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Knowledge of Dietary Diversity, Hygienic Practices of Caregivers and Nutritional Status of under five Children in Rural West Bengal, India

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KEYWORDS

Hygienic practices; Minimum dietary diversity; Nutritional status; Pre-school children; India.

ABSTRACT

A mother's knowledge about dietary diversity is the key component for providing a high-quality diet to her children. However, there is a dearth of literature to assess a mother's knowledge about dietary diversity and its impact on the nutritional status of children. Therefore, an attempt was made in this study to understand a mother's knowledge on dietary diversity and her hygienic practices on the nutritional status of under-five children. This cross-sectional community based study was conducted in rural West Bengal, India. Data was collected using Android-based ODK data collection tools and analysed using WHO Anthro and SPSS (version 25) software. Frequency distribution, bi-variate cross-tabulation and binary logistic regression analysis were performed. 31% of children found underweight, 41.4% stunted and 17% wasted. About 37% of mothers knew about minimum dietary diversity and 24% used to wash their hands with soap and water before feeding their children. A mother's knowledge on dietary diversity was significantly associated with lower odds of being underweight (AOR:0.34), stunted (AOR:0.49) and wasted (AOR:0.33). Other significant predictors were a mother's educational attainment, knowledge on the symptoms of malnourishment and the habit of handwashing. The findings of this study reinforce the importance of enhancing a mothers' knowledge on child nutrition, dietary diversity and hygienic practices to improve the nutritional status of children.

Introduction

The Sustainable Development Goal-2 (SDG-2) aims to end all forms of malnutrition by 2030 (Ki-Moon, 2015). But a recent survey, conducted by the Government of India (CNNS, 2019), has tracked down that 33% of Indian children under five years or less are underweight (low weight-for-age), 35% are stunted (low height-for-age), and 17% are wasted (low body mass index-for-age), it is worse than India's neighbouring countries Nepal and Bangladesh. Inappropriate complementary feeding practices may increase the risk of undernutrition, illness and mortality in children (Joshi *et al*., 2012). Malnutrition directly or indirectly is responsible for at least 35 percent of child deaths worldwide (WHO, 2014). It has been found that up to 6 percent of under 5 deaths can be avoided by ensuring optimal complementary feeding (Bhutta *et al*., 2008), in which dietary diversity and meal frequency are very important. The World Health Organization has suggested to introduce complementary food at sixth month of age along with breastfeeding (WHO, 2011) to bridge the gap between the nutritional need of the children and the amount of nutrition received from breast milk (Agize *et al*., 2017). The complementary food should include diverse components from different food groups and the quality and quantity of food

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should be improved as the child gets older (UNICEF, 2020).

Dietary diversity is defined as the total number of food groups consumed over a given period of time (Ruel, 2003). It is being used as a universally agreed reliable indicator to measure dietary adequacy among young children. To increase the amount of micronutrients in the diet of young children, they need to be fed especially meat, poultry, fish, fruits and vegetables (WHO, 2003). The World Health Organization recommends four out of the seven food groups for the normal growth and development of children (WHO, 2008).

Many studies from India and other developing countries have identified different aspects of nutrition, such as breastfeeding factors (Suri and Humar, 2015), feeding practices (Suri and Humar, 2015; Ahmad *et al*., 2018; Godbole *et al*., 2020), micronutrient deficiency (Samundeeswary *et al*., 2016), childhood illness (Suri and Humar, 2015), mother's education (Ansuya *et al*., 2018) and socio-economic determinants of malnutrition (Ansuya *et al*., 2018). There are studies which have investigated the relationship between the nutritional knowledge of the mothers and the nutritional status of the children, but they are contradictory to each other. For instance, Ruel *et al*., 1992 and Webb & Block, 2003 found a significant positive association between maternal nutritional knowledge and child nutritional status whereas, other studies reported no correlation between these two (Walia and Gambhir, 1975).

In those studies, maternal nutritional knowledge was assessed based on indicators like 'importance of colostrum feeding', 'exclusively breastfeeding', 'age for introducing complementary feeding and its frequency', 'home-based remedies of diarrhoea management' and so forth. Another study has established the relationship between the knowledge on complementary feeding and feeding practices (Maingi *et al*., 2020), but we did not find any such literature to understand the impact of a mother's knowledge on minimum dietary diversity and nutritional status of the rural preschool children. Another important determinant of child malnutrition is poor wash practices. Previous studies have illustrated how different WASH factors, e.g. absence of safe drinking water, improved sanitation and handwashing practices are linked to various forms of undernourishment (Langford *et al*., 2011; Rah *et al*., 2015; Zemichael and Alemayehu, 2019; Merchant *et al*., 2003).

Thus the present study was undertaken to determine the impact of a mother's knowledge on nutrition, dietary diversity and different components of handwashing practices on the nutritional status of under five children. Findings would be useful to formulate an effective intervention strategy for improving the nutritional status of children; thereby, the country could achieve SDG-2 by 2030.

Materials and Methods

Study Design and Setting

This community based cross-sectional study was conducted from December, 2019 to January, 2020 as a part of a baseline study of a Maternal and Child Health (MCH) program, implemented by the Terre des hommes Foundation (Tdh) with its partner organisations. The study was conducted at Canning-II block of the district South 24 Parganas in West Bengal, India. Ten villages were selected using PPS and from each selected village, 31 mothers having at least a child less than five years were selected using systematic sampling. Data on all children (under five years) of each of the selected mothers was taken. For this paper, we have extracted data for children aged 6-59 months only.

Anthropometric Measurements

An electronic digital weighing scale (to the nearest 0.1kg) was used to measure children's weight, while a stadiometer and infant ruler (to the nearest 0.1cm) was used to measure the length/height. Stunting, i.e. Height-for-age z-scores (HAZ), wasting, i.e. weight-for-height z-score (WHZ) and underweight, i.e. weight-for-age z-score (WAZ), were calculated using anthropometry conversion to sex-specific Z-scores

using WHO Anthro Software. Children with a z-score <-2SD from median reference were termed as stunted, wasted or underweight.

Data Collection and Analysis

A bilingual interview schedule was prepared based on previous studies and WHO recommendations to assess minimum knowledge on dietary diversity. Data were collected by well-trained enumerators using android based ODK software for data collection. Age and sex-specific Z-scores were calculated using WHO Anthro software. The descriptive and multivariate analysis was carried out using SPSS (version 25) software. Univariate and bivariate analysis were conducted to present distribution of different dependent and independent variables. To identify the impact of different explanatory variables on the outcome variables, a binary logistic regression model was fitted. We computed the adjusted odds ratios and to consider a result as statistically significant, '*P*' value < 0.05 was considered in this analysis.

Variables and Measurements

The dependent variables of the study were the nutritional status of a child (HAZ, WHZ and WAZ), whereas the independent variables were categorised into three levels; maternal background (age, educational attainment, nutritional knowledge and hygienic practices), household characteristics (religion, social classes and house type) and child factors (age and sex of the child). Several indicators were prepared to assess the mother's nutritional knowledge. These indicators were the mother's knowledge on different signs or symptoms of malnourishment, minimum dietary diversity, appropriate age for providing solid/semisolid food and recommended frequency of complementary feeding. To understand the hygienic practices of mothers, three questions were asked: whether the mother washes her hands with soap and water before feeding the child, after defecation and before cooking food.

Knowledge on at least two signs or symptoms of malnourishment. The mother's knowledge on at least two signs or symptoms of malnourishment was assessed from a multiple response type question without reading out the options. The question was, "What are the signs and symptoms of malnourishment among children?" Mothers who could rightly say at least two such signs or symptoms were considered as 'knowledgeable' else 'not knowledgeable'.

Development of indicator for measuring mothers' knowledge on minimum dietary diversity. Without reading the options, the mother's understanding of minimum dietary diversity was calculated using a multiple response question. The question was, "Which foods should be included in a child's diet?" Responses of mothers were coded as per the appropriate options available in the questionnaire. For example, if a mother says "rice, potato, pulses, egg/fish, green vegetables and milk", then the same was coded as (1) Grain and roots, (2) Legumes and nuts, (3) Egg, (4) Flesh foods, (5) Vitamin-A rich fruits and vegetables and (6) Dairy products. Probing was made like "do you know any more foods?" to get more response from mothers regarding dietary diversity. Mothers who could respond four or more food groups were categorized as 'having knowledge on minimum dietary diversity' and below four groups were classified as 'not having knowledge on minimum dietary diversity'.

Researchers have confirmed that there will be no potential harm for the respondents and all ethical issues are properly addressed. The purpose of the study was explained in detail to the respondents. The questions were administered on the field only after taking verbal informed consent from the study participants and were ensured about the confidentiality of their identity and responses. For children who were found malnourished, their caregivers were suggested to contact the nearest child development centre (ICDS) at the end of the interview. Similarly, mothers having incomplete awareness on dietary diversity for children and signs or symptoms of malnourishment for children were informed on these issues and referred to nearby ICDS centres.

Result

Sociodemographic Characteristics and nutritional status

The analysis of anthropometric measurements of the children demonstrate that 31% of children were underweight, 41.4% stunted and 17% wasted. More than a quarter of mothers (26%) were illiterate, about 17.7% had primary education and only 5.7% had ten or more years of schooling. The majority of the households (54.6%) had kuccha type, 25.1% had semi-pucca type and 20.3% had pucca type of houses (Table 1). About 14% of children had low weight at birth (<2.5kg) and the average birth weight was 2.74±0.36 kg. The mean age at which complementary foods were initiated was 6.33±0.89 months. These indicators reflect the poor nutritional status of children. In this study, we have found that mothers were the primary caregivers for children in all cases (Table 1).

Knowledge and practice of Mothers

Mothers' knowledge on different aspects of nutrition was judged based on their responses to various questions. Table-2 displays the knowledge of mothers on various aspects of child nutrition and their hygienic behaviour. More than half of the mothers (60.8%) knew when to start complementary feeding and 46.8% were knowledgeable about the frequency of complementary feeding. Regarding dietary diversity, 36.9% of mothers knew at least four food groups out of seven. 43.7% of mothers were aware of at least two signs or symptoms of malnourishment among children. When enquired about the handwashing practices with soap and water, we found that 71.9% of mothers washed their hands after defecation, 16.8% before preparing foods and 23.9% before feeding their children (Table 2).

Factors associated with Nutritional Status of Children

Mother's knowledge about at least two signs or symptoms of malnourishment, knowledge on minimum dietary diversity and hand wash practice before feeding the child was significantly associated with WAZ, HAZ and WHZ. Differences in nutritional status by sex of the children was not statistically significant. A higher proportion of children from the Hindu religion were malnourished than Muslim children; though, the results were statistically significant for underweight and wasted but not for stunted. Similarly, the nutritional status of children varied across social classes but was statistically significant only for WHZ. The type of house structure could be one of the crucial indicators for a household's economic status, but in this study no significant difference in children's nutrition was observed with the type of house structure. A higher proportion of children of illiterate mothers were malnourished compared to the literate mothers and the difference was statistically significant for WAZ and HAZ but not for WHZ. Other variables like mother's age, knowledge on the frequency of complementary feeding and hand wash with soap after defecation were also significantly associated with WAZ and WHZ but not with HAZ (Table 3).

Determinants of nutritional status of children

Table-4 shows the contribution of different independent variables to determine child nutritional status. For this, all predictor variables (Household level: religion, caste and type of house; Maternal level: maternal nutritional knowledge, hygienic behaviour, educational level and age; Child level: sex of the child) were simultaneously entered in the model and child nutritional status (WAZ, HAZ and WHZ) was taken as the outcome variable. Therefore, we conducted three regression models with three different nutritional outcomes, but the sets of predictor variables remained the same in all the three models. The results show that mothers' knowledge about at least two symptoms of malnourishment, knowledge on minimum dietary diversity and hand wash practice before feeding the child were statistically significant determinants of the nutritional status of children under five years old. Mothers who were knowledgeable of at least two symptoms of malnourishment, their children were 41% times less likely to be underweight (AOR = 0.59, 95% CI=(0.35, 0.97)), 76% less likely to be stunted (AOR=0.24, 95% CI= (0.15, 0.39))

and 55% less likely to be wasted (AOR=0.45, 95% CI=(0.24, 0.84)) compared to the mothers who were not knowledgeable about at least two symptoms of malnourishment. Similarly, on average, children of mothers who were familiar to minimum dietary diversity were 66% less likely to be underweight (AOR = 0.34, 95% CI=(0.20, 0.58)), 51% less likely to be stunted (AOR=0.49, 95% CI=(0.30, 0.81)) and 67% less likely to be wasted (AOR=0.33, 95% CI=(0.17, 0.67)) than those children whose mothers had no knowledge on minimum dietary diversity. When we consider the association of hygienic practices by mothers, the result shows that mothers who washed their hands before feeding the child, their children were 74% less likely to be underweight, 48% less likely to be stunted and 58% less likely to be wasted compared to the mothers who were not practising handwash. The results show a significant association with child nutritional outcome (WAZ and HAZ but not WHZ) with the mother's education. On average, children from mothers who completed their primary education were 51% less likely to be underweight and 60% less likely to be stunted than those of children from mothers with no education. The nutritional status of the children was also varied with the sex of the child, religion, type of housing structure, mother's education, mother's knowledge on the appropriate age for providing complementary feeding and its frequency, but those were not statistically significant (Table 4).

Discussion

The present analysis shows that 31% of children were underweight, 41.4% stunted and 17% wasted. These findings are almost similar to the findings of the National Family Health survey (NFHS-5, 2019-21) for the South 24 Parganas district of West Bengal, where 32.2% of children were underweight, 36.7% stunted and 21.2% wasted (IIPS, 2021). The current study revealed that only 36.9% of the mothers were aware of minimum dietary diversity for children; which is lower compared to studies conducted in Ethiopia by Agize *et al*. and in Kenya by Maingi *et al*. where they have found 51% and 53.7% of mothers were knowledgeable on this (Agize *et al*., 2017; Maingi *et al*., 2020). In this study less than half of the mothers (46.8%) were aware of at least two symptoms of children's malnourishment, whereas, a hospital-based study in India found that 50% of the mothers had average knowledge, 30% had poor knowledge and only 20% of mothers had good knowledge of symptoms, effects and prevention of malnutrition among children (Kavitha, 2015).

The current study shows that mothers' nutritional knowledge on at least two signs or symptoms of malnourishment and knowledge on minimum dietary diversity were statistically significant determinants for the all three nutritional indicators (WAZ, HAZ and WHZ) of children under five years old, these findings are similar to other studies (Webb and Block, 2003; Fadare *et al*., 2019). However, some other studies say different stories. For example, a study conducted by Agize *et al*., (2017) found that though 51% of Ethiopian mothers were knowledgeable on dietary diversity of children, but only 16% practised appropriate dietary diversity for their children aged 6–23 months. Which means the knowledge is not being translated into practice (Agize *et al*., 2017). A study in Kenya found that children of mothers who had better knowledge on minimum dietary diversity, a higher proportion of them have received a diverse diet than the children whose mothers had poor knowledge of that (Maingi *et al*., 2020). Therefore, it may be concluded that the better is the knowledge on dietary diversity of mothers, the higher is the chance of providing diverse diets to their children and thereby improving the nutritional status of their children.

In our study, 23.9% of mothers reported washing hands with soap and water before feeding the child, 16.8% prior to preparing food and 71.9% after defecation. These findings are comparable with a study conducted by WaterAid in the year 2017 in four Indian states, namely, Bihar, Odisha, Chhattisgarh and Rajasthan, where it was found that proper handwash practice by the caregivers before feeding children was significantly associated with the nutritional outcome of children (Water AID, 2017).

The study's findings highlight the importance of mothers' nutritional knowledge and hygienic

practices to reduce malnourishment among under-five children and it will have important policy implications in a country like India. Nutritional knowledge is not only crucial for illiterate mothers but also equally important for literate mothers. Alongside the mothers' nutritional knowledge, their hygienic practices need to be improved.

The study's limitations are that it was carried out in a small sample in a rural setting of West Bengal and we did not assess the actual calorie intake of a child in association with the mother's knowledge. Apart from this, the study provides a good insight into mothers' nutritional knowledge and hygienic practices on the nutritional outcome of children. Thus, further studies with robust study designs with larger augmentation may be carried out for an in-depth understanding of the issue.

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Tables

Table 1: Nutritional status of children and sociodemographic background of the respondents

Sociodemographic indicator	**n (423)**	**%**	**95% CI**	
Sex of children				
Male	227	53.66	48.78	58.49
Female	196	46.34	41.51	51.22
Religion				
Hindu	162	38.3	33.64	43.12
Muslim	261	61.7	56.88	66.36
Caste				
General	231	54.61	49.73	59.43
SC	102	24.11	20.11	28.48
ST	52	12.29	9.32	15.81
OBC	38	8.98	6.44	12.12
Type of House				
Kaccha	231	54.61	49.73	59.43
Semi pucca	106	25.06	21.00	29.47
Pucca	86	20.33	16.60	24.49
Mothers age				
18 or below	19	4.49	2.73	6.93
19-24	211	49.88	45.01	54.75
25-30	152	35.93	31.36	40.71
31-36	41	9.69	7.05	12.92
Mothers education				
Illiterate	110	26	21.89	30.46
Primary	75	17.73	14.21	21.71
5 and above	238	56.26	51.39	61.05
Underweight				
Yes	131	30.97	26.59	35.62
No	292	69.03	64.38	73.41
Stunted				
Yes	175	41.37	36.63	46.23
No	248	58.63	53.77	63.37
Wasted				
Yes	72	17.02	13.56	20.95
No	351	82.98	79.05	86.44

Table 2: Knowledge of mothers on child nutrition and their hygienic behaviour

Knowledge and practice indicator	**n (423)**	**%**	**95% CI**	
Knowledge of at least 2 signs or symptoms of malnourishment				
No	225	53.19	48.31	58.03
Yes	198	46.81	41.97	51.69
Knowledge of 4 or more food groups				
No	267	63.12	58.33	67.73
Yes	156	36.88	32.27	41.67
Knowledge of appropriate age for complementary feeding				
No	166	39.24	34.56	44.08
Yes	257	60.76	55.92	65.44
Knowledge of appropriate frequency of complementary feeding				
No	225	53.19	48.31	58.03
Yes	198	46.81	41.97	51.69
Hand wash with soap before feeding child				
No	322	76.12	71.77	80.11
Yes	101	23.88	19.89	28.23
Hand wash with soap after defecation				
No	119	28.13	23.90	32.68
Yes	304	71.87	67.32	76.10
Hand wash with soap before preparing food				
No	352	83.22	79.31	86.65
Yes	71	16.78	13.35	20.69

Table 3: Factors associated with nutritional status of children in rural West Bengal

Variables	**Under weight**		**Stunted**		**Wasted**	
	%	**P value (χ^2)**	**%**	**P value (χ^2)**	**%**	**P value (χ^2)**
Sex of the child		0.883		0.314		0.383
Male	31.3		43.6		18.5	
Female	30.6		38.8		15.3	
Religion		0.003		0.419		0.000
Hindu	39.5		43.8		25.9	
Muslim	25.7		39.8		11.5	
Social classes		0.059		0.609		0.002
General	26.0		40.3		14.3	
SC	38.2		40.2		27.5	
ST	40.4		50.0		19.2	
OBC	28.9		39.5		2.6	
Type of house structure		0.306		0.098		0.248
Kaccha	33.8		45.5		16.5	
Semi pucca	25.5		33.0		21.7	
Pucca	30.2		40.7		12.8	
Mother's age		0.115		0.165		0.065
18 or below	31.6		42.1		36.8	
19-24	31.8		39.3		14.7	
25-30	34.2		47.4		19.1	
31-36	14.6		29.3		12.2	
Mother's education		0.003		0.000		0.487

Illiterate	42.7		57.3		20.0	
Primary	33.3		38.7		18.7	
5 and above	24.8		34.9		15.1	
Knowledge on at least 2 signs or symptoms of malnourishment		0.000		0.000		0.001
No	38.7		57.3		22.7	
Yes	22.2		23.2		10.6	
Knowledge on 4 or more food groups		0.000		0.003		0.000
No	38.2		46.8		22.1	
Yes	18.6		32.1		8.3	
Knowledge on appropriate age for providing complementary feeding		0.002		0.013		0.467
No	39.8		48.8		18.7	
Yes	25.3		36.6		16.0	
Knowledge on frequency of complementary feeding		0.484		0.542		0.337
No	32.4		40.0		18.7	
Yes	29.3		42.9		15.2	
Hand wash with soap and water before feeding child		0.000		0.000		0.005
No	37.0		46.3		19.9	
Yes	11.9		25.7		7.9	
Hand wash with soap and water after defecating		0.789		0.095		0.349
No	31.9		45.4		14.3	
Yes	30.6		39.8		18.1	
Hand wash with soap and water before cooking food		0.576		0.006		0.175
No	31.5		44.3		15.9	
Yes	28.2		26.8		22.5	

Table 4: Adjusted Odds Ratio (AOR) for factors associated with nutritional status of children in rural West Bengal

Characteristics	**Underweight**	**Stunted**	**Wasted**
	AOR (95% CI)	**AOR (95% CI)**	**AOR (95% CI)**
Sex of the child			
Male	1	1	1
Female	0.86 (0.53, 1.38)	0.73 (0.46, 1.15)	0.9 (0.51, 1.61)
Religion			
Hindu	1	1	1
Muslim	0.96 (0.37, 2.52)	1.31 (0.57, 3.01)	0.53 (0.18, 1.56)
Caste categories			
General	1	1	1
Schedule Caste (SC)	1.89 (0.67, 5.38)	1.17 (0.47, 2.91)	1.4 (0.45, 4.36)
Schedule Tribe(ST)	1.59 (0.56, 4.54)	1.29 (0.5, 3.32)	0.67 (0.2, 2.26)
Other Backward Classes	0.94 (0.38, 2.32)	1.26 (0.56, 2.86)	0.13 (0.02, 1.09)

Type of house structure			
Kaccha	1	1	1
Semi pucca	0.59 (0.33, 1.07)	0.53 (0.3, 0.92)*	1.39 (0.72, 2.68)
Pucca	0.98 (0.52, 1.82)	0.82 (0.46, 1.48)	0.8 (0.35, 1.83)
Mother's age			
18 or below	1	1	1
19-24	1.57 (0.51, 4.86)	1.08 (0.36, 3.27)	0.27 (0.08, 0.87)*
25-30	1.57 (0.5, 4.91)	1.29 (0.42, 3.91)	0.34 (0.11, 1.1)
31-36	0.49 (0.12, 2.07)	0.48 (0.13, 1.78)	0.25 (0.06, 1.14)
Mother's education			
Illiterate	1	1	1
Primary	0.49 (0.24, 1.03)	0.40 (0.19, 0.81)*	0.99 (0.41, 2.4)
5 and above	0.50 (0.28, 0.89)*	0.47 (0.27, 0.82)*	0.91 (0.45, 1.82)
Knowledge on at least 2 signs or symptoms of malnourishment			
No	1	1	1
Yes	0.59 (0.35, 0.97)*	0.24 (0.15, 0.39)*	0.45 (0.24, 0.84)*
Knowledge on 4 or more food groups			
No	1	1	1
Yes	0.34 (0.2, 0.58)*	0.49 (0.3, 0.81)*	0.33 (0.17, 0.67)*
Knowledge on appropriate frequency for providing complementary feeding			
No	1	1	1
Yes	0.72 (0.44, 1.18)	1.1 (0.69, 1.73)	0.67 (0.38, 1.21)
Knowledge on the appropriate age for providing complementary feeding			
No	1	1	1
Yes	0.47 (0.27, 0.83)*	0.68 (0.4, 1.16)	0.64 (0.32, 1.28)
Hand wash with soap and water before feeding child			
No	1	1	1
Yes	0.26 (0.13, 0.51)*	0.52 (0.29, 0.9)*	0.42 (0.18, 0.98)*
Hand wash with soap and water after defecation			
No	1	1	1
Yes	1.48 (0.85, 2.58)	1.29 (0.77, 2.19)	2.46 (1.22, 4.99)*
Constant	1.63	3.55	1.74

**Statistically significant at P value < 0.05.*