Department of Medical Studies

Effect of Environmental Stressors on Biobehavioral Responses of Preterm Infants in Neonatal Intensive Care Unit

Thesis Proposal Submitted for Fulfillment of PhD in
Childhood Studies
Medical Studies Department
(Child Health and Nutrition)

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2013

بسم الله الرحمن الرحيم

" وهو الذى أنشأ لكم السمع و
الأبصار والأفئدة قليلا ما تشكرون"

صدق الله العظيم

(المؤمنون– الآية ٧٨)

ACKNOWLEDMENT

First and foremost, I thank **Allah**, who gave me the strength to accomplish this work.

Words cannot express my sincere gratitude and appreciation to ***Prof.Dr.Ehab Mohamed Eid*** *Professor of public health, Ain Shams University. I had the honor to work under his supervision. I wish also to express my deep gratitude for his continuous support, valuable remarks meticulous supervision and for offering me much of his time and effort throughout this study.*

I would like to express my sincere indebtedness and profound gratitude to ***Prof.Dr. Mohamed Sami El Shimi*** *Professor of Pediatrics, Ain Shams University, for his continuous guidance, valuable suggestions and keen supervision throughout work.*

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Abstract

Although research has demonstrated that the neonatal intensive care unit (NICU) is a stressful environment for preterm, little research validates the suspected relationships between infant biobehavioral responses and environmental stress in the NICU. This study examined the relationship between environmental stress and biobehavioral responses of preterm infants. The study used a repeated-measures research design to examine research variables in one group of preterm infants. Measurements of research variables were recorded every 2 minutes during two 60-minute observation periods for each research day (1 hour in the morning and 1 hour in the afternoon) and conducted over 2 days. A convenience sample of 84 preterm infants was recruited from Almaza NICU. A total of 10416 observations were made and recorded during the study. There was a statistically significant ($P < 0.05$) relationship between environmental stressors and changes in physiological signals. There were also statistically significant ($P < 0.05$) relationships between environmental stress and some specific stress behavioral responses. This research is applicable to neonatal clinical practice because it demonstrates the importance of recognizing the preterm infant's biological stress responses to environmental

stressors, allowing for early interventions to reduce the possibility of more serious physiological or pathological changes in the status of the preterm infant.

Key words:*environmental stress, preterm infant, stress behavioral responses, stress physiological signals.*

List of Abbreviations

AAP	American Academy of Pediatrics
ACTH	Adrenocorticotropic hormone
BPD	Bronchopulmonary dysplasia
dB	Decibel
Ft-c	Foot candle
GA	Gestational age
HC	Head circumference
ISO	International Organization for Standardization
IUGR	Intrauterine growth retardation
KC	Kangaroo Care
KMC	Kangaroo Mother Care
L/S	Lethicinsphyngomylien ratio
LMP	Last date of menstrual period
LUX	unit of measurement of light
NEC	Necrotizing enterocolitis
NICU	Neonatal intensive care unit
NIDCAP	Neonatal Individualized Developmental Care and Assessment Program
NREM	Non Rapid Eye Movement

OHC	outer hair cells
ONB	Observation of Newborn Behavior
PG	Prostaglandin
PROM	Premature rupture of membranes
RDS	Respiratory distress syndrome
REM	Rapid Eye Movement
RHT	retinohypothalamic tract
SCN	suprachiasmatic nuclei
SLM	The sound level meter
SPL	decibels of sound pressure level

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Introduction

The neonatal intensive care unit (NICU) provides treatment for maintaining the vital functions of preterm infants because of immaturity of all major body systems, especially the nervous system. However, some researchershave pointed out that the NICU environment involves sensory overload and is a mismatch to the requirements of the developing nervous system in preterm infants. In order to not only assure survival but also foster the development of preterm infants, it is critical to understand the interaction among the environment and the function and progression of preterm infants***(Niang and Bachman, 2009).***

Light, sound, and caregiving interventions are the mainenvironmental stressors that are harmful to preterminfants in NICUs***(Nair et al., 2003).***

Preterm infants have often been cared for in NICUs typically illuminated 24 hours a dayby a mixture of natural and artificial light.The ambient light levels range from12 to 99 foot-candles (ft-c) with a mean light illumination of 46.29 ft-c in the NICU ***(Slevin et al., 2000).***

Sound levels in the NICU have also been a majorsource of environmental stress for premature infants. The American Academy of Pediatrics recommendedthat noise levels should not exceed 40 to 45 dB in theNICU and basic sound levels should be less than 35 dBto promote infant sleep***(Levy et al., 2003).***

Caregiving interventions in the NICU often combinemultiple stimuli that include sound, light, tactile stimuli,and pain. In interventions that require openingthe plastic sleeve of the incubator, the mean decibellevel has been found to be 67 to 86 dB. Nursing and medical interventions sometimes include painful stimuli. These painful interventions may produce a physiologicalresponse and induce stress behaviors in preterminfants***(Bremmer et al., 2003).***

Environmental stimuli in the NICU cancause initial increases in heart and respiratory rate in acutely illinfants, along with possible increases in oxygen consumptionand caloric requirements. If the stressfulstimulation continues without any intervention, the initialincreases in cardiac and respiratory rates ceases and the infantwill become bradycardic and apneic***(Philibin and Klass, 2000).***