ORAL FEEDING SKILLS OF PREMATURE INFANTS

by

Karina Johanna Uys

Presented in partial fulfilment of the requirements for the degree M Communication Pathology in the Department of Communication Pathology, Faculty of Humanities, University of Pretoria

October 2000
ACKNOWLEDGEMENTS

Special thanks to the following persons who contributed to the completion of this captivating study:

Professors Brenda Louw and Renè Hugo for their patience, guidance and constant encouragement

Mrs Anne-Marie Van Heerden for the typing of the FEFARI and typing advice

Mrs Rina Owen and Dr Borraine for the statistical processing of the data

Mrs Liesel Hiemstra for the language editing

The staff of the NICU of the Pretoria Academic Maternity Hospital for their collaboration and support

My colleagues at the speech therapy and occupational therapy departments of the Pretoria Academic Hospital for their understanding and constant enthusiastic encouragement

My family, parents and parents in law for their understanding, prayers and contributions towards this study

Most important, to the Lord Jesus Christ, for the strength and perseverance to complete this research project.
SUMMARY

ORAL FEEDING SKILLS IN PREMATURE INFANTS

by

Karina Johanna Uys

SUPERVISOR: Professor Brenda Louw
CO-SUPERVISOR: Professor Renè Hugo
DEPARTMENT: Communication Pathology
DEGREE: M Communication Pathology

Early intervention is a rapid-growing, comprehensive science. The premature infant forms a significant part of the population who requires early intervention services from the speech-language therapist. Oral feeding problems represent a large part of the unique set of problems which premature infants experience. A lack of information in the literature was identified in terms of: firstly, the comprehensive description of oral feeding skills in premature infants and secondly, a comprehensive evaluation tool which would enable the researcher to describe these oral feeding skills.

The aim of this study was to describe the oral feeding skills of the premature infant during bottle- and cup-feeding. The different effects of the two feeding methods on the physiological status of the subjects were also examined.

The study comprises a theoretical and an empirical section. The theoretical section purports a literature review. Information obtained from recent literature on the premature infant with his/her specific problems as well as the on the mechanism of the whole swallowing process forms the underpinning of the empirical study. The empirical study comprises two phases. The first phase
purports the development and design of a comprehensive oral feeding evaluation tool, namely, the "Feeding Evaluation Form for At-Risk Infants" (FEFARI). The second phase was executed by applying the FEFARI to 42 premature infants of four different gestational ages (34-37 weeks), to enable the researcher to describe all aspects involved in oral feeding in premature infants. A descriptive research design was used, as the oral feeding skills of the subjects had to be observed in their natural conditions. Information regarding the risk factors for feeding problems, the state and behaviour of the subjects and the non-nutritional and nutritional sucking skills during bottle- and cup-feeding, was obtained with the FEFARI. This information is described, discussed, analysed and interpreted according to the aims of this research project.

The results of this study prove the FEFARI to be invaluable for the description of the oral feeding skills of premature infants. The information obtained with the FEFARI is also valuable for the planning of appropriate, effective and accountable oral feeding therapy for premature infants.

These findings have important implications for the management of oral feeding of premature infants. This study encourages the early involvement of the speech-language therapist/feeding specialist with the premature infant in the NICU. Further research is recommended to expand and support the findings of this study.

KEY WORDS:
Premature infant, NICU, oral feeding skills, nutritional sucking, non-nutritional sucking, swallowing, feeding problems, high risk factors, speech-language therapist, feeding specialist.
OPSOMMING

ORALE VOEDINGS VAARDIGHEDE IN PREMATURE BABAS
deur
Karina Johanna Uys

LEIER: Professor Brenda Louw
MEDELEIER: Professor Renè Hugo
DEPARTEMENT: Kommunikasie Patologie
GRAAD: M.Kommunikasie-patologie

Vroeë intervensie is 'n snel groeiende, omvangryke vakgebied. Die premature baba maak 'n beduidende deel uit van die populasie wat vroeë intervensie gelewer deur die spraak-taal terapeut, benodig. Orale voedingsprobleme maak 'n groot deel uit van die unieke probleme wat die premature baba ervaar. 'n Leemte is in die literatuur geïdentificeer in terme van: eerstens, die omvattende beskrywing van die orale vaardighede van die premature baba en tweedens, 'n omvattende evalusieinstrument wat die navorser in staat sal stel om die voedingsvaardighede te beskryf.

Die doel van die studie was om die orale voedingsvaardighede van die premature baba te beskryf tydens bottel- en koppievoeding. Die verskillende uitwerking van die twee voedingsmetodes op die proefpersone se fisiologiese toestand is ook ondersoek.

Die studie bestaan uit 'n teoretiese en 'n empiriese gedeelde. Die teoretiese gedeelde bevat 'n literatuuroorsig. Inligting verkry uit resente literatuur oor die premature baba met sy spesifieke probleme, sowel as die mekanisme van die
slukproses, dien as begronding van die empiriese ondersoek. Die empiriese ondersoek bestaan uit twee fases. Die eerste fase behels die ontwerp en ontwikkeling van 'n omvattende orale voedingsevaluasie-instrument, naamlik die "Feeding Evaluation Form for At-Risk Infants" (FEFARI). Die tweede fase bestaan uit die toepassing van die FEFARI op 42 premature babas van 4 verskillende gestasie-ouderdomme (34-37 weke) om die navorser in staat te stel om alle aspekte wat met orale voeding van die premature baba te make het, te kan beskryf. ’n Beskrywende navorsingsontwerp is gebruik aangesien die proefpersone se voedingsgedrag in 'n natuurlike omgewing waargeneem moes word. Inligting met betrekking tot die risikofaktore vir voedingsprobleme, die toestand en gedrag van die proefpersone, die nie-nutrisionele sowel as die nutrisionele suigvaardighede tydens bottel- en koppievoeding is met behulp van die FEFARI versamel. Hierdie inligting is na aanleiding van die navorsingsdoelstellings bespreek, ontleed en ge"interpreteer.

Die resultate van die studie toon dat die FEFARI waardevol was vir die beskrywing van die orale voedingsvaardighede van die premature beba. Die inligting verkry van die FEFARI kan ook sinvol aangewend word om 'n toepaslike, effektiewe en verantwoordbare voedingsterapie vir premature babas te beplan.

Die bevindinge hou belangrike implikasies in vir die hantering van orale voeding in premature babas. Die studie moedig ook betrokkenheid van die spraak-taal terapeut/voedingspesialis by die premature baba in die neonatale eenheid so spoedig moontlik, aan. Verdere navorsing word aanbeveel ter uitbreiding en bevestiging van hierdie navorsingsresultate.

SLEUTELWOORDE:
premature baba, neonatale eenheid (NICU), orale voedingsvaardighede, nutrisionele suig, nie-nutrisionele suig, sluk, voedingsprobleme, hoë risiko faktore, spraak-taal terapeut, voedingspesialis.
INDEX

CHAPTER 1
ORIENTATION AND STATEMENT OF PROBLEM

1.1 INTRODUCTION-------------------------------------------------------------1
1.2 STATEMENT OF PROBLEM----------------------------------------------------2
1.3 AIM OF STUDY-------------------------------------------------------------10
1.4 DESCRIPTION OF TERMINOLOGY---------------------------------------------11
   1.4.1 PREMATURE/PRETERM INFANT------------------------------------------12
   1.4.2 ORAL FEEDING SKILLS-----------------------------------------------12
   1.4.3 AT-RISK FACTORS--------------------------------------------------12
   1.4.4 FEEDING SPECIALIST-----------------------------------------------13
   1.4.5 DEGLUTITION--------------------------------------------------------13
   1.4.6 ABBREVIATIONS------------------------------------------------------13
1.5 CHAPTER OUTLAY-----------------------------------------------------------13
   1.5.1 CHAPTER 1-----------------------------------------------------------14
   1.5.2 CHAPTER 2-----------------------------------------------------------14
   1.5.3 CHAPTER 3-----------------------------------------------------------14
   1.5.4 CHAPTER 4-----------------------------------------------------------14
   1.5.5 CHAPTER 5-----------------------------------------------------------15
   1.5.6 CHAPTER 6-----------------------------------------------------------15
1.6 CONCLUSION---------------------------------------------------------------15
1.7 SUMMARY---------------------------------------------------------------------16

CHAPTER 2
THE PREMATURE INFANT IN THE NEONATAL UNIT

2.1 INTRODUCTION-------------------------------------------------------------17
CHAPTER 3
DEGLUTITION IN PREMATURE INFANTS

3.1 INTRODUCTION-----------------------------------------------54
3.2 DEVELOPMENT OF ORAL FEEDING SKILLS-------------------------56
    3.2.1 EMBRYOLOGICAL DEVELOPMENT OF ORAL MOTOR
          SKILLS (INTRA-UTERINE)-------------------------------------56
    3.2.2 DEVELOPMENT OF ORAL MOTOR SKILLS (EXTRA UTERINE)-------59
3.3 ANATOMICAL STRUCTURES RELEVANT FOR FEEDING----------------62
    3.3.1 ORAL CAVITY---------------------------------------------62
    3.3.2 PHARYNGEAL CAVITY----------------------------------------64
    3.3.3 OESOPHAGUS---------------------------------------------66
3.4 NEUROPHYSIOLOGY OF DEGLUTITION-------------------------------68
    3.4.1 AFFERENT SYSTEM-----------------------------------------69
    3.4.2 EFFERENT SYSTEM-----------------------------------------70
    3.4.3 ORGANIZING LEVEL----------------------------------------70
3.5 PHASES OF DEGLUTITION (SWALLOWING)----------------------------72
    3.5.1 ORAL PREPARATORY PHASE----------------------------------73
    3.5.2 ORAL PHASE---------------------------------------------73
    3.5.3 PHARYNGEAL PHASE----------------------------------------74
    3.5.4 OESOPHAGEAL PHASE---------------------------------------77
3.6 CONCLUSION----------------------------------------------------78
3.7 SUMMARY--------------------------------------------------------79

CHAPTER 4
METHODOLOGY

4.1 INTRODUCTION-----------------------------------------------80
4.2 AIMS OF STUDY-----------------------------------------------82
4.2.1 SUB-AIM 1
4.2.2 SUB-AIM 2
4.3 RESEARCH DESIGN
4.4 RESEARCH PHASES

4.4.1 PHASE 1: DEVELOPMENT OF FEEDING EVALUATION INSTRUMENT

4.4.1.1 Critical Review of Existing Feeding Scales
4.4.1.2 Compilation of Feeding Evaluation Form (FEFARI)

4.5 PILOT STUDY

4.6 PHASE 2: MAIN STUDY

viii
CHAPTER 5
RESULTS AND DISCUSSION

5.1 INTRODUCTION

5.2 PRESENTATION OF RESULTS OBTAINED FROM THE FEFARI

5.2.1 DESCRIPTION OF THE CHARACTERISTICS OF SUBJECTS

5.2.1.1 Biographical Information

5.2.1.2 Medical History

5.2.1.3 Current State and Behaviour

5.2.1.4 Physical Examination

5.2.1.5 Oral Feeding History

5.2.1.6 Mother-Infant Interaction

5.2.1.7 Oral Structures at Rest

5.2.1.8 Summary of Characteristics

5.2.2 DESCRIPTION OF ORAL FEEDING SKILLS OF PREMATURE INFANTS

5.2.2.1 Non-Nutritive Sucking Skills
CHAPTER 6
CONCLUSIONS AND RECOMMENDATIONS

6.1 INTRODUCTION-----------------------------------------------183
6.2 CONCLUSIONS AND IMPLICATIONS-------------------------------185
  6.2.1 CHARACTERISTICS OF THE SUBJECTS----------------------186
  6.2.2 ORAL FEEDING SKILLS-----------------------------------189
    6.2.2.1 Non-Nutritive Sucking (NNS)----------------------189
    6.2.2.2 Nutritive Sucking (NS)-----------------------------190
  6.2.3 TRAINING OPPORTUNITIES-------------------------------193
6.3 CRITICAL EVALUATION OF THE STUDY----------------------------195
6.4 RECOMMENDATIONS--------------------------------------------198
  6.4.1 RESEARCH RECOMMENDATIONS-----------------------------198
6.4.2 RECOMMENDATIONS WITH REGARD TO THE APPLICATION OF THE FEAFRI
6.4.3 RECOMMENDATIONS FOR THE HOSPITAL SETTING

6.5 CONCLUSION

6.6 SUMMARY

REFERENCE LIST

APPENDIXES

APPENDIX A FEFARI

APPENDIX B Readiness for Transfer to Oral Feeding

LIST OF TABLES:

Table 3.1 Differences between oral structures of the premature and full-term infant

Table 4.1 Critical review of the existing Feeding Scales

Table 4.2 Description of subjects

Table 4.3 Material and equipment used in study

Table 5.1 The description of subjects according to each category

Table 5.2 Number of subjects displaying the most recorded Risk Factors

Table 5.3 Subjects' scoring on items in the STATE AND BEHAVIOUR section of the FEFARI

Table 5.4 Subjects displaying unfavourable characteristics for oral feeding in the PHYSICAL EXAMINATION section of the FEFARI

Table 5.5 Subjects managing amount of their feed

Table 5.6 Subjects with "abnormal" scores in items of the Oral Structures at Rest subsection of the FEFARI
Table 5.7 Problems experienced with NNS -----------------------------------------------138
Table 5.8 Problems experienced by Group 1 during the oral/oral preparatory phase----140
Table 5.9 Comparison between bottle and cup feeding in Group 1------------------------141
Table 5.10 Problems experienced by Group 2 during the oral/oral preparatory phase-145
Table 5.11 The comparison between bottle and cup feeding in Group 2-------------------146
Table 5.12 Problems experienced by Group 3 during the oral/oral preparatory phase-150
Table 5.13 Comparison between bottle and cup feeding in Group 3------------------------152
Table 5.14 Problems experienced by Group 4 during the oral/oral preparatory phase-156
Table 5.15 The comparison between bottle and cup feeding in Group 4-------------------157
Table 5.16 Subjects with deviant behaviour during the pharyngeal phase----------------161
Table 5.17 Subjects who displayed problems during the oesophageal phase----------167
Table 5.18 Subjects displaying stress symptoms-----------------------------------------169
Table 5.19 The range and the average percentages of the saturation levels
pre-, mid- and post feeding during both feeding methods--------------------------174

LIST OF FIGURES:

Figure 1.1 The interaction of aspects determining the feeding skills of the premature infant. -----------------------------------------------11
Figure 2.1 Disorganisational potential of systems on each other--------------------------26
Figure 2.2 The relationship between risk factors and developmental outcome-----------28
Figure 3.1 Areas of discussion of deglutition in premature infants---------------------55
Figure 3.2 Neural network for swallowing----------------------------------------------71
Figure 4.1 Research phases of the study ---------------------------------------------85
Figure 4.2 Procedures followed in both phases of this study-------------------------104
Figure 5.1 Distribution of Ballard scores of the subject groups-----------------------119
Figure 5.2 Distribution of gestational ages of the total group of subjects.--------120
Figure 5.3 Distribution of Birthweight for the total group of subjects----------------121
Figure 5.4  The ratio between SGA (Small for Gestational Age) and AGA (Appropriate For Gestational Age) infants of the total group of subjects----------------------121
Figure 5.5  Distribution of the current weight for the total group of subjects. ---------122
Figure 5.6  Distribution of gender: Total group------------------------------------------123
Figure 5.7  Distribution of race : Total group---------------------------------------------123
Figure 5.8  Feeding Method for each Age group---------------------------------------------131
Figure 5.9  Feeding Method for the Total group---------------------------------------------131
Figure 5.10 Subjects who displayed deviant behaviour during bottle and cup feeding in the pharyngeal phase----------------------------------163
Figure 5.11 The stress symptoms displayed by the different subject groups during bottle and cup feeding-----------------------------------170
Figure 5.12 The distribution of problem areas in lip functioning for the different groups during bottle-feeding--------------------------177
Figure 5.13 The distribution of problems jaw functioning for the different age groups during bottle-feeding-------------------------------178
Figure 5.14 The distribution of problems with tongue functioning in different age groups during bottle-feeding----------------------179
Figure 5.15 The distribution of problems with swallowing in the different age groups during bottle-feeding-------------------------180