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Research Article

Prevalence and Risk Factors of Diarrheal Diseases in Niger, 2022

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Abstract

Diarrhea is the second leading cause of death in children under five years of age and is most often the result of contaminated water or food. The objective of the study was to determine the prevalence and risk factors of diarrhoeal diseases in Niger in 2022. The study used data from the National Institute of Statistics' cross-sectional national nutrition survey. The data collected on children aged 0 to 59 months had constituted the population of our work. Logistic statistical regression analyses were used to identify risk factors for diarrheal diseases. A total of 9514 children aged 0 to 59 months were included in the study, 1647 (17.3%) had had an episode of diarrhea in the 2 weeks prior to the survey. Risk factors for diarrheal diseases were: fever in the 2 weeks prior to the survey [Adjusted Odds Ratio (ORA):4.02; 95% confidence interval (CI) (3.30-4.91)], acute respiratory infection in the 2 weeks prior to the survey [3.23; 95% CI (2.65-3.94)], mothers' failure to wash hands after washing the child who had had the bowel movements [ORA: 1.77; 95% CI (1.41-2.22)]. And the protective factor for diarrheal disease was mothers' handwashing before and after meals [ORA: 1.35; 95% CI (1.11-1.63)].

Conclusion: The study showed that washing mothers' hands before and after preparing meals protected children from diarrheal disease. Hence the interest in strengthening prevention activities, including raising awareness among mothers on best practices for behavior change.

Keywords: Diarrhea; Children; Risk Factors; Niger

Introduction

Diarrhea is usually a symptom of an intestinal infection that can be caused by various microorganisms, bacteria, viruses or parasites. It is defined as at least 3 emissions of loose or liquid stools in a day or more frequent bowel movements than is usual for the affected person [1]. In low-income countries, children under 3 years of age suffer an average of 3 episodes of diarrhea per year. Each of these episodes deprives them of the nutrients they need to grow [2,3]. Diarrhea is more prevalent in the developing world due to the lack of safe drinking water, poor hygiene habits, increased incidence of malnutrition, poor health status of the general population [4]. Every year, about 2.5 billion cases of diarrhea are reported in children under 5 years of age, half of them in Africa and South Asia [5]. Diarrhea is the second leading cause

of death in children under five years of age and is most often the result of contaminated water or food [1,6]. Nearly one in five child deaths is due to diarrhea, and each year about 1.5 million children die from diarrheal diseases alone [5]. Inadequate water, sanitation and hygiene are responsible for more than 4% of the total number of deaths worldwide. Most of them are children from developing countries [7]. Handwashing with soap has been proven to reduce the incidence of diarrhoeal diseases by about 40% [5]. Access to drinking water is a constant struggle in Niger. Only 56% of the population has access to a safe water source, with a 7% increase in the supply of services between 2012 and 2015 [8]. These conditions compromise the survival of children but also their physical and mental development. According to the Demographic and Health and Multiple Indicator Survey IV, 14% of children suffered from diarrhea in the last two weeks prior to the survey in Niger [9]. However, despite the development and implementation of strategies to improve people's access to safe drinking water, hygiene and sanitation by the Government of Niger and its partners to reduce the risk of the disease. Diarrheal diseases remain a public health problem in our practice environment. Although several studies have been conducted in sub-Saharan Africa on water, hygiene and sanitation and risk factors associated with diarrheal diseases, no studies have been conducted in Niger. Hence the interest of this work, the objective of which was to determine the prevalence and risk factors of diarrheal diseases in children under 5 years of age in Niger in 2022.

Materials and Methods

Data source

The study used data from Niger's 2022 National Cross-Sectional Nutrition Survey according to Niger's SMART (Standardized Monitoring and Assessment of Relief and Transition) methodology, which are freely available on demand from the National Institute of Statistics of Niger.

Setting and period of the study

The survey was conducted throughout the national territory with regional representation for the 7 regions (Agadez, Diffa, Maradi, Tahoua, Tillabéry, Zinder and Niamey) and departmental representation for all departments in the Dosso region. Data collection took place from 20 August to 16 September 2022 in the seven (7) regions and from 2 to 27 September 2022 in the Dosso region.

Ethical approval and consent to participate

Ethical approval and consent of the participants were not particularly necessary for this study, which was a secondary analysis of publicly available survey data from the National Institute of Statistics (INS). We asked the INS who made the data available to us. However, the procedures approved by the NSO Review Committee for data for public use do not identify the respondents, households, or communities in the samples. In the data file made available to us, there was no household address or individual name. The identifiers only drill down to the level of the regional enumeration area as a whole.

Study population and sampling

Data collected on children aged 0 to 59 months made up the population of our study. All children aged 0 to 59 months (usual residents or visitors) who were in households at the time of the survey were included. A total of 10765 households were surveyed in the 620 clusters sampled. And the sample of our study were a subpopulation composed mainly of 9514 children aged 0 to 59 months.

In addition to detailed information on the sample, the methodology of the survey is published in the SMART Survey report at: rapport_smart_niger_2022_vf.pdf (stat-niger.org).

Study variables

The dependent variable in this study was diarrheal disease in the 2 weeks prior to the survey with its 2 modalities (yes and no). Independent variables included: socio-demographic characteristics and medical history of children 0-59 months (sex, age, birth order, region of residence, household size, number of children under 5 years of age per household, age of mothers and their level of education, acute respiratory infection and fever in the 14 days prior to the survey) health care system characteristics, mothers' practices and feeding of children aged 0-23 months (deworming in children aged 12-59 months, vitamin A supplementation in children aged 6-59 months, measles vaccination of children aged 9-59 months, washing mothers' hands before feeding children; mothers' hand washing before and after meals, mothers' hand washing after cleaning a child who has had a bowel movement, washing of mothers' hands after touching dirty objects, immediate breastfeeding, continued breastfeeding, children never breastfed).

Statistical analysis

Data were analyzed using SPSS version 25.0 software. Frequency and percentage were calculated for qualitative variables. Quantitative variables were expressed as mean and standard deviation. Bivariate analysis using the Pearson Chi2 test at the 5% significance level was performed between the dependent variable (diarrheal disease) and the selected variables. Variables that were significant (bilateral p-value <0.05) were introduced into the binary logistic regression model to identify risk factors for diarrheal disease in the children surveyed. An adjusted odds ratio (OR) with a 95% confidence interval was used to measure the strength and direction of the associations with a bilateral p-value < 0.05 indicating statistical significance.

Results

Frequency of diarrheal diseases in children

Of the 9514 children under 5 years of age collected, 1647 had had an episode of diarrhea in the 2 weeks preceding the survey, i.e. an estimated frequency of 17.3%.

Children's socio-demographic characteristics and medical history

The mean age was 28, 39 ± 16.48 months, 1980 (20.8%) were less than one year old and 50.1% (n = 4854) were male. The birth order was 1st in 6241 (65.6%) children. The region of residence of the children was in 43.54% (n = 4354), Dosso and Maradi in 7% (n = 662). The number of children under 5 years of age per household was 2 to 3 in 63.9% (n = 6079) and the household size was 2 to 5 persons in 45.7% (n = 4346). Among the mothers of the children surveyed, 9242 (97.1%) were married, 36 (0.4%) were single and 7634 (80.2%) were uneducated.

In the 14 days prior to the survey, 26% (n = 2476) had an acute respiratory infection (cough, difficulty breathing) and 2984 (31.4%) children had a fever (warmer than usual body).

Characteristics related to the health care system, mothers' practices and the feeding of children aged 0-23 months

Among children, 74.4% (n = 5538) were dewormed, 77.2% (n = 6606) were supplemented with vitamin A, and 78.3% (n = 6307) were fully vaccinated.

Mothers said they washed their hands before and after meals in 49.5% (n = 4710), those who washed their hands before feeding the respondents represented 26.8% (n = 2549). Hand washing after cleaning a child who had had a bowel movement was observed in 35.2% of mothers (n = 3352) and 37.1% (n = 3527) of mothers who washed their hands after touching dirty objects.

Among children under 2 years of age, 1879 (48.3%) were breastfed immediately, breastfeeding continued until 23 months in 90.4% (n = 3516) of the children, and 0.1% (n = 2) were never breastfed.

Bivariate analysis

Links between sociodemographic characteristics, respondents' medical history and diarrheal disease

There was a statistically significant association between: age of children (p-value <0.001), history of acute respiratory infection (p-value <0.001), fever in the 2 weeks prior to the survey (p-value <0.001) and diarrheal illness in this study (Table 1).

	Diarrheal disease		
Variables	**Yes n (%)**	**No n (%)**	**p-value**
Sex			0.733
Male	834 (50.6)	4020 (51.1)	
Female	813(49.4)	3847 (48.9)	
Age			<0.001
0-11 months	472 (28.7)	1508 (19.2)	
12-23 months	475 (28.8)	1454 (18.5)	
24-59 months	700 (42.5)	4905 (62.3)	
Birth order of children			0.14
1	1516 (92)	7125 (90.6)	
2-3	118 (7.2)	653 (8.3)	
4 and up	13 (0.8)	89 (1.1)	
Child under 5 years of age in the household			0.12
1	369 (22.4)	1870 (23.8)	
2-3	1057 (642)	5022 (63.8	
4 and up	221 (13.4	975 (12.4)	
Household size/ person			0.38
2-5	728 (44.2)	3618 (46.0)	
6-10	723 (43.9)	3369 (42.8)	
11 and over	196 (11.9)	880 (11.2)	

Marital status of mothers			0.67
Married	1599 (97.1)	7643 (97.2)	
Divorced	16 (1.0)	87 (1.1)	
Single	12 (0.7)	24 (0.3)	
Widow	20 (1.2)	113 (1.4)	
Level of education			0.17
None	1304(79.2)	6330 (80.5)	
Primary	185 (11.2)	841 (10.7)	
Secondary	150 (9.1)	632 (8.0)	
Upper	8 (0.5)	64 (0.8)	
Acute respiratory infection			<0.001
Yes	971 (59.0)	1505 (19.1)	
No	675 (41.0)	6359 (80.9)	
Fever			<0.001
Yes	1140 (69.2)	1844(23.5)	
No	507 (30.8)	6005 (76.5)	

Table 1: Associations between sociodemographic characteristics, children's medical history and diarrheal disease (bivariate analysis).

Links between health care system characteristics, maternal practices, feeding of children aged 0-23 months and diarrheal disease

Deworming of children aged 12-59 months ($p < 0.001$), vitamin A supplementation of children aged 6-59 months ($p < 0.001$), measles vaccination of children aged 9-59 months ($p < 0.001$), mothers' handwashing before and after meals (0.041), mothers' handwashing before feeding the child ($p < 0.001$), mothers' handwashing after washing a child who has had a bowel movement ($p < 0.001$) and immediate breastfeeding after delivery of children aged 0-23 months ($p = 0.01$) were statistically associated with diarrheal disease in this study (Table 2).

	Diarrheal disease		
Variables	**Yes n (%)**	**No n (%)**	**p-value**
Deworming			<0.001
Yes	807 (69.5)	4731 (75.4)	
No	354 (30.5)	1547 (24.6)	
Vitamin A supplement			<0.001
Yes	1074 (74.4)	5532 (78.6)	
No	370 (25.6)	1510 (21.4)	
Measles vaccination			<0.001
Yes	969 (73.6)	5338 (80.3)	
No	348 (26.4)	1313 (19.7)	
Hand washing before and after meals			0.041
Yes	853 (51.8)	3857 (49.0)	
No	794 (48.2)	4010 (51.0)	
Hand washing before feeding the child			<0.001
Yes	280 (17.0)	2269 (28.8)	
No	1367 (83.0)	5598(71.2)	
Hand washing after washing a child who has had a bowel movement			<0.001
Yes	403 (24.5)	2949 (37.5)	
No	1244 (75.5)	4918 (62.5)	
Washing hands after touching a dirty object			0.064
Yes	644 (39.1)	2883 (36.6)	
No	1003 (60.9)	4984 (63.4)	
Breastfeeding			0.01
Immediate	422(44.8)	1457 (49.5)	
Less than 24 hours	449 (47.7)	1325 (45.1)	
More than 24 hours	70 (7.5)	160 (5.4)	
Child breastfed at least once			0.618
Yes	947 (100)	0 (0.0)	
No	0 (0.0)	2 (100)	
Continued breastfeeding			0.612
Yes	849 (89.9)	280 (9.5)	
No	95 (10.1)	2667 (90.5)	

Table 2: Characteristics of the health care system, maternal practices, feeding of children aged 0-23 months and diarrheal disease (bivariate analysis).

Multivariate analysis

After logistic regression, the risk factors for diarrheal disease were: fever in the 2 weeks prior to the survey [ORA: 4.02; 95% CI (3.30-4.91), acute respiratory infection within 2 weeks prior to the survey [3.23; 95% CI (2.65-3.94)], mothers' failure to wash hands after washing the child who had had the bowel movements [ORA: 1.77; 95% CI (1.41-2.22)]. Failure to wash mothers' hands before and after meals [ORA: 0.74; 95% CI (0.61-0.90)], otherwise with an ORA < 1, hand washing before and after meals was then a protective factor for diarrhoeal disease [ORA: 1.35; 95% CI (1.11-1.63)] (Table 3).

Variables	Adjusted Odds Ratio (IC à 95%)	P-value
Fever		< 0.001
Yes	1	
No	4,02 (3.30-4.91)	
Acute respiratory infection		< 0.001
Yes	1	
No	3.23 (2.65-3.94)	
Hand washing before and after the meal		0.002
No	1	
Yes	0.74 (0.61-0.90)	
Hand washing after washing child who has had bowel movements		< 0.001
No	1	
Yes	1.77 (1.41-2.22)	

Table 3: Characteristics of children associated with diarrheal disease (multivariate analysis).

Discussion

The study determined the prevalence and identified risk factors for diarrheal diseases in children under 5 years of age. It appears from this work that the prevalence of diarrhoea in the 2 weeks preceding the survey was 17.3%. this prevalence is higher than those reported by the Sierra Leone [10], Indonesia [11] and Nigeria [12] study which were 14.9%, 14.4% and 11%, respectively. Our proportion is similar to those found by the study of South Africa [13] and Mali [14] which were 20% and 17% respectively. the prevalence of diarrhea was 28.6% in the Senegal study [15], a higher result than ours.

In bivariate analysis, the age of the children was statistically associated with diarrhea. Indeed, children aged 24 to 59 months had had at least one episode of diarrhea in the 2 weeks preceding the survey in 40.5%. The high proportion of diarrhea in this age group could be due to the introduction of other solid foods that could be contaminated. This could increase the risk of diarrhea in the future.

The association between acute respiratory infection in the 2 weeks prior to the survey and diarrheal disease was observed (p-value <0.001). In 51%, children who had the acute respiratory infection had had at least one episode of diarrhea in the 2 weeks preceding the survey. There was also a statistically significant association between fever in the 2 weeks prior to the survey (p-value <0.001) and diarrheal disease in our series. With 69.2% of cases of fever in children who had had diarrhea. Indeed, fever and respiratory infection are immunosuppressive. And children who are immunodeficiency are most at risk of diarrhea [16]. Regarding health system characteristics in bivariate analysis, deworming of children aged 12-59 months, vitamin A supplementation of children aged 6-59 months and measles vaccination of children aged 9-59 months were associated with diarrheal disease. These preventive actions protected children from diarrheal diseases in our series. They represent actions to be sustained. The fully vaccinated child received the measles and rota virus vaccine at the same time, which is responsible for more than 40% of young children's hospitalizations due to diarrhea worldwide [5]. The Guinea-Conakry study [17] also reported that measles vaccination protected children from diarrhea (ORa = 0.23; 95% CI: 0.12-0.24; p < 0.0001). Deworming makes it possible to eradicate helminths, the causal agent of diarrhea. Immediate breastfeeding after delivery was also associated with diarrheal disease in children 0-23 months in this study. Indeed, among the children breastfed immediately after birth, 1457 (77.5%) had not had a diarrheal episode in the 2 weeks preceding the survey. Babies who are not breastfed for the first six months of life are six times more likely to die from infectious diseases, including diarrhea, than those who breastfeed [5]. Anteneh., *et al*. in Ethiopia in 2017 [18], reported that not breastfeeding the child resulted in an increased risk of mortality from diarrhea compared to children aged 0 to 23 months put at the breast. Diarrhea was associated with washing the mothers' hands before and after meals, before feeding the child and after cleaning the child in this series. These results are consistent with those in

the literature [1,5]. Handwashing with soap reduces the incidence of diarrheal diseases by about 40% [5]. The Mali study [14] also found statistically significant links between diarrhea and mothers' handwashing before feeding (p = 0.02) and after washing children (p = 0.001). In multivariate analysis, fever in the 2 weeks prior to the survey increased the risk of diarrheal disease by 4 times in the study. Diarrhea and fever are symptoms most closely related to the immediate environment recognized in the literature [19,20]. However, diarrhea and fever can be concomitant without there being a link between these two symptoms. And the chronology of the appearance of these symptoms can also be multiple: The risk of diarrheal disease was 4 times higher in the case of respiratory infection, which was a comorbidity with diarrhea following the decline in the body's immunity. Children with weakened immune systems are at a higher increased risk of developing an acute respiratory infection. Weakened immune systems can be caused in infants by the absence of exclusive breastfeeding. Infants under six months of age who are exclusively breastfed and continue to be breastfed for up to two years of age and beyond have fewer infections and less severe illness than those who do not [5]. Failure to wash mothers' hands after washing the child who had a bowel movement increased the risk of diarrheal disease in children in our series by 1.77 times. And washing mothers' hands before and after meals protected 1.35 times higher from diarrheal disease [ORA: 1.35; 95% CI (1.11-1.63)]. Poor handwashing practices (ORA = 6,104 (2,100, 17,738)) were risk factors for diarrheal disease in the Ethiopia series as well [21]. Studies have reported that poor hygiene and sanitation, poor water quality, drinking water supply and storage problems have been identified as risk factors increasing the prevalence, morbidity and mortality of diarrheal diseases [22,23].

Conclusion

About one in five children included in this study had had an episode of diarrhea in the 2 weeks prior to the survey. Fever; Acute respiratory infection, lack of hand washing by mothers before and after meals were the factors that influenced the occurrence of diarrheal diseases in children. While mothers who washed mothers after cleaning children is a factor that may protect them from diarrheal disease. Diarrheal diseases remain a public health problem despite the actions taken to prevent and treat them. Strengthening prevention through vaccination, hygiene and sanitation practices, awareness raising and the promotion of exclusive breastfeeding is necessary in the fight against diarrhoeal diseases in children under 5 years of age.

Conflicts of Interest

The authors do not declare any conflict of interest.

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