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**Association between postnatal maternal
nutritional status, maternal HIV disease
progression and infant feeding practices in
4 clinics in Pretoria, South Africa**

by

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**Submitted in fulfilment of the
requirements for the degree of
Doctor of Philosophy**

**in the
Faculty of Health Sciences**

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**Supervisor: Prof. DF Wittenberg
Co-Supervisor: Prof. UE MacIntyre**

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DECLARATION

I declare that the thesis which I hereby submit for the degree Philosophiae Doctor at the University of Pretoria, is my own work and has not previously been submitted by me for a degree at this or at any other tertiary institution.

Signed :

Joan Nteboheleng Matji

Date :

I hereby confirm the above

Signed :

Supervisor **Prof DF Wittenberg**

Date :

PUBLICATIONS

Based on the research presented in this thesis, the following articles have so far been published:

Matji JN, Wittenberg DF, Makin JD, Jeffery B, MacIntyre U, Forsyth BWC.
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Factors affecting HIV-infected mothers' ability to adhere to antenatally intended infant feeding choice in Tshwane/Pretoria. South African Journal of Child Health 2009; 3(1): 20-23.

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DEDICATION

This thesis is dedicated with love and gratitude to my parents, my husband Ramatseliso and our two cherished daughters, Morakane and Thenjiwe.

ABSTRACT

Association Between Postnatal Maternal Nutritional Status, Maternal HIV Disease Progression And Infant Feeding Practices In Four Clinics In Pretoria, South Africa

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Introduction

A group of 317 HIV-1 infected pregnant women and 53 postpartum HIV-negative women were recruited for a two-year prospective descriptive study of psychosocial and other determinants of antenatally planned and actual postnatal feeding, associations between maternal status and infant feeding practices, and health outcomes.

Methods

The subjects were interviewed periodically for 2 years using structured research instruments. Anthropometric measurements, biomarkers of nutritional status and measurements of psychosocial wellbeing were obtained from the mothers. Data was collected on infant feeding and outcomes for the babies.

Results

At recruitment, 74% of mothers planned to formula-feed. Significant differences between these women and those who planned to breastfeed emerged.

After delivery, 25% of the women who antenatally planned to formula-feed changed their minds and actually breastfed. Conversely, half of the women who

antenatally planned to breastfeed actually formula-fed. Some significant reasons emerged for these feeding changes.

Most mothers were well-nourished or overweight. Breastfeeding mothers lost little weight between six weeks and six months after delivery. At the end of follow-up, 65% were obese.

While there were differences between HIV-infected and uninfected women in respect of micronutrients, no deficiencies were observed. Vitamin A and selenium concentrations were higher in the HIV-infected women than uninfected women at six weeks. There were no significant micronutrient changes over time.

Most mothers maintained an adequate immune status with only slow deterioration of CD4 counts. At two years postpartum, 60% had a CD4 cell count greater than 500cells/mm³, and only about 8% less than 200/mm³.

HIV transmission was 15% by 24 months of follow-up. Among the 65 ever breastfed children, 16 (24.6%) were HIV-infected compared to 12.8% of never breastfed children. Most children were growing normally, suggesting that, overall, maternal HIV status did not interfere with feeding ability.

Eight mothers (3%) and 33 children (11%) died. Only 12 of 33 children who had died had a positive HIV-PCR. By 2 years, 78% surviving HIV-infected children had been initiated onto ARV therapy. Maternal adherence to HAART was poor.

Conclusion

HIV and infant feeding counselling is inadequate in the routine PMTCT programme, with stigma and lack of disclosure continuing as major barriers to appropriate care. Whilst maternal obesity was common, most children were



growing normally. Weaknesses in routine PMTCT services were identified, and compliance with HAART was poor.

Key words: HIV infection, infant feeding practices, psychosocial wellbeing, maternal anthropometric status, maternal micronutrient status, child growth and outcomes.



OPSOMMING

Die verhouding tussen post-natale moederlike voedingstatus en die progressie van moederlike MIV siekte, baba voedingspraktyke en uitkomste in vier klinieke in Pretoria, Suid Afrika

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Opsomming

Drie honderd en sewentien MIV-1 ge-infekteerde swanger vroue asook 53 MIV-negatiewe post-partum vroue is gewerf vir deelname aan 'n twee-jaar prospektief beskrywende studie van psigososiale en ander determinante van antenataal beplande en postnataal werklik deurgevoerde babavoeding, asook van assosiasies tussen moederlike status, voedingspraktyke en gesondheidsuitkomstes.

Metodes

Gestruktureerde onderhoud is periodiek met die deelnemers gevoer tot op 2 jaar. Antropometrie en biomerkers van voedingstatus is van die moeders verkry en metings van psigososiale welsyn is uitgevoer. Data is ook versamel oor die voeding en uitkomstes van die babas.

Resultate:

Met die eerste onderhoud was 74% van die vrouens van voorneme om hulle babas formule melk te voed. Daar was betekenisvolle verskille tussen hierdie vrouens en diegene wat beplan het om borsvoeding te gee.

Na geboorte het 25% van die moeders wat voorheen beplan het om formule melkvoedings te gee, van besluit verander en wel geborsvoed, terwyl die helfte van die vrouens wat borsvoeding wou gee, formule melk gevoed het. Betekenisvolle redes is gevind vir hierdie besluitveranderinge.

Die meeste studie moeders was goed gevoed of oorgewig. Borsvoeding het tot min gewigsverlies gelei tussen ses weke en ses maande na geboorte. Met die einde van die studie was 65% van die moeders oobe.

Terwyl daar verskille was tussen MIV ge-infekteerde en MIV-negatiewe moeders ten opsigte van mikronutriente, is geen gebrek aangetoon nie. MIV positiewe moeders het op 6 weke hoër vlakke van Vit A en selenium getoon as die kontrole moeders. Daar was geen betekenisvolle ontwikkelings met opvolg oor twee jaar.

Die meeste moeders het 'n voldoende immuniteitstatus gehandhaaf met slegs stadige afname van CD4 tellings. Na twee jaar het 60% steeds 'n CD4 telling $>500/\text{mm}^3$ gehad, en net omtrent 8% se CD4 telling was onder $200/\text{mm}^3$.

Die MIV moeder-tot-baba transmissie het op 2 jaar 15% beloop. Onder die 65 kinders wat ooit borsvoeding ontvang het, was 16 (24.6%) MIV ge-infekteerd, in vergelyking met 12.8% van babas wat nooit borsmelk gekry het nie.

Die meeste kinders het normaal gegroei, betekende dat die moeders se MIV status oor die algemeen nie hulle sorg-vermoë belemmer het nie.

Agt moeders (3%) en 33 kinders (11%) is oorlede. Net 12 van 33 oorlede kinders het 'n positiewe MIV-PCR toets gehad. Na twee jaar was 78% van die oorlewende MIV-positiewe kinders reeds op ARV behandeling geplaas. Moeders het die ARV behandeling egter swak nagekom.



Gevolgtrekking

In die roetiene PMTCT program word onvoldoende berading oor MIV en babavoeding gegee . Stigma en gebrek aan openbaarmaking van MIV status bly belangrike struikelblokke vir goeie sorg. Moederlike obesiteit kom algemeen voor.

Swakhede van die roetine PMTCT dienste is aangetoon en die moederlike nakoming van ARV behandeling is onvoldoende.

Sleuteltermes:

MIV infeksie, baba voeding, psigososiale welsyn, antropometriese status, mikronutrient status, kind groeipatroon, uitkomst.

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TABLE OF CONTENTS

DECLARATION	ii
DEDICATION.....	iv
ABSTRACT	v
OPSOMMING.....	viii
ACKNOWLEDGMENTS	xi
TABLE OF CONTENTS	xii
LIST OF TABLES	xvi
LIST OF FIGURES AND ILLUSTRATIONS.....	xviii
APPENDICES.....	xix
TERMINOLOGY AND ACRONYMS	xx
CHAPTER 1 - INTRODUCTION.....	22
CHAPTER 2 - BACKGROUND AND LITERATURE REVIEW	24
2.1 HIV AND INFANT FEEDING CHOICES.....	24
2.1.1. Mother-to-child transmission of HIV.....	24
2.1.2. Infant feeding choices and prevention of HIV transmission.....	25
2.1.3. HIV and infant feeding policy guidelines	27
2.1.4. Recall bias in estimating exclusivity or duration of infant feeding practices.....	28
2.1.5. Unsafe formula-feeding.....	29
2.1.6. Problems and risks in the PMTCT programme.....	30
2.1.7. Practical considerations in the application of HIV transmission and infant feeding guidelines.....	31
2.1.8. Practical issues associated with early cessation of breastfeeding.....	34
2.1.9. Maternal viral load and mastitis as risk factors for HIV transmission.....	35
2.1.10. Breastfeeding and maternal outcome.....	36
2.1.11. Infant Feeding practices in South Africa.....	39
2.1.12. Summary	41
2.2. NUTRITIONAL STATUS AND HIV INFECTION AMONG WOMEN	42
2.2.1. Interactions between Nutrition and HIV infection.....	42
2.2.2. Body composition and HIV infection	43
2.2.2.1. Prenatal and postnatal body composition trends among HIV-infected women...	44
2.2.2.2. Body composition trends, survival and initiation of HAART.....	51
2.2.2.3. Summary.....	53
2.2.3. Maternal micronutrient status and HIV infection.....	53
2.2.3.1. Mechanisms by which HIV infection impacts on blood micronutrient levels.....	54
2.2.3.2. The role of vitamins and minerals on pregnancy outcome and MTCT of HIV.....	57
2.2.3.3. Micronutrient deficiencies and HIV disease progression.....	59
2.2.3.4. Dietary micronutrient intake, blood micronutrient levels and HIV disease.....	65
2.2.3.5. Micronutrient levels and initiation of HAART.....	68
2.2.3.6. Summary	69
2.3. MATERNAL HEALTH, HIV AND GROWTH OF HIV-EXPOSED CHILDREN	70



2.3.1. Overview of maternal HIV infection and nutritional status on child outcomes.....	70
2.3.2. Trends in child mortality and HIV prevalence.....	71
2.3.3. Child growth, morbidity, mortality and HIV infection	72
2.3.4. Maternal caring capacity, psychosocial wellbeing and child growth.....	76
2.3.5. Summary	78
CHAPTER 3 - SCOPE OF RESEARCH AND HYPOTHESIS/PROBLEM STATEMENT	79
3.1. INTRODUCTION	79
3.2. SCOPE OF RESEARCH	81
3.3. RESEARCH QUESTIONS.....	83
CHAPTER 4 - PARTICIPANTS AND METHODS	85
4.1. INTRODUCTION	85
4.2. METHODS.....	88
4.2.1. Socio-demographic information	88
4.2.2. Anthropometric measurements.....	89
4.2.3. Infant feeding assessment.....	91
4.2.4. Clinical assessment	92
4.2.5. Nutritional biomarkers and immunological assessment.....	92
4.2.6. HIV transmission assessment.....	94
4.2.7. Measures of Psychosocial well-being.....	94
4.2.7.1. Disclosure.....	94
4.2.7.2. Stigma.....	95
4.2.7.3. Depression	95
4.2.7.4. Coping.....	95
4.3. STATISTICAL ANALYSES	96
4.4. ETHICAL CONSIDERATIONS.....	97
5.1. OBJECTIVES.....	101
5.2. SUBJECTS AND METHODS	101
5.3. STATISTICAL ANALYSIS.....	102
5.4. RESULTS.....	107
5.4.1. Description of the Study Population	107
5.4.2. Prenatal infant feeding intent.....	110
5.4.3. Factors associated with prenatal feeding intent	110
5.4.5. Postnatal infant feeding practices.....	112
5.4.5.1. Neonatal breastfeeders.....	112
5.4.6. Comparison of antenatal infant feeding choices and postnatal feeding practices. ...	113
5.4.8. Supply of infant formula.....	117
5.5. DISCUSSION.....	118
5.6. SUMMARY	127
CHAPTER 6 - ANTHROPOMETRIC MEASUREMENTS AMONG HIV- INFECTED WOMEN OVER A 24 MONTH PERIOD	130
6.1. OBJECTIVES.....	130

6.2. SUBJECTS AND METHODS	130
6.2.1. Anthropometric measurements.....	130
6.3. STATISTICAL ANALYSES	131
6.4. RESULTS.....	132
6.4.1. Comparison between the baseline anthropometric measurements of HIV-infected and un-infected women at six weeks post-delivery	132
6.4.2. Anthropometric measurements and infant feeding practices.....	133
6.4.3. Comparison between anthropometric measurements of HIV-infected women from six weeks to 24 months after delivery.....	134
6.4.4. Comparing the BMI between the first visit and the last visit by the reference categories	135
6.4.5. Health status of HIV-infected women over a 24 month period.....	135
6.5. DISCUSSION.....	136
6.6. SUMMARY	143
CHAPTER 7 - MICRONUTRIENT STATUS AMONG HIV-INFECTED MOTHERS IN TSHWANE, 2003-2005	144
7.1. OBJECTIVES.....	144
7.2. SUBJECTS AND METHODS	144
7.2.1. Sampling and measurement parameters.....	144
7.3. STATISTICAL ANALYSIS	145
7.4. RESULTS.....	146
7.4.1. Comparison of indicators of HIV-infected and un-infected women at six weeks postpartum	146
7.4.2. Comparison of micronutrient and biomarker levels by infant feeding mode at six weeks and six months.....	151
7.4.4. Assessment of micronutrient supplementation usage amongst HIV-infected women	157
7.4.5. Sources of information on nutrition and HIV/AIDS.....	158
7.5. DISCUSSION.....	158
7.6. SUMMARY	166
CHAPTER 8 - CHILD OUTCOMES IN RELATION TO MATERNAL HEALTH	167
8.1. OBJECTIVES.....	167
8.2. SUBJECTS AND METHODS	167
8.3. STATISTICAL ANALYSES	168
8.4. RESULTS.....	169
8.4.1. HIV transmission	169
8.4.2. Nevirapine Administration	171
8.4.3. HIV-infected study participants on HAART.....	171
8.4.4. Child Growth	172
<i>8.4.4.1 Comparison of Growth of HIV-exposed boys and girls according to feeding mode</i>	<i>175</i>
Table 8.3: Growth of HIV-exposed boys according to feeding mode at visit 1 and 5.....	175



Table 8.4: Growth of HIV-exposed girls according to feeding mode at visit 1 and 5	177
8.4.4.2 <i>Comparison of the growth of HIV-infected and non-infected children</i>	177
8.4.4.3. <i>Growth of boys and girls in relation to maternal CD4 count</i>	178
8.4.5. Maternal and child deaths and morbidity	178
8.5. DISCUSSION	180
8.7 SUMMARY	190
CHAPTER 9 - CONCLUSIONS AND RECOMMENDATIONS	192
9.1. CONCLUSIONS	192
9.1.1. Prenatal and Postnatal infant feeding choices and practices of HIV-infected women	192
9.1.2. Maternal outcomes.....	193
9.1.3. Child outcomes in relation to maternal health	194
9.2 RECOMMENDATIONS	195
REFERENCES	197

LIST OF TABLES

Table 4.1	Assessments undertaken at scheduled visits
Table 4.2	Classification of BMI
Table 4.3	Classification of Mid-upper arm circumference
Table 4.4	Interpretation of Anthropometric Z-scores
Table 4.5	Methodologies for micronutrient, biomarker and immunological parameter assessment
Table 4.6	Constructs of psychological wellbeing applied
Table 5.1	Variables included in the analysis of factors associated with prenatal feeding intent
Table 5.2	Baseline characteristics of study participants
Table 5.3	Factors associated with prenatal infant feeding choice
Table 5.4	Logistic regression to identify factors associated with breastfeeding intent
Table 5.5	Reasons for breastfeeding in the early neonatal period
Table 5.6	Determinants of change from antenatal formula-feeding intention to actual feeding practice
Table 5.7	Logistic regression on factors associated with a change from formula-feeding intent to breastfeeding practice
Table 5.8	Comparison between stigma and disclosure levels at recruitment by infant feeding intent and practice
Table 6.1	Comparison of anthropometric measurements at six weeks postpartum between HIV-infected and HIV-uninfected mothers
Table 6.2	Anthropometric measurements and CD4 counts by feeding mode at six weeks and at six months postpartum
Table 6.3	Trends in anthropometric measurements among HIV-infected women between the first (baseline) visit and the last visit (24 months postnatally)
Table 7.1	Comparison of indicators of HIV-infected and uninfected women at six weeks postpartum

Table 7.2	Micronutrient and biomarker levels by feeding mode at six weeks post-delivery
Table 7.3	Change in micronutrient and biomarker levels among HIV-infected women over the 24-month period postnatally.
Table 7.4	Micronutrient supplements and traditional “immune boosters” taken by study participants
Table 8.1	Schedule of visits for growth assessment
Table 8.2	Z-scores and their interpretation
Table 8.3	Growth of HIV-exposed, non-breastfed boys and girls between visit 1 and visit 5
Table 8.4	Growth of HIV-exposed breastfed boys and girls between visit 1 and visit 5
Table 8.5	Comparison of growth among HIV-infected and non-infected children by visits

LIST OF FIGURES AND ILLUSTRATIONS

- Figure 1 Vicious cycle of micronutrient deficiencies and HIV pathogenesis
- Figure 2 Ampath Laboratories Flow Chart on management of blood samples
- Figure 5.1 Comparison between prenatal infant feeding intent and postnatal feeding practice
- Figure 6.1 Proportion of women by BMI category at baseline and on follow-up
- Figure 7.1 Proportions of HIV-infected mothers by CD4 cell count categories
- Figure 8.1 Flow diagram on HIV transmission and infant feeding practices
- Figure 8.2 Mean Z-scores of HIV-infected girls over time
- Figure 8.3 Mean Z-scores of HIV-infected boys over time



APPENDICES

APPENDIX A Questionnaires for recruitment and follow-up visits

TERMINOLOGY AND ACRONYMS

ACT	Alpha 1-antichymotrypsin
AFASS criteria	Acceptable, feasible, affordable, sustainable and safe
AIDS	Acquired Immunodeficiency Syndrome
ANC	Antenatal Care
AOR	Adjusted Odds Ratio
ARV	Anti-retroviral drugs or therapy
BF	Breastfeeding
BIS	Bio-impedance spectroscopy
BMI	Body Mass Index
CD4 count	A measure of the absolute CD4 T cell count/cubic mL of blood
CDC	Centres for Disease Control
CI	Confidence Interval
CRP	C-Reactive Protein
CTA	Classification Tree Analysis
DHS	Demographic and Health Survey
EBF	Exclusive Breastfeeding
EFF	Exclusive Formula-Feeding
FF	Formula-Feeding
FFM	Fat free mass
FM	Fat mass
HAART	Highly active antiretroviral therapy
HARS	HIV-associated adipose redistribution syndrome
HIV	Human Immunodeficiency Virus
HR	Hazard Ratio
HST	Health Systems Trust
HR	Hazard Ratio
Ht/age	Height for Age
IVACG	International Vitamin A Consultative Group
MF	Mixed Feeding

MRC	Medical Research Council
MTCT	Mother-to-child-transmission (of HIV)
MUAC	Mid-upper arm circumference
NAIDS	Nutritionally acquired immune deficiency syndrome
NNRTI	Non-nucleoside reverse-transcriptase inhibitors
NRTI	Nucleoside reverse-transcriptase inhibitors
NVP	Neviropine
OI	Opportunistic Infections
OR	Odds Ratio
PCR	Polymerase Chain Reaction
PLWHA	Person/people living with HIV and AIDS
PMTCT	Prevention of Mother to Child Transmission (of HIV)
RDA	Recommended Dietary Allowance
RF	Replacement Feeding
ROI	Reactive oxygen intermediates
SA	South Africa
SADHS	South African Demographic and Health Study
SD	Standard Deviation
TAG	Technical Advisory Group
UN	United Nations
UNAIDS	Joint United Nations Programme on HIV/AIDS
UNICEF	United Nations Children's Fund
VCT	Voluntary Counselling and Testing
Wt/age	Weight for age
Wt/height	Weight for height
WHO	World Health Organization
Z	Z-score