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A Comparative Study on feeding practices among well-nourished and malnourished Children in Western India

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ABSTRACT

Introduction

Feeding practices significantly influence the nutritional status of children, particularly during the first two years of life. Inadequate breastfeeding and delayed complementary feeding contribute to malnutrition, a major public health concern. This study focuses on a rural block of Vadodara district, aiming to compare socio-demographic factors and feeding practices between well-nourished and malnourished children. The findings may guide targeted nutrition education and community interventions to improve child health outcomes and reduce malnutrition-related morbidity and mortality in the local context.

Methods

An analytical cross-sectional study was conducted from November 2020 to February 2022 in 30 anganwadis of Vadodara district, Gujarat, using a thirty-cluster sampling method. A total of 246 children aged 6–60 months (including Severe Acute Malnutrition, Moderate Acute Malnutrition, and normal) were selected. Data on socio-demographics and feeding practices were collected using a pre-tested questionnaire administered to mothers. Nutritional status was assessed using anthropometric measurements, including weight, height/length, and MUAC, were recorded. The variables were compared with appropriate statistical tests and p-value less than 0.05 was considered statistically significant.

Results

A total of 246 children were included (120 well-nourished, 126 malnourished). Malnutrition was significantly associated with age, low birth weight, father's education, and mother's occupation. Exclusive breastfeeding (EBF) was more common among well-nourished children as compared to malnourished($p<0.05$). Complementary feeding practices, early initiation of Breast feeding were proportionately more in the well-nourished group but not statistically significant.

Conclusion

Malnutrition was associated with a child's age, lower birth weight, father's literacy, and mother's occupation. Exclusive breastfeeding significantly influenced nutritional status, highlighting its importance. Other feeding practices showed no significant difference between well-nourished and malnourished children, indicating the need for focused breastfeeding promotion.

Key-words: Feeding practices, Exclusive Breast Feeding, Early initiation of Breast Feeding, Malnutrition, Infant and Young Child Feeding.

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INTRODUCTION

Nutrition is a fundamental right of every child and is crucial for proper health and development during the early years of life. Adequate nutrition during infancy and early childhood is essential to ensure proper growth, strengthen the immune system, and improve cognitive development. Malnutrition, resulting from deficiencies or excesses of nutrients, remains a major public health challenge, particularly in low- and middle-income countries. It is associated with increased morbidity and mortality among children under five years of age. Malnutrition is categorized into undernutrition, micronutrient deficiencies, and overnutrition. Undernutrition includes stunting (low height-for-age), wasting (low weight-for-height), and underweight (low weight-for-age).(1) Micronutrient deficiencies result from inadequate intake of essential vitamins and minerals such as vitamin A, iodine, iron, and zinc, leading to serious health consequences. Among the most severe forms of undernutrition is Protein Energy Malnutrition (PEM), which includes Severe Acute Malnutrition (SAM) and Moderate Acute Malnutrition (MAM), both of which significantly contribute to childhood morbidity and mortality. Feeding practices play a critical role in determining the nutritional status of children. Inappropriate feeding, including lack of exclusive breastfeeding in the first six months, premature cessation of lactation, and delayed introduction of complementary foods, has been linked to malnutrition. The World Health Organization (WHO) estimates that poor feeding practices contribute to nearly one-third of malnutrition cases. Exclusive breastfeeding for the first six months and timely introduction of complementary feeding are essential to prevent malnutrition and associated complications. The Infant and Young Child Feeding (IYCF) guidelines have been established at a global level to promote appropriate feeding practices for children under two years of age. Optimal IYCF practices, including early initiation of breastfeeding, exclusive breastfeeding for six months, and timely introduction of complementary foods, have been proven to reduce childhood morbidity and mortality rates. Breast milk provides essential nutrients and antibodies that protect newborns from infections, while timely complementary feeding ensures adequate energy and nutrient intake required for proper growth and development. Cultural beliefs, traditions, maternal education, and socioeconomic factors play a crucial role in shaping infant feeding practices. In India, mothers are primarily responsible for child feeding, and their knowledge and practices significantly impact the nutritional status of their children. Several studies have indicated poor knowledge and awareness regarding breastfeeding and complementary feeding among mothers of malnourished children. Furthermore, comparing these two groups can uncover best practices that correlate with positive nutritional outcomes. Identifying and promoting these practices could support nutrition education programs and community health initiatives at local level. Ultimately, the findings from such a comparison are critical in breaking the vicious cycle of malnutrition—ensuring that children receive adequate nutrition during their formative years, thereby reducing childhood morbidity and mortality and enhancing overall public health outcomes. Hence, this research was carried out with the following objectives

1. To compare the socio-demographic details of well-nourished and malnourished children in the Vadodara rural.
2. To compare feeding practices among well-nourished and malnourished children in the Vadodara rural.

Method

Study Design and Study Site

This study was an Analytical Cross-Sectional Study (Comparative Study) conducted to assess and compare the nutritional status of children aged 6 to 60 months attending selected anganwadis in the Vadodara district, Gujarat. Anganwadis are available to every 800 people in India under Integrated Child Development Services (ICDS), where under five children registered and had been given nutritious food and non-formal education. The study was conducted over a period of from November 2020 to February 2022.

Study Population

The study included children aged 6 months to 60 months attending the selected anganwadis. The study population was categorized into three groups:

- Severely Acute Malnourished (SAM) children
- Moderately Acute Malnourished (MAM) children
- Normal children

The Children with congenital defects were excluded from the study. Children who were admitted to Nutritional Rehabilitation Centers (NRC) or Child Malnutrition Treatment Centers (CMTC) at the time of the visit were also excluded.

Sample Size and Sampling Method

A thirty-cluster sampling technique was employed to select the anganwadis for the study. The sampling unit for this study was the Anganwadi. First, one taluka (block) from Vadodara district was selected. This block had 299 registered anganwadis, with a total of 22,663 children registered at the time of the study. The cluster interval was calculated as 755 (22,663/30). The first Anganwadi was randomly selected after arranging the Anganwadi list in alphabetical order within the cluster interval. Subsequent anganwadis were selected by adding the cluster interval to the previous selection. Within each selected Anganwadi, simple random sampling was used to select the required number of children from each category (SAM, MAM, and Normal). Based on primary data from the Health and Family Welfare Department, an average of two SAM children were available per Anganwadi. Therefore, for each selected Anganwadi, two SAM children were included in the study. An equal number of two MAM children were also selected per Anganwadi. Additionally, four normal children, which is double the number of SAM and MAM children combined, were included. As a result, the total sample size for the study was 240 children, derived from 30 anganwadis with 8 children per Anganwadi.

Data Collection

Data were collected using a pre-tested, semi-structured questionnaire. The questionnaire was administered to mothers of the selected children.

Information on demographic details, nutritional status, breastfeeding practices and complementary feeding practices, and socio-economic factors was recorded. For calculations of nutritional status of the children, height/length and weight of the children were measured by the Principal Investigator using WHO growth chart weight for height/length.Mid Upper Arm Circumference was calculated by using colour coded, non-stretchable MUAC tape recommended by WHO.

Operational Definition:

Well-nourished Children:

The children whose Weight-for-Height Z score is within 2 Standard Deviation for Height/Length from median were considered as well nourished children.

Severe Acute Malnutrition:

It is defined as a very low weight for height (Z score of less than 3 SD of Median WHO growth standards) ,or MUAC less than 11.5cm or visible severe wasting or by presence of nutritional edema(2)

Moderate Acute Malnutrition:

It is defined as weight for height (Z score between -3 SD to -2SD of Median of WHO growth standards) ,and/or MUAC is more than or equal to 11.5 cm and less than 12.5 cm(3)

Malnourished Children:

Children with Severe Acute Malnutrition and Moderate Acute Malnutrition were considered as malnourished in this study.

Ethical Considerations

Ethical approval was obtained from the relevant institutional ethics committee. Written informed consent was taken from the mothers before enrolling their children in the study. Confidentiality and anonymity of the mothers were maintained throughout the study.

Result

A total of 246(120 well-nourished and 126 malnourished) children were included in the study. Among malnourished 63 children were SAM and 63 were MAM. Table-1 shows comparison of sociodemographic details of children. A statistically significant difference was observed in the age-group of the children. Malnutrition was more common in the age-group of 13-36 months and 37-60 months

Table 1: Comparison of Child details in both the group

Variables	Malnourished n(%)	Well-nourished n(%)	Chi-Square	p-value	OR (95% CI)
Age (in months)					
6-12	14(11.11)	47(39.17)	26.80	0.0001	1
13-36	54(42.96)	30(25.00)			6.04(2.86-12.73)
37-60	58(46.03)	43(35.83)			4.52(2.21-9.25)
Gender					
Male	60(47.62)	68(56.67)	1.67	0.19	0.69 (0.42-1.14)
Female	66(52.69)	52(43.33)			
Siblings					
0	30(23.81)	34(28.33)	1.94	0.58	1
1	62(49.21)	57(47.50)			1.23 (0.67-2.26)
2	27(21.43)	26(21.67)			1.17 (0.56-2.43)
3 or more	07(05.56)	03(02.50)			2.64(0.62-11.14)
Birth Order					
1	48(38.10)	55(45.83)	1.99	0.36	1
2	56(44.44)	50(41.67)			1.28 (0.74-2.20)
3 or more	22(17.46)	15(12.50)			1.68(0.78-3.60)
Total	126	120			

There was no difference observed in the birth order or gender. Socio-demographic details of parents are given in Table-2.Father's education level and occupation of mother was significantly associated with the nutritional level of children ($p<0.05$).

Table 2: Comparison of Socio-demographic details of the parents among both group (N=246)

Variable	Malnourished n (%)	Well-nourished n (%)	Chi-square/ t-test	p-value	OR (95% CI)
Mother *Education*					
Illiterate	13(10.32)	06(05.00)	3.65	0.18	2.18
Literate	113(89.58)	114(95.00)			(0.80-5.95)
Mother *Occupation*					
Non-working	110(87.30)	115(95.83)	4.68	0.03	3.34
Working	16(12.70)	5(04.17)			(1.18-9.44)
Father Education					
Illiterate	16 (12.69)	05 (04.77)	4.68	0.03	3.34
Literate	110(87.30)	115 (95.23)			(1.18-9.44)
Socio-economic Status (BG Prasad Classification)					
I	02(01.59)	06 (05.00)	3.52	0.47	1
II	08(06.35)	11 (09.17)			2.18(0.34-13.75)
III	24(19.05)	23 (19.17)			3.14(0.57-17.12)
IV	69(54.76)	63 (52.50)			3.28(0.63-16.87)
V	23(18.25)	17 (14.17)			4.05(0.72-22.63)
Total	120	126			

Birth history and immunization status are depicted in Table-3. As per the findings, only birth weight was significantly associated with nutritional status. The mean birth weight of the malnourished children was lower as compared to well-nourished children.

Table 3: Comparison of Birth Details and Immunization status in well-nourished and mal-nourished children (N-246)

Variable	Mal-nourished n (%)	Well-nourished n (%)	Chi-square/ t-test	p-value	OR (95% CI)
Type of Delivery					
NVD	102(80.95)	91(73.87)	0.67	0.41	0.73(0.40-1.35)
Caesarean Section	24(19.05)	29(24.17)			
Maturity at Birth					
Pre-term	08(06.35)	03(02.50)	2.34	0.31	2.59(0.67-10.04)
Term	116(92.06)	113(95.00)			1
Post-term	02(01.59)	03(02.50)			0.64(0.10-3.95)
Birth weight (Average)	2.44 (SD=0.46)	2.75 (SD=0.47)	5.22	<0.0001	-
Birth-complication					
Yes	0(0)	02(01.67)	-	0.23	-
No	126(100)	118(98.33)			
NICU Admission					
Yes	11(08.73)	08(06.67)	0.13	0.73	1.33 (0.51-3.45)
No	115(91.27)	112(93.33)			
Total	126	120			
Upto 1 year of age(n-38)					
Fully Immunized	14(100)	24(100)	-	-	-
Partially Immunized	0(0)	0(0)	-	-	-
Above 1 year of age (n-208)					
Fully Immunized	110(98.21)	95(98.95)	0.01	0.89	-
Partially Immunized	02(01.79)	01(01.05)			1.72 (0.15-19.34)

Exclusive breastfeeding was more common among well-nourished children as compared to the malnourished children. ($p<0.05$, Table-4). Other practices such as breastfeeding duration, giving colostrum, initiation of complementary feeding practices were appropriate as per IYCF guidelines in the well-nourished as compared to malnourished group, but the difference was not statistically significant.

Table 4: Comparison of feeding practices in well-nourished and malnourished children (N-246)

Variable	Mal-nourished n (%)	Well-nourished n (%)	Chi-square/t-test	p-value	OR(95% CI)
Exclusive Breastfeeding					
Yes	95(75.40)	110(91.67)	10.57	0.001	3.58(1.67-7.70)
No	31(24.60)	10(08.33)			
Median months for Continuation BF	13.5(IQR- 10 to 21)	14(IQR- 10 to 18)	Mann-whitney U=7454.5	0.845	-
Initiation of BF					
Within half an hour	67(53.17)	72(60.00)	1.18	0.55	1
Within One Day	29(23.02)	23(19.17)			1.35(0.71-2.57)
After One day	30(23.81)	25(20.83)			1.28(0.68-2.41)
Colostrum					
Yes	113(89.68)	112(93.33)	0.63	0.42	1.61(0.64-4.03)
No	13(10.32)	08(06.67)			
Frequency of Breastfeeding					
<6 times	04(03.17)	01(0.83)	2.54	0.27	4.38(0.47-40.32)
6-8 times	60(47.62)	52(43.33)			1.50(0.89-2.53)
8-12 times	62(49.20)	68(55.83)			1
Pre-lacteal Feeding					
Yes	34(26.98)	28(23.33)	0.26	0.60	1.21(0.68-2.16)
No	92(73.02)	92(76.67)			
Starting of Complementary Feeding					
Before 6 months	16(12.70)	10(08.33)	1.46	0.47	1.65(0.71-3.86)
At 6 months	83(65.87)	86(71.67)			1
After 6 months	27(21.43)	24(20.00)			1.16(0.62-2.18)
Complementary feeding type					
Liquid	51(40.48)	46(38.33)	1.119	0.57	1.24(0.67-1.88)
Semisolid	72(57.14)	73(60.83)			1
Solid	03(02.38)	01(0.83)			3.04(0.30-29.93)
Total	126	120			

DISCUSSION

The feeding practices have been proven for improving the nutritional status for under five children. By comparing the feeding practices among well nourished and malnourished children, we can clearly provide the role of feeding practices in improving the nutritional status of children.

Socio-demographic details:

The present study found more malnourished children in 13-36 months of age group and even more in age group of 37 months-60 months of age group; while we had more well-nourished children in the age group of 6-12 months of age group and we found that higher age group was significantly associated with malnutrition(Table-1).A facility based study done by **Tette EMA et al** titled factors affecting malnutrition in children and uptake of intervention to prevent the condition reflected that majority of patient in malnourished group came under the category of 12-24 months(4).A community based cross sectional study done by **Gebre A et al** found that 36-59 months of age group was more significantly associated with malnutrition(AOR-4.42,95% CI-2.79-6.54)(5).Therefore, we could say that malnutrition was more observed in the age group of 12-24 months and 36-59 months of age group. The reason could be weaning of breastfeeding, infections and inappropriate complementary feeding practices could be possible reasons for high range of malnutrition in above one year of age. A

community based cross sectional study titled p revalence and socio-demographic determinants in rural communities by **Khanna P et al** revealed that there was no association between gender wasting(weight-for-height),stunting (height-for-age) and undernutrition(weight-for-age)(6). In our study we had more females in malnourished groups compared to well-nourished, but in comparison there was no association between gender and malnutrition. A study on maternal employment and child malnutrition done by **Nankingia** O et al and Toyamay N et al revealed that the odds of being underweight and wasted were higher if the mother was working(7),(8). In present study, association between nutritional status of child and mother's occupation was observed (table-2). In Indian households, mothers are the main caregivers. Consequently if the mother is working feeding practices may be compromised, potentially affecting the child's nutrition status. Therefore, if mother is working than feeding practices could be compromised and the nutritional status can be affected.

Birth History

While comparing the birth history among two groups, the significant difference between birth weight of malnourished children and well-nourished children(p<0.0001) (Table-3).A study intended to know the association of low birth weight and malnutrition by **Rahman MS et al** found that low birth weight significantly increase the risk of being malnourished with RR 1.71(1.53-1.92)(9).A community based case control study by **David S et al**, which was done in Vellore South India showed that Severe acute malnutrition was significantly associated with low birth weight <2.499kg (aOR-8.95,2.98-25.85)(10). Hence, could conclude that lower birthweight was significantly associated with malnutrition in children.

Feeding Practices

A cross sectional study done by **Asoba GN et al** titled influence of feeding practices on occurrence of malnutrition in under five children showed that Exclusive breastfeeding reduces the occurrence of malnutrition in under five children (p<0.0001)(11).A community based case-control study done by **David S et al** showed that Severe acute malnutrition was significantly seen in children who were not exclusively breastfed for six months(Adjusted OR:4.67,1.72-12.65)(10). In our study we also had similar finding in 91 % of well-nourished children had given exclusive breastfeeding as compared to malnourished children, in this category only 75% of children had been given EBF, and we found significant association between these two groups(p<0.0001) (Table-4). Hence, it can be concluded that EBF has a role in prevention of malnutrition.

In a study done by **Muldiasman et al** study intended to establish association between early initiation of breast feeding and stunting revealed that delayed initiation of breastfeeding was significantly associated with the stunting in children(p-0.024,AOR-1.3(1.0-1.6))(12).On the contrary a community based case control study for determinant of severe acute malnutrition in under five children, which was done by **Pranava NK et al** reflected initiation of breastfeeding and colostrum feeding was not associated with the nutritional status of child(13). Findings of the present study were also similar in that, proportion of early breast feeding was more in well-nourished children as compared to malnourished children, but association between initiation of breastfeeding and nutritional status was not statistically significant (Table-4). Therefore, we could not comment on any association between initiation of breastfeeding and nutritional status of a child.

Complementary feeding:

A study done by **Gadappan SM et al** showed that starting of complementary feeding was significantly associated with malnutrition(p-.02)(14).A case-control study by **E. Tette et al** revealed that introduction of complementary feeding in less than 6 months of age was significantly associated with malnutrition(p value-0.009,OR-1.89(95% CI-1.14-3.14)(15).A cross sectional study in hospital setting aimed to identify the timely initiation of complementary feeding on acute malnutrition showed that not timely introduction of complementary feeding was associated with acute malnutrition(AOR-2.02,1.06-3.82)(16).In our study it was found that 35 % of malnourished children had started complementary feeding at inappropriate time while nearly 30% of well-nourished children had been given complementary feeding at inappropriate time, but we were unable to find any

association among them. Therefore, the relation between complementary feeding and nutritional status of the child remained unclear in our study.

Conclusion

Malnutrition was more common in the age group of 13-36 months, and it was also associated with the literacy level of father and mother's occupation status. Birth weight was lower in the malnourished group as compared to the well-nourished group. In comparison to feeding practices, exclusive breastfeeding practices were more practiced in well-nourished children as compared to malnourished children. There was a significant association between nutritional status of children and Exclusive breastfeeding. No significant differences were observed in breastfeeding frequency, breastfeeding starting time, pre-lacteal feeding practices as well as complementary feeding practices.

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