IMPACT OF INFANT FEEDING PRACTICES ON GUT FUNCTION IN DZIMAULI COMMUNITY, SOUTH AFRICA

BY

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Introduction

- The feeding practices of young children less than two years of age have a direct effect on their nutritional status (World Health Organisation (WHO), 2008).
- Such practices may ultimately impact negatively on the child's quality of life with serious implications on the child's chances of survival.

Intro…

- Children aged 6 to twenty three months and those living in rural areas are the most vulnerable to childhood malnutrition in South Africa (South African Vitamin A Consultative Group (SAVCG), 1995).
- South African Demographic Household Survey (SADHS, 2003) indicated that only 8.3% of infants below 6 months of age are exclusively breastfed

Intro….

- These were also supported by Mamabolo et al. (2004) and Mushaphi et al. (2008) who found that in the rural regions of Limpopo Province of South Africa infants are breastfed for longer periods, with more than 80% breastfed up to ninth month

- The onset of common non-breast milk foods comprised maize meal porridge and sorghum porridge (*mabella*), as well as teas and herbal drinks (Mamabolo et al., 2004).
- Mushaphi et al. (2008) reported that the common early introduction of *tshiunza* (a traditional porridge) before the infants gut can digest foods other than breast milk interferes with exclusive breastfeeding and can severely reduce the positive effect of breastfeeding.
- It has been shown that poor infants feeding practises have negative impact on absorption and gut function in infants (Lunn et al., 1991).

Intro….

- Goto et al. (2009) showed that infants are exposed to high level of infections with associated gut damage and growth faltering
- Caused by inappropriate infants feeding practices and poor standards of hygiene.

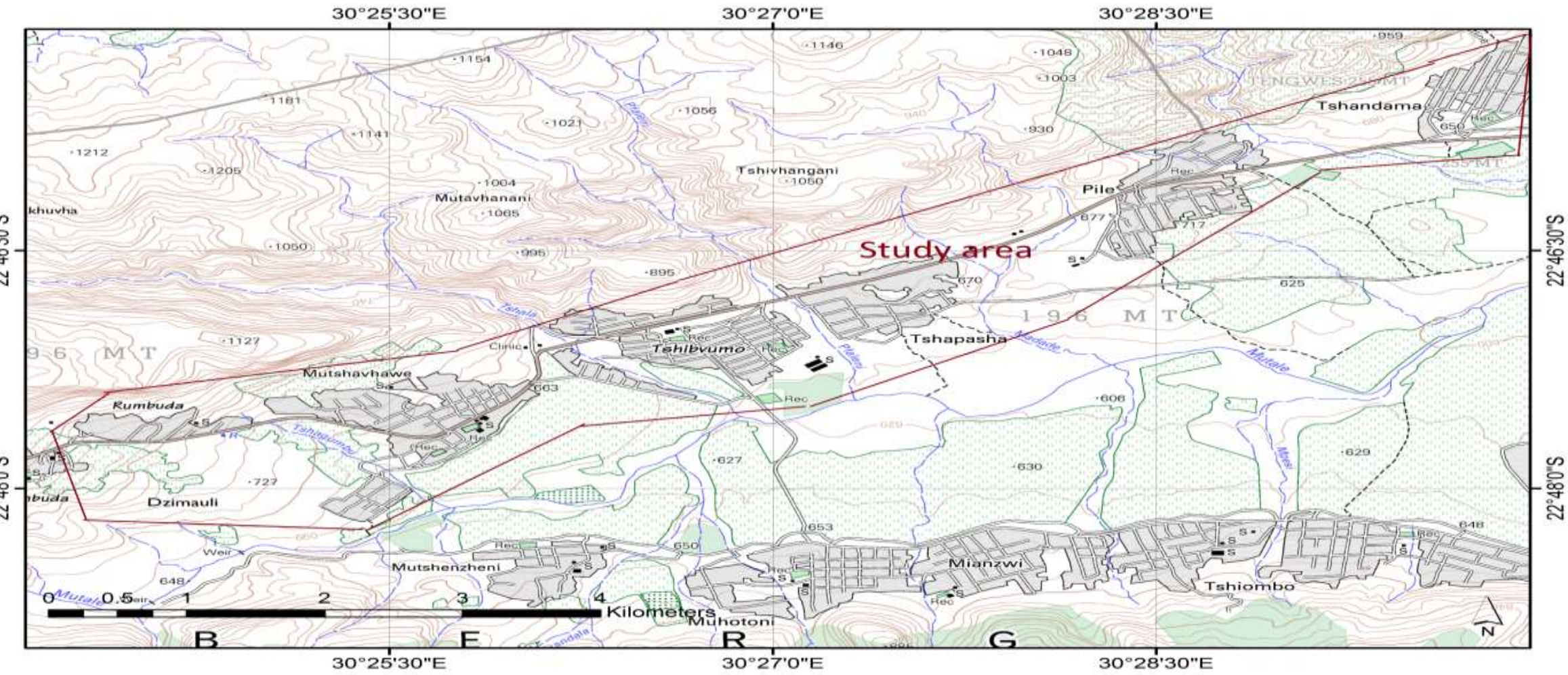
- The present study aimed at investigating the impact of feeding practices on gut function in infants
- Proper intervention and recommendation for improved infants and child feeding habits, and subsequent improvement in growth pattern will be determined

- Inspite of all this
- Previous studies on child feeding practices conducted in the Limpopo Province in particular (Mamabolo et al., 2004; Mushaphi et al., 2008) indicated concerns about feeding practices employed.
- However, there is limited data on whether these feeding practices do affect gut function and permeability among young children in South Africa.

Methods

- **Study design**
  - Descriptive and exploratory
  - Determine the impact of feeding practices, gut function and growth indicators.
  - Quantitative methods were used to collect data.
  - A birth cohort was followed for one year to determine feeding practices, food intake, markers for gut function and anthropometric assessment

Study area and population …



Sampling

- All infants born at the area from October 2009 to May 2011 were approached
- Pregnant women residing at Tshandama to Baimoro were approached and consented to be participants before they gave birth
- Enrolled within 17 days of child's birth.
- A sample size of 133 infants was used for the purpose of this study and followed up for a period of one year.
- Data was generated in different time points of follow up.

Sampling…

- Exclusion
  - Infants <1.500g
  - Infants born to teenage, twins and those born at the study area but not residing at Rambuda community were excluded from the study.
  - Plans to move out of the community within 6 months after enrolment
  - Cases of congenital or severe neonatal diseases
  - Prolonged hospitalisation for two weeks and above.
  - Unable to give permission
  - Mothers of less than sixteen years

Data collection

- Stages of data collection

- Baseline surveys on infant on the day of enrolment
- Mothers' demographics and infants' feeding practices from the previous 24 hours
- Infants feeding practices was collected twice weekly
- A monthly assessment form was administered comprising feeding practices and food frequencies
- Anthropometric assessment (W/L)
- At months 3, 6 and 9 urine samples were collected.

Urine collection

- Urine specimens -assess the ratio of lactulose: mannitol excretion.
- The lactulose: mannitol (LM) test is considered a consistent and sensitive method to measure small intestinal epithelial area, paracellular and transcellular transport, damage and permeability (Berger et al., 2007).
- A measured lactulose (5g) was added to the beaker and stirred for another 15 minutes to dissolve.
- L:M solution was aliquoted into labelled sterile vials according to the weight of each subject (at a dose of 2 ml/Kg of weight or a maximum 20 ml).
- Final concentration of 20 ml Lactulose: Mannitol = 1 g mannitol + 5 g lactulose was given.

Validity

- The study was validated by
  - Using trained field workers
  - Instruments were adopted from credible studies .
  - Several instrument reviews were conducted by.
  - A pilot study
  - Local language (Tshivenda
- Reliability
  - various instruments
  - twice on a weekly basis to capture all the necessary data about child illnesses and the twice weekly 24 hour recall.
  - Food frequency questionnaire was administered once a month for the period of 1 to 8 months to accommodate the expanding diet as the child grows.
  - The anthropometric measurements were taken twice
  - Digital weight
  - length board to measure recumbent length.
  - Quality assurance was done at randomly selected 5 to 10% of the sample every month

Ethical consideration

- Part (Mal-ED) at the University of Venda coordinated by the Department of Microbiology, in collaboration with the University of Virginia, USA.
- Approval
  - Health, Safety and Research Ethics Committee of the University of Venda (SMNS/09/MBY/004)
  - the Institute Review Board for Health Sciences Research of the University of Virginia (HSR#/4269).
  - Limpopo Provincial Department of Health
  - Dzimauli authorities.
  - Signed informed consent obtained
  - Signed consent forms were kept under lock

Analysis

- SPSS version 21
- Frequency distributions
  - Describe demographic
  - feeding practices to indicate progressive transition of the infants from breastfeeding to complementary feeding.
  - The infants were divided into groups of exclusive breastfeeding,
  - formula feeding and
  - complimentary feeding according to how they were fed.

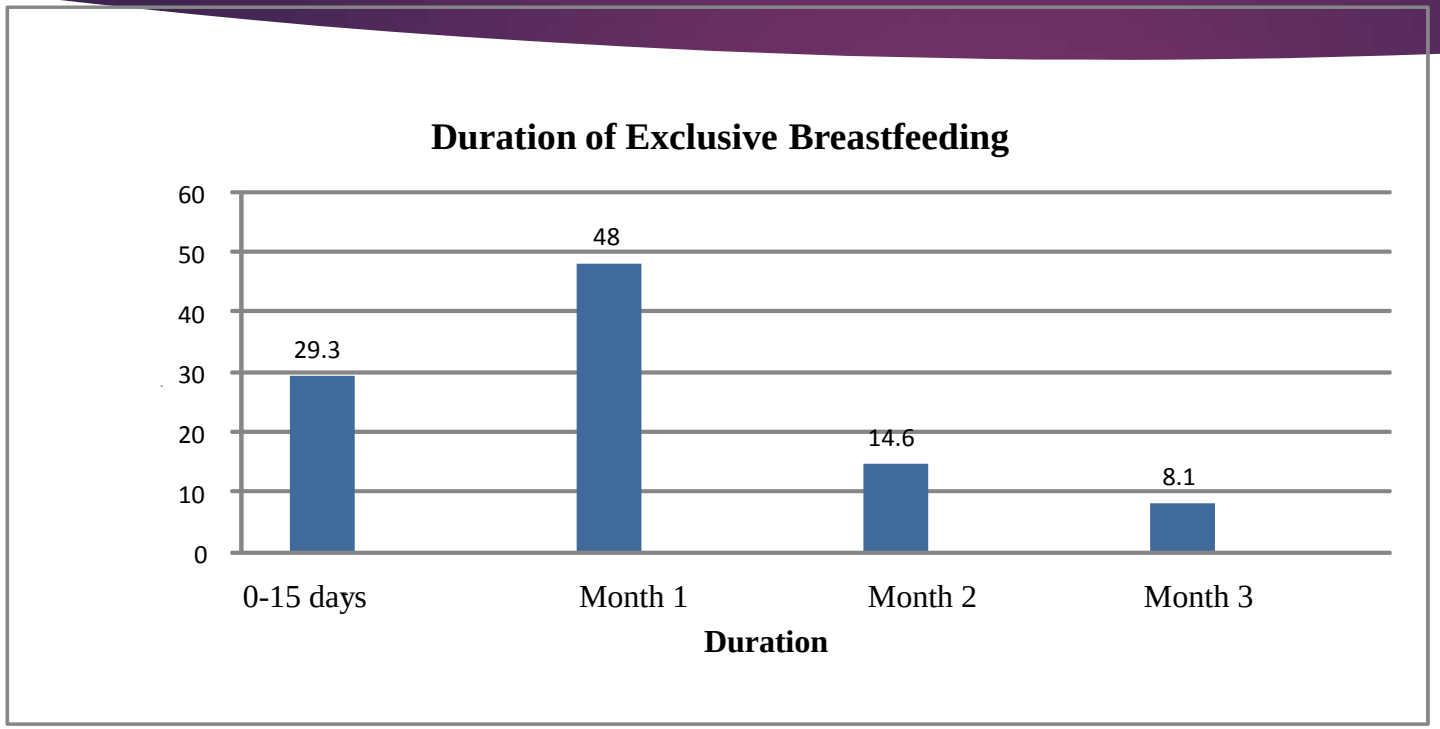
Analysis cont…

- The z-scores were calculated using (WHO Anthro version 2.0).
- The effect of feeding practices on gut function was determined through the Multiple Regression Model.
- Feeding practices and anthropometry results were correlated with L:M ratio scores.
- The initiation age of various feeding practices were explored in relation to anthropometry indicators and concentration of L:M scores.
- The L:M permeability test is considered abnormal or positive for comparison purposes if the L:M ratio is ≥ 0.0864.
- These values equal to normal mean plus two standard deviations as previously reported (Barboza, 1999).
- Two-tailed Student *t* test was used for continuous and categorical variables in comparisons between the groups, using $P < 0.05$ and $P < 0.01$ for statistically significant difference. Two-sided significance tests were used throughout.

Exclusive breastfeeding experiences, Dzimauli (n=133)

Breastfeeding initiation	No.	(%)
Ever breastfed		
Yes	123	(92.5)
No	10	(7.50)
Infants fed colostrum		
Yes	123	(92.5)
No	10	(7.50)
Time infants first breastfed (n=123)		
Within one hour	74	(55.6)
1-24 hours	46	(34.6)
1-3 days	3	(2.30)

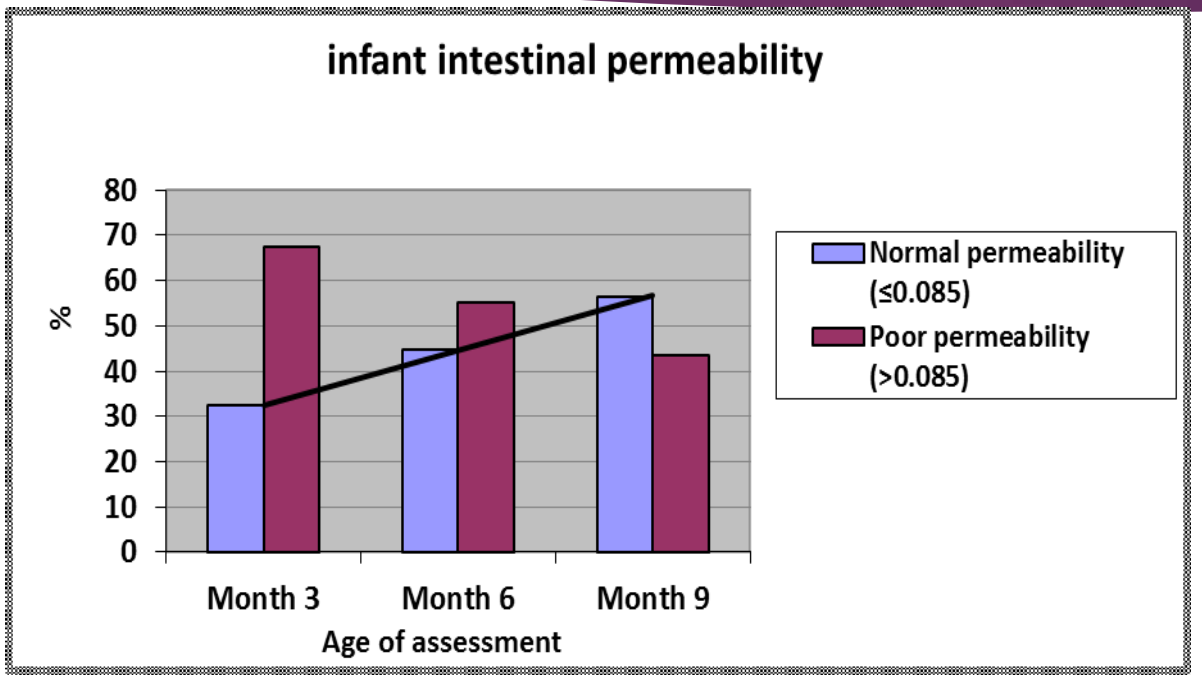
Duration of exclusive breastfeeding



Intestinal permeability of infants in the Dzimauli area

*L/M ratio	Month 3		Month 6		Month 9	
	n=108		n=85		n=62	
	No.	(%)	No.	(%)	No.	(%)
Low (≤0.085)	35	(32.4)	38	(44.7)	35	(56.5)
High (>0.085)	73	(67.6)	47	(55.3)	27	(43.5)

poor gut function was indicated by the increased pemeability


infant intestinal permeability
80
70
60
50
40
30
20
10
0
%
Month 3
Month 6
Month 9
Age of assessment
Normal permeability (≤0.085)
Poor permeability (>0.085)

DICUSSION

- No relationship between exclusive breastfeeding and gut function (No children exclusively breastfed)
- Infants introduced early to non-breast milk foods had poor gut function as defined by the high absorption of the lactulose and mannitol sugars
- Boaz et al. (2013) increased mannitol absorption is an outcome of increased gut permeability in children.
- Infants introduced to solids earlier than six months had poor intestinal permeability at 3, 6 and 9 months
- Absorption was disturbed

DICUSSION

- In this study most impairment of the gut in infants occurred at three months and got better with time.
- At nine months, most children showed normal intestinal permeability.
- This improvement in the intestinal permeability is expected at later months because the gut of the infant from six months is physiologically ready for the kinds of foods fed to them.
- The damage of the gut in infants occurs as a result of early introduction of foods other than breast milk before six months of age.

Discussion_anthro

- Poor gut function often results in stunted growth and poor development.
- Anthropometric assessment
  - Wasting and stunting were the main growth problems
  - Severity of wasting (19.6%-29.4%) throughout the first year of life.
- Infants introduced to solid foods as early as the first six months of age had poor weight for age and weight for height z-scores.
- Of great concern is the observation made in this study that poor anthropometric status in infants was as early as the first month after birth.

- However, introduction of grains showed
  - Positive relationship from six months of age with weight for height decreasing as grains were introduced
- Infants introduced to tea and other liquids had poor weight for height at nine months.
- Formula milk was associated with poor weight for height at the age of twelve months.

Conclusion

- This study confirmed the importance of giving colostrum to infants as infants breastfed the first milk showed better intestinal permeability as compared to those who were not given.
- There was no relationship observed between infant exclusively breastfeed
  - No infant exclusively breastfed
- Maternal characteristics such as level of education, age and marital status influence decision on infant feeding.
- Poor feeding practices of infants in Dzimauli is a major focus area that need more attention possibly to other rural areas of South Africa as well.

Thank you

- This study was part of the birth cohort project, Malnutrition and Enteric Diseases (MAL-ED) Study, in Dzimauli Community in collaboration with the University of Venda .

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Department of health

Nutrition colleagues

Participants