Caregivers' knowledge of pneumonia and diarrhoea in children under-5 years in the Vhembe District, Limpopo Province

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Background. Caregivers play an important role in preventing and managing childhood illnesses by implementing the key family practices from the integrated management of childhood illnesses (IMCI) strategy. Their knowledge of diarrhoea and pneumonia prevention, appropriate homecare and when to seek medical attention is crucial in reducing morbidity and mortality from these conditions.
Objective. To assess caregivers' knowledge about pneumonia and diarrhoea in the Vhembe district.
Methods. The study employed a quantitative, descriptive and correlational design, and involved 201 caregivers of children under-5, conveniently selected from a community health centre in Vhembe District, Limpopo Province. Data were collected using a questionnaire and analysed with Stata software. Univariate and bivariate analyses were performed to examine the relationship between variables using Fischer's exact test.
Results. Guardians demonstrated knowledge that good personal hygiene (82.1%), fresh food (73.6%) and milk (66.7%) help prevent diarrhoea. They identified poor sanitation (78.6%) and inadequate nutrition (77.1%) as risk factors for diarrhoea, and knew it could be treated with an oral rehydration solution (77.6%) or an enema (28.4%). Caregivers knew that immunisation (78.1%), exclusive breastfeeding (69.2%) and sufficient nutrition (76.1%) could prevent pneumonia regardless of their education.
Conclusion. Regardless of educational level, most guardians were aware of the risk factors and treatment of diarrhoea and pneumonia. However, some were unaware of the dangers of using enemas to manage diarrhoeal diseases. Healthcare workers should ascertain caregivers' healthcare practices, discourage enema for diarrhoea and promote good practices.
Keywords. Caregivers; children under-five; diarrhoea, knowledge; pneumonia.

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Caregivers are integral members of the healthcare team and play a vital role in the holistic care of a sick child as they are uniquely familiar with all aspects of the child's life.[1] Caregivers include parents, aunts, uncles, grandparents, siblings and helpers who care for children under 5 years of age. Their role in healthcare falls under the community component of the integrated management of childhood illnesses (IMCI), which comprises four key childcare roles: improving physical growth and development, prevention of diseases, provision of appropriate care and seeking healthcare for childhood illnesses such as pneumonia and diarrhoea.[2,3] Pneumonia is an inflammatory lung condition that causes breathing difficulties and poor gas exchange. It typically presents with symptoms such as cough, difficulty breathing, fast breathing and lower-chest indrawing.[2,3] Diarrhoea is a symptom of a gastrointestinal infection and is transmitted through the faecal-oral route by ingesting contaminated food or liquids. The transmission risk is high in places with poor water and sanitation facilities. If not treated, diarrhoea can lead to severe dehydration and death.[4,5] To effectively prevent, manage and seek treatment for pneumonia and diarrhoea in children, caregivers need sufficient knowledge of the illness' risk factors, causes, clinical manifestations and preventive measures.[6]

Healthcare workers are responsible for ensuring that caregivers understand the child's condition through counselling and education during consultations. This empowers caregivers with the knowledge to promote health, implement preventive strategies and seek medical care when necessary. Community health workers further support this by educating caregivers on managing childhood illnesses including diarrhoea and pneumonia.[6] However, studies highlight a lack of caregiver knowledge about these childhood illnesses. In Saudi Arabia, most mothers attribute diarrhoea to teething.[7] Similarly, most caregivers in South Africa (SA) identified teething (95.5%), worm infection (62.8%), germ infection (93.2%) and poor hand hygiene (76.4%) as causes of diarrhoea.[4] Regarding pneumonia, caregivers in Badin lacked awareness of its cause,[8] while those in Uganda were less informed about its transmission, signs and symptoms.[3] Education level significantly influences caregiver knowledge. Caregivers with secondary education and higher were 11 times more likely to understand diarrhoea prevention and management in children under 5 years.[4] Similarly, caregivers with tertiary education were more knowledgeable about pneumonia than those without formal education.[3]

A lack of knowledge affects caregivers' ability to practise disease prevention measures, increasing children's susceptibility to illnesses such as diarrhoea and pneumonia. Furthermore, an inability to recognise when to seek childcare owing to insufficient knowledge often leads to delays, resulting in preventable health complications.[2,3] Such complications are among the leading contributors to high mortality rates in children under five years worldwide.[9,10]

In 2022, SA recorded 34.5 under-5 deaths per 1 000 live births,[11] with Limpopo Province reporting 18.6 under-5 deaths per 1 000.[12] According to the District Health Barometer, pneumonia cases in

SA increased from 19.1 per 1 000 under-5 deaths in 2021 to 25.1 in 2022. Among the cases, 10.6 per 1 000 under-5s were admitted, and 0.2 died, representing a fatality rate of 1.5%. In Limpopo Province, pneumonia affected 13.0 per 1 000 under-5s, with 9.6 hospitalised and 0.3 dying, resulting in a case fatality rate of 2.6%–higher than the national rate. Furthermore, Limpopo province recorded a higher pneumonia-related mortality rate for children under 5 years compared with the Northern Cape, KwaZulu-Natal, Free State, Gauteng, Northwest, and Western Cape, where rates were below 2.5%.[13] Therefore, assessing caregiver knowledge of pneumonia and diarrhoea in the low-resource, rural district of Vhembe, SA, is crucial for generating evidence to inform targeted health literacy interventions relevant to the local contexts.

Methods

Study setting, design, population and sampling

The study employed a quantitative, descriptive and correlational design. The study was conducted at the Community Health Centre (CHC) in Thulamela Municipality, Vhembe District, Limpopo Province. This 24-hour facility provides a comprehensive primary health care (PHC) package including maternal and child health. The facility was selected based on its accessibility to researchers. According to Statistic SA, Vhembe district has an under-5 population of 192 224, with Thulamela Municipality accounting for 34.6% (n=66 588).[14] The CHC's under-five headcount of 714, based on the 2021 District Health Information System data,[15] was used as a proxy to estimate the target population of caregivers. The sample size was calculated using the Raosoft online sample calculator (Raosoft Inc., USA) with a 95% confidence interval (CI), a 5.5% margin of error and a 50% response distribution, yielding a representative sample size of 220.[16] Convenience sampling was applied to select caregivers aged 18 years and older who brought under-5 children to the facility. Eligible caregivers were those who lived with the child and spent at least 12 hours caring for them. Caregivers could include parents, aunts, uncles, grandparents, siblings and domestic helpers. Caregivers of children presenting with symptoms of severe illness such as lethargy were excluded to avoid delaying treatment.

Data were collected after obtaining permission from the Department of Health, Vhembe District. Researchers contacted the facility manager to arrange and schedule dates for data collection. They visited the facility on alternate days from June to July 2022, recruiting 24 caregivers per visit from the waiting room while they awaited child health service. Those who agreed to participate were taken to a private room and assisted in completing the consent form before data collection. Data were collected in a private room provided by the manager using a structured questionnaire. The researchers assisted participants who could not read or write by conducting interviews and clarifying terminology as needed. A total of 242 questionnaires were distributed to account for a 10% buffer; and 218 were returned. Of these, 17 were incomplete and excluded from the analysis. A total of 201 questionnaires were fully completed, yielding an 83% response rate.

Data collection tool

The questionnaire was prepared based on a review of the relevant literature and reviewed by a statistician for professional input.[4,7,17] It was written in English and Tshivenda, the predominant languages spoken in the district. The questionnaire comprised 17 closed-ended questions, divided into three sections. Section A collected demographic data including sex, age, relationship to the child, level of education and employment status. Section B focused on caregivers' knowledge of diarrhoea prevention, risk factors (labelled as 'causes' on the questionnaire clarity) and treatment for children under 5 years. Knowledge was assessed using a 3-point Likert scale ('agree', 'neutral', 'disagree') to gauge their agreement with statements on prevention, causes and management of diarrhoea. Similarly, Section C assessed knowledge of pneumonia prevention, presentation and management using the same 3-point Likert scale. The questionnaire was pre-tested on ten caregivers at the same facility who were excluded from the primary study. Minor revisions were made to the questionnaire after the pre-test.

Ethical considerations

The Research Ethics Committee of Sefako Makgatho Health Sciences University granted ethical clearance (ref no. SMUREC/H/334/2021#). The Limpopo Provincial Department of Health, the Vhembe district manager and the operational managers of the selected PHC facility granted permission to conduct the research. Written consent was obtained from all respondents, and the questionnaire was completed anonymously. The study adhered to the ethical principles of self-determination, confidentiality and justice.

Data analysis

Data from 201 completed questionnaires were captured in Microsoft Excel (Microsoft Corp., USA), coded and cleaned according to the structure of the questionnaire. Stata 17.0 (Stata Corp, USA) was used to analyse the data. Each variable was analysed separately, and frequencies and percentages were calculated for categorical variables. Bivariate analysis was performed to examine the relationships between two categorical variables using the χ^2 test, or Fischer's exact test for values less than five.

Results

Sociodemographic characteristics of caregivers

Most (97.0%) of the enrolled caregivers were women, with the largest group (40.3%) aged between 26 and 35 years. Most (64.2%) were mothers of the children. The majority (76.6%) had attended some level of formal schooling (between grades 1 and 12), while 18.9% were graduates with at least a higher education qualification (higher certificate, diploma, bachelor's degree or higher). The unemployment rate was 84.1% (Table 1).

Caregivers' knowledge of diarrhoea prevention, risk factors/causes and management in children under five

Most caregivers agreed that diarrhoea in children under 5 years could be prevented through good hand hygiene (82.1%), provision of freshly cooked meals (73.6%) and freshly prepared milk (66.7%). A similar proportion agreed that diarrhoea can be caused by poor sanitation (78.6%) and poor nutrition (77.1%). Respondents also agreed that diarrhoea can be managed with oral rehydration solution (77.6%) and that it can result in dehydration if untreated (80.1%). Significant differences were observed in caregiver knowledge based on education level. A higher percentage of caregivers with education between grades 1 and 12 (77.3%) and graduates (86.8%) agreed that diarrhoea could be caused by poor nutrition (p=0.026). Similarly, a significant percentage of caregivers with an education level between grades 1 and 12 (79.9%) and graduates (78.9%) agreed that poor sanitation such as a lack of clean water and toilets (p=0.05) can cause diarrhoea. Furthermore, more than half (56.5%, p=0.001) of caregivers with education between grades 1 and 12 disagreed that diarrhoea can be treated with medicinal enemas (Table 2).

Table 1. Sociodemographic characteristics of caregivers (*N*=201, 100%)

Characteristics	*n* (%)
Sex	
Male	6 (3.0)
Female	195 (97.0)
Age (years)	
18 - 25	50 (24.9)
26 - 35	81 (40.3)
36 - 45	35 (17.4)
46 - 55	18 (8.9)
>55	17 (8.5)
Relationship to child	
Mother	129 (64.2)
Father	3 (1.5)
Aunt	45 (22.4)
Grandmother	22 (10.9)
Other next-of-kin	2 (1.00)
Level of education attained	
Illiterate	4 (2.0)
Informal education	5 (2.5)
Grades 1-12	154 (76.6)
Graduate	38 (18.9)
Employment status	
Employed	32 (15.9)
Unemployed	169 (84.1)

Caregivers' knowledge of pneumonia prevention, presentation and management in children under five

Most caregivers agreed that pneumonia could be prevented through immunisation (78.1%), exclusive breastfeeding (69.2%), adequate nutrition (76.1%), reduction of indoor pollution (72.6%) and good hygiene (80.1%). A significant proportion of illiterate caregivers (75.0%, p=0.030) and those with an educational level between grades 1 and 12 (77.9%, p=0.030) agreed that pneumonia can be prevented by reducing indoor air pollution. Across all educational levels, more than 80% (p=0.049) of caregivers agreed that pneumonia presents with cough and fast breathing and requires medical treatment (Table 3).

Discussion

Regardless of educational level, most respondents in this study recognised that good hand hygiene and feeding the child with freshly prepared milk and food reduce the risk of diarrhoea. They also understood that poor sanitation and inadequate nutrition increase the risk of diarrhoeal disease. These findings align with those from similar studies conducted in Pakistan[8] and Senegal,[18] where caregivers attributed the risk of diarrhoea in children to poor personal hygiene, poor environmental sanitation and contaminated food and water. However, the findings contradict those of a SA study that found that most caregivers with tertiary education were less knowledgeable about the risk factors and causes of diarrhoea.[4]

The study did not find a significant association between caregivers' knowledge of using oral rehydration solutions to manage diarrhoea and their level of education. Most caregivers, regardless of education, were aware that diarrhoea can be managed with oral rehydration solutions. This contrasts with a study in Ethiopia,[5] where caregivers with formal education (primary level and above) were more likely to know about the use of oral rehydration solutions compared with illiterate caregivers.

More than half (56.5%) of caregivers with education levels between grades 1 and 12 disagreed that diarrhoea can be managed with enema. However, it is concerning that approximately one-third (28.4%) of caregivers in this study agreed that an enema can be used to treat diarrhoea. The finding aligns with a study in Nigeria,[19] where 8.9% of mothers of children under five years reported using enemas for diarrhoea, and with another study in KwaZulu-Natal,[20] where 89.0% of mothers used enemas for children under 3 months. The use of enemas to treat diarrhoea is not recommended, as it causes more dehydration, electrolyte imbalances and severe recto-anal injuries. A SA case report[21] revealed two devasting injuries from home use of enemas in children under five years: a necrotic rectum and burns to the perineum and rectum.

Most caregivers knew that diarrhoea could cause dehydration if untreated. Dehydration results from the loss of body fluids and electrolytes through loose stools. Proper oral rehydration treatment resolves more than 90.0% of cases of mild dehydration, while severe dehydration requires intravenous fluid replacement. Failure to effectively manage dehydration can lead to shock and death, significantly increasing child mortality.[22]

The study found no significant difference between the educational level of caregivers and their knowledge of pneumonia prevention. Over 60.0% of caregivers recognised that pneumonia can be prevented through immunisation, exclusive breastfeeding, adequate nutrition and good personal hygiene. Similarly, most caregivers in Uganda understood that lack of immunisation and poor sanitation predispose children to pneumonia.[3] However, these findings contrast with a study in Kenya,[2] where less than 10.0% of caregivers knew that inadequate breastfeeding, undernutrition and lack of vaccination are risk factors for pneumonia. Instead, 94.5% attributed pneumonia to exposure to cold weather, believing that avoiding cold air and drinks could prevent the disease. Similarly, the misconception that cold air is a risk factor for pneumonia was reported in a Nigerian study.[23]

Interestingly, most illiterate caregivers and those with primary and secondary education in this study were aware that reducing indoor pollution can help prevent pneumonia. This contrasts with findings from Kenya, where only 7.7% of caregivers recognised indoor pollution as a risk factor for pneumonia.[2] Similar to the Kenyan study, where most caregivers identified cough as a sign of pneumonia,[2] 90.5% of caregivers in the present study knew that coughing and fast breathing are signs of pneumonia and require medical treatment, irrespective of their educational level.

The findings of this study differ from those in Kenya[2] and Uganda,[3] where higher educational levels among caregivers were associated with greater knowledge of pneumonia among caregivers. In the present study, the lack of significant difference in caregivers' knowledge of diarrhoea and pneumonia across educational levels may be attributed to the communities' access to health education provided by community healthcare workers (CHWs). SA has implemented ward-based primary care outreach teams (WBPHCOTs) consisting of multidisciplinary teams and CHWs who conduct home visits. These CHWs play a pivotal role in promotive and preventive healthcare by educating caregivers on preventing and managing childhood illnesses and ensuring referral for immunisation.[24-26]

Study limitations

This study has several limitations. First, it assessed only the level of caregiver's knowledge without exploring the source of the knowledge and how caregivers applied it to maintain their children's health.

Table 2. Caregivers' knowledge about diarrhoea prevention, risk factors and management in children under five years

Diarrhoea in children under five years	Educational level: Illiterate, *n* (%)	Informal education, *n* (%)	Grades 112, *n* (%)	Graduate, *n* (%)	Total, *n* (%)	*p*-value
Can be prevented by good hand hygiene/washing of hands before preparing food						0.309
Agree	4 (100)	2 (40.0)	124 (80.5)	35 (92.1)	165 (82.1)	
Neutral	0	1 (20.0)	5 (3.2)	1 (2.6)	7 (3.5)	
Disagree	0	2 (40.0)	25 (16.2)	2 (5.3)	29 (14.4)	
Can be prevented by giving the child freshly prepared milk						0.073
Agree	2 (50.0)	2 (40.0)	107 (69.5)	23 (60.5)	134 (66.7)	
Neutral	1 (25.0)	1 (20.0)	7 (4.5)	8 (21.1)	17 (8.5)	
Disagree	1 (25.0)	2 (40.0)	40 (26.0)	7 (18.4)	50 (24.9)	
Can be prevented by giving the child freshly cooked meals						
Agree	1 (25.0)	2 (40.0)	117 (76.0)	28 (73.6)	148 (73.6)	0.106
Neutral	1 (25.0)	1 (20.0)	7 (4.6)	5 (13.2)	14 (7.0)	
Disagree	2 (40.0)	2 (40.0)	30 (19.5)	5 (13.2)	39 (19.4)	
Can be caused by poor sanitation/ no clean water for drinking and toilets						0.050
Agree	3 (75.0)	2 (40.0)	123 (79.9)	30 (78.9)	158 (78.6)	
Neutral	1 (25.0)	1 (20.0)	6 (3.9)	3 (7.9)	11 (5.5)	
Disagree	0	2 (40.0)	25 (16.2)	5 (13.2)	32 (15.9)	
Can be caused by giving herbal medicinal enema						0.309
Agree	1 (25.0)	2 (40.0)	78 (50.6)	14 (36.8)	95 (47.3)	
Neutral	2 (50.0)	1 (20.0)	37 (24.0)	16 (42.1)	56 (27.9)	
Disagree	1 (25.0)	2 (40.0)	39 (25.3)	8 (21.1)	50 (24.9)	
Can be caused by poor nutrition/not feeding the child food with good nutrients						0.026
Agree	2 (50.0)	1 (20.0)	119 (77.3)	33 (86.8)	155 (77.1)	
Neutral	1 (25.0)	2 (40.0)	10 (6.5)	3 (7.9)	16 (8.1)	
Disagree	1 (25.0)	2 (40.0)	25 (16.2)	2 (5.3)	30 (14.9)	
Can be treated in the healthcare facility						0.043
Agree	2 (50.0)	3 (60.0)	99 (64.3)	17 (44.7)	121 (60.2)	
Neutral	1 (25.0)	2 (40.0)	14 (9.1)	3 (7.9)	20 (10.0)	
Disagree	1 (25.0)	0	41 (26.6)	18 (47.4)	60 (29.9)	
Can be managed with an oral rehydration solution						0.164
Agree	4 (100)	4 (80.0)	124 (80.5)	24 (63.2)	156 (77.6)	
Neutral	0	1 (20.0)	17 (11.0)	10 (26.3)	28 (13.9)	
Disagree	0	0	13 (8.4)	4 (10.5)	17 (8.5)	
Can be managed by giving an enema						0.001
Agree	0	3 (60.0)	47 (30.5)	7 (18.4)	57 (28.4)	
Neutral	2 (50.0)	2 (40.0)	20 (13,0)	14 (36.8)	38 (18.9)	
Disagree	2 (50.0)	0	87 (56.5)	17 (44.7)	106 (52.7)	
It can result in dehydration if untreated						0.261
Agree	3 (75.0)	4 (80.0)	127 (82.5)	27 (71.1)	161 (80.1)	
Neutral	1 (25.0)	1 (20.0)	10 (6.5)	5 (13.2)	17 (8.5)	
Disagree	0	0	17 (11.0)	6 (15.8)	23 (11.4)	

The study obtained an 83% (*n*=201) response rate, which was lower than the required sample size of 220 for population representation. Additionally, grouping educational levels broadly into the 'grade 1 to 12' category may have influenced the correlational findings between education level and knowledge. Finally, the lack of significant differences in knowledge among caregivers could be explained by the low proportion of respondents who were illiterate (2%) or had informal education (2.5%).

Conclusion

The study found that most caregivers had good knowledge of the prevention, risk factors, and management of diarrhoea and pneumonia, regardless of educational level. However, this raises the possibility that while caregivers may possess knowledge, they may not consistently apply it in practice. This gap could contribute to the persistently high mortality rates among children under five years owing to complications from diarrhoea and pneumonia. A critical

Table 3. Caregivers' knowledge about pneumonia prevention, presentation and management in children under five (*N*=201, 100%)

Pneumonia in children under 5 years	Illiterate, *n* (%)	Informal education, *n* (%)	Grades 1 - 12, *n* (%)	Graduate, *n* (%)	Total, *n* (%)	*p*-value
Can be prevented by immunisation						0.287
Agree	4 (100)	3 (60.0)	125 (81.2)	25 (65.8)	157 (78.1)	
Neutral	0	1 (20.0)	13 (8.4)	9 (23.7)	23 (11.4)	
Disagree	0	1 (20.0)	16 (10.4)	4 (10.5)	21 (10.4)	
Can be prevented by exclusive breastfeeding/giving only breastmilk to the child younger than six months						0.616
Agree	4 (100)	2 (40.0)	107 (69.5)	26 (68.4)	139 (69.2)	
Neutral	0	0	17 (11.0)	5 (13.2)	22 (10.9)	
Disagree	0	3 (60.0)	30 (19.5)	7 (18.4)	40 (19.9)	
Can be prevented by adequate nutrition/ feeding the child food with good nutrients						0.474
Agree	3 (75.0)	2 (40.0)	120 (77.9)	28 (73.7)	153 (76.1)	
Neutral	1 (25.0)	1 (20.0)	13 (8.4)	6 (15.8)	21 (10.4)	
Disagree	0	2 (40.0)	21 (13.6)	4 (10.5)	27 (13.4)	
Can be prevented by reducing indoor air pollution						0.030
Agree	3 (75.0)	2 (40.0)	120 (77.9)	21 (55.3)	146 (72.6)	
Neutral	1 (25.0)	0	12 (7.8)	8 (21.1)	21 (10.4)	
Disagree	0	3 (60.0)	22 (14.3)	9 (23.7)	34 (16.9)	
Pneumonia can be prevented by good hand hygiene/washing of hands before preparing food						0.389
Agree	4 (100.0)	3 (60.0)	123 (79.9)	31 (81.8)	161 (80.1)	
Neutral	0	1 (20.0)	10 (6.5)	3 (7.9)	14 (7.0)	
Disagree	0	1 (20.0)	21 (13.6)	4 (10.5)	26 (38.3)	
Pneumonia can be prevented by administering herbal medication						0.507
Agree	1 (25.0)	3 (60.0)	62 (40.3)	11 (28.9)	77 (38.3)	
Neutral	2 (50.0)	1 (20.0)	26 (16.9)	12 (31.6)	41 (20.4)	
Disagree	1 (25.0)	1 (20.0)	66 (42.9)	15 (39.5)	83 (41.3)	
Cough and fast breathing are signs of pneumonia						0.049
Agree	4 (100)	4 (80.0)	142 (90.3)	35 (92.1)	182 (90.5)	
Neutral	0	0	9 (5.8)	3 (7.9)	12 (6.0)	
Disagree	0	1 (20.0)	6 (3.9)	0	7 (3.5)	
A child with pneumonia needs medical treatment						0.049
Agree	4 (100)	4 (80.0)	142 (90.3)	35 (92.1)	182 (90.5)	
Neutral	0	0	9 (5.8)	3 (7.9)	12 (6.0)	
Disagree	0	1 (20.0)	6 (3.9)	0	7 (3.5)	

concern is the lack of awareness regarding the dangers of enemas in managing diarrhoea, emphasising the need for targeted health education and counselling from healthcare providers. In addition to counselling, health departments should initiate strategies to enhance and support good health practices at home. Potential strategies include establishing peer support groups and organising community engagement initiatives to reinforce child health practices.

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Data availability statement. The data generated and analysed during the current study are available from the corresponding author upon reasonable request.

Conflicts of interest. None.

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