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Risk Factors for Diarrhoea and Upper Respiratory Tract Infections among Children in a Rural Area of Uganda

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ABSTRACT

This study explored risk factors associated with diarrhoea and upper respiratory tract infections (URTIs) among children in Sembabule district, Uganda. Data were collected from 300 women with children aged less than two years using the WHO 30-cluster sampling technique. The prevalence of diarrhoea among children was 40.3%. A child not immunized (odds ratio [OR] 2.8, $p<0.001$), absence of latrine in a house (OR 1.4, $p<0.03$), low knowledge of mixing oral rehydration salts (OR 1.7, $p<0.01$), garbage thrown anywhere around the house (OR 2.6, $p<0.001$), not washing hands after using latrine (OR 1.8, $p<0.03$), and not washing hands before preparing food (OR 1.4, $p<0.04$) were risk factors for diarrhoea. The prevalence of URTIs among children was 37.4%. A child not immunized (OR 2.4, $p<0.001$), children aged 6-11 months (OR 2.1, $p<0.03$), and previous episode of diarrhoea (OR 2.5, $p<0.001$) were risk factors for URTIs. The results showed that low immunization status was an important risk factor for diarrhoea and URTIs among children in the study district of Uganda. For 75% of the children, care for fever was obtained from drug shops, while 9.2% were taken to health units. This is in contrast to diarrhoea cases where 49.5% of children were taken to health units for care. To reduce the burden of disease among children in this district, an integrated package of immunization services and other childcare programmes need to be implemented in addition to improved personal and environmental hygiene. There is also a need to design well-focused health-education messages to improve treatment-seeking behaviour for childhood diseases.

Key words: Diarrhoea; Diarrhoea, Infantile; Upper respiratory tract infections; Risk factors; Prevalence; Knowledge, attitudes, practice; Uganda

INTRODUCTION

Diarrhoea and upper respiratory tract infections (URTIs) account for 7.5 million deaths of children aged less than five years annually in developing countries. Most deaths occur in sub-Saharan Africa; for example, 36% of 10.5 million children who died in 2000 were from this region (1).

A number of risk factors for diarrhoea among children in Africa have been documented. Food bought from street vendors has been associated with prolonged diarrhoea among children in Nigeria (2), while age of a child, quality of water, environmental sanitation, parental education, household size, and birth interval have been identified as risk factors for children in a rural area of Zaire (3). A study, in Burkina Faso, West Africa, has shown that faecal disposal is associated with diarrhoea or dysentery among children (4).

In southwestern Ethiopia and in West Africa, the high prevalence of diarrhoea has been associated with socioeconomic, demographic and environmental factors and the immunization status of a child (5-7).

It is now widely recognized that, to decrease high mortality and morbidity among children in sub-Saharan Africa, there is a need to pursue WHO recommendations of implementing standard diagnostic and treatment

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procedures, strengthening immunization against the six killer diseases, ensuring adequate nutrition, and improving water supply and sanitation as important preventive measures (1).

In Uganda, children aged less than five years constitute 17% of the total population, and mortality of children aged less than five years is currently estimated at 152 per 1,000 livebirths (8). Malaria, diarrhoea, and acute respiratory tract infections (ARTIs) are the leading causes of mortality. The prevalence of diarrhoea among children in Uganda is estimated to be 20% and URTIs to be 23% (9).

In addition to high morbidity among children in Uganda, immunization coverage has stagnated at lower levels for the last 12 years. In 1995, immunization coverage was 47%, which declined to 37.6% in 2000. At the same time, the prevalence of diarrhoea and URTIs among children has been high over the same period (9).

Initiatives to address morbidity and mortality among children in Uganda have been implemented at national and district levels under a decentralized health system. These strategies include implementation of the integrated management of childhood illness (IMCI), home management of malaria, improved case management and proper diagnosis of childhood diseases at health units, training and support supervision of health workers. These initiatives have involved partnership among the government, the private sector, and non-governmental organizations (9). Despite this endeavour, immunization and childcare programmes are implemented as vertical programmes. It is, therefore, necessary to obtain data that show that integration of these programmes is one of the cost-effective ways to reduce morbidity and mortality among children.

Identifying factors associated with morbidity and mortality among children in Uganda is of public-health importance for two main reasons. First, morbidity and mortality among children are quite high, thus, creating a strong national drive to reduce morbidity. Therefore, there is a need to identify information necessary for designing appropriate strategies for child-survival programmes. Second, there is a need to obtain data necessary for use in advocacy among policy-makers so that adequate resources are allocated for child-health programmes and issues, such as integration of programmes, are well-addressed.

This paper presents results of a knowledge, attitude, and practice study carried out in 2001 in Sembabule district, a remote area in southern Uganda. The aim of the study was to assess the impact of a child-survival project, which supported immunization of children, proper nutrition, and improved healthcare-seeking for children. The specific objectives were: to assess the prevalence of diarrhoea, URTIs, and immunization coverage among children aged less than two years, and to identify risk factors associated with high prevalence of diseases among children.

MATERIALS AND METHODS

Study area and population

Sembabule district lies in a remote area in southern Uganda. The district has a poor road-network and is served by one health centre and five dispensaries. The district is divided into five sub-counties which are different in terms of socioeconomic activities and ways of life. Mijwara sub-county is in central area of the district and is inhabited by Baganda who are mainly farmers and engaged in some limited business activities. Lwebitakuri sub-county is in the east of the district and is inhabited by Bakiga immigrants who are agricultural peasants. Lwemiyaga and Ntusi sub-counties are in the southern and western parts of the district respectively and are inhabited by the Bahima and Banyarwanda who are pastoralists. These pastoralists move from one area to another in search of grass and water for their cows, especially in the dry season. The district has a flat geographical terrain with a poor source of clean water. The main sources of water in the district are: streams, ponds, and wells that provide water for home-use and for the animals.

The district has two dry seasons (December-March and May-July), which are important in two aspects: it is when transmission of malaria peaks, and it is when there is scarcity of water, which makes it difficult to maintain proper hygiene.

Study design

A sample of 300 women with children aged less than two years was randomly selected from five sub-counties of the district using the WHO 30-cluster sampling technique. The sampling frame was obtained from the Housing and Population Census (10). All houses in the 30 selected clusters were listed and visited by trained interviewers. All women who had children aged less than two years were interviewed on a range of issues affecting child health, using a structured questionnaire. The study obtained data on 323 children aged less than two years in the five sub-counties of the district. In addition, in-

depth interviews were conducted with key-informants who included community health workers, trained traditional birth attendants, teachers, and local leaders. In total, 50 in-depth interviews were carried out.

The structured questionnaire was initially translated into Luganda, the local language understood by most people in the district. The questionnaire was pre-tested and revised. Interviewers were selected to include social workers and health workers who were trained and assisted in the revision of the questionnaire.

Case definitions

***Fever*:** Fever was defined as a child feeling hotter than usual, associated with loss of appetite and general weakness. In the Luganda language, the term 'omusujja gwe ensiri' translated as fever caused by mosquitoes was used to mean malaria. This term is widely known among most mothers in Uganda (11).

***Diarrhoea*:** Diarrhoea was defined as watery stools that occur more frequently than usual and is associated with weakness.

***Upper respiratory tract infection*:** Upper respiratory tract infection was defined as cough accompanied with rapid short breathing.

The period of recall of diarrhoea, fever and URTI episodes was limited to two weeks preceding the survey. The study elicited data on a single episode of any of the illnesses within this period.

Data analysis

Data were double-entered using Epi Info version 6.0 and were further analyzed using SPSS PC version 9.0. The chi-square test was used during bivariate analysis for identifying variables associated with prevalence of diarrhoea and URTIs among children. Three models were constructed using binary logistic regression. The first model was used for defining explanatory variables associated with high prevalence of diarrhoea among children; the second model was used for identifying variables associated with URTIs; and the third model was used for identifying factors associated with immunization of a child. Variables, which were statistically significant during bivariate analysis, were entered first into models; odds ratios were obtained, and 95% confidence intervals were computed. A p value of less than 0.05 was considered to be significant.

Data from in-depth interviews were manually analyzed along thematic areas covered in the structured interviews and were used in interpreting the results.

RESULTS

Sociodemographic characteristics

In total, 300 women, aged 15-49 years, were interviewed on a range of factors affecting child survival. Thirty-seven percent of them had attained no education, 58.2% had attained primary education, and 4.0% had secondary education. 67.3% were involved in peasantry agriculture, 14.3% were housewives, and 18.4% were selling cattle products.

Thirty-nine women (13.1%) were adolescent mothers aged 15-19 years. Most women (84.2%) were aged 20-39 years, and 2.7% were aged 40-49 years (Table 1).

Most (82.7%) respondents thought that malaria was a serious health problem of their children, whereas 32.8% considered diarrhoea and 38.1% thought respiratory infection. Most (84.2%) women were breastfeeding during the study period, and 97.6% had breastfed the previous child. 44.3% thought a child should be breastfed for 24 months, while 98.4% thought that a child should be breastfed for at least six months.

Table 1. Sociodemographic characteristics of women interviewed

Characteristics	Frequency	
	No.	%
Age (years) structure		
15-19	39	13.1
20-39	252	84.2
40-49	9	2.7
Education level		
No education	113	37.8
Completed primary	174	58.2
Completed secondary	13	4.0
Occupation		
Housewife (no work)	43	14.3
Agriculture	202	67.3
Cattle-keeping	55	18.4

53.3% of the women were supplementing breast-feeding with cow's milk, 2.5% were feeding formula milk, and 10.2% were giving fruits to their children (Table 2).

Environmental factors associated with spread of diseases

Table 3 shows that 46.1% of the households got drinking-water from ponds and wells, 38.4% from rivers and streams, and 12.0% from boreholes.

Twenty-seven percent of the households did not have pit latrines, and 8.0% washed hands after using latrine. 16.7% washed their hands before preparing food, and

73.3% did not at all wash hands before handling food; 75.2% of the households disposed garbage anywhere around the household, and 20.4% had a pit to throw garbage (Table 3).

did not know how to mix oral rehydration salts (ORS). Care for 75% of children who had fever was obtained from drug shops, while 9.2% of mothers sought care from health units, 5.1% from private clinics, 6.1% from a

Table 2. Perceptions of women about the most serious health problems of their children and care-seeking patterns

Health problem	Proportion of women who perceive a health problem serious to their children (%)	Proportion of women seeking care from a provider when a child is sick and taken for immunization (%)	χ^2	p value
Fever	82.7	44.7	31	<0.0001
Respiratory diseases	38.1	35.0	0.2	>0.66
Diarrhoea	32.8	31.3	0.9	>0.76
Measles	31.3	31.0*	-	-
DPT3	10.8	5.7**	1.6	>0.20
Skin diseases	9.0	-	-	-

* Percentage of children who received measles vaccine
**Percentage of children who received DPT3 vaccine

Burden of disease among children

The prevalence of diarrhoea among children was 40.3%, and the prevalence of URTIs was 37.4%. Children aged 6-11 months (49.5%) were more at risk of getting diarrhoea compared to those aged 0-5 month (s) (34.1%) and those aged 12-23 months (37.5%). The prevalence of diarrhoea was associated with age of a child (χ^2=19.1, p<0.01). Twenty percent of mothers breastfed their children when they had an episode of diarrhoea, while 72.8% did not breastfeed their children; 15.2% of children were given cow's milk, and 24.0% were given more fluids than usual. The majority (58.2%) of mothers

Table 3. Source of water and hygiene practices

Source and practice	Frequency	
	No.	%
Source of drinking-water		
River/stream	115	38.4
Ponds/wells	139	46.1
Boreholes	36	12.0
Harvested rainwater	10	3.5
Availability of pit latrines		
Households with pit latrine	219	73.1
Households with no pit latrine	81	26.9
Disposal of garbage		
Thrown in compound pit	61	20.4
Burnt	13	4.4
Thrown anywhere around the homestead	226	75.2
Personal hygiene		
Washing hands after using latrine	26	8.0
Washing hands before preparing food	54	16.7
Not washing hands before handling food	220	73.3

community health worker, and 4.1% from a traditional healer. On the contrary, 49.5% of mothers sought care from health units when their children had diarrhoea, 15.8% sought care from drug shops, and 11.9% sought care either from a traditional healer or used traditional herbs.

Table 4 shows that the prevalence of URTIs among children aged 6-11 months was 37.4% and was highly associated with the age of a child (χ^2=17.5, p<0.02).

Nearly 27% of the children were fully immunized against the six killer diseases. Children aged 12-23 months (30.8%) were more likely to be immunized compared to the rest. The age of a child was associated with immunization of a child (χ^2=40, p<0.0001).

Table 5 shows the risk factors associated with a child getting diarrhoea and URTIs. The immunization status of a child was strongly associated with diarrhoea (OR=2.8, p<0.001). Other risk factors included: knowledge of a mother on how to mix ORS (OR=1.7, p<0.01), a child having had a previous episode of URTI (OR 2.5, p<0.001), absence of latrine in the house (OR 1.4, p<0.03), garbage thrown anywhere in the compound (OR 2.6, p<0.001), not washing hands before preparing food (OR 1.4, p<0.04), source of drinking-water obtained from water/ river streams (OR 2.2, p<0.001), and water obtained from stagnant water in ponds and wells (OR 2.8, p<0.001).

Also shown in Table 5 are risk factors associated with a child getting RTIs, a child not being immunized (OR 2.4, p<0.001), a child aged 6-11 months (OR 2.1, p<0.03), and a child having a previous episode of diarrhoea (OR 2.5, p<0.001).

The following were risk factors associated with immunization of a child. Children aged less than six months were eight times less likely to be immunized

Table 4. Prevalence of diarrhoea and URTIs among and immunization coverage of children aged less than two years

Age (months)	Diarrhoea (%)	URTIs (%)	Immunization status (%)
0-5	34.1	26.7	21.9
6-11	49.5	46.2	27.7
12-23	37.5	38.8	30.8
All children	40.3	37.4	26.8
Association with age of child	χ^2=19.1 p<0.08	χ^2=17.5 p<0.02	χ^2=40.5 p<0.001

URTIs=Upper respiratory tract infections

than ones aged 6-11 months and about six times compared to those aged 12-23 months. This is because 63% of children in Uganda are born outside the health system, and they do not benefit from BCG immunization at birth (9). However, as they grow, they receive different antigens. Children born to mothers aged 20-39 years were two times more likely to be immunized compared to those born to mothers aged 15-19 years and to mothers aged 40-49 years. Children from Mijwara and Ntusi sub-counties were less likely to be immunized compared to children in other sub-counties.

DISCUSSION

The results of the study showed that diarrhoea and URTIs were highly prevalent among children in Sembabule district, and the low immunization status of a child was a risk factor for diarrhoea and URTIs. This finding is important because it has implications on the implementation of current programmes to address child-health problems in Uganda. The immunization programme and other child healthcare programmes, such as IMCI, are implemented as vertical programmes. Integration of these programmes needs to be intensified for effective reduction of childhood morbidity.

Treatment-seeking for diarrhoea, fever, and URTIs has been observed to be poor in this district since most children are not taken to health units where specialized care could be offered. This is mainly determined by the way people perceive symptoms of diseases and their experience with management of these diseases at home. For example, diarrhoea weakens children rather fast compared to fever, and because of this, a larger proportion of children with diarrhoea is taken to health units. Because people are used to getting malaria, which commonly presents with fever, their treatment option is usually to get drugs from drug shops as they watch for the progress of symptoms. When symptoms do not improve, they visit health units as a last resort. A similar pattern of treatment-seeking has been documented elsewhere (12,13).

The results of the present study confirm previous findings that showed that the source of drinking-water, personal hygiene, disposal of garbages, and absence of latrine are risk factors for diarrhoea among children (4-7). Only one study in southwestern Ethiopia identified immunization status of a children, father's ethnicity, family income, and availability of latrine as risk factors for diarrhoea among children aged 6-59 months (6).

The high prevalence of diarrhoea and URTIs observed among children in this study is consistent with the results of a previous survey in Uganda, which documented high morbidity and mortality and low immunization coverage among children (9).

In this study, it was observed that the factors that led to a child not being immunized also led to a child being exposed to diseases, such as diarrhoea and URTIs. Such factors include education of the mother and the socioeconomic status of the family. The logistic regression analysis used in this study took care of this confounding and estimated the contribution of each factor separately. For example, in Table 5, the logistic regression model analyzed all the factors that had a significant association with diarrhoea and URTIs together to find out the relative contribution of each factor for a child to get diarrhoea or URTIs. After controlling for confounding, the immunization status was found to be a risk factor for both diarrhoea and URTIs among children. However, it is not surprising because immunization of a child boosts immunity, thereby enhancing the body's ability to fight diseases.

Although this study has documented a high prevalence of diarrhoea among children aged 0-5 month(s), 84.2% of the children were currently breastfeeding. This is probably because 53.3% of the mothers were supplementing breast-feeding with cow's milk. Cow's milk causes diarrhoea among children if appropriate dilution is not adhered to (9).

Since there is a scarcity of water in this district, the poor hygiene of utensils used in feeding children could be responsible for diarrhoea. In addition to this, good hygiene practices, such as washing hands after use of latrine and before preparing food were poor.

The results of this study do not show any association between education of mother and the risk of a child getting diarrhoea, URTIs, or the immunization status of a child. This is because 96% of the mothers in this study had either no education or just attained primary education, a typical picture in most areas of rural Uganda. A recent study in Uganda, combining both rural and urban districts, has demonstrated that education of a mother is negatively associated with the risk of a child getting diarrhoea and URTIs. Children born to mothers

Table 5. Risk factors associated with prevalence of diarrhoea, upper respiratory tract infections, and immunization status among children aged <24 months (logistic regression models)

Dependent variable	Covariate	Odds ratio	95% CI	Level of significance
Child having diarrhoea	Child not immunized	2.8	1.4-3.9	<0.001
	Low knowledge on how to mix ORS	1.7	1.3-2.6	<0.01
	Previous episode of URTIs	2.5	1.5-4.1	<0.001
	Age (months) of children	1.2	0.8-1.9	>0.08
	0-5 (reference category)	1.0		
	6-11	8.1	4.1-15.5	<0.001
	12-23	1.8	1.1-3.5	<0.04
	Absence of pit latrine	1.4	1.1-2.4	<0.03
	Disposal of garbage			
	Burnt (reference category)	1.0	-	-
	Thrown in pit	1.3	0.7-1.5	>0.08
	Thrown anywhere in the compound	2.6	1.6-3.5	<0.001
	Not washing hands after using latrine	1.8	1.3-2.7	<0.03
	Not washing before preparing food	1.4	1.1-2.2	<0.04
	Source of drinking-water			
	Borehole (reference category)	1.0		
	Harvested rainwater	1.4	0.9-1.9	>0.09
	River/stream	2.2	1.6-2.9	<0.02
	Ponds/wells	2.8	2.2-4.1	<0.001
	Education of mothers			
	Secondary education (reference category)	1.0		
	No education	1.4	0.6-1.9	>0.09
	Primary education	1.3	0.8-2.3	>0.08
Child having URTIs	Child not immunized	2.4	1.5-4.0	<0.001
	Age (months) of children			
	0-5 (reference category)	1.0		
	6-11	2.1	1.4-3.6	<0.001
	12-23	1.6	1.2-3.7	<0.03
	Previous episode of diarrhoea	2.5	2.1-3.5	<0.001
	Education of mothers			
	Secondary education (reference category)	1.0		
	No education	1.3	0.5-2.0	>0.09
	Primary education	1.2	0.73-2.0	<0.07
Immunization status of child	Age (months) of children			
	0-5 (reference category)	1.0		
	6-11	8.1	4.1-15.7	<0.001
	12-23	1.8	1.1-3.5	<0.04
	Age (years) of mothers			
	15-19	1.0		
	20-39	1.85	1.2-4.1	<0.04
	40-49	0.16	0.01-2.2	>0.17
	Sub-county			
	Lwebitakuli (reference category)	1.0		
	Mijwala	3.2	1.4-6.9	<0.001
	Lugusulu	1.1	0.5-2.5	>0.76
	Lwenyaga	1.2	0.5-3.4	>0.59
	Ntusi	8.2	2.3-2.9	<0.001

CI=Confidence interval
ORS=Oral rehydration solution
URTIs=Upper respiratory tract infections

with secondary education and above are less likely to suffer from diarrhoea and URTIs and are likely to receive immunization and benefit from better healthcare (9).

As seen in Table 2, perceptions on disease and its seriousness influence care-seeking. For example, for most children who had fever, the first resort of treatment was drug shops, whereas almost half the children who had diarrhoea were taken to a health unit. This is because diarrhoea weakens children quickly, and this is regarded as serious to the child. There is, therefore, a need to design health messages on childhood diseases, signs, and symptoms that necessitate referral and appropriate places where to seek care.

Identification of personal hygiene practices, environmental factors, and the immunization status of a child as risk factors for diarrhoea and URTIs have implications in designing appropriate prevention strategies directed at three levels: (i) interventions for improving personal hygiene, especially when feeding children; (ii) interventions for improving infant nutrition, especially exclusive breast-feeding for four months as recommended in the Ministry of Health policy guidelines; and (iii) interventions directed at improving environmental hygiene, especially disposal of faeces and garbages.

This study is limited by the case definitions used for fever, diarrhoea, and URTIs that were not highly specific. This was because the study devised definitions that mothers with low education could identify childhood illnesses. For example, diarrhoea in children is widely known by mothers, although they use subjective means to identify it. Similarly, the term 'omusujja gwe ensiri' is not known to everyone that it means clinical malaria. Thus, it is possible that some other types of fever could have been misclassified using this definition. In-depth interviews were used for ascertaining these definitions, and data from these interviews have been used in explanations and interpretation of quantitative data.

The results of this study have implications on the strategy to implement primary healthcare programmes in Uganda. There is a need to implement an integrated package of immunization services and other childcare programmes to reduce morbidity among children, especially in rural areas where access to services is poor. There is also a need to focus health-education messages to improve treatment-seeking behaviour for childhood diseases.

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