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Research Article

The Association between Nutritional Knowledge, Socio-Economic Status of Caregivers and Stunting of Children under 5 Years in Kwale County of Kenya: A Baseline Survey

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ABSTRACT

Background: In Low- and Middle-Income Countries (LMIC), including Kenya, undernutrition has been the most significant contributor to child morbidity and mortality. Knowledge and practices of mothers/caregivers have been identified as a key sustainable factor for consideration in determining the nutritional status of children. The study aim was to determine how caregiver knowledge and socio-economic status will impact on nutritional status of children under 5 years.

Methods: This study was conducted in Kwale County, Kenya, to assess baseline maternal and child parameters. Seven hundred pairs; children and their primary caregivers were sampled at baseline.

Results: A total of 681 households comprised of caregiver and index child pair participated in the survey from the sampled 700. Knowledge scores of food functions, breastfeeding and complementary feeding were combined to assess caregivers' nutritional knowledge with a maximum score of 24. The median score was 11 (IQR: 9-12) and ranged from 0 to 24. Those with scores of 12 and above (50% plus) were 230 (33.2%). Stunting was 29.8% and the level of under-weight was 16.4%. No significant association was found between nutritional knowledge of the caregivers and nutritional indicators of children under 5 years, but there were significant differences ($P=0.002$) in the Knowledge score of caregivers between the five wealth quintiles.

Conclusion: Most of the caregivers did not have any nutritional knowledge which was assessed as knowledge of food groups and sources and functions of different foods as well as knowledge in breastfeeding and complementary feeding.

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Introduction

In the Sustainable Development Goals (SDGs), which replaced the Millennium Development Goals (MDGs), the importance of reduction of child mortality and enhancement of child health and nutrition has been

captured in goal 3 [1]. In developing countries, undernutrition has been the most significant contributor towards child morbidity and mortality [2]. It has been reported to be the underlying cause of about 35% of the disease burden in children under 5 years [3]. Kenya has been ranked among 34 countries suffering the highest burden of child malnutrition

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globally [4]. In Kenya, 26% of children under 5 years have been reported as stunted, and 11% underweight. Kwale county, in the coastal region of Kenya, is above the national average for stunting, at 29.7% [5]. In order to reverse this trend, it has been suggested that proper interventions should be based on bottom-up approaches where local communities and caregivers are sensitized on child nutrition based on the local culture and context [6]. Enhancing the knowledge and practices of mothers/caregivers has been identified as a key sustainable factor for consideration in improving the nutritional status of children [7]. Appropriate feeding of young infants and children under 5 years has been identified among the key interventions necessary to reduce under 5 mortality and this cannot be achieved without enhancement of caregiver knowledge and practices [8].

In a study on advice on breastfeeding for first-time mothers in rural coastal Kenya, it was found that the majority of the key advisers are relatives rather than trained health workers [9]. A study in Uganda also reported that women face numerous challenges to their freedom to make decisions and married women reported that their husbands make the primary decisions about their health care and household purchases [10]. Constrained decision-making among women was described to limit women's caregiving capabilities for nutrition [11]. In Kenya, mothers also receive health advice from health workers at clinics during antenatal and maternity services, but for a majority of the mothers/caregivers, this may be hampered by poor transport links to the facility [12]. Home-based follow-up visits by community health volunteers (CHVs) trained in nutritional counselling and peer support groups for mothers are two promising approaches that have been identified for not only improving mothers' breastfeeding self-efficacy and confidence but also for improving the nutritional well-being of children [13].

Personalised home-based nutritional counselling and support of mothers/caregivers has been hypothesized to lead to higher knowledge and self-efficacy in adhering to breastfeeding guidelines and other feeding practices for children under 5 years [14]. Caregiver attitudes and practices have been highly correlated with the nutritional status of children under 5 years [15]. In a study conducted in Mexico City, in a community based randomized study, it was found that repeated contact with peer counsellors was highly associated with exclusive breastfeeding and the duration of breastfeeding [16]. It has been reported that children under 5 years in low-income countries are not fed with a diversity of diets and are also not frequently fed according to the guidelines for Infant and Young Child Feeding (IYCF) practices. Analysis carried out of countries with a high burden of undernutrition reported less than 40% of children in 16 of 22 sub-Saharan African countries were fed a "minimally diverse diet" [17]. Lack of caregiver knowledge about healthy complementary feeding practices was found to present a major barrier to adequate child feeding [18]. Caregivers with limited literacy skills are also less likely to feed their children according to recommended infant and young child feeding (IYCF) practices [19]. Apart from caregiver knowledge, caregiver socio-economic status is also a factor in enhancing child nutrition [20]. In socio-economic status, wealth index is used to rank households into quintiles. The value of using the wealth index is important in contexts where reliable income and expenditure data is absent. In surveys, the wealth index is chosen because of the impact that wealth or financial status has on household

health. Researchers can identify the impact of wealth status on health outcomes within a community [21].

The aim of this study was to determine how an intervention to improve caregiver knowledge, attitude, and practices through nutritional counselling, including exclusive breastfeeding promotion, complementary feeding using locally available options and peer support, will impact on nutritional status, morbidity and mortality of children under 5 years, at end line. This study reports the knowledge and socio-economic status of the caregivers in both the control and the intervention arms before the intervention was implemented.

Materials and Methods

I Study Design

This was a baseline study based on a prospective cohort comparative study which was conducted in Kwale County to determine caregiver knowledge, socio-economic status and Child nutrition status before the intervention was carried out. The study participants were a sample nested in the Health and Demographic Surveillance System (HDSS) program that was implemented in the area by the Kenya Medical Research Institute in collaboration with Nagasaki University [22].

II Study Populations and Sampling Procedures

681 children under five years and their caregivers were recruited randomly from a list of individual households with children under five years. Out of the 700 sampled pairs, only data for 681 pairs was complete.

III Study Site

In the HDSS area, there was a population of 65,000 living by December 2017 in about 12,000 households. The area has 4 locations which include Mwaluphamba, Kinango, Ndumbule, and part of Puma, which is north of Kinango town. This study covered the areas of Dumbule and Miatsani under the HDSS program.

IV Sample Size Considerations

The sample size was based on a two-arm prospective interventional study whose baseline survey results are presented in this paper. For the prospective study, the primary outcome was infant growth velocity which was estimated by using proportion of infants experiencing growth faltering as assessed by stunting levels. From KDHS 2014 for children aged under 5 years, the stunting level countrywide was 26%. If we assume the control represents the current situation and the estimate of growth faltering (stunting) among infants is the same as that reported by KDHS 2014 of 26%, then it can be hypothesized that counselling will reduce growth faltering by 10%. A sample size of 289 per group was sufficient to detect a 10% difference in growth faltering between the control and intervention groups ($\alpha = 0.05$, $\beta = 0.10$). To cater for loss to follow up, the sample size was adjusted upwards by 20%, giving a final sample size of 350 per group, control, and intervention groups (700 total child/caregiver pairs).

V Assessment of Caregiver Knowledge

In the first section, as indicated in (Table 1), caregivers were asked about knowledge of food groups and the sources of different functions of food.

Knowledge of foods was assessed by giving a score of 1 to each correct response on food groups and specific food types for each food group with a maximum score of 12.

Table 1: Questions on caregiver knowledge on food functions.

4.1	Do you know the three food groups	[1]No [2]Yes
4.1b	IF YES, Name them	1. 2. 3.
4.2	Can you name the sources of energy	[1]No [2]Yes
4.2b	IF YES, Name them	1. 2. 3.
4.3	Can you name the sources of body-building foods	[1]No [2]Yes
4.3b	IF YES, Name them	1. 2. 3.
4.4	Can you name the sources of protective foods	[1]No [2]Yes
4.4b	IF YES, Name them	1. 2. 3.

Caregivers were also asked several simplified questions on breastfeeding and complementary feeding (Table 2). The questions were formulated from the National Baby Friendly Community Initiative (BFCl) guidelines by the Ministry of Health (MOH) in Kenya [23]. These guidelines are derived from the Maternal Infant and Young Child

Nutrition (MIYCN) policy [24]. The BFCl implementation guidelines were developed in order to operationalize MIYCN policy which aimed to protect, promote and support optimal maternal and infant and young child feeding practices and improve child survival.

Table 2: Questions on caregiver knowledge on breastfeeding and complementary feeding.

Read each statement and then respond in one of these four (4) ways:	
If you believe the statement to be correct, respond	[1] AGREE
If you believe the statement to be wrong, respond	[2] DISAGREE
If you cannot firmly agree or disagree, respond	[3] NOT SURE
If you do not know about the item, respond	[4] DON'T KNOW
4.5	Colostrum should be given to a newborn
4.6	Early initiation of exclusive breastfeeding is beneficial to a newborn
4.7	Breastmilk contains sufficient water
4.8	Babies should be breastfed without being given any other food including water, upto 6 months
4.9	Babies should be breastfed on demand, at all times including night time
4.10	Complementary foods should be introduced at 6 months
4.11	After introduction of complementary foods, there should be continued breastfeeding
4.12	Mothers working away from home should breastfeed
4.13	A mother working away from home can express breast milk for the baby to use while she is away
4.14	Breastfed Children 6-23 months should be fed more than four times a day
4.15	Children over 6 months should be fed more than four food groups a day
4.16	Women should eat more foods during pregnancy and lactation

VI Study Procedures

i Pre-Testing

Data collection tools to gather information on respondents’ socio-economic and demographic characteristics, nutrition knowledge, food variety score and index child morbidity & body measurements were developed. The tools were pre-tested and identified modifications and/or corrections made after the pre-testing exercise to ensure consistency and correct logical flow of information.

ii Data Analysis

Data collected was entered into a computer, and IBM SPSS version 21.0 statistical software was used for analysis. Computation of anthropometric indices (WAZ, HAZ, and BAZ) was done using NutriSurvey software. Analysis included descriptive statistics (means, standard deviations & medians for continuous variables, proportions, and frequency distributions for categorical variables). To test the association between knowledge and nutritional status, Student T-test (for normally distributed data) and Mann-Whitney U test (for skewed data) were used to test for continuous variables and Chi-square or Fisher’s exact probability (where applicable) test for categorical variables. Wealth indices were created using Principal Component Analysis (PCA) of the World Food Programme. The population was divided into five equally large groups based on their Wealth rank. The wealth rank is obtained from aggregating ownership of items used in the PCA [25]. Pearson correlation was used to test correlations between knowledge and wealth quintiles. A p-value of <0.05 was considered statistically significant.

Results

I Socio-Demographic Characteristics of Study Respondents

A total of 681 households of the sampled 700, agreed to participate in the survey. Almost all respondents (caregivers) were females, except 41

(6.0%) who were males. The median age of respondents (caregivers) was 28 years (Inter-quartile range (IQR): 23-34 years) and ranged from 16 to 72 years. With regard to marital status, 89.7% were married, 4.8%, single and the rest either divorced, separated or widowed. As for relationship to index child, 84.3% were mothers, 4.3% fathers and the rest other relatives including siblings. Only 6.3% of the caregivers had post-primary level of education.

II Index Child Characteristics

The sex distribution of index child was 333 (48.9%) males and 348 (51.1%) females. The median age of index child was 27.4 months (IQR: 16.99 - 40.96 months) and ranged from 0.26 to 67.93 months. Table 3 shows the age distribution of index child.

Table 3: Age distribution of index child.

Age group (Months)	Frequency	Percent
<6	38	5.6
6-<24	244	35.8
24-36	171	25.1
>36-60	228	33.5

III Nutritional Knowledge of Caregivers on Food Functions

Knowledge of foods was assessed by giving a score of 1 to correct responses on food groups and specific food types for each food group with a maximum score of 12. The median score was 0 and ranged from 0 to 12. Over a of half 414 caregivers (60.8%) had no score, while 12 caregivers (1.6%) had a score of 9 and above.

Although 25.3% indicated they had knowledge of food groups, only 7.2% were able to correctly mention at least one food group. At least one specific food type was mentioned for sources of energy foods (Carbohydrates) by 31.9% of study participants, for sources of body-building foods (Proteins) by 17.2%, and for sources of protective foods (Vitamins) by 11.7% (Table 4).

Table 4: Knowledge of food functions.

	Food functions	N	Number of correct responses, %			
			0	1	2	3
1	Food groups (maximum 3)	681	92.8	1.0	1.8	4.4
2	Sources of energy foods (Carbohydrates)	681	68.1	12.3	9.5	10.0
3	Sources of body-building foods (Proteins)	681	82.8	9.7	5.7	1.8
4	Sources of protective foods (Vitamins)	681	88.3	4.3	4.0	3.5

IV Nutritional Knowledge of Caregivers on Breastfeeding and Complementary Feeding

Knowledge of breastfeeding and complementary feeding was assessed by giving a score of 1 to agree responses on breastfeeding and complementary feeding questions with a maximum score of 12. The median score was 10 (IQR: 9-11 and ranged from 0 to 12 and indicating that the majority had adequate knowledge in this area. Only 48 (6.9%) of caregivers scored 7 and below while 65 (9.5%) had maximum score of 12. Almost all caregivers except 9 (1.3%) indicated babies should be breastfed on demand, at all times including night time while only 118

caregivers (17.3%) believed that mothers should express breast milk for feeding the baby when they are working away from home. Correct responses from caregivers on breastfeeding and complementary feeding are shown below (Table 5).

V Combined Nutritional Knowledge of Caregivers on Food Functions, Breastfeeding and Complementary Feeding

Knowledge scores of food functions, breastfeeding, and complementary feeding were combined to assess the caregivers’ nutritional knowledge with a maximum score of 24. The median score was 11 (IQR: 9-12) and

ranged from 0 to 24. Those with scores of 12 and above (50% plus) were 230 (33.2%).

VI Nutritional Status

Stunting was 29.8% (Table 6) and the level of under-weight was 16.4%.

VII Association between Nutrition Knowledge and Nutritional Status of Children under 5 Years

Nutritional knowledge was further categorized into those with less 12 scores (attaining less than 50% of total scores) and those with 12 plus scores. No significant association was found between nutritional knowledge and nutritional indicators of children under 5 years (Table 7).

Table 5: Caregiver knowledge on breastfeeding and complementary feeding.

	Breastfeeding and complementary feeding	Frequency	Percent
1	Colostrum should be given to a newborn	592	86.9
2	Early initiation of exclusive breastfeeding is beneficial to a newborn	622	91.3
3	Breastmilk contains sufficient water	591	86.8
4	Babies should be breastfed without being given any other food including water, upto 6 months	635	93.2
5	Babies should be breastfed on demand, at all times including night time	672	98.7
6	Complementary foods should be introduced at 6 months	656	96.3
7	After introduction of complementary foods, there should be continued breastfeeding	662	97.2
8	Mothers working away from home should breastfeed	472	69.3
9	A mother working away from home can express breast milk for the baby to use while she is away	118	17.3
10	Breastfed Children 6-23 months should be fed more than four times a day	446	65.5
11	Children over 6 months should be fed more than four food groups a day	528	77.5
12	Women should eat more foods during pregnancy and lactation	628	92.2

Table 6: Distribution of Nutrition Status of index child.

Nutritional indicator	Description	Frequency	Percent
Weight-for-Age Z score (WAZ)			
<-2	Under-weight	110	16.4
≥-2	Not Under-weight	561	83.6
Height-for-Age Z score (HAZ)			
<-2	Stunted	194	29.8
≥-2	Not Stunted	458	70.2
*BMI-for-Age Z score (BAZ) (Wasting)			
<-2	Thinness	36	5.4
≥-2	No Thinness	625	94.6

Table 7: Distribution of nutritional knowledge by Nutritional Status of index child.

Nutritional status	Nutritional knowledge				P-value
	<12 scores		12+ scores		
	n	%	n	%	
HAZ					
Stunted	128	66.0	66	34.0	0.95
Not Stunted	301	65.7	157	34.3	
Total	429	65.8	223	34.2	
WAZ					
Under-weight	74	67.3	36	32.7	0.79
Not Under-weight	370	66.0	191	34.0	
Total	444	66.2	227	33.8	
BAZ					
Thinness	21	58.3	15	41.7	0.33
No Thinness	414	66.2	211	33.8	
Total	435	65.8	226	34.2	

VIII Distribution of Wealth Quintiles and Nutritional Knowledge

There were significant differences in the Knowledge score between the five wealth quintiles $P=0.002$. There was also a significant correlation between knowledge score and the wealth quintile or socio-economic status (SES) ($r=0.681$, $p=0.012$).

Discussion

This survey evaluated caregiver's (mostly women) nutritional knowledge on food groups and sources of different functions of food. The level of knowledge was low with 60.8% of the respondents having no knowledge at all. Despite 25.3% of caregivers alluding to having knowledge of food groups, only 7.2% of them were able to correctly mention at least one food group. This may be due to the fact that only 6.3% of caregivers had post-primary education. Caregivers may have had nutrition lessons in their primary schooling but lacked clear understanding as they did not progress to the secondary level where more nutrition information would have been gained. This finding is consistent with the results of studies done in Papua New Guinea, Indonesia, and Nigeria, where mothers with a low levels of education were found to have insufficient nutritional knowledge [26-28]. In our study, however, the educational background was not considered when assessing the knowledge score.

Caregiver's nutrition knowledge has been identified as an imperative contributing factor to appropriate complementary feeding practices with a consequential positive impact on child's nutritional status [29, 30]. In this survey, children aged 0-59 months participated, and their nutritional status was assessed using three key indicators: stunting, underweight and wasting. Malnutrition prevalence rates were 29.8% stunting, 16.4% under-weight and 5.4% wasting. These figures were higher than the national average of 26% stunting, 11% under-weight, and 4% wasting [5]. Stunting which indicates low length/height for age (<-2 SDs) still ranked highest [31]. Several studies have observed stunting to arise mostly during the complementary feeding period (children at the age of 6-23 months) after which it becomes permanent and causes lifelong undesirable impacts on health and cognitive development [4, 32].

Whilst inadequate nutrient intake from complementary foods is the main cause of stunting, maternal education and knowledge are also contributing factors. To ascertain relationship between education and nutritional status, this study conducted a correlation test on caregiver's nutritional knowledge and stunting. However, it found no significant association ($P>0.05$) between the two variables. These findings correspond with findings of a study by Emina *et al.* on association between maternal education and child's nutritional status in Democratic Republic of Congo [33]. The study found no significant association between maternal education and stunting; it only became significant when socio-economic factors were controlled [33]. This suggests that other confounding factors may need to be considered in order to establish a relationship. In our study, the knowledge the caregivers had did not contribute to better nutritional well-being for the children due to the fact that the caregivers' knowledge was based on sources of nutritional foods that were not available in the local context. The caregivers had no knowledge based on the local context or foods available locally. Another

study in Kwale revealed poor infant feeding knowledge and practices among caregivers and suggested the need for culturally acceptable interventions to empower caregivers on optimal practices for proper growth and development of infants [34].

In this study, a factor such as household income may have had an impact on nutritional status notwithstanding mother's nutrition knowledge as households with better income may have had a higher potential of providing appropriate complementary foods as compared with households of low income. Another study by Peiris and Wijesinghe in Sri Lanka also relates to this study as it sought to establish a relationship between maternal nutrition knowledge on micronutrients and feeding practices with a child's nutritional status [35]. The study found that maternal nutrition knowledge on micronutrients was low but the child feeding practices were satisfactory. The study further accounts no association between maternal educational and stunting [35]. From the findings, it is suggested that having knowledge may not automatically translate to good practice and vice versa. In spite of lack of knowledge of micronutrients, mothers recorded satisfactory level of complementary feeding and breastfeeding.

Other studies, however, disagree with this finding as it finds a significant association. Jemide *et al.*, noted that children born to mothers with poor nutritional knowledge were sub-optimally fed and had a higher susceptibility to malnutrition [28]. Stunting as an indicator in the study was strongly linked to maternal knowledge on nutrition and health [28]. This study is in agreement with an earlier study by Akerodolu *et al.*, which also acknowledged a significant link between maternal knowledge on nutrition and child's health with children's nutrient intake [36].

Although this current study does not validate this relationship, maternal nutrition knowledge still is an essential factor worth considering in effort to eradicate malnutrition. Nutrition education intervention have yielded positive impacts. Several intervention studies have reported caregivers to have improved in their nutrition knowledge, child feeding practices and child's nutritional status [17, 37, 38].

Conclusion

Most of the caregivers did not have any nutritional knowledge, which was assessed as knowledge of food groups and sources and functions of different foods. For the minority who had the knowledge, it was not based on local context this did not impact positively on nutritional status of the children. Therefore, there is need to enhance knowledge among caregivers of children under five years based on the local context. The socio-economic status of the caregivers had a positive correlation with the knowledge score of the caregivers.

Ethical Approval

Permission to carry out this study was obtained from the Kenya Medical Research Institute (KEMRI) Scientific and Ethics Review Unit (SERU) under protocol number 3570 and relevant authorities from Kwale County. The Institutional Review Board of the Institute of Tropical Medicine, Nagasaki University (IRB # 171207184) also granted ethical permission to carry out this study.

Consent

Informed consent was obtained from each index child caretaker prior to participation in the study.

Conflicts of Interest

None.

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