

A Case-Control Study of Maternal Knowledge of Malnutrition and Health-Care-Seeking Attitudes in Rural South India

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Introduction: In India, approximately 20 percent of children under the age of four suffer from severe malnutrition, while half of all the children suffer from undernutrition. The contributions of knowledge and attitudes of nutrition-conscious behaviors of the mothers to childhood malnutrition has been unclear. The purpose of this study was to explore maternal knowledge of the causes of malnutrition, health-care-seeking attitudes and socioeconomic risk factors in relation to children's nutritional status in rural south India.

Methods: A case-controlled study was conducted in a rural area in Tamil Nadu, India. Thirty-four cases and 34 controls were selected from the population of approximately 97,000 by using the local hospital's list of young children. A case was defined as a mother of a severely malnourished child under four years of age. Severe malnutrition was defined as having less than 60 percent of expected median weight-for-age. A control had a well-nourished child and was matched by the location and the age of the child. Interviews obtained: (1) socioeconomic information on the family, (2) knowledge of the cause of malnutrition and (3) health-care-seeking attitudes for common childhood illnesses, including malnutrition.

Results: Poor nutritional status was associated with socioeconomic variables such as sex of the child and father's occupation. Female gender (OR = 3.44, $p = .02$) and father's occupation as a laborer (OR = 2.98, $p = .05$) were significant risk factors for severe malnutrition. The two groups showed a significant difference in nutrition-related knowledge of mild mixed malnutrition (OR = 2.62, $p = .05$). No significant difference was apparent in health-care-seeking attitudes. Based on their traditional beliefs, the mothers did not believe that medical care was an appropriate intervention for childhood illnesses such as malnutrition or measles.

Discussion: The results suggested that the gender of the child and socioeconomic factors were stronger risk factors for malnutrition than health-care availability and health-care-seeking attitudes. The father's occupation was a more accurate indicator for malnutrition than household income. These results suggest a need for intensive nutritional programs targeted toward poor female children and their mothers.

INTRODUCTION

In developing countries, approximately 193 million children under five years of age suffer from malnutrition [1]. Sixty percent of these children reside in South Asia, mostly in India. The National Family Health Survey in 1992-93 showed that approximately 20 percent of all Indian children under four suffer from severe malnutrition, while half (53 percent) of all the children suffered from undernutrition [2].

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^b *Abbreviations:* CHAD, Community Health and Development Program; OR, odds ratio.

Past studies have investigated risk factors for malnutrition. The education of women, especially, has been found to play a central role in improving the health of children. Mother's nutrition-related knowledge, attitudes, and practices tend to be strongly associated with children's nutritional status [3-5]. However, few studies in south India have investigated people's common knowledge about childhood nutrition and nutritional deficiencies based on local belief systems [7-9].

The health-care-seeking attitudes of mothers, how they utilize available health resources in response to their children's illnesses, is another factor that can affect children's health and nutritional status but has been neglected by the past studies. Evidence suggests that active health-care-seeking attitudes of mothers play a critical role in children's well-being in developing countries [10, 11]. No studies in India have yet investigated effects of health-care-seeking attitudes of mothers on children's nutritional status.

The purpose of this study was to examine the relationship between children's nutritional status and mothers' knowledge of the cause of childhood malnutrition, their attitudes toward resources available to improve their children's condition and their socio-economic backgrounds. A specific aim of the study was to provide information to guide anticipated programs and research designed to decrease malnutrition in Kaniyambadi block, Tamil Nadu, India.

MATERIALS AND METHODS

The hypothesis was that the following factors would be associated with children's nutritional status (normal weight-for-age vs. < 60 percent of median weight-for-age): (1) socioeconomic status, gender of the child, family size and type (nuclear or extended), and maternal education; (2) mother's knowledge of the causes of malnutrition; and (3) mother's health-care-seeking attitudes. Both subjects and the field worker who conducted the interviews were blind to the study purposes.

Setting

An observational case-control study was conducted in a small area in the north of Tamil Nadu, India, between June and August 1995. The study area, Kaniyambadi block, is located outside the town of Vellore in the district of North Arcot. The predominant language is Tamil. Kaniyambadi block is an entirely rural area with a population of 97,000 people living in 68 villages [12]. About 40 percent of the population lives below the poverty line and is illiterate; this percentage may be as high as 70 percent for women. Malnutrition is prevalent among children. A survey conducted in 1994 by the Community Health Department of Christian Medical College and Hospital found that 60 percent of children in Kaniyambadi block were undernourished and that 1-2 percent were severely malnourished.

The Christian Medical College and Hospital conducts a comprehensive health and development program known as the Community Health and Development (CHAD)^b program. Each month, trained health aides from CHAD weigh all children in Kaniyambadi block under age three to monitor for malnutrition. They report to the CHAD Hospital any child with second degree malnutrition (< 70 percent of the expected median weight-for-age) or greater.

Subjects

Cases. The study included thirty-four mothers as cases, based on their children's nutritional status and their location of residence. Inclusion criteria were residence in Kaniyambadi block and being a mother of a severely malnourished child under four years of age. Severe malnutrition was defined as having less than 60 percent of expected median

weight-for-age for healthy Indian children (Grade III malnutrition). The expected weight was based on the Indian Academy of Pediatrics criteria.

Controls. Thirty-four matching controls were included in the study. The controls were mothers in Kaniyambadi block with their children selected from the list of young children at the CHAD hospital. The children were matched by two criteria. They were: (1) born one month prior or following the birth of each case child and (2) living in close proximity to the case child. The controls were not matched by gender because the investigator wished to determine if gender was an independent predictor of children's nutritional status.

Data collection

The study focused on the following data: (1) sociodemographic information on the family size and type (nuclear or extended), number, age and gender of children in the household, mother's age, education and occupation, father's occupation, household income and ownership of land and livestock; (2) knowledge of the causes of severe malnutrition; and (3) health-care-seeking attitudes for common childhood illnesses, including malnutrition.

Part (1) was adapted from the Socio-Economic Scale and Guidelines for Filling Up the General Survey Proforma developed by the Community Health Department [13, 14]. Part (2) employed interview methods used by Sivaramakrishnan and Patel [9]. Questions for Part (3) were adapted from the Rapid Assessment Procedures for Nutrition and Primary Health Care developed by Scrimshaw and Hurtado [11].

To assess the knowledge of malnutrition, a field worker showed pictures of children with symptoms of two types of protein-energy malnutrition: severe marasmus [15, 16] and mild marasmus-kwashiorkor mixed malnutrition [16]. First, the field worker asked the mothers about the symptoms in each picture. If mothers could not correctly identify all the essential symptoms (e.g., enlarged stomach, wasting, and swelling), the field worker verbally told them the symptoms. Then, the mothers were asked to explain what they believed caused these symptoms. Their answers were grouped into three categories: nutrition-related, health-related and non-relevant. If a mother could provide one nutrition-related or health-related cause, then she was considered to have general knowledge of the causes of malnutrition. Second, in order to determine health-care-seeking attitudes of mothers, the field worker asked which health resources they would use if their children had each of the following common childhood illnesses: diarrhea, cold, worms, measles or malnutrition.

The interviews were conducted mostly in Tamil. A language of a neighboring state, Telegu, was used for one non-Tamil speaking subject. The interviews lasted between 20 and 40 minutes. At the end of each interview, the height and weight of the target child were measured using a tape measure and a spring balance with a hanging cradle respectively.

Data analysis

The data were entered and analyzed using SPSS and EpiInfo. The statistical software package SAS was used to assess associations and frequencies. For categorical variables, chi-squared univariable analysis was performed to determine the associations between nutritional status and socioeconomic factors, nutritional knowledge and healthcare seeking attitudes. For continuous variables such as household income, one-way analysis of variance test was used. Furthermore, stepwise multiple logistic regression was used to analyze a possible interaction of these variables.

RESULTS

Anthropometric profile and ages of the sampled children

The sample consisted of 34 severely malnourished children and 34 healthy children, matched on age and residence. Their ages ranged from two to 38 months, and the mean age of the children was 19.3 months (Table 1). The mean height and weight of the healthy children were 77.1 cm and 9.60 kg respectively, whereas the mean height and weight of the severely malnourished children were 68.4 cm and 6.37 kg. The differences in the mean height and weight of healthy and malnourished children were 8.7 cm and 3.23 kg respectively.

Table 1. Anthropometric profile and ages of the sampled children, Kaniyambadi block, Tamil Nadu, India, 1995.

	Cases (n = 34)	Controls (n = 34)	Difference
Mean height	68.4 cm	77.1 cm	8.7 cm
Mean weight	6.37 kg	9.60 kg	3.23 kg
Mean age	19.3 months	19.3 months	
Age range	2 to 38 months	2 to 38 months	

Sociodemographic profile of the mothers

The 68 mothers interviewed were young (mean age = 25; range: 18-35), poor and mainly illiterate (Table 2). The mean age at first childbirth was 20 for both cases and controls (range 14-30). The mothers had an average of two children. The mean family income was 802 rupees per month (equivalent to U.S. \$26 in August 1995). The mean per capita income was 166 rupees per month for each person in the family (about U.S. \$5). About 22 percent of all the fathers were daily wage farmers. Only 15 percent of the mothers worked outside their home, while the majority worked caring for the home and children. Approximately 37 percent of the families owned their own land and one or more livestock. Only 32.4 percent of the 68 mothers knew how to read and write.

Table 2. Demographic profile of 68 mothers interviewed in Kaniyambadi block, Tamil Nadu, India, 1995.

	Cases (n = 34)	Controls (n = 34)	Total (n = 68)
Mean age (range)	25 (18-30)	25 (19-35)	25 (18-35)
Mean age at 1st childbirth (range)	20 (14-26)	20 (14-30)	20 (14-30)
Illiterate	25 (73.5 %)	21 (61.8 %)	46 (67.6 %)
Mean number of children	2.2	2.2	2.2
Mean family income *	777 Rs/mo.	827 Rs/mo.	802 Rs/mo.
Mean income per capita **	164 Rs/mo.	167 Rs/mo.	166 Rs/mo.
Father's daily-wage (farmer)	10 (29.4 %)	5 (14.7 %)	15 (22.1 %)
Mother employed outside home	5 (14.7 %)	5 (14.7 %)	10 (14.7 %)
Owned land	9 (26.5 %)	16 (47.1 %)	25 (36.8 %)
Owned one or more animals	10 (29.4 %)	16 (47.1 %)	26 (38.2 %)

*About \$26 U.S. in 1995; **About \$5 U.S. in 1995.

Sociodemographic risk factors for malnutrition

The analysis of sociodemographic variables showed the following factors to be significant risk factors for severe malnutrition: female gender (crude OR = 3.38, $p = .02$), and having a father doing labor (in contrast to civil and private service profession) (crude OR = 3.67, $p = .01$). Other sociodemographic factors that did not show significant associations with children's nutritional status were family type (nuclear or extended), family size, maternal education, mother's type of work or ownership of land and livestock.

The data were analyzed using stepwise multiple logistic regression, to determine if there was confounding between sex and other variables, or whether other variables influenced the strength of the effect of sex (effect modification). When non-significant independent variables were removed from the analysis, two variables persisted in being statistically significant: sex and father's occupation (defined as laborer vs. other) (Table 3). The adjusted odds ratio for serious malnutrition among children of laborers compared to children of non-laborers was 2.98 ($p = .05$). The adjusted odds ratio for malnutrition among girls as compared to boys was 3.44 ($p = .02$).

Knowledge of the cause of malnutrition

Severe marasmus. Sixty-five percent of cases and 74 percent of controls attributed the cause of marasmus to the lack of food or nutrition (Table 4). Lack of food, breast milk or *sattu*, which is a local term equivalent to strength or nutrition, were common answers given by the mothers. Sixty-five percent of the cases and 74 percent of the controls attributed the cause of marasmus to nutrition. Since marasmus can be directly and indirectly caused by both food-related and other health-related causes, answers such as diarrhea, premature birth and lack of immunization were categorized as correct causes. The results showed that approximately 80 percent of both cases and control had general knowledge of the causes of marasmus.

Table 3. Potential sociodemographic risk factors for malnutrition and their associations to children's nutritional status, Kaniyambadi block, Tamil Nadu, India, 1995.

Potential risk factors	Cases (n=34)	Controls (n=34)	Odds ratio	95% confidence interval	p-value
Have a nuclear family (parents & children)	18 (52.9 %)	18 (52.9 %)	1.00	0.34<OR<2.92	1.00
Live with less than 6 family members	21 (61.8 %)	19 (55.9 %)	1.28	0.69<OR<1.86	0.62
Being a girl	23 (67.6 %)	13 (38.2 %)	3.38	1.11<OR<10.54	0.02*
Have a mother with no schooling	25 (73.5 %)	21 (61.8 %)	1.72	0.54<OR<5.53	0.30
Have a father engaged in agri-labor	10 (29.4 %)	5 (14.7 %)	2.42	0.63<OR<9.66	0.14
Have a laborer as a father	25 (73.5 %)	15 (44.1 %)	3.52	1.12<OR<11.27	0.05*

*Significant at $\alpha = .05$

Table 4. Frequency of occurrence of concepts related to the cause of marasmus, Kaniyambadi block, Tamil Nadu, India, 1995.

Concepts of causes	Cases (n = 34)	Controls (n = 34)
Nutrition-related causes		
Lack of food	13 (38.2 %)	9 (26.5 %)
Lack of breast milk	7 (20.6 %)	9 (26.5 %)
Lack of strength	4 (11.8 %)	7 (20.6 %)
Lack of food during pregnancy	1 (2.9 %)	1 (2.9 %)
Lack of strength in breastmilk	1 (2.9 %)	0 (0 %)
Improper food	1 (2.9 %)	1 (2.9 %)
Total N	22 (64.7 %)	25 (73.5 %)
Health-related causes		
Lack of immunization	3 (8.8 %)	3 (8.8 %)
No care	1 (2.9 %)	1 (2.9 %)
Polio	1 (2.9 %)	1 (2.9 %)
Diarrhea	1 (2.9 %)	0 (0 %)
Born premature	1 (2.9 %)	0 (0 %)
Total N	5 (14.7 %)*	1 (2.9 %)*
Have general knowledge**	27 (79.4 %)	26 (76.5 %)
Don't know	7 (20.6 %)	8 (23.5 %)

*Does not include those who gave both nutrition- and health-related causes

**The number of subjects who have a general knowledge of marasmus = Subjects who had Nutrition-related concepts + Subjects who had Health-related concepts

Mild marasmus-kwashiorkor mixed malnutrition. Significantly more controls (59 percent) attributed causes of mixed malnutrition to the lack of food or nutrition than cases (35 percent) (OR = 2.62, $p = .05$) (Table 5). Including those who answered health-care-related causes of mixed malnutrition, approximately half of both cases and controls had general knowledge of the causes of mild mixed malnutrition.

Health-care seeking attitudes

Health-care seeking attitudes did not differ between cases and controls, but differed significantly with the type of disease (Table 6). For diarrhea, colds and worms, taking the child to a doctor was a common practice. For malnutrition and measles, however, mothers tended not to seek medical care.

For malnutrition, 72 percent of the mothers said they would try to treat the child at home. Only 28 percent would seek medical care such as CHAD, private doctors or government-run nutrition centers. No significant differences were found in mothers' health-care seeking attitudes toward malnutrition between two groups. With measles, 90 percent of all the mothers answered that they would not take the child to a doctor. Instead, they preferred to keep their children at home.

Thirty percent of the mothers preferred giving home remedies to their children when they have diarrhea. Nine percent of the mothers would take their children to a *nattu vaethiyar*, a traditional healer. If the child had a cold, 12 percent would provide home remedy to the child. All others would take the child to either private doctors, the Mobile Health Clinic, or to the CHAD Hospital. If a child had worms, most mothers answered that they would consult a doctor at the Mobile Health Clinic or the CHAD Hospital, or a private doctor, or the Government Health Nurse.

Table 5. Frequency of occurrence of concepts related to the cause of protein-energy malnutrition, Kaniyambadi Block, Tamil Nadu, India, 1995.

Concepts of causes	Cases (n = 34)	Cases (n = 34)
Nutrition-related causes		
Lack of food	8 (23.5 %)	13 (38.2 %)
Lack of breast milk	2 (5.9 %)	5 (14.7 %)
Lack of strength	3 (8.8 %)	2 (5.9 %)
Improper food	0 (0 %)	1 (2.9 %)
Total N*	12 (35.3 %)	20 (58.8 %)
Health-related causes		
Lack of immunization	2 (5.9 %)	0 (0 %)
No care	4 (11.8 %)	0 (0 %)
Worms	2 (5.9 %)	3 (8.8 %)
Diarrhea	1 (2.9 %)	0 (0 %)
Mud eating	2 (5.9 %)	0 (0 %)
Total N	6 (17.6 %)**	3 (8.8 %)
Have general knowledge	18 (52.9 %)	23 (67.6 %)
Non-relevant causes		
<i>Udhukamalai</i> [†]	1 (2.9 %)	0 (0 %)
Tuberculosis	2 (5.9 %)	2 (5.9 %)
Too much food	2 (5.9 %)	0 (0 %)
Total N	4 (11.8 %)	2 (5.9 %)
Don't Know	12 (35.3 %)	9 (26.5 %)

*Does not include those who gave both nutrition and health-related causes.

**The difference is significant: OR = 2.62 (0.98<OR<7.90), p = .052.

[†]A local term for kwashiorkor (mothers did not know the cause).

DISCUSSION

This study suggests that socioeconomic factors and knowledge of the cause of malnutrition are stronger risk factors for malnutrition than health care availability or health-care-seeking attitudes. Female gender (OR = 3.44, p = .02) and father's occupation (OR = 2.98, p = .05) were independently and significantly related to severe malnutrition. Other socioeconomic variables were unrelated to children's nutritional status. Mothers of the well-nourished children were significantly more aware that mild marasmus-kwashiorkor mixed malnutrition was caused by lack of nutrition. Health-care-seeking attitudes did not differ between cases and controls, but differed significantly with the type of disease.

Gender, occupation and nutritional status

The finding of the present study about gender inequalities in nutritional status is congruent with the existing literature. A preference for sons over daughters has existed for centuries in India. Family and social pressure is placed on mothers to bear sons, in order to maintain the economic strength of the family. Traditionally, sons remain in the family and take care of the parents while daughters marry and start their own family. Daughters

Table 6. Preference of health resources for common childhood illnesses, Kaniyambadi block, Tamil Nadu, India, 1995.

Q: Where do you go first if your child has the following illnesses?

Diarrhea	Cold	Worms	Malnutrition	Measles
1 PD (30 %)	PD (29 %)	MHV (24 %)	HR (72 %)	HR (90 %)
2 HR (28 %)	MHV (22 %)	PD (22 %)	CHAD (13 %)	CHAD (7 %)
3 CHAD (10 %)	HR (12 %)	CHAD (18 %)	PD (7 %)	MHV (3 %)
4 Nattu Vaethiyar* (9 %)	CHAD (10 %)	Govt Health (10 %) Nurse	TNIP** (3 %)	

*Traditional healer

**Tamil Nadu Integrated Nutrition Program (Government-run nutrition center)

PD: Private Doctor; MHV: Mobile Health Van; HR: Home Remedy

are not only seen as temporary boarders in the family, but also as a financial burden. Parents have to provide a considerable dowry for their daughters to assure a good marriage. As a result, female infanticide, selective abortion and a skewed sex ratio in the population have been reported [17-21]. Even in an area with a comprehensive health and development program such as in Kaniyambadi block, a case of a possible female infanticide has been reported while an investigator was in the area [22].

Social discrimination against female children, particularly in South Asia, has been repeatedly documented to have a strong impact on child nutrition [23]. For example, a survey done by Gupta [24] found that Indian mothers selectively fed male children better than female children. More female children suffered from protein energy malnutrition, especially those with mothers in traditional communities. A study of a rural Punjabi village examined milk supply in relation to gender within families and found that little milk was given to female children in families where mothers-in-law control the milk supply [25].

Contradictory results were found in other studies conducted in India, Nepal, Sri Lanka and Bangladesh as no gender differences were found. Recently, Basu [26], after reviewing field data and the existing literature, concluded that gender discrimination in food allocation between boys and girls did not exist in South Asia.

However, in the state of Tamil Nadu, gender differences do appear to exist in children's nutritional status. The National Family Health Survey conducted in 1992 found that half (49 percent) of all girls under four in Tamil Nadu were malnourished, whereas only 43 percent of the boys had the same level of malnutrition. The results from this study confirm that, in Kaniyambadi block, female gender is a risk factor for malnutrition. As in other parts of India, families' strong preference for sons endangers the health and survival of female children.

A correlation between the household income and the children's nutritional status was not found in this study. This finding is contradictory to an existing theory that malnutrition is largely due to poverty [27, 28]. A possible source of this contradiction is an inaccurate assessment of the household income. Household earnings reported by the mothers may not have been an accurate assessment of the actual income, income spent on food, or food allocation in the family.

For example, even if a husband earned a sufficient income for the family, he may choose to spend it on things other than food for the family. Thus, asking how many rupees mothers have control over would have been a better question in assessing the real availability of the income to the family members. An expenditure on nutrition, rather than income, might have measured poverty more accurately [29]. Future studies should use

other measures such as occupation and land ownership to assess the socioeconomic status.

Knowledge of the causes of malnutrition and nutritional status

The knowledge of the nutrition-related cause of mild marasmus-kwashiorkor mixed malnutrition significantly differed between cases and controls. The mothers who could identify the cause of mixed malnutrition as lack of nutrition were more likely to have well-nourished children. This supports the findings from other studies. Other studies that determined relationships between maternal nutrition-related knowledge, attitudes and practices using yes or no answers generally showed an association between the knowledge and children's nutritional status [3-5].

However, for severe marasmus, this knowledge did not differ between two groups. There could be several explanations. First, since mild mixed malnutrition is more common than severe marasmus, the mothers may attribute the cause of mild malnutrition to a variety of factors related to certain folk beliefs. When the disease is thought as *Udhukamalai*, which is a local term for kwashiorkor, people tend not to associate the disease to lack of food [8]. Also, the case mothers might have acquired their knowledge of marasmus from the nutritional education prior to the interview. Some of the case mothers have already gone through the nutritional education at CHAD Hospital, and the present study did not take their prior knowledge into consideration. The study also found a large variance within, rather than between, the knowledge of the cases and controls. For example, some cases could confidently provide insightful answers about nutrition, while others repeatedly replied "I don't know." Moreover, having knowledge of malnutrition does not necessarily mean that the person will put the knowledge into practice, especially if the knowledge is still new and foreign to them. The case mothers who recently received the nutritional education may be aware that the lack of food can cause severe malnutrition, yet may not realize that it can also cause mild malnutrition, or they may not be able to apply the concept to her own feeding practice. Thus, it is important for a nutritional education program to provide the information continuously in a coherent manner, to review, and to test knowledge periodically. It would be useful for future researches to examine recipients and non-recipients of nutritional education and compare their nutrition-related knowledge, attitudes and practices.

Comparison of Kaniyambadi block to other areas in Tamil Nadu

The current study exhibited that the majority of mothers in Kaniyambadi block had an adequate knowledge of malnutrition. This elevated level of knowledge is most likely to be due to the long-term intervention of CHAD. The health indicators from Kaniyambadi block and outside clearly suggests that this small rural area is superior in terms of infant mortality, immunization coverage, and nutritional status [30, 31].

Extrapolation of these findings to areas outside Kaniyambadi is therefore difficult. The only data available for comparison are the results from a similar study done in Madurai district in southern Tamil Nadu, by Sivaramakrishnan and Patel [9]. In the present study, the concepts of causes were mainly related to nutrition and health. In the Madurai study, the investigators found maternal beliefs in traditional folk concepts related to malnutrition. Nearly half of the subjects had a folk belief of childhood malnutrition: they believed that *therai*, a toad, or its shadow touching the pregnant mother caused subsequent severe malnutrition to her child. For treatment, the local mothers suggested tying a live toad on the neck of the malnourished child. No such traditional concept was expressed in the present study, though traditional concepts regarding malnutrition and its treatment do exist among villagers in Kaniyambadi block [32]. It is possible that the current study's small sample size was not enough to detect such traditional concepts. The

investigator's inability to understand the local language might have limited understanding the underlying implications of the answers as well. Moreover, the field worker's blindness to the study purposes may have hindered the finding of traditional concepts^c. Nevertheless, the present study supports the notion that more mothers in Kaniyambadi block have an accurate knowledge of malnutrition than the outside areas, combined with better attitudes and practices with fewer traditional concepts.

Preference of health resources for common childhood illnesses

The investigation of maternal health-care-seeking attitudes revealed that mothers change their preference for health care resources depending on their child's disease. For diarrhea, cold and worms, the mothers prefer seeing a health care professional, such as private doctors, a mobile health van or CHAD Hospital.

For treating malnutrition, however, most of the mothers prefer to treat the child at home. The finding that both cases and controls equally chose home remedy as the treatment of malnutrition may suggest a population-based perception that malnutrition is not a serious disease that requires medical care. This could be from a widespread undernutrition in the population. In Kaniyambadi block, approximately 35 percent of children under three are undernourished [30]. A mother may feel that it is normal for her child to be slightly malnourished, and thus may not feel the need to seek medical care. She may not be aware of nutritional needs for healthy growth or complications resulting from infectious and diarrheal diseases interacting with chronic undernutrition. Conversely, a mother may not seek medical care because she feels competent to treat malnutrition. This may give her a false sense of security. Thus, it is important for nutritional education programs to convey accurate information about dangers of malnutrition, its prevention and treatment methods that can be carried out at home.

With measles, 90 percent of all the mothers answered that they would not take the child to a doctor. Instead, they preferred to care for their children at home. This practice came from a traditional belief that a child contracting measles is a sign of a goddess, Amman, expressing her anger to the family [33, 34]. In rural villages, people often believe that the only cure for the disease is to please the goddess by giving her offerings. In places where this traditional belief is commonly practiced, people tend not to feed or care for the sick child. The families avoid taking the child to a doctor in fear of making the goddess more angry.

This traditional concept can be highly perilous in most poor rural communities. Fortunately, in Kaniyambadi block, the measles immunization coverage is approximately 98 percent [30]. Thus, children in Kaniyambadi block do not have a significant risk of contracting measles. However, this traditional concept would be highly problematic in any community where immunization coverage is not as extensive as Kaniyambadi block. The government's and private sector's continuous effort in maximizing the immunization coverage and providing a sound health education at the same time is absolutely necessary.

Another important finding about the health-care-seeking attitudes was that the mothers took active roles in finding the best treatment for their children. Except for measles and malnutrition, mothers were fully willing to take the children to various outside health resources such as private doctors, the CHAD Hospital and the Mobile Health Clinic. The

^c Villagers use several different terms to describe diarrhea, depending on the causes of diarrhea. One type of diarrhea, *dosham*, is a diarrhea that is caused by being in a shadow of a woman who had an induced abortion. The investigator noticed that at least one mother answered "*dosham*" for one of the causes of malnutrition. However, the field worker transcribed all types of diarrhea as "diarrhea" in English, and the investigator, when analyzing the data, could not distinguish different types of diarrhea.

overall active and positive health-care-seeking attitudes was a plus for improving the health of the family and redeeming to the health of the community.

CONCLUSION

The results showed that gender of the child, father's occupation and knowledge of nutrition-related cause of mild mixed malnutrition were more significant risk factors for malnutrition than health care availability and health-care-seeking attitudes. The study suggests that it is important for any nutritional intervention programs to incorporate social components into medical practices. Since girls are much more disadvantaged than boys, CHAD's continued emphasis on the health of women and their female children is essential.

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