

The Effect of Oral Glucose and Non-nutritive Sucking in Reducing Needle-Related Procedural Pain among Infants

Thesis

*Submitted for Partial Fulfillment of the
Requirements for the Doctorate Degree
in Pediatric Nursing*

By

Safaa Ramadan Gharib Hassan

*(M.Sc. Pediatric Nursing, 2008)
Assistant Lecturer in Pediatric Nursing Department
Faculty of Nursing - Helwan University*

**Faculty of Nursing
Ain Shams University
(2015)**

The Effect of Oral Glucose and Non-nutritive Sucking in Reducing Needle-Related Procedural Pain among Infants

Thesis

*Submitted for Partial Fulfillment of the
Requirements for the Doctorate Degree
in Pediatric Nursing*

Supervised By

Prof. Sabah Saad Al-Sharkawy

*Professor of Pediatric Nursing - Faculty of Nursing
Ain Shams University*

Assist. Prof. Randa Mohamed Adly

*Assistant Professor of Pediatric Nursing
Ain Shams University*

Assist. Prof. Safaa Salah Ismail

*Assistant Professor of Pediatric Nursing
Helwan University*

**Faculty of Nursing
Ain Shams University
(2015)**



Acknowledgment

*First and foremost, I feel always indebted to **Allah**, the most kind and the most merciful for all countless gifts I have been offered. One of these gifts is accomplishing this research work.*

*I am so grateful to **Prof. Sabah Saad Al-Sharkawy**, Professor of Pediatric Nursing, Faculty of Nursing, Ain Shams University for her supervision, constructive criticism, her valuable advice experienced and time she has devoted to the fulfillment of this work.*

*I wish to express my deepest gratitude and sincere appreciation toward **Asst. Prof. Randa Mohamed Adly**, Assistant Professor of Pediatric Nursing, Faculty of Nursing, Ain Shams University, who devoted much of her time, effort generous advice for the completion of this work. Words can never express my hearty thanks and indebtedness to her guidance and friendly encouragement.*

*I am especially indebted and feel appreciation to **Asst. Prof. Safaa Salah Ismail**, Assistant Professor of Pediatric Nursing, Faculty of Nursing, Helwan University, for her kind help, generous advices, guidance and time she has devoted to the fulfillment of this work.*

I could never forget to offer my especial thanks to the nurses and caregivers of infants that participated in this research work for their cooperation which had great value to accomplish this study.

Contents

<i>Title</i>	<i>Page</i>
List of tables	i
List of figures	v
List of abbreviations	vii
Abstract	viii
Introduction and aim of the study	1
Review of literature	6
▪ Concept of pain	6
▪ Neurobiological development of pain	7
▪ Pain theories	8
▪ Physiology of Pain	11
▪ Pathophysiology of Pain	17
▪ Types of pain	18
▪ Factors influencing pain	20
▪ Effect of pain	23
▪ Pain assessment	29
▪ Non-pharmacological Pain management	34
☒ Management of painful procedure	37
☒ Non-pharmacological strategies for pain management	
○ Sweet tasting solutions	41
○ Non-Nutritive Sucking (NNS)	42
☒ Barriers to pain management in infants	44
☒ The nurse's role in non-pharmacological pain strategies.....	50
▪ Application of nursing process for infant undergoing painful procedures	53
▪ Ethical imperative of managing pain in children.....	58

Subjects and methods	62
Results	75
Discussion	104
Conclusion and recommendations	119
Summary	121
References	131
Appendix I	147
Appendix II	156
Appendix III	159
Arabic summary	—

List of tables

Table	Title	Page
<u>Tables of review:</u>		
Table (1):	Responses of infants to pain	31
Table (2):	FLACC Behavioral Pain Scale	33
Table (3):	Non-pharmacological interventions to relieve infant pain	37
Table (4):	Myth and misconception about pain in infants and children	47
Table (5):	Teaching guideline to manage pain without drugs	51
Table (6):	Pain assessment tools for infants	57
<u>Tables of results:</u>		
Table (1):	Number and percentage distribution of infants in experimental groups and control group as regards to their characteristics.	76
Table (2):	Number and percentage distribution of nurses according to their characteristics.	78
Table (3):	Number and percentage distribution of infants in experimental groups and control group regarding their previous exposure to painful procedures.	81
Table (4):	Number and percentage distribution of infants in experimental groups and control group regarding their present exposure to a painful procedure.	82

List of tables

Table	Title	Page
Table (5):	Number and percentage distribution of infants in experimental groups and control group regarding to their caregivers use of non-pharmacological pain relief measures during a painful procedure.	83
Table (6):	Means & standard deviation of infants in experimental groups and control group regarding categories of FLACC pain scale after needle related procedure.	84
Table (7):	Number and percentage distribution degree of pain among the studied infants in experimental groups and the control group after the interventions.	85
Table (8):	Relation between the experimental groups and the control group regarding duration of crying after intervention.	86
Table (9):	Number and percentage distribution of nurses according to their knowledge related to definition of acute procedural pain, Physiology, Types, and Factors affecting perception of pain in infants before implementation of the program, immediately after and at follow-up	87
Table (10):	Number and percentage distribution of nurses according to their knowledge related to the effects of pain on infants, assessment and clinical manifestation of pain before implementation of the program, immediately after and at follow-up.....	88

List of tables

Table	Title	Page
Table (11):	Number and percentage distribution of nurses according to their knowledge related to concept of acute procedural pain management before implementation of the program, immediately after and at follow-up.	89
Table (12):	Number and percentage distribution of nurses according to their knowledge related to non-pharmacological interventions for acute procedural pain before implementation of the program, immediately after and at follow-up.	90
Table (13):	Number and percentage distribution of nurses according to their knowledge related to oral glucose as a non-pharmacological intervention for acute procedural pain before implementation of the program, immediately after and at follow-up.	91
Table (14):	Number and percentage distribution of nurses according to their knowledge related to non-nutritive sucking as a non-pharmacological intervention for acute procedural pain before implementation of the program, immediately after and at follow-up.	92
Table (15):	Number and percentage distribution of nurses according to their knowledge related to preparation of the parent for infants' procedural pain, preparation of the environment and their role in non-pharmacological pain intervention before implementation of the program, immediately after and at follow-up.	93

List of tables

Table	Title	Page
Table (16):	Percentage distribution of nurses according to their practices related to the administration of oral glucose immediately after the program implementation and at follow up.	95
Table (17):	Percentage distribution of nurses according to their practices related to giving a pacifier immediately after the program implementation and at follow up.	96
Table (18):	Percentage distribution of nurses according to their practices related to giving oral glucose and pacifier immediately after the program implementation and at follow up.	97
Table (19):	Relation between infants' characteristics and the degree of pain among experimental groups and control group after the intervention.	99
Table (20):	Relation between nurses' characteristics and their knowledge immediately after the program implementation and at follow up.	101
Table (21):	Relation between nurses' characteristics and their practices immediately after the program implementation and at follow up.	102
Table (22)	Correlation between total nurses' knowledge and their practice.	103

List of figures

<i>Figure</i>	<i>Title</i>	<i>Page</i>
<u>Figures of review:</u>		
Figure (1):	Gate control theory: Blocking the transmission of pain	10
Figure (2):	Physiology of pain.....	11
Figure (3):	A noxious stimulus for pain.	12
Figure (4):	Transmission of pain impulses in infant.	13
Figure (5):	Impulses pathway	15
Figure (6):	Factors influence on the child's perception of pain.	21
Figure (7):	Facial expression of pain in the infant.	26
Figure (8):	A withdrawal reflex.	27
Figure (9):	Algorithm for management of procedural pain ...	39
Figure (10):	Barriers to optimal pain management	44
Figure (11):	Factors that impact on pain management practices.	45
Figure (12):	The stage of pain management	53

List of figures

<i>Figure</i>	<i>Title</i>	<i>Page</i>
<u>Figures of results:</u>		
Figure (1):	Percentage distribution of the studied infants according to presence of health problem.	77
Figure (2):	Percentage distribution of nurses according to their place of work.	79
Figure (3):	Percentage distribution of nurses according to their previous attendance of training programs in the field of pediatric nursing.	80
Figure (4):	Percentage distribution of total nurses' knowledge regarding to non-pharmacological strategies of infants' procedural pain before implementation of the program, immediately after and at follow-up.	94
Figure (5):	Percentage distribution of nurses' total practices regarding to non-pharmacological methods used to relieve infants' procedural pain immediately after implementation of the program and at follow-up.	98

List of Abbreviations

APA	Association of Paediatric Anaesthetists
CHEOPS.....	Children's Hospital of Eastern Ontario Pain Scale
CNS.....	Central Nervous System
(FLACC) Behavioral Pain Scale	Face, Legs, Activity, Cry, and Consolability Behavioral Pain Scale
IASP.....	International Association for the Study of Pain
NNS.....	Non-Nutritive Sucking
OPS.....	Objective Pain Scale
PCA.....	Post Conceptual Age
WHO.....	World Health Organization

ABSTRACT

Infants experience pain similarly and more intensely than older children and adult. The issue of pain management in infants has been largely neglected in most clinical settings, despite subjecting them to painful procedures. However, non-pharmacological interventions are reported to be effective in relieving pain in infants (**Rouben, 2013**). **This study aimed** to evaluate the effect of oral glucose and non-nutritive sucking in reducing needle-related procedural pain among infants; Assess nurses' knowledge and practices toward oral glucose and non-nutritive sucking as a non-pharmacological pain relief strategies in alleviating pain among infants undergoing acute painful procedures; and plan, implement and evaluate the effect of the nursing guideline program on nurses' knowledge and practices. **Research design:** A quasi-experimental research design was applied to achieve the aims of the study. **Settings:** The study was carried out at the Paediatric Emergency Department and Outpatient Clinics at Ain Shams Children's Hospital and the Immunization Center for Children affiliated to Ministry of Health in Benha City. **Subjects:** A purposive sample of 120 infants was selected by specific criteria and randomly distributed into one control and three experimental groups and 23 nurses who were available during the study period and working on the study settings. **Tools of data collection:** 1) Structured interview questionnaire sheet for nurses to assess their knowledge, 2) Observation checklist for nurses' practice regarding to oral glucose and non-nutritive sucking in reducing needle-related procedural pain among infants, 3) Infant assessment sheet, 4) FLACC behavioral pain scale to assess infant's pain, and 5) Crying time. **The results of this study** revealed that there were very highly statistically significant differences of total FLACC behavioral score between the experimental groups and the control group after the intervention, as well as, mean of crying time. Also, the study result revealed that the majority (91.3%) of the studied nurses improved in their knowledge immediately after the program implementation and at follow-up. In addition, all nurses had competent in their practices immediately after implementation of the program compared to 87% at follow-up. **The study concluded** that, the use of oral glucose and non-nutritive sucking is effective in reducing pain for infants undergoing needle related procedures. Moreover, the implementation of the nursing guideline program had a positive effect on the improvement of nurses' knowledge and practices regarding oral glucose and non-nutritive sucking as non-pharmacological pain relief strategies in alleviating pain among infants undergoing acute painful procedures. **The study recommended** that, oral glucose and non-nutritive sucking should be used in pediatric units as a routine intervention to reduce pain during minor needle related procedures for infants. Also, the educational programs and trainings for pediatric nurses should be focused particularly on training them about pediatric pain and its non-pharmacological management.

Key words: Oral glucose, Non-nutritive sucking, Procedural pain, Infants

Introduction

Pain is a highly individualized, subjective experience that can affect any person at any age. It is a complex phenomenon that involves multiple components and is influenced by several factors; while, it involves both sensory and emotional factors (**International Association for the Study of Pain "IASP", 2012**). In children, pain is a highly prevalent problem; it is a predominantly subjective emotional distress that also leads to impairment in their quality of life (**Inal & Kelleci, 2012; Canbulat et al., 2014**). The most common and important sources of pain experiences by infants are medical pain; primarily needle pain such as venipunctures and immunizations, while its cause fear. This fear of pain experienced due to medical procedures in the infancy period usually continues up to adulthood. Indeed, Infants experience pain similarly and probably more intensely than older children and adults (**Michael & Ric, 2009**).

The experience of untreated pain early in life can lead to physiological and psychological consequences for children. Such as increase oxygen consumption and increased distress during later procedures. While, treating pain decreases the need for physical restraints, and prevents short and long term consequences of pain (**Kyle & Carman, 2013**). Part of the reluctance to aggressively treat pain during infancy was rooted in the belief that the pain system was not yet fully developed. Also, due to the nonverbal nature of infants, they are incapable of reporting and describing the subjective phenomenon of pain (**Bissonnette et al., 2011**).

Reduction of pain is both a professional imperative and an ethical expectation. Pain reduction therapies are often under used for the numerous minor procedures that are part of routine medical and nursing care for infants. Scientific and clinical evidence points to the efficacy of natural, non-

pharmacological strategies to reduce pain due to minor procedures (**Academy of Breastfeeding Medicine Protocol Committee, 2010**). Some of these strategies are feeding of sweet compounds such as sucrose, glucose, and saccharine; non-nutritive sucking on pacifiers (**Michael & Ric, 2009**).

Over the past century sweet tasting solutions have been used to promote calm and to reduce pain in infants and even before this time Prophet Mohammed, circa 632 AD, recommended giving infants a well chewed date (**Harrison et al., 2011**). Sucrose and glucose are the most commonly used sweet-tasting solutions; however, they are effective, simple and fast-acting non-pharmacological method to use and have no documented side effects. There is no fully accepted explanation for the pain-reducing effect of sweet-tasting solutions, but activation of endogenous opioids has been suggested as a possible mechanism (**Suhrabi et al., 2014**).

Additionally, offering a pacifier is the most common way to provide non-nutritive sucking to an infant (**Liu et al., 2010**). Non-nutritive sucking is a comfort measure for infants and helps them to calm. Oral administration of 30% glucose combined with sucking provided better control of pain induced by blood sampling in newborns at neonatal unit (**Mekkaoui et al., 2012**). These interventions may modulate pain sensation and response to pain through changes in attention and decreasing apprehension (**McGrath et al., 2014**).

Nursing is the profession with the greatest pediatric patient contact. One of the important nursing cares includes the alleviation of pain. Infants are less able to communicate their pain to staff nurses. So, the important responsibility of health care professionals who care for infants is eliminating pain and its suffering when possible. However, insufficient knowledge among nurses and inadequate application of knowledge contribute to the lack of effective management. The personal values and beliefs of health care