

## **Assessment of the Incidence and Contributing Factors of Diarrheal Episodes in Children Under Five Years Admitted to Hoima Regional Referral Hospital, Hoima District**

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### **ABSTRACT**

Diarrhea is a major public health concern worldwide, with 2.5 billion cases occurring annually among children under five. Nearly three-quarters of child deaths are due to diarrhea, with 16,000 children under five dying daily from preventable causes like pneumonia, diarrhea, and malaria. This study aimed to determine factors influencing diarrhea in children under five admitted at Hoima Regional Referral Hospital. A cross-sectional study was conducted, with 238 mothers randomly sampled from the population whose children were admitted. The prevalence of diarrhea among children under five admitted at Hoima Regional Referral Hospital was 24.4% at the time of data collection. Factors influencing this high prevalence include the child's vaccination status, the introduction of supplementary foods at an early age, early weaning, and the child's age. Mothers often do not practice exclusive breastfeeding, but introduce their children to other foods at a very early age, coupled with early weaning practices.

**Keywords:** Diarrhea, Malaria, Child deaths, Mothers, children under five years.

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### **INTRODUCTION**

Diarrhea is one of the major public health concerns worldwide; the World Health Organization [1-3] estimates that 2.5 billion cases of diarrhea occur yearly among children under five years of age. The same reports further indicate that nearly three-quarters of child deaths are due to diarrhea [3, 4]. In 2015, it was reported that 16,000 children under five die every day from mostly preventable causes such as pneumonia, diarrhea, and malaria; 80% of these cases are in Africa and South Asia (46% and 38%, respectively)[5].

In Africa, a study done by the Centre for Infectious Disease Research and Policy (CIDRAP) in 2015 showed that Nigeria had the most variance of disease rates among African countries, with estimates ranging from 1.6 deaths per 1000 children to 9.5 deaths per 1000 children. According to this study, all the severe cases of diarrhea

occurred in Ethiopia and the Democratic Republic of Congo [6].

In Rwanda, according to the National Institute of Statistics of Rwanda [7], the prevalence of children under five years who had symptoms of diarrhea in the two weeks preceding the survey was 12%. This was higher than acute respiratory infections. Among children with symptoms of diarrhea, the percentage who sought treatment from a health facility/provider was 44%, more than in previous surveys [7]. According to records from Nyarugenge district by Rwanda Health Management Information System (RHMS), diarrheal diseases among children less than five years attending Nyarugenge district health centers was nearly 40% [8].

Uganda was ranked number 9 among the countries with the highest number of diarrhea cases under five, with 29,000 deaths due to diarrhea [9, 10]. According

to the Annual Health Sector Performance Report[11], diarrhea is number six among the top ten causes of under-five-year morbidity and mortality in Uganda, accounting for 3.4% of under-five-year mortality[5, 12]. The AHSPR 2013 report further shows an increase in the trend from 1.84% in 2011 to 3.4% in 2013. Overall, these children experience an average of 3.2 episodes of diarrhea per child per year [11].

The Demographic and Health Survey [13], conducted by the Uganda Bureau of Statistics (UBOS), indicates that in Uganda, the prevalence was 20% in 2011 and 23% in 2016. This shows an increasing trend in diarrhea cases in the country. It is, therefore, necessary to identify associated factors leading to the increase in diarrhea using Hoima Regional Referral Hospital. This study was conducted at Hoima Regional Referral Hospital and generated information to necessitate the development of an appropriate program with the aim of reducing the number of diarrhea cases in the area.

Childhood diarrhea is one of the leading causes of morbidity and mortality in children under 5 years of age and is estimated to account for over 600,000 deaths globally annually making it the second most common cause of childhood mortality after pneumonia [1, 2, 9]. There are lessons to be learned from past experience; an international commitment to tackle childhood diarrhea in the 1970s and 1980s resulted in a major reduction in child deaths [14]. This came about largely through the scaling up of oral rehydration therapy, coupled with

programs to educate caregivers on appropriate use. However, this lost momentum as the world turned its attention to other global emergencies [14].

Globally, in 2015, 5.9 million children under the age of 5 years died, and the majority of these children were in the African region [15]. Most of these mortalities occurred as a consequence of diarrhea and acute respiratory infections [16-18]. Uganda is among the countries where the burden of childhood diarrhea is heavily concentrated [9]. The incidence varies greatly with seasons and children's age, highest in the rainy season and among children aged 6-11 months [13]. Some of the risk factors include poor nutrition, environmental pollution, population increase, and climate change [19]. Poor sanitation, lack of access to clean water supply, and inadequate personal hygiene are responsible for 90% of diarrheal disease occurrence in Uganda [19-21]. Diarrhea prevalence increases with age and peaks at 12-23 months (33%), then declines at older ages [22]. However, there's no documented data about Hoima district regarding the associated factors leading to an increase in the number of diarrhea cases in children under five years, which is also the same case at Hoima Regional Referral Hospital. These factors have not been well understood, and this remains a problem. This study will help identify maternal and child factors associated with the increasing cases of diarrhea among children under five years of age admitted at Hoima Regional Referral Hospital.

## METHODOLOGY

### Study Design

A cross-section study was conducted to determine factors associated with diarrhoea in children under five years admitted at Hoima Regional Referral Hospital.

### Area of Study

The study was conducted in Hoima Regional Referral Hospital in Hoima District, Western Uganda which is about 200km by road west of Kampala, Uganda's Capital and largest city.

### Study Population

All mothers with children under five years were admitted to Hoima Regional Referral Hospital.

### Inclusion Criteria

Children under five years old are admitted at Hoima Regional Referral Hospital.

Mothers to all children under five years admitted at Hoima Regional Referral Hospital who had consented.

### **Exclusion Criteria**

Mothers with children above five years are admitted at Hoima Regional Referral Hospital.

### **Sample Size Determination**

The sample size will be determined using the Kish Leslie[23] and used the prevalence (p) which is 23% of children with diarrhea under five years as reported by UDHS[13]

$$n = z^2 P(1- p)/E^2$$

n = sample size

Z=1.96 - approximate 95% confidence level.

P -prevalence (23%) [UDHS 2016].

E=5 % ( 0.05), which is the margin of error.

$$n = 1.96^2 \times 0.23 (1-0.23)/0.05^2$$

$$n = 272$$

n = 272 as the minimum sample size for this study.

### **Sampling Technique Procedure**

A convenience sampling technique was used, where every patient who was present at the time of data collection and met the inclusion criteria was selected to get the required sample size. All mothers with children under five years who met the inclusion criteria were approached and invited to participate in the study.

### **Data Collection tools, methods and management.**

This involved the distribution of structured and closed-ended questionnaires to the mothers for responses. The questionnaire was designed into sections; Demographic section, maternal factors section, and

### **Social-demographic characteristics of the study population**

A total of 272 children from the age of 6 months to 4 years were studied with a response rate of 87.5%. Table 1 below shows the distribution of the study population by demographic characteristics. The results are based on the 238 respondents having the child's age, status of vaccination and weaning

child factors section. The questionnaire was developed in English and translated to Runyoro and Luganda for those who could not comfortably express themselves in English. The questionnaire was pretested before the actual data collection to check whether questions and responses were appropriate. The pretest was done on mothers with children above 5 years of age since these were not among the selected mothers for the study. Data was further checked for completeness and errors.

### **Data analysis**

Data capture was done based on the dependent and independent variables of the study. The data field included the questionnaire codes in order to ensure excellent data entry. The data was entered; cleaned and analyzed using IBM Statistics SPSS 26 and graphics by Microsoft Excel.

### **Quality control**

To ensure quality control, questionnaires were pretested, assistants were trained and necessary adjustments were made.

### **Ethical Consideration**

Informed Consent and Respect for Participants. Voluntary recruitment was done and informed consent was sought and signed. Informed consent from participants was obtained after fully explaining the details of the study to them in English and local languages including Runyoro and Luganda. The participants were not forced to enroll against their will.

## **RESULTS**

age of the child. The majority of the children with diarrhea were 1 year of age (25%), this study also showed that children with incomplete vaccination had diarrhea were 147(61.8%) and those who had completed vaccination were only 91(38.2%), the study also showed weaning age child below 1 year with diarrhea was 174(73.1%) and those with weaning age above 1 year were only 64(26.9%).

**Table 1: Socio-demographic findings for child**

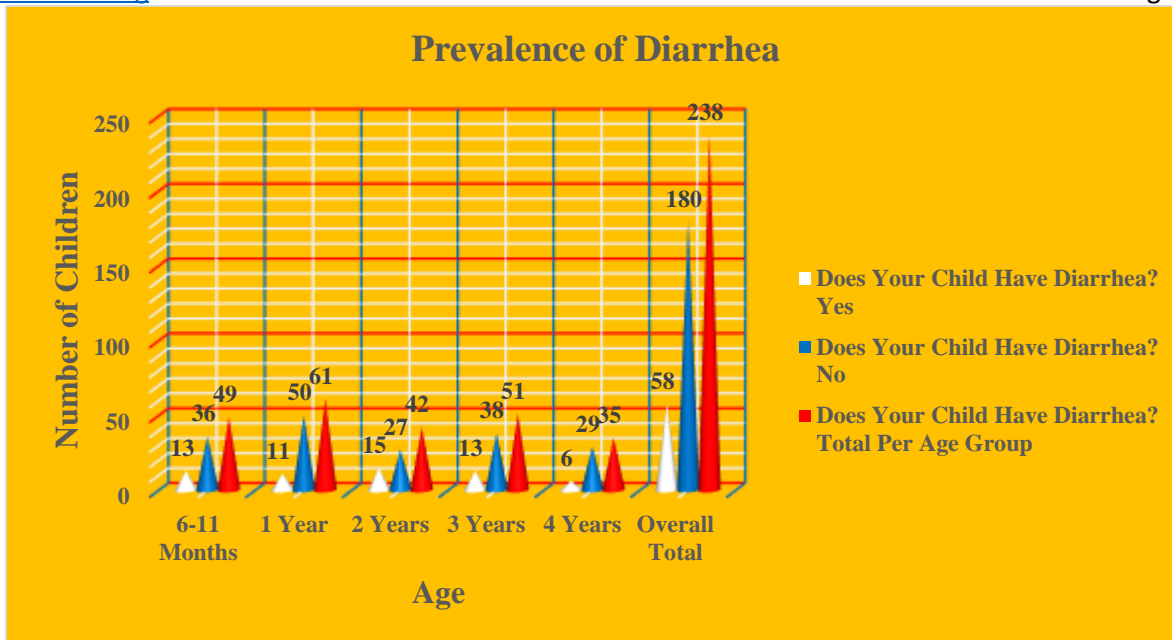
Variables	Frequency	Per cent
<b>Age</b>		
6-11months	49	20.6
1year	61	25.6
2years	42	17.6
3years	51	21.4
4years	35	14.7
<b>Vaccination</b>		
Complete	91	38,2
incomplete	147	61.8
<b>Weaning age</b>		
<1year	174	73.1
>1year	64	26.9

**Table 2: Socio-demographic findings for mothers**

Variables	Frequency	Per cent
<b>Age</b>		
Below 25 years	19	8
Above 25years	219	92
<b>Education</b>		
Primary	56	23.5
Secondary	54	22.7
Tertiary	81	34
University	47	19.7
<b>Exclusive breastfeeding</b>		
3-4months	159	66.8
5-6months	56	23,5
>6months	23	9.7

**Table 2** above shows socio-demographic findings for mothers (age, education level and breastfeeding status) from this study showed that the majority of children with diarrhoea were from mothers above 25 years of age 219(92%),and those from mothers below 25 years were only 19(8%).mothers whose education level was

tertiary level had the highest number of children with diarrhae81(34%), also showed that mothers who breastfed exclusively between 3-4months their children had the highest number of diarrhea159(66.8%) followed by those between 5-6months56(23.5%) then those above 6months were only 23(9.7%).



**Figure 1: Prevalence of Diarrhea in Children under the Age of Five as Studied at Hoima Regional Referral Hospital April 2021**

The figure shows that diarrhea is more prevalent in children of 2 years who account for 15(25.8%) of the overall total (58) of children with diarrhea. The figure further depicts that children of 3 years

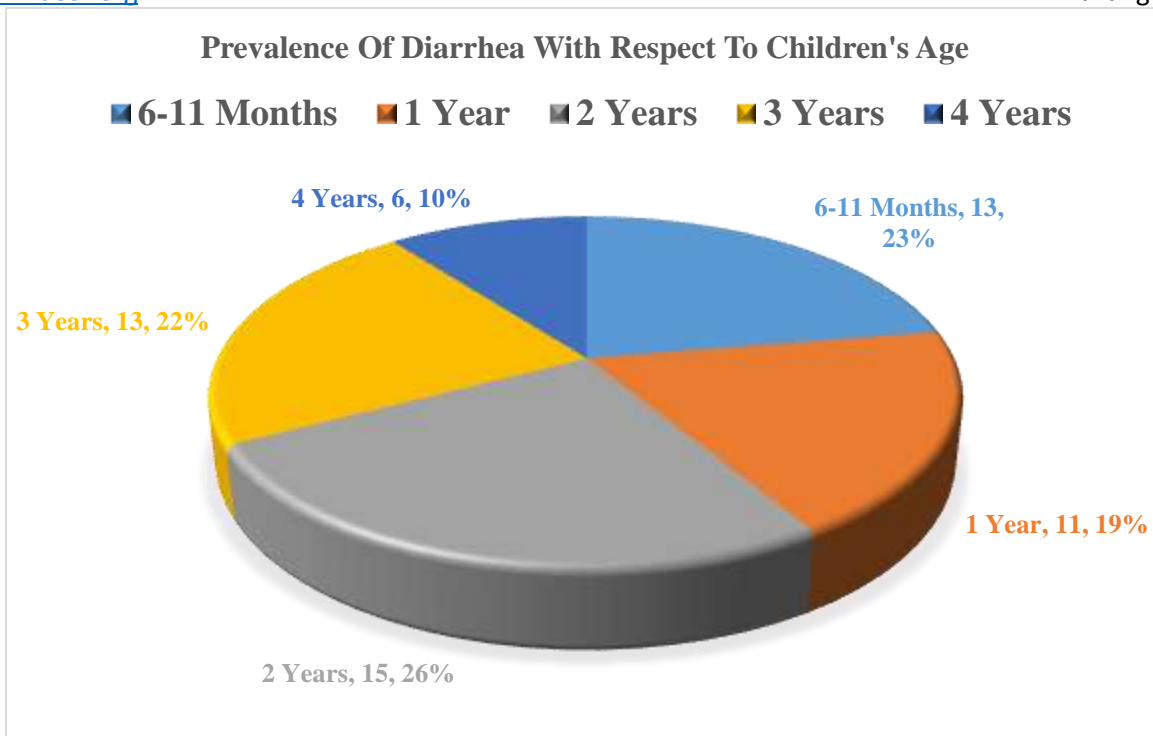
follow with 13(22.4%), then children of 6-11 months who account for 13(22.4%), then children of 1 year 11(18.9%) and children of 4 years having the least prevalence of 6(10.5%).

**Table 3: Total Prevalence of Children with Diarrhea under Five Years Admitted at HRRH**

Category	Diarrhea	
	Yes	No
Percentage for Each Category	24.4%	76.6%

Table 4 above shows the total percentage of children under five years admitted at

home regional referral hospital with diarrhoea which is 24.4%.



**Figure 2: Percentage Prevalence of Diarrhea in Children under the Age of Five with respect to Age as Studied at Hoima Regional Referral Hospital April 2021**

Figure 2 above shows that diarrhoea is more common in children of 2 years who account for 26% of all the children who were reported to have diarrhoea at the time of the study, children of 6-11 months following in the trend with 23% and those of three years who are 22% of the total children with diarrhoea.

Diarrhoea is seen to be relatively lower in children aged 4 years who accounted for 10% of all the children with diarrhoea; comparative reference made to Figure 4 gives a clear picture of the incidence of diarrhoea among children under the age of five.

#### Binary and multivariate logistic analysis for child factors

**Table 4: Binary logistic analysis of child factors associated with children under five years of diarrhoea**

		diarrhoea		OR(95%CI)	P-value
		yes	no		
Age of the child	6-11months	13	36	1	0.545
	1 year	11	50	0.819	0.737
	2 years	15	27	0.627	0.401
	3years	13	38	0.462	0.177
	4years	6	29	0.535	0.259
Incomplete vaccination	yes	23	68	1	
	no	35	112	0.947	0.837
Weaning age	below 1 year	46	128	2.57	0.267
	Above 1 year	12	52	0.857	0,636

**Table 5: multivariate logistic analysis of child factors associated with children under five years of diarrhoea**

Predictors	Diarrhea		AOR	95% Confidence Interval		P-Value
	Yes	No		Lower	Upper	
Child's Age						
<b>6-11 Months</b>	13	36	1			0.545
<b>1 Year</b>	11	50	0.819	0.256	2.624	0.737
<b>2 Years</b>	15	27	0.627	0.21	1.866	0.401
<b>3 Years</b>	13	38	0.462	0.151	1.418	0.177
<b>4 Years</b>	6	29	0.535	0.181	1.585	0.259
Incomplete vaccination						
<b>Yes</b>	23	68	1			
<b>NO</b>	35	112	0.947	0.566	1.586	0.837
Weaning Age						
<b>Below 1Year</b>	46	128	2.57			0.267
<b>Above 1 Year</b>	12	52	0.857	0.452	1.624	0.636

Table 5 shows the association of child factors with the incidence of diarrhoea; the odds of children getting diarrhoea are seen to decrease with age; there is a modest discrepancy in odds seen with the age of above 1 year however, this could be due to other factors; those with incomplete vaccination are observed to have higher odds of getting diarrhoea than those with complete vaccination; Children weaned at the age below 1 year are seen to have diarrhoea more than

those weaned at above 1 year; therefore the odds of getting diarrhoea are seen to reduce with increasing weaning age of the child, the older the child the more unlikely they are to get diarrhoea.

#### **Maternal factors associated with diarrhoea in children under five years**

According to Table 6 below mother's education, age and exclusive breastfeeding had values with p-value < 0.2 and thus proceeded to the multivariate stage.

**Table 6: Binary logistic analysis of maternal factors associated with diarrhoea in children under five years**

Variables	Diarrhea		OR (95% CI)	P-value	
	yes	no			
Mother's education	primary	11	45	1	0.257
	secondary	17	37	1.333	0.539
	Tertiary university	16	65	0.511	0.107
maternal age	>25years	14	33	0.878	0.676
	<25years	11	08	1	0.796
Exclusive breastfeeding	3-4months	47	172	3.25	0.027
	5-6months	12	11	0.536	0.191
	>6months	19	37	0.29	0.006
		27	132	0.444	0.008

**Table 7: Multivariate Analysis for Maternal Factors associated with diarrhoea in children under the age of five admitted at Hoima Regional Referral Hospital.**

Predictors	Diarrhea		AOR	95% Confidence Interval		P-Value
	Yes	No		Lower	Upper	
Mother's Education						
Primary	11	45	1			0.257
Secondary	17	37	1.333	0.532	3.342	0.539
Tertiary	16	65	0.511	0.226	1.157	0.107
University	14	33	0.878	0.477	1.617	0.676
Occupation						
Casual Laborer	19	50	1			0.83
Self-Employed	32	105	0.929	0.5	1.729	0.817
Civil Servant	7	25	0.772	0.331	1.799	0.549
Maternal age						
Above 25 years	11	8	1			0.796
Below 25 years	47	172	3.25	1.141	9.262	0.027
When do you normally introduce Supplementary feeding to your children?						
3-4 Months	12	11	0.536	0.211	1.363	0.191
5-6 Months	19	37	0.29	0.12	0.7	0.006
Above 6 months	27	132	0.444	0.244	0.807	0.008

Table 7 shows the association of maternal factors with the incidence of diarrhoea in children. It is clearly shown that children of mothers with a lower education level (primary and secondary) had the highest odds of getting diarrhoea, however, the trend is seen to skew towards mothers who had attained university in which their children's odd ratio of getting diarrhoea is seen to be higher than that of mothers who went for tertiary institutions; Age of the mothers is seen to show a

counteracted skewness from conventional acceptance where we observe that children from mothers above 25 years have the highest odds of getting diarrhoea whereas those who are from mothers below 25 years seem to do quite better; Supplementary food introduction at the age of 3-4 months is seen to show greater odds of causing diarrhea in children under five; with a discrepancy seen with the age of 6 months.

## DISCUSSION

### Prevalence of Diarrhea

This study was a cross-sectional investigation focused on determining the prevalence and factors influencing acute watery diarrhea in children under the age of five admitted at Hoima Regional Referral Hospital in Hoima District, Uganda. The study revealed that the overall prevalence of diarrhea among children under five admitted at HRRH was 24.4% at the time of data collection, based on responses provided by the children's mothers. This prevalence was found to be significantly associated with several factors, including health service-seeking behavior, weaning age, breastfeeding practices, and initiation of supplementary feeding, with the latter showing the

highest odds of influencing diarrhea in children under five.

The significance of these variables was determined using Pearson's correlation, with health service-seeking behavior being significant with a value of 0.139\* (P=0.021), and frequency of breastfeeding being significant with a value of 0.286\* (P=0.000), and health service-seeking behavior being significant with a value of 0.131\* (P=0.021) with a two-tailed test at a 95% confidence level, with P<0.05. It is widely recognized that diarrhea is a major cause of morbidity and mortality among children, particularly in developing countries. Low socioeconomic status, limited education, poor environmental sanitation, and low hygienic practices pose a serious threat to people's health,



especially children's health. Risk factors for diarrhea vary with the child's age, the pathogens involved, and the local environment [24-27].

The prevalence of diarrhea among children under five in the Aragon district was 40.8% (CI: 0.353-0.454). This is higher than the 23% diarrhea prevalence in Uganda and the 24% prevalence in the northern region where Aragon is located [13]. The high prevalence of diarrhea in Aragon within two weeks is comparable to studies carried out in Uganda by Bbaale [28]. These two studies also reported diarrhea prevalence above the national rate at 32% and 40.3%, respectively [29, 30]. The fact is that it is not common for all diarrhea cases to be captured at health facilities; it depends on community healthcare-seeking behavior. Other diarrhea cases are managed at home or by traditional health attendants and the data may be missed in health records, thus underestimating the magnitude of diarrhea in the community. So the observed prevalence might be the true prevalence of diarrhea [31].

#### **Maternal Factors**

The maternal factors in this study have been associated with a high prevalence and were significantly correlated with factors including breastfeeding practices and initiation of supplementary feeding, which showed the highest odds of influencing diarrhea in children under the age of five. The significance of these variables was computed using Pearson's correlation, with health service-seeking behavior being significant with a value of 0.139\* (P=0.021), and frequency of breastfeeding being significant with a value of 0.286\* (P=0.000).

Also, from this study, it was observed that children of mothers above 25 years had a higher incidence of diarrhea compared to those born to mothers below 25 years. However, the age of the mother was positively associated with child diarrhea in the northwest and north-central regions. In contrast to previous findings, the older the mother, the less likely the under-five child was to have diarrhea [29]. This study's results contradict studies conducted in Nigeria by Ugboko and

others, who found that the age of the mother was a significant predictor for diarrhea among children under five years of age, with higher odds of diarrhea among children born to mothers aged less than 24 years old [32]. This was in line with a cross-sectional study conducted in Ghana to determine the risk factors associated with diarrhea morbidity among under-five children [33]. These studies also contradict our findings, possibly because younger mothers in our study were more likely to seek medical attention promptly due to their higher energy levels and fewer responsibilities. According to the study conducted by Omona [10] in Uganda, diarrhea occurrence in children under 5 years was associated with the mother's age, with higher maternal age correlating with lower diarrhea prevalence in children below 5 years.

It is clear that children of mothers with lower education levels (primary and secondary) had the highest odds of getting diarrhea. However, the trend appears to shift towards mothers who had attained a university education, where their children's odds of getting diarrhea are higher than those of mothers who attended tertiary institutions. In contrast to findings by Bekele [34], the level of maternal education was positively associated with the occurrence of diarrhea among children under five, with higher maternal education resulting in lower odds of children experiencing diarrhea episodes. In our study, the reason for this could be that mothers with lower education levels have less knowledge about diarrhea, leaving their children under 5 years more vulnerable to diarrhea.

#### **Child Factors**

The child factors associated with the incidence of diarrhea in this study show that the odds of children getting diarrhea decrease with age. There is a slight discrepancy in odds for children above 1 year of age; however, this could be attributed to other factors. Children with incomplete vaccination have higher odds of getting diarrhea compared to those with complete vaccination. Children weaned at an age below 1 year are more

likely to experience diarrhea than those weaned after 1 year. Therefore, the odds of getting diarrhea decrease with increasing weaning age; older children are less likely to get diarrhea.

Similarly, the study conducted by Nantege et al. and Omona et al. [9, 10] in Uganda showed that the weaning age of the child was significantly associated with diarrhea, with diarrhea occurrence decreasing as the weaning age increased. This may be due to complications associated with early weaning, such as malnutrition, which is often accompanied by diarrhea. Children who completed their vaccination had a lower odds ratio compared to those with incomplete vaccination. This is consistent with the study by Budu et al. [35], which also showed that children under five years who completed their vaccination were fewer compared to those with incomplete vaccination. This may be because children who receive immunizations have a higher chance of

also receiving vaccines against diarrhea, such as the rotavirus and pneumococcal vaccines, where they are available. The age of the child is associated with diarrhea, with older children at lower risk of getting diarrhea. This finding aligns with the study conducted by Anne Node Mule (2018) in Uganda, which showed that the age of the child was significantly associated with diarrhea, with diarrhea occurrence decreasing as the child's age increased. This occurrence was most prominent in the age group 12-23 months. Other studies have shown that the highest incidence and deaths due to diarrhea occur in children less than 2 years of age [32, 36, 37]. According to our study, this could be because as a child grows, their immunity matures, reducing cases of diarrhea. Additionally, as children grow, their sense of self-care for good hygiene improves, reducing the chances of getting diarrhea.

#### CONCLUSION

The prevalence of diarrhea among children under five admitted at Hoima Regional Referral Hospital was 24.4% at the time of data collection based on the responses given by the mothers. This high prevalence is influenced by factors including the vaccination status of the child, the introduction of supplementary

foods to children at an early age, the early weaning of children, and the age of the child. Mothers often do not practice exclusive breastfeeding; instead, they introduce their children to other foods at a very early age, coupled with early weaning practices.

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