Research Square

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Prevalence of diarrhoea and associated risk factors among children under five years old in Pader district, Northern Uganda

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Abstract

Background: Diarrhoea remains a major cause of morbidity and mortality in children < 5 years in sub-Saharan Africa. Uganda has the worst mortality rate in children < 5 years among the three East African countries, with 22% of these deaths attributed to diarrhoea. For proper planning and implementation of control interventions, an understanding of the prevalence and determinants of the disease is crucial. This study assessed the prevalence of diarrhoea and related risk factors among children aged < 5 years in Pajule sub-county in Pader district in northern Uganda.

Methods: A cross-sectional survey was conducted covering 244 randomly selected households having children < 5 years old in the study area. A semi-structured questionnaire was used to interview the households about diarrhoeal history in their children in the last two weeks preceding the survey, and on the risk factors predisposing children to diarrhoeal infections. Descriptive statistics was used to summarize the risk factors whereas bivariate and multivariate logistic regression analyses (95% confidence interval and $p < 0.05$) were used to identify the risk factors associated with childhood diarrhoea.

Results: We found a prevalence of diarrhoea of 29.1% among children < 5 years of age in Pajule sub-county during the two weeks preceding the survey. Multivariate logistic regression revealed significant associations between diarrhoeal prevalence and use of unprotected water sources (adjusted Odd Ratio, aOR=2.866, 95% CI: [1.431 – 5.741]), presence of animals in respondents' homes (aOR=3.950, 95%CI: [1.399 – 11.156]) and infrequent hand washing practices (aOR=2.737, 95% CI: [1.304 – 5.743]).

Conclusion: The present study identified a high prevalence of diarrhoea among children < 5 years of age in Pajule sub-county, higher than the Ugandan national average. Extensive use of unprotected water sources, animals' presence in homes and poor hand washing practices had significant associations with diarrhoeal occurrence. These findings underscore the need for continuous community health promotion emphasizing good hand washing practices and interventions that target improvement of hygiene practices at homes as the best methods for fighting childhood diarrhoea in the study area.

Background

Diarrhoea, defined as having unusually loose or watery stool that occur more frequently than usual within 24 hours (1), remain among the most common causes of mortality and morbidity in children, particularly in low- and middle-income countries. Worldwide, diarrhoea accounts for an estimated 3.6% of the global burden of disease, as expressed in disability-adjusted life years (2), and it is the leading killer, accounting for approximately 8% of all deaths among children < 5 years, despite the availability of simple effective treatment (3). Although the global mortality from diarrhoea has been declining over the past 25 years, the disease is still a major cause of mortality in children < 5 years of age in developing countries, contributing up to 21% of deaths (4).

In Uganda, diarrhoea is among the top four causes of morbidity in infants and young children (5). The Uganda Democratic and Health Survey of 2016 reported that the prevalence of diarrhoea among children < 5 years in Uganda was 20% (6). In 2017, diarrhoeal disease deaths reached 6.41% of total deaths, making the country to be ranked 27th worldwide (7). Presently, diarrhoea still remains among the top ten causes of morbidity in the country, with rotavirus being responsible for about 40% of all diarrhoeal cases (8).

Pader district in northern Uganda was affected by the civil war between the Lord's Resistance Army (LRA) and the Uganda People's Defense Force (UPDF) that plagued the region between 1980's and 2008. This resulted in the creation of internally displaced persons' camps (IDPs), disrupting social services delivery [9; 10]. Currently, the district lags behind the rest of the country in terms of the human development indices and is characterized by high levels of poverty (11). Infant mortality rate (IMR) in the district is standing at a staggering over 180+ per 1,000 live births, with acute diarrhoea accounting for 8% of such deaths (12). Sanitation remains a challenge with only 30% of the households having unimproved toilet facilities, and about 600,000 households do not have any toilet facility at all (13). Despite these statistics, accurate information on prevalence and factors associated with diarrhoea in the district remain virtually unknown. The current study determined the prevalence of diarrhoea and risk factors among children < five years old with the view of providing information that could be useful in planning interventions to reduce the burden of the disease in the district.

Methods

Study area

The study was conducted in Pajule sub-county (2^{0}56'23" N and 32^{0}56'38") located in Aruu North constituency, Pader District in northern Uganda (Fig. 1). Pajule sub-county consists of six parishes and has a population of 22,713, with 4,050 of these being children below 5 years (11). Like in other parts of northern Uganda, poverty level is higher than the national average, due to a combination of factors like the prolonged civil war that affected the entire northern region, cattle rustling by the Karimojong, and marginalisation that dates back to the colonial era (9)(9). The majority of the households derive their livelihood from subsistence farming; only 27% depend on earned income (13). Water coverage has reduced from 57% when the population was in camps to only 38% as the communities returned to their homes (14).

[Figure 1]

Study design and data collection

A cross-sectional survey was conducted in February 2018 in randomly selected households in 4 out of the 6 parishes in Pajule sub-county. The sample size of households was calculated using the table in (15).

Based on projection using a growth rate of 1.67% between 2002 and 2014, the population of children below 5 years in Pajule sub-county was estimated to be about 4,256 by 2017 (11) giving a representative sample size of 351 households. However, due to logistical constraints, we were only able to sample 244 households. We consolidated the names of households with children < 5 years old per cluster (parishes and villages) to generate our sampling frame. The households were proportionally distributed per parish and village depending on population size. The consolidated list of households was numbered and randomly sampled from each village using random number generator downloaded from the Internet. Only individuals from households where the mother or caregiver was present and had a child < 5 years old were interviewed. Trained research assistants administered semi-structured questionnaires based on the World Health Organization (WHO) guidelines (16). The dependent or outcome variable was the presence of diarrhoea among children aged < 5 years within the 14 days before the survey. This was evaluated by asking the mother or caregiver if the child involved in the study had suffered from diarrhoea (defined as "having three or more loose or watery bowel movements over a 24-hour period (1), within 14 days before the study. Independent variables included socio-demographic and/or socio-economic, environmental and behavioural factors. Socio-demographic/economic characteristics included age of the child, number of children under the age of five in the household, family size, age of the child's caregiver, sex of the child, the income status of the family, and the mother's or caregiver's education level. Environmental factors included type of water source, availability of animals' in the homestead, presence of animals' houses, nature of child's stool disposal, availability of latrines, latrine sharing, hand washing practices, availability of kitchen, household's environmental cleanliness, and presence of utensils' drying racks. The behavioral characteristics included source of drinking water, boiling or chemical treatment of water before consumption, nature of storage of drinking water, duration of storage of drinking water, frequency of warming cold food, weaning age, and age of food supplementation.

Data analyses

To determine the associations between diarrhoea and other risk factors, first we conducted univariate analysis with binary chi-square and logistic regression. Nine variables with p-values less than 0.05 in the bivariate analyses were included in the final multivariate logistic regression model to see the relationship of selected variables to childhood diarrhoeal disease. The adjusted odd ratios (aORs) of having diarrhoea with 95% confidence interval (CIs) and P<0.05 were used to describe associations between risk factors and occurrence of diarrhoeal disease in children < 5 years in Pajule subcounty. All analyses were done using IBM SPSS version 25.

Results

General characteristics of study households

Of the 244 households surveyed, 11.1% were caretakers/mothers with no formal education while the majority (68%) had primary level education (Table 1). In terms of latrine coverage, 79.9% of the

households had latrines in their homesteads while 68.0% reported sharing of latrines with other nearby households. For those who had latrines, only 31.1% had hand-washing facilities erected near the latrines. The practice of disposal of children's stool was fairly well addressed with 80.7% of the respondents properly disposing off children's stool as opposed to 19.3% who disposed of tools unsafely. According to the World Health Organization(17), a child's stool is considered to be disposed of safely when the child uses the toilet/latrine or when the faeces is put/rinsed in the toilet/latrine and/or buried. Furthermore, majority of the households (83.2%) gave food supplement to children mostly when aged > 6 months, and 49.2% weaned their children at the age >1 year. Only 63.5% of caretakers/mothers completed their immunization schedules as required (Table 1).

[Table 1: General characteristics of the households/respondents]

Prevalence of diarrhoea and associated risk factors among children < 5 years

Overall, 29.1% of the households reported episodes of diarrhea in children < 5 years two-week period preceding the survey. The diarrhoeal prevalence in males and females were 32.3% and 25.6%, respectively. Age group 13–24 months appeared most vulnerable, followed by 0–12 months, and the lowest prevalence was in category 37–48 months (Table 2).

[Table 2: Socio-demographic and socio-economic risk factors for occurrence of Diarrhoea in children under the age of five in Pajule]

Socio-demograpahic and socio-economic factors associated with diarrhoea

From Table 2above,the socio-demographic factors associated to diarrhoea among children of 0–59 months in Pajule. The significant socio-economic and socio-demographic factors were: number of children below five years in a given family $\chi 2 = 8.8$, df = 4, P = 0.066 [1 child ($p<0.001$), 2 children ($p<0.001$), 3 children ($p = 0.005$)], family size [2 to 5 people ($p = 0.003$*),* 6 to 9 children ($p = 0.009$)], and the age of the caretakers [6 to 15 years ($p = 0.029$)].

Environmental risk factors associated with diarrhoea

The environmental variables significantly associated with diarrhoea in children < 5 years in Pajule were having unprotected water source ($p<0.001$), absence of separate kitchen for cooking activities ($p = 0.008$), absence of animals' houses ($p = 0.048$*)* and presence of animals' in a home ($p = 0.021$) (Table 3).

[Table 3: Environmental factors associated with diarrhea in children under five in Pajule subcounty]

Behavioral risk factors associated with diarrhoea

Regarding behavioural risk factors, the chi-square test results showed that the prevalence of diarrhoea in children under five years of age were significantly associated with infrequent washing of hands during critical times by both child and mother/caretaker (P<0.001), weaning at an early age < 1 year (P = 0.024), and to a small extent introduction of supplementation food at less than 6 months (P = 0.062) (Table 4).

[Table 4: Behavioral risk factors for the occurrence of diarrhoea among children below 5 years old analyzed using bivariate logistic regression at 95% confidence interval]

Multiple logistic regression analyses result of the significant risk factors

Multiple logistic regression revealed that the most statistically significant factors associated with diarrhoea in children below 5 years in Pajule sub-county are presence of animals in homesteads, having unprotected water source, and infrequent hand washing at critical times (Table 5). Children whose homesteads had animals had four times higher odds risk of developing diarrhoea than children who had no animals at their homes (aOR: 3.950, 95% CI: 1.399—11.156). Households using unprotected water source faced three times higher odds of having children with diarrhoea compared with those using protected water sources (e.g. boreholes and protected springs) after controlling for other factors (aOR: 2.866, 95% CI: 1.431– 5.741). Children and mothers/caretakers who do not use hand-washing facilities had three times higher odds of diarrhoea than children use hand washing facilities (aOR: 2.737, 95% CI: 1.304—5.743). Despite being significant under bivariate analysis and logistic regression, caretakers' age (aOR = 0.057, 95% CI: 0.006– 0.522), weaning age (aOR = 0.292, 95% CI: 0.094—0.902) and family size of interviewed households (aOR = 0.112, 95% CI: 0.023– 0.534) were not significantly associated with diarrheal prevalence in children < 5 years old in Pajule in the multivariate logistic regression (Table 5).

[Table 5: Multivariate logistic regression analyses of the overall significant risk factors for the spread of dirrhoea in Pajule sub-county]

Discussion

We assessed the prevalence of diarrhoea and risk factors among children < 5 years of age in Pajule subcounty in Pader district, northern Uganda. Overall, the caregivers/mothers reported that the prevalence of diarrhoea among children under 5 years in Pajule was 29.1%, which is higher than the 20% rate reported for the same age group in the Ugandan Demographic and Health survey of 2016 (6). However, our reported prevalence rate is lower than the 41.3% reported in a similar study in children < 5 years conducted in Adjumani Refugee camp in West Nile, Uganda (18). The high prevalence of diarrhoea in Pajule sub-county than the national average is could be due to the fact that the area suffered a prolonged conflict which disrupted the social services, e.g., education and health, and economic fabric of the society,

as well as infrastructural development (9). For example, 11.1% of the mothers or caretakers had no formal education, and the majority (68.0%) had stopped in the lower primary (Primary one to four). Although this was not significant in our analyses, the role of formal education cannot be under-rated, as less educated people are less likely to take seriously their hygiene and sanitation, and those of their children.

The prevalence of diarrhea was highest in the age group 13–24 months (13.6%), followed by 0–12 months (8.2%), 49–59 (11.2%), 25–36 months (5.3%) and least in age group 37- 48 months (0.8%) (Table 2). The finding of high prevalence in age group 13–24 months is in contrast with results conducted in Bukina Faso, where highest rate of diarrhoea (44%) was in children < 12 months (19). Bezatu et al., 2013 (20) reported higher prevalence among children in the age of 6–11 months and 12–23 months compared to children above 35 months in Eastern Ethiopia. The age bracket (6–24 months) coincides with stage during which children start to crawl and are highly mobile, literally picking and ingesting any contaminated materials that may potentially contain diarrhoea-causing germs. In addition, this high prevalence of diarrhea at this age group can be attributed to the introduction of contaminated weaning foods. The decreasing prevalence of diarrhea after 24 months is probably because the children have developed immunity to pathogens after repeated exposure (21).

Our results showed that diarrheal sickness was significantly associated with hand washing practices of mothers or caregivers at critical times such as before starting to feed a child, when preparing food and after visiting latrines (Table 5). Despite the relatively high latrine coverage in the district (79.9% of households), however, hand washing after latrine visits was very low as only 31.1% of households had hand-washing facilities erected near their latrines. Nationally, only one in four Ugandans wash hands properly with soap and water after using a latrine or toilet, explaining why about 75% of the country's disease burden is listed as preventable and linked to poor hygiene and inadequate sanitation facilities and practices (22). Hand-washing with soap and water at critical times has been shown to reduce the occurrence of diarrhea and other water-borne diseases by half (23).

Additionally, we found that diarrhoeal prevalence was reportedly relatively higher among boys compared to girls. This is similar to the results of a study carried out in Sudan (24) but differs from the results of a study by (25) in Senegal where prevalence was higher among girls (27.6%) compared to boys (24.4%). Our finding could possibly be explained by the differences in cultural practices in the different places. For example, in the Acholi land where the study area was conducted, most women tend to adore their daughters and take care of them more than they do for the sons. It's always envisaged that boys can always "take care of themselves" and are always left to play more independently. Besides girls are culturally more valuable because their bride price is a source of wealth to the parents.

The results of the present study indicated that the prevalence of diarrhoea was significantly associated with weaning of children at less than one year, and introduction of supplementation at less than 6 months (Table 5). Given the poor hand washing practices and general unhygienic conditions as observed in this study, preparations of such foods have the potential of spreading diarrhoeal causing germs to the

infants. Weaning foods prepared under unhygienic conditions are frequently heavily contaminated with pathogens and thus are a major factor in the cause of diarrhoeal diseases and associated malnutrition(21).

Although the number of children <5 years in a household was not significantly associated with the occurrence of childhood diarrhoea, overall household size (those with more than two individuals) had a significant relationship with the occurrence of diarrhoea (Table 5). High number of individuals in a household potentially compromises hygiene and sanitation, making children more prone to contact with potential pathogens. In Pajule, house sizes are also generally small temporary huts where humans, and sometimes pets, occupy the limited space, further reducing cleanliness in the household.

The caretakers' age was also significantly associated with diarrhoea in children < 5 years. Children under the care of caretakers that fell within the age group 6–15 years had more chances of having diarrhoea than their counterparts having older caretakers (16 years and above) (Table 5). This finding is consistent with a study, which noted that the level of knowledge of mother or caretaker on diarrhoea management had significant relationship with their age (26). More so, older caretakers tend to have experience in caring and handling of the children compared to their younger counterparts. They are also likely to have better knowledge of proper food preparation, hand washing and disposal of faeces for diarrhoea prevention.

Our study also showed that the prevalence of diarrhoea was significantly associated with the nature of water source being unprotected. This finding is in line with a study by (27) in Kenya who found that sources of drinking water was one of the households' characteristics that had significant influence on childhood diarrhea. However, a study conducted in southwest Ethiopia by (28) did not find any significant association of diarrhoeal occurrence and drinking water sources. Nevertheless, unprotected water sources have higher chances of fetching germs from the intruding animals or from running water carrying waste matters to contaminate it. In Pajule, like the rest of northern Uganda, access to safe water is a major challenge due to inadequate funding for construction of clean water sources and/or inadequate training of users in water source maintenance (29)(14). Due to lack of access to safe water, communities are forced to utilize unsafe sources such as streams, which requires boiling to make it safe. This creates an additional burden for women and children, who typically spend hours every day collecting firewood and water. Even so, boiling water does not always guarantee that it is absolutely safe to drink, thus water-borne diseases continue to afflict the community.

Our study also showed that animals' presence in households is highly associated with diarrhoea. This result agrees with a study done in Uganda by (8) where family ownership of dogs was highly associated with acute diarrhea caused by rotaviruses. This could be because some diarrheal pathogens are zoonotic in nature(30); for example, the rotaviruses and Cryptosporidium spp that cause acute diarrhoea (31). More so animals create filthy environments with their droppings or dungs attracting mechanical vectors such as houseflies and cockroaches.

Conclusions

The prevalence of diarrhoea in children under five years in Pajule was found to be high (29.1%), and the highest prevalence was in the age group 13–24 months (13.6%). The presence of animals in homesteads, having unprotected water sources and infrequent hand washing at critical times had significant associations with occurrence of diarrhoea. Our findings underscore the need for heightened public health education and interventions that target improvement of hygiene practices at homes to reduce the burden of childhood diarrhoea in the study area.

Study limitations

Our study is prone to recall bias since it was based on respondents' recalling of the diarrheal history in their children within the last two weeks preceding the survey. However, we asked the mothers to report on the diarrhoea episode within two weeks from the time of the interview to reduce on recall bias. Additionally, being cross-sectional in design did not take into account seasonal variation in the prevalence; data was collected in April 2018, which is the beginning of the wet season in northern Uganda. It would be interesting to look at the diarrhoeal prevalence in the dry season as well. Follow up studies should also cater for the stool and water analysis for the diarrhoeal causal agents and contaminations.

Abbreviations

aOR: Adjusted Odds Ratio

CI: Confidence Interval

IDPs: Internally Displaced Persons

IMR: Infant Mortality Rate

LRA: Lord's Resistance Army

SPSS: Statistical Package for the Social Sciences

UPDF: Uganda People's Defense Forces

WHO: World Health Organization

Declarations

Ethical approval and consent to participate

Ethical approval for the study was obtained from the Gulu University Ethical Review Committee (GUREC–077–18). Households' heads were briefed verbally about the study and required to sign consent forms translated into the local language. For participants under 16 years old, written informed consent was obtained from a their parents or guardians. The Local Council I Chairpersons of the different villages were also made aware of the exercise in their villages.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

We do not have any competing interests to declare.

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Authors' contributions

SO and RO2 conceived and designed the study, collected data, performed initial analyses and wrote initial draft of manuscript. GM, RO1 and GO critically revised the manuscript. All authors read and approved the final version of the manuscript.

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Authors' information

Not applicable

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Tables

Table 1. General characteristics of the households surveyed.

The variables	Frequency	Percentage
Educational status		
No formal education	27	11.1
Primary	166	68.0
Secondary and above	51	20.9
Availability of latrine		
Present	195	79.9
Absent	49	20.1
Child's stool disposal.		
Proper	197	80.7
Improper	47	19.3
Latrine sharing practice.		
Yes	76	31.1
No	168	68.9
Weaning age of the child.		
On breast feeding	109	44.7
< 1 year	15	6.1
< 1 year	120	49.2
Hand washing facility near the latrine.		
Present		
Absent	35	14.3
	209	85.7
Immunization status of the child.		
Completed		
Not completed	155	63.5
	89	36.5
Age of food supplementation		
Not started	15	6.1
< 6 months	26	10.7
> 6 months	203	83.2

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Table 2: Socio-demographic and socio-economic risk factors for occurrence of Diarrhoea in children under the age of five in Pajule (χ^2)/N=244

Variables	Category	Diarrhoea cases Yes		Diarrhoea cases No		χ^2	p-value
		N	%	N	%		
Age of child in months	0 to 12 13 to 24 25 to 36 37 to 48 49-59	20 33 13 02 03	8.2 13.6 5.3 0.8 1.2	49 65 31 14 14	20.0 26.6 12.7 5.8 5.8	4.216	0.378
Sex	Female Male	41 31		86 87		1.302	0.254
Child caretaker	Other Mother	06 65		22 151		0.902	0.342
Caretaker's Education	Secondary and above Elementary No formal	14 48 09		37 118 18		0.304	0.859
Child caretaker's age	31 and above 6 to 15 16 to 30	17 04 50		62 02 109		6.729	0.035
Family size	10 to15 2 to 5 6 to 9	03 39 29		36 72 29		10.763	0.005
Income status of family	Poorest Middle Rich	14 48 09		37 118 18		1.053	0.591
Number of children below 5 years in a home	4 children 1 child 2 children 3 children	00 37 30 04		05 78 71 19		4.125	0.248

Table 3: Environmental factors associated with occurrence of Diarrhoea in children under the age of five in Pajule (χ2)/N=244

The variables		Diarrhoea cases Yes		Diarrhoea cases No		χ^2	P value
		N	%	N	%		
Water source	Borehole	49	20.08	119	48.77	4.724	0.193
	Tap in the house	02	0.82	18	7.38		
	Public tap	04	1.64	10	4.10		
	Wells	16	6.56	26	10.66		
Nature of water source	Protected	26	10.65	121	45.59	23.339	<0.001
	Unprotected	45	18.44	52	21.31		
Animals' presence	Absent	58	23.77	159	65.16	5.340	0.021
	Present	13	5.33	14	5.74		
Animals' houses	Present	03	1.23	23	9.43	4.349	0.037
	Absent	68	27.87	150	61.48		
Presence of latrine in homesteads	No	17	6.97	32	13.11	0.930	0.335
	Yes	54	22.13	141	57.79		
Type of latrine	None	17	6.97	32	13.11	2.885	0.410
	Sewer	03	1.23	03	1.23		
	Latrine with pit	07	2.87	14	5.74		
	Traditional latrine	44	18.03	124	50.82		
Hand washing facilities	No	64	26.23	145	59.43	1.640	0.200
	Yes	07	2.87	28	11.48		
Child's stool disposal	Improper	17	6.97	30	12.30	1.411	0.235
	Proper	54	22.13	143	58.61		
Racks for drying utensils	No	56	22.95	130	53.28	0.386	0.534
	Yes	15	6.14	43	17.62		
Separate kitchen	Yes	48	19.67	144	59.01	7.355	0.007
	No	23	9.43	29	11.89		
Environmental cleanliness	Not clean	23	9.43	47	19.26	0.672	0.412
	Clean	48	19.67	126	51.64		

Table 4: Behavioral factors for the occurrence of diarrhea among children below 5 in Pajule subcounty (χ^2)/N=244

The variables		Diarrhoea cases Yes		Diarrhoea cases No		χ^2	P value
		N	%	N	%		
Latrine sharing	No Yes	46 25	18.86 10.26	122 51	50.00 20.90	0.771	0.380
Age of food supplementation	Not started <6 months >6 months	02 12 57	0.82 4.92 23.36	13 14 146	`5.33 5.74 59.84	5.575	0.062
Child weaning age	>1 year On breast feeding < 1 year	33 29 09	13.52 11.89 3.69	87 80 06	35.66 32.79 2.46	7.420	0.024
Hand washing practices at critical times	Yes Sometimes	29 42	11.89 17.21	123 50	50.41 20.49	19.616	<0.001
Immunization status	No Yes	24 47	9.84 19.26	65 108	26.64 44.26	0.309	0.578
Cold food warming frequency	None Very often Rarely	02 29 40	0.82 11.89 16.39	00 120 53	- 49.18 21.72	20.303	<0.001
Boiling drinking water	No Yes	70 01	28.69 0.41	160 13	65.57 5.33	3.470	0.062
Frequency of boiling drinking water	Not at all Often Sometimes	70 00 01	28.69 - 0.41	160 06 07	65.57 2.46 2.86	3.730	0.155
Drinking water treatment	No Yes	50 21	20.49 8.61	122 51	50.00 20.90	0.000	0.988
Drinking water storage duration	Use none treated 1 day 2 days 3 days 4 days	50 08 06 05 02	20.49 3.28 2.46 2.05 0.82	118 30 15 10 00	48.36 12.30 6.15 4.10 -	2.519	0.641

Table 5: Multivariate logistic regression analyses of the risk factors significant in the bivariate analyses

The variables		P value	Adjusted odds ratio, aOR at 95% CI lower upper
Caretaker's age	31yrs and above 6 to 15 years 16 to 30 years	1.000 **0.011** 0.815	 0.057[0.006 – 0.522] ** 0.913[0.425 – 1.961]
Family size	10 to 15 people 2 to 5 people 6 to 9 people	1.000 **0.006** **0.007**	 0.112[0.023 – 0.534] ** 0.026[0.003 – 0.558] **
Nature of water source	Protected Unprotected	1.000 **0.003**	 2.866[1.431 – 5.741] **
Animals' presence	Absent Present	1.000 **0.009**	 3.950[1.399 – 11.156] **
Animal houses	No Yes	1.000 0.519	 1.569[1.0.379 – 6.164]
Separate kitchen	Yes No	1.000 0.976	 1.012[0.475 – 2.155]
Weaning age	>1 year Still breast feeding <1year	1.000 0.977 **0.032**	 1.009[0.536 – 1.902] 0.292[0.094 – 0.902] **
Hand washing practices	Yes Sometimes	1.000 **0.008**	 2.737[1.304 - 5.743] **

Figures

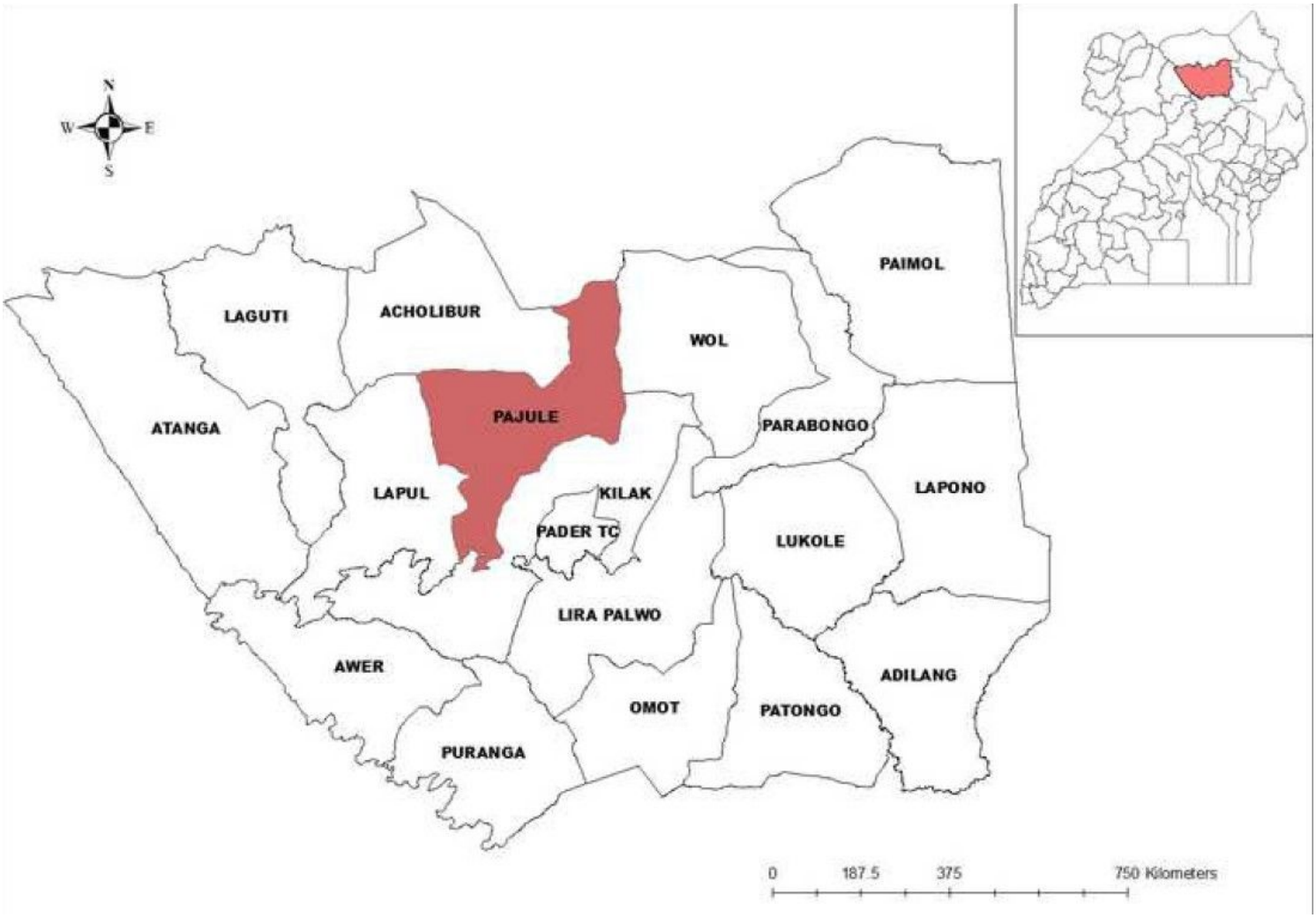

Figure 1

Map of study area. Inset map to the right is map of Uganda showing the location of Pader District (light shade of red) while to the left is the map of Pader district showing the location of Pajule subcounty (light shade of red), the study area.