on Mechanical Ventilation in relation to Age on performing Bayley scale on first assessment in the prospective group.	100
Figure (34):	Scatter plots chart shows the negative correlation between Duration on Mechanical Ventilation in relation to Bayley scale by using Composite Score (Congitive) at follow up in the prospective group.....	100
Figure (35):	Scatter plots chart shows the negative correlation between weight on admission in relation to CARS scores in the prospective group.	101
Figure (36):	Scatter plots chart shows the positive correlation between weight on admission in relation to Bayley Scale by using Composite Score (Cognitive) on first assessment in the prospective group.	101

List of Figures *cont...*

Fig. No.	Title	Page No.
Figure (37):	Scatter plots chart shows the positive correlation between Weight on admission in relation to Bayley Scale by using Composite Score (Language) on first assessment in the prospective group.	102
Figure (38):	Scatter plots chart shows the positive correlation between weight on admission in relation to Bayley Scale by using Composite Score (Cognitive) at follow up in the prospective group.	102
Figure (39):	Scatter plots chart shows the positive correlation between Gestational age in relation to Bayley Scale by using Composite Score (Cognitive) on first assessment in the Retrospective group.....	104
Figure (40):	Scatter plots chart shows the positive correlation between Gestational age in relation to Bayley Scale by using Composite Score (Language) at first time in the Retrospective group.....	105
Figure (41):	Scatter plots chart shows the positive correlation between Gestational age in relation to Bayley Scale by using Composite Score (Motor) on first assessment in the Retrospective group.....	105
Figure (42):	Scatter plots chart shows the negative correlation between Duration of stay in NICU in relation to Bayley Scale by using Composite Score (Congitive) on first assessment in the Retrospective group.....	106

List of Figures *cont...*

Fig. No.	Title	Page No.
Figure (43):	Scatter plots chart shows the negative correlation between Duration of stay in NICU in relation to Bayley Scale by using Composite Score (Language) on first assessment in the Retrospective group.....	106
Figure (44):	Scatter plots chart shows the negative correlation between Duration of stay in NICU in relation to Bayley Scale by using Composite Score (Motor) on first assessment in the Retrospective group.....	107
Figure (45):	Scatter plots chart shows the negative correlation between Duration of stay in NICU in relation to Bayley Scale by using Composite Score (Cognitive) at follow up in the Retrospective group.....	107
Figure (46):	Scatter plots chart shows the positive correlation between Duration on Mechanical Ventilation in relation to Age on performing Bayley scale on first assessment in the Retrospective group.....	108
Figure (47):	Scatter plots chart shows the negative correlation between Duration on Mechanical Ventilation in relation to Bayley scale by using Composite score (Cognitive) on first assessment in the Retrospective group.	108
Figure (48):	Scatter plots chart shows the negative correlation between Duration on Mechanical Ventilation in relation to Bayley scale by using Composite score (Motor) on first assessment in the Retrospective group.	109

List of Figures cont...

Fig. No.	Title	Page No.
Figure (49):	Scatter plots chart shows the negative correlation between Duration on Mechanical Ventilation in relation to Bayley scale by using Composite score (Cognitive) at follow up in the Retrospective group.	109
Figure (50):	Scatter plots chart shows the positive correlation between Weight on admission in relation to Bayley scale by using Composite score (Cognitive) on first assessment in the Retrospective group.....	110
Figure (51):	Scatter plots chart shows the positive correlation between Weight on admission in relation to Bayley scale by using Composite score (Language) on first assessment in the Retrospective group.....	110
Figure (52):	Scatter plots chart shows the positive correlation between Weight on admission in relation to Bayley scale by using Composite score (Motor) on first assessment in the Retrospective group.....	111
Figure (53):	Scatter plots chart shows the positive correlation between Duration of stay in NICU in relation to Age on performing Bayley scale on first assessment in the Retrospective group.	111
Figure (54):	Scatter plots chart shows the negative correlation between Duration on Mechanical Ventilation in relation to Bayley scale by using Composite score (Language) on first assessment in the Retrospective group.	112

List of Figures *cont...*

Fig. No.	Title	Page No.
Figure (55):	Scatter plots chart shows the positive correlation between Weight on admission in relation to Bayley scale by using Composite score (Language) at follow up in the Retrospective group.....	112