

Community knowledge, Perceptions and Care-seeking Behaviour for Childhood Pneumonia among Caregivers in Oyo State, Nigeria: A Mixed-Methods Study

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Background: Childhood pneumonia remains a leading cause of under-five mortality in Nigeria. There are inequities in health system responsiveness, shaped by caregivers' knowledge, perceptions, and socioeconomic context that influence timely care seeking. This study examined community knowledge, perceptions, and care-seeking behaviours in Oyo State, Nigeria.

Methods: A mixed-methods study grounded in the Health Belief Model was conducted in three LGAs across the senatorial districts of Oyo State. Quantitative data were collected through structured questionnaires from 1,154 women aged 15–49, selected using a multi-stage sampling approach. Qualitative data were obtained through 12 key informant interviews, 7 household in-depth interviews, and 3 focus group discussions. Quantitative data were analysed using descriptive statistics, Chi-square test and Logistic regression at $p < 0.05$, while the qualitative data were analysed thematically.

Results: Most caregivers recognised pneumonia symptoms such as cough (87.4%), fever (79.1%), and catarrh (71.5%). However, only 18% linked pneumonia to indoor smoke exposure and 8.2% to aspiration during childbirth, indicating low awareness of biomedical risk factors. Women who were married (OR=2.702; 95% CI: 1.535–4.759) and engaged in business (OR=2.420; 95% CI: 1.206–4.857) were more likely to seek hospital care than those who were single-mother and unemployed respectively. Despite this, qualitative findings revealed strong reliance on traditional remedies, spiritual beliefs, and the influence of elder women in care decisions. Rural caregivers reported more delays due to financial and physical barriers, and a stronger preference for herbal treatments.

Conclusion: While caregivers commonly recognised pneumonia symptoms, critical gaps exist in knowledge of biomedical causes and prevention. Socioeconomic status, geography, and cultural beliefs have a significant influence on care-seeking. Interventions should integrate culturally sensitive health education, improve access to rural health services, and promote maternal education to enhance pneumonia prevention and child survival outcomes.

Keywords: Childhood pneumonia, caregivers' attitude and practises, health seeking behaviour, traditional remedies, mixed method research

Introduction

Pneumonia remains the leading infectious cause of mortality among children under five worldwide, accounting for over 739,000 deaths in 2022 (WHO, 2022). Although progress has been made, the burden of childhood pneumonia is disproportionately concentrated in low- and middle-income countries, where poverty, malnutrition, limited access to healthcare, and environmental risks heighten vulnerability (UNICEF & IVAC, 2023). Sub-Saharan Africa

continues to record some of the highest pneumonia mortality rates, reflecting persistent inequities in child health interventions and health system responsiveness.

Nigeria is one of the ten countries with the highest number of childhood pneumonia deaths, with the disease responsible for an estimated 19% of all under-five mortality nationally (UNICEF, 2020). While interventions outlined in the Global Action Plan for the Prevention and Control of Pneumonia and Diarrhoea (GAPPD) exist, their

uptake remains suboptimal. Household air pollution from biomass fuels, overcrowded living conditions, and poor ventilation continue to intensify the risk of pneumonia, particularly in rural and peri-urban areas (Jafta *et al.*, 2025; WHO, 2024). Within Oyo State, variations in environmental exposures, cultural practices, socioeconomic status, and access to healthcare contribute to uneven patterns of recognition and management of childhood pneumonia.

Existing Nigerian studies have predominantly focused on the biomedical, clinical, and epidemiological aspects of pneumonia (King *et al.*, 2022; Oyegoke *et al.*, 2021; Ogunsemowo *et al.*, 2018). Far fewer studies have explored the socio-cultural beliefs, household decision-making processes, and community-level perceptions that influence early recognition and timely care-seeking (Bakare *et al.*, 2020; Okafor *et al.*, 2021). Misconceptions – such as associating pneumonia with exposure to cold air, teething, or spiritual attacks – remain common and continue to shape caregivers' responses to illness (Saunders, 2024). However, most of this evidence is fragmented, region-specific, and rarely linked to behavioural frameworks that explain why caregivers' actions often deviate from biomedical recommendations.

Another important gap is the scarcity of mixed-methods research that integrates quantitative patterns of knowledge and health-seeking behaviour with qualitative insights into cultural norms, gender roles, maternal autonomy, and the influence of community actors such as traditional healers, grandmothers, and patent medicine vendors. In Oyo State, where rural and urban conditions differ markedly, such comprehensive evidence is limited. Understanding these contextual realities is crucial for developing culturally aligned interventions that strengthen community-level pneumonia control.

This study addresses these gaps by examining caregivers' knowledge, perceptions, and management practices of childhood pneumonia across three Local Government Areas (LGAs) in Oyo State using a mixed-methods approach grounded in the Health Belief Model (HBM). The HBM provides a useful theoretical lens for understanding how caregivers' perceptions of susceptibility, severity, benefits, barriers, cues to action, and self-efficacy shape treatment decisions and health-seeking behaviour.

This study contributes to the literature by providing context-specific, theory-informed evidence on how caregivers recognise pneumonia symptoms, interpret its causes, and navigate between traditional and biomedical treatment options across rural, semi-urban, and urban settings in Oyo State. By integrating quantitative and qualitative data, the study offers a nuanced understanding of the socio-cultural and structural factors influencing care-seeking and highlights geographic inequities that are often overlooked in national pneumonia studies. The findings offer practical insights to guide culturally responsive health education, community engagement, and policies aimed at reducing pneumonia morbidity and mortality.

Based on these gaps, this study aimed to:

1. Assess caregivers' knowledge and recognition of childhood pneumonia symptoms;
2. examine caregivers' perceptions of the causes and prevention of childhood pneumonia;
3. explore household and community factors influencing treatment-seeking behaviours; and
4. analyse how socio-demographic and geographic differences shape pneumonia management across the three LGAs.

Guided by the Health Belief Model, the study integrates quantitative and qualitative evidence to explain how caregivers' beliefs, perceived risk, and structural constraints influence health-seeking practices for childhood pneumonia.

Methodology

This study adopted a cross-sectional mixed-methods design, integrating both quantitative and qualitative approaches to explore community perceptions and management practices related to childhood pneumonia in Oyo State, Nigeria. The quantitative component consisted of a structured household survey, while the qualitative component comprised in-depth interviews, key informant interviews, and household panel discussions. This triangulation of data sources enabled a deeper understanding of not only what caregivers know about pneumonia but also how their beliefs and practices influence treatment decisions.

Study Setting

The study was conducted in Oyo State, located in the south-western region of Nigeria. The state is divided into three senatorial districts - Oyo North, Oyo Central, and Oyo South—with a mix of urban, semi-urban, and rural communities. This diversity in geography and population dynamics offers a representative view of community health experiences in Oyo state, Nigeria.

Three Local Government Areas (LGAs) were purposively selected across the three senatorial districts, based on childhood pneumonia prevalence data provided by the Oyo State Ministry of Health (2014). According to these records, Saki West (in Oyo North) had the highest reported prevalence of pneumonia among children under five, followed by Ibadan North (in Oyo South), while Afijio (in Oyo Central) had one of the lowest reported rates. This selection allowed the study to capture both high- and low-burden areas, facilitating comparative insights into community perceptions and management practices of childhood pneumonia across different epidemiological contexts.

Study Population and Eligibility Criteria

Quantitative Component

The study population for the quantitative survey consisted of mothers and primary caregivers of children under five years of age residing in selected households within the three LGAs.

Inclusion Criteria

Participants were eligible if they:

1. were mothers or primary caregivers of at least one child under five years;
2. had resided in the community for at least six months;
3. were aged 15–49 years; and
4. provided informed consent.

Qualitative Component

Participants for the qualitative interviews included: mothers of under-five children, grandmothers, traditional healers, community leaders, patent medicine vendors, nurses, and physicians.

Inclusion Criteria

Participants were included if they:

1. had direct experience with child care, health provision, or community health roles;
2. had lived or worked in the community for ≥ 1 year;
3. were willing to participate and provided informed consent.

Sampling Procedure

Quantitative Sampling

A multistage sampling technique was employed:

1. **Stage 1:** Purposive selection of the three LGAs.
2. **Stage 2:** Random selection of two wards per LGA.
3. **Stage 3:** Systematic sampling of streets and enumeration areas.
4. **Stage 4:** Systematic sampling of households, with one eligible caregiver selected per household.

A total of 1,154 caregivers completed the questionnaire.

Qualitative Sampling

Purposive sampling was used to select participants for:

- 12 Key Informant Interviews (KIIs),
- 7 In-depth Interviews (IDIs), and
- 3 Household Panel Interviews (HPIs).

Selection was guided by the principles of maximum variation and data saturation.

Operational Definition of Childhood Pneumonia

For this study, childhood pneumonia was defined according to the WHO Integrated Management of Childhood Illness (IMCI) guidelines as caregiver-reported episodes characterised by:

- cough and/or difficult breathing plus
- fast breathing for age or
- signs such as chest in-drawing, inability to feed, or convulsions.

Because diagnosis relied on caregiver recall, the term “self-reported pneumonia symptoms” is used to distinguish these from clinically confirmed cases.

Data Collection Instruments

Quantitative Instrument

Data were collected using a structured, interviewer-administered questionnaire divided into five sections: Socio-demographic characteristics, Knowledge of pneumonia symptoms, Perceived causes and prevention, Health-seeking behaviour and treatment practices, Household environment and risk factors.

Instrument Development and Validation:

- Items were adapted from previous pneumonia-related studies (Bakare *et al.*, 2020; Ndu *et al.*, 2015) and IMCI guidelines.
- The questionnaire was reviewed by experts in medical sociology and child health to ensure **content validity**.
- A pilot test was conducted among 50 caregivers in a non-study LGA to assess clarity and relevance.
- Cronbach's alpha values ranged from 0.72 to 0.84, indicating acceptable internal consistency.

Qualitative Instruments

Semi-structured interview guides were developed for KIIs, IDIs, and HPIs. The guides explored: cultural meanings of pneumonia, symptom recognition, perceived causes and risk factors, traditional treatment practices, barriers to formal care, and household decision-making dynamics. The guides were reviewed by qualitative research experts and pretested to ensure contextual appropriateness.

Data Collection Procedures

Data collection occurred between March and December 2018. Trained research assistants conducted face-to-face interviews in either English or Yoruba, depending on the participant's preference. All qualitative interviews were audio-recorded with permission and supplemented with field notes. Each session lasted 45–60 minutes.

Data Analysis

Quantitative Analysis: Data were entered into SPSS version 22. Analysis included: descriptive statistics (frequencies, means, and proportions), cross-tabulations, and logistic regression to identify factors associated with health-seeking behaviour.

Qualitative Analysis

Interviews were transcribed verbatim and analysed thematically using a manual coding approach.

Analysis involved: Familiarisation with transcripts, development of initial codes, Grouping of codes into themes, and Interpretation of themes in relation to the HBM and quantitative findings. Themes were triangulated with quantitative data to enhance depth and validity.

Trustworthiness of Qualitative Data

To ensure scientific rigour, the following strategies were used:

- **Credibility:**
Triangulation across interview types (IDIs, KIIs, HPIs), prolonged engagement, and member-checking with selected participants.
- **Dependability:**
Detailed documentation of data collection processes and peer debriefing sessions among the research team.
- **Transferability:**
Thick descriptions of the study context, sampling, and participant characteristics are provided for applicability to similar settings.

Ethical Considerations

Ethical approval was obtained from the University of Ibadan Social Sciences and Humanities Research Ethics Committee (Ref: UI/SSHEC/2017/0020). Community entry permissions were granted by local authorities. Written and verbal informed consent were obtained from all participants. Confidentiality and anonymity were strictly maintained.

Rewritten Results (Socio-Demographic Section) Results Section –

A total of 1,154 respondents participated in the survey across the 3 LGAs. Saki West (430), Afijio (318), and Ibadan North (406). Table 1 presents the socio-demographic characteristics of respondents.

The mean age of respondents was 28.3 ± 7.3 years. Most caregivers were between 25 and 34 years, with Ibadan North having the highest proportion of younger mothers aged 15–24 years, while Afijio had more respondents aged 35 years and above. No respondent in the study fell within the 45–49-year age group.

Most caregivers were married (91.9%), predominantly of Yoruba ethnicity (91.3%), and almost equally distributed between Christianity (49.8%) and Islam (50.0%). Educational attainment varied widely across LGAs: Saki West had the

highest proportion of caregivers without formal education (21.9%), while Ibadan North had the highest proportion with tertiary education (41.4%).

Household income levels differed significantly, with low-income households constituting the majority in Saki West and Afijio, while medium- and high-income households were more common in

Ibadan North. Occupation also varied, with artisans and traders accounting for the majority of respondents across all LGAs.

Overall, the demographic distribution illustrates clear rural–urban differences in socioeconomic status, education, and age structure among caregivers.

Table 1: Socio-demographic Characteristics of the Respondents

Demographic variables	Response categories	Respondents' LGA			Total (n=1154)
		Saki West (n=430)	Afijio (n=318)	Ibadan North (n=406)	
Age	15 – 19	34 (7.9)	10 (3.1)	59 (14.5)	103 (8.9)
	20 – 24	89 (20.7)	46 (14.5)	112 (27.6)	247 (21.4)
	25 – 29	138 (32.1)	89 (28.0)	143 (35.2)	370 (32.1)
	30 – 34	100 (23.3)	78 (24.5)	75 (18.5)	253 (21.9)
	35 – 39	59 (13.7)	76 (23.9)	17 (4.2)	152 (13.2)
	40 – 44	10 (2.3)	19 (6.0)	0 (0.0)	29 (2.5)
	45+	-	-	-	-
	Mean age	28.47±7.13	31.43±7.94	25.76±5.76	28.33±7.28
Number of children	0	-	-	-	-
	1	92 (21.4)	86 (27.0)	80 (19.7)	258 (22.4)
	2	122 (28.4)	108 (34.0)	106 (26.1)	336 (29.1)
	3	111 (25.8)	73 (23.0)	96 (23.6)	280 (24.3)
	4	74 (17.2)	41 (12.9)	96 (23.6)	211 (18.3)
	5+	31 (7.2)	10 (3.1)	28 (6.9)	69 (6.0)
Marital Status	Single-parent	43 (10.0)	6 (1.9)	8 (2.0)	57 (4.9)
	Married	374 (87.0)	289 (90.9)	398 (98.0)	1061 (91.9)
	Separated/divorce/widow	13 (3.0)	23 (7.2)	0 (0.0)	36 (3.1)
Ethnic group	Yoruba	401 (93.3)	299 (94.0)	354 (87.2)	1054 (91.3)
	Igbo	18 (4.2)	13 (4.1)	52 (12.8)	83 (7.2)
	Hausa	1 (0.2)	3 (0.9)	0 (0.0)	4 (0.3)
	Other ethnic groups	10 (2.3)	3 (0.9)	0 (0.0)	13 (1.1)
Religion	Christianity	91 (21.2)	212 (66.7)	272 (67.0)	575 (49.8)
	Islam	338 (78.6)	105 (33.0)	134 (33.0)	577 (50.0)
	Traditional	1 (0.2)	1 (0.3)	0 (0.0)	2 (0.2)
Educational Level	No formal education	94 (21.9)	6 (1.9)	73 (18.0)	173 (15.0)
	Primary	150 (34.9)	62 (19.5)	96 (23.6)	308 (26.7)
	Secondary	128 (29.8)	195 (61.3)	69 (17.0)	392 (34.0)
	Tertiary	58 (13.5)	55 (17.3)	168 (41.4)	281 (24.4)
Occupation	Unemployed	26 (6.0)	13 (4.1)	4 (1.0)	43 (3.7)
	Artisan	145 (33.7)	105 (33.0)	209 (51.5)	459 (39.8)
	Business/trader	239 (55.6)	154 (48.4)	153 (37.7)	546 (47.3)
	Auxiliary Nurse	14 (3.3)	13 (4.1)	26 (6.4)	53 (4.6)
	Teaching	6 (1.4)	9 (2.8)	14 (3.4)	29 (2.5)
	Self-employed	0 (0.0)	24 (7.5)	0 (0.0)	24 (2.1)
Income level	Low income	313 (72.8)	228 (71.7)	115 (28.3)	656 (56.8)
	Medium income	92 (21.4)	82 (25.8)	236 (58.1)	410 (35.5)
	High income	25 (5.8)	8 (2.5)	55 (13.5)	88 (7.6)
Marriage type	Monogamy	221 (51.4)	263 (82.7)	397 (97.8)	484 (76.3)
	Polygyny	209 (48.6)	55 (17.3)	9 (2.2)	273 (23.7)
Husband's educational level	No formal education	61 (14.2)	7 (2.2)	35 (8.6)	103 (8.9)
	Primary	120 (27.9)	43 (13.5)	70 (17.2)	233 (20.2)
	Secondary	151 (35.1)	184 (57.9)	81 (20.0)	416 (36.0)
	Tertiary	98 (22.8)	84 (26.4)	220 (54.2)	402 (34.8)

Knowledge and Perception of Pneumonia Symptoms Local Terminologies and Perceived Causes of Pneumonia

Caregivers and community members described pneumonia using culturally rooted terms such as:

- “Iba-ategun” (Yoruba): loosely translated as "cold-induced fever."

- Otutu – Igbaya (Yoruba) translated as a cold-induced fever that affects the chest region.
- “Iba gidi”: serious fever or life-threatening illness.

The study revealed varying beliefs about the causes of childhood pneumonia among respondents. While some caregivers correctly linked the illness to environmental and biological factors, others attributed it to cultural or spiritual explanations. When asked about their knowledge of childhood pneumonia symptoms, many

respondents were able to identify at least one symptom. As shown in Table 2, the most commonly mentioned symptoms included cough (92.1%), fever (91.2%) and catarrh (85.6%). Less frequently mentioned symptoms included difficulty breathing (12.7%) and chest indrawing (7.9%). Only a small proportion of respondents mentioned convulsion (8.6%), which may reflect under-recognition of severe illness progression.

Table 2: Percentage Distribution by Knowledge of Childhood Pneumonia Symptoms

S/N	Knowledge of symptoms	Respondents' LGA			Total (n=1154)
		Saki West (n=430)	Afijio (n=318)	Ibadan North (n=406)	
a.	Cough and Catarrh	383 (89.1)	305 (95.9)	375 (92.4)	1063 (92.1)
b.	Fever – High Temperature	394 (91.6)	283 (89.0)	375 (92.4)	1052 (91.2)
c.	Running nose/catarrh	401 (93.3)	253 (79.6)	334 (82.3)	988 (85.6)
d.	Difficulty in breathing	24 (5.6)	30 (9.4)	93 (22.9)	147 (12.7)
e.	Mild chest in-drawing	34 (7.9)	4 (1.3)	53 (13.1)	91 (7.9)
f.	Convulsion	38 (8.8)	9 (2.8)	52 (12.8)	99 (8.6)
g.	Inability to breastfeed or eat	56 (13.0)	14 (4.4)	85 (20.9)	155 (13.4)

Qualitative narratives supported these findings, with several caregivers reporting awareness of respiratory difficulties and fever as warning signs. A mother in Ibadan North remarked:

The only way I can recognise and differentiate pneumonia from malaria and other sicknesses is when the child has a terrible cough, catarrh, fever and difficult breathing. Particularly if a child is wheezing and the chest movement is not stable and there is difficulty to breathe very well. Then I know the sickness is more than just malaria, the child has pneumonia, so I take them to the hospital straight away. I don't take chances at all. Because I have had a terrible experience with my second child, thank God we were already at the hospital when the child started convulsing. I was told he had severe pneumonia. He was placed on drips and was admitted in the hospital for some days. *(FGD with mothers of children under-five, Ibadan, age 38 years, mother of four children)*

This finding is also corroborated by the responses from the household in-depth interview. For example; a mother at an in Ekokan in Shaki West LGA explained:

That abnormal breathing or difficult breathing is a major sign of pneumonia. When mothers observe this in their children along with other symptoms like fever and shivering, it is usually confirmed that the child has pneumonia. *(IDI, Saki/ age 41years)*

Also some key informant in the community sighted some symptoms (swollen legs, swollen stomach and cheeks, overweight, etc.) that were unrelated to the biomedical symptoms of pneumonia. A key informant Elewe-omo (traditional herbs seller) rightly said:

‘Otutuigbaya’ and ‘ile tutu’ are interrelated as both of them tend to cause the complication of convulsion if not properly treated. A common symptom of ile-tutu (Convulsion) is profuse sweating, usually, this shows that the child is having much difficulty with breathing. Some children may have discharge from the eye, and you can observe that such children are heavy and overweight. These are the common symptoms of *ile-tutu* and *otutuigbaya*. The child may or may not have fever. So when you observe these

symptoms in a child you quickly administer herbs (agbo-ile tutu). The child will take the herbs after every 3-4 days or once in a week or twice in a month depending on the severity of the illness. (Ibadan North LGA, KII with "Eleweomo"- traditional herbs seller age 42 and she has been on the business for 15 years)

Findings from the KII above show that traditional herb sellers were able to recognise the symptoms of pneumonia in a sick child; these symptoms, however, are not usually mentioned by caregivers. These symptoms include profuse sweating, which may be a sign of difficulty breathing, discharge from the eyes, and convulsions. These reports suggest a fair level of symptom recognition, although the majority of caregivers' understanding of danger signs remains limited.

Perception of the cause of childhood Pneumonia

The respondents were first asked the perceived causes of childhood pneumonia. Table 3 displayed the percentage distribution of the respondents by the perceived causes of childhood pneumonia. Sixty per cent of the respondents perceived pneumonia to be caused by exposure to colds or cold weather. This is understandable in the sense that literature reveals that the incidence of pneumonia typically peaks during the harmattan and rainy seasons. Usually, during the harmattan or rainy seasons, many households keep their windows locked because of the cold weather. However, this can result in poor ventilation as the exhaled carbon dioxide may not be replaced by fresh air. The situation gets worse if the number of people sleeping in the room is large. Thus, this condition has the tendency to increase a child's susceptibility to pneumonia and other airway and bone respiratory infections.

Table 3: Perceived cause of childhood Pneumonia by Caregivers

S/N	Perceived causes of childhood pneumonia	Respondents by LGAs			Total
		Saki West	Afijio	Ibadan North	
1	Exposure to cold weather	282 (65.6)	288 (85.1%)	183 (45.1%)	753 (65.3%)
2	Eating of sand	52 (12.1%)	3 (0.9%)	89 (21.9%)	144 (12.5%)
3	Dust	53 (12.3%)	11 (3.5%)	52 (12.8%)	116 (10.1%)
4	Pregnancy and childbirth-related conditions	22 (5.1%)	6 (1.9%)	67 (16.5%)	95 (8.2%)
5	Smoke or smoking	13 (3.0%)	0 (0.0%)	5 (1.2%)	18 (1.6%)
6	Dirty environment	6 (1.4%)	3 (0.9%)	5 (1.2%)	14 (1.2%)
7	Don't know	2 (0.5%)	7 (2.2%)	5 (1.2%)	14 (1.2%)
**	TOTAL	430 (100%)	318 (100%)	406 (100%)	1154 (100%)

Chi Square = 294.631, DF = 14, P=0.000

Quantitatively, only 1.6% of respondents identified exposure to smoke as a cause of pneumonia. However, qualitative findings provided deeper insight into this perception. A grandmother in Afijio noted:

Exposure to smoke from a burning substance or moving cars can predispose our children to pneumonia. Men who are heavy smokers are many in this vicinity... This little girl has pneumonia; her mother's shop is beside a beer parlour where we have chain smokers. (HP11, Grandmother, Age 63, Afijio)

Another theme that emerged was the perception that pneumonia may result from complications during childbirth, particularly when newborns inhale fluid during delivery. This view was supported by 8.2% of survey respondents and expanded upon interviews. One mother shared:

Pneumonia can be implicated if a child takes in water into the lungs during birth... I had this experience with my first child... We were told she had pneumonia and sepsis. (IDI, Female, 39 years, Afijio, 2018)

A paediatrician interviewed at Adeoyo Hospital, Ibadan, further corroborated this:

There are many cases of bronchopneumonia in neonates, especially children who were force-fed or placed on infant formula. Some of them aspirate the feed, and this may lead to pneumonia. (KII, Female, Medical Doctor, 2019)

In addition to biomedical and environmental causes, some respondents expressed cultural and supernatural beliefs, suggesting that pneumonia could result from a curse, exposure to “cold air,” or a spiritual attack, especially when the condition persisted or was unresponsive to hospital treatment.

These findings show that caregivers draw from both indigenous and biomedical frameworks in interpreting the causes of pneumonia, with implications for how and where they seek treatment.

Community Views on the Prevention of Pneumonia

As revealed in Table 4, the majority of the survey participants believe that pneumonia in children can be prevented. Only less than one-tenth held the view that it could not be prevented. When asked

about specific prevention strategies, about a quarter of the respondents (56.3%) mentioned keeping babies warm or wearing a cardigan as a way to prevent pneumonia. Others identified feeding children hot food and warm water (25.7%) as a protective measure. A smaller proportion cited the use of herbs (7.6%), and self-medication (5.8%) as preventive approaches.

Qualitative findings supported these perceptions. Many caregivers believed that exposing children to cold air or not dressing them properly could lead to pneumonia. In rural communities, preventive practices were deeply embedded in cultural routines, such as wrapping babies tightly, administering local herbs, and restricting exposure to nighttime air.

A mother in Saki West explained:

Pneumonia comes when a child is not kept warm. If a baby sleeps naked during harmattan, cold will enter the chest. That is how it starts.

These findings suggest that although community members acknowledge that pneumonia is preventable, their prevention strategies are largely shaped by cultural beliefs rather than biomedical guidelines, as stipulated by the 2013 Global Action for the prevention and control of Pneumonia. This gap presents an opportunity for targeted health education that reinforces accurate preventive behaviours.

Table 4: Distribution of the Respondents by the Perceived Method of Preventing Childhood Pneumonia

S/N	Perceived method of preventing childhood pneumonia	Respondents by LGAs			Total
		Saki West	Afijio	Ibadan North	
1	By giving the child hot food and warm water	159 (37.0%)	20 (6.6%)	88 (21.7%)	267 (23.4%)
2	Keeping babies warm	108 (25.1%)	122 (40.3%)	104 (25.6%)	334 (29.3%)
3	By wearing cardigan	127 (29.5%)	132 (43.6%)	48 (11.8%)	307 (27.0%)
4	Herbs	28 (6.5%)	7 (2.3%)	98 (24.1%)	133 (11.7%)
5	Self-medication	8 (1.9%)	22 (7.3%)	68 (16.7%)	98 (8.6%)

Treatment Seeking Behaviour and Traditional Management Practices

While 64.5% of caregivers reported seeking care at formal health facilities, 19.9% used herbal remedies, and 15.6% practiced self-medication. Variations existed by LGA:

Saki West: Highest use of traditional treatments and delays in care due to transport and cost barriers.

Ibadan North: More frequent use of pharmacies and private clinics.

Afijio: Home remedies and advice from elder women were commonly used before formal care was considered.

Respondents reported diverse approaches to treating childhood pneumonia, reflecting both biomedical and traditional healthcare systems. Many caregivers indicated that they would first attempt home-based or traditional remedies before visiting a health facility, particularly in rural areas such as Saki West and Afijio. A few respondents reported using both simultaneously or sequentially.

Qualitative interviews revealed a rich array of traditional treatment practices, including:

- “Agbo ile-tutu” – a cold herbal decoction used to “cool the body” and relieve chest congestion.
- Garlic (*Allium sativum*) – either ingested raw or added to hot water for steam inhalation.
- Steam therapy – involving mentholated rubs (e.g., Robb) and chest massage with hot water.
- Herbal mixtures – made from leaves such as *ewe mafowokanomo mi*, *ewe okooko*, and bark extracts from mango or cashew trees (*epoigi mango*).
- Lime, palm kernel oil, and cow urine – mixed with *ayu* (a bitter extract) and administered orally to induce vomiting or purging.

These remedies were often used intermittently and sometimes alongside prescribed drugs.

A grandmother in Ibadan North remarked:

When my grandson had pneumonia, we gave him agbo and used Robb to rub his chest. When he didn’t get better, we went to the health centre. The nurse gave him injections.

A number of respondents in urban areas like Ibadan North reported prompt health facility use, often due to better awareness and access. In contrast, in more rural locations, reliance on herbs

and spiritual interpretation of illness delayed biomedical care.

These findings reflect a pluralistic health-seeking culture, shaped by socio-economic factors, physical access to care, cultural norms, and perceived effectiveness of treatments.

Socioeconomic and Demographic Influences on Care-seeking

Statistical analysis in Table 5 revealed that those whose children were 4 years old were 1.6 times more likely to use modern health care facilities than those who were 1 year and below in the management of childhood pneumonia. Similar analysis was revealed in the number of children a mother has. Those who had 4 children were 1.6 times more likely to use modern health care facilities than those who had 1 children. This result suggests that the number of children is a predictor of health care facilities utilization in the management of childhood pneumonia.

In the analysis of the relationship between marital status and the use of health care facilities, the mothers who were married were 2.7 times more likely to use modern health care facilities in the management of childhood pneumonia than those who were single-mother. This implies that women who were married is a strong predictor in the utilization of health care facilities.

In the analysis of ethnic group membership and the use of health care facilities, although the majority of the respondents were Yoruba by ethnicity, yet there was no statistically significant association between ethnicity and the use of health care facilities in the management of childhood pneumonia while religion and education had no statistical association between health care facilities utilization, mother’s occupation has been found to be statistically significant with the utilization of health care facilities.

Table 5: Influence of socio-economic and demographic characteristics on the use of health care facilities

Socio-demographic variables	Response categories	Health Care Facilities		Regression Model
		Traditional Care	Modern Care	Odds Ratio
Mother’s Age	15 – 19 (RC)	27 (12.3)	72 (9.1)	1.000
	20 – 24	42 (19.2)	177 (22.3)	1.580 [.907 – 2.755]
	25 – 29	73 (33.3)	261 (32.9)	1.341 [.803 – 2.239]

	30 – 34	51 (23.3)	166 (20.9)	1.221 [.710 – 2.099]
	35 – 39	20 (9.1)	97 (12.2)	1.819 [.946 – 3.497]
	40 – 44	6 (2.7)	20 (2.5)	1.250 [.454 – 3.445]
Child's Age	1 (RC)	61 (27.9)	168 (21.2)	1.000
	2	62 (28.3)	227 (28.6)	1.329 [.886 – 1.995]
	3	51 (23.3)	196 (24.7)	1.395 [.912 – 2.135]
	4	35 (16.0)	157 (19.8)	1.629* [1.019 – 2.604]
	5	10 (4.6)	45 (5.7)	1.634 [.776 – 3.443]
Number of children	1 (RC)	59 (26.9)	162 (20.4)	1.000
	2	62 (28.3)	227 (28.6)	1.333 [.885 – 2.008]
	3	51 (23.3)	196 (24.7)	1.400 [.912 – 2.149]
	4	35 (16.0)	157 (19.8)	1.634* [1.019 – 2.620]
	5	12 (5.5)	51 (6.4)	1.548 [.772 – 3.104]
Marital Status	Single-mother (RC)	22 (10.0)	32 (4.0)	1.000
	Married	188 (85.8)	739 (93.2)	2.702* [1.535 – 4.759]
	Separated/divorced	9 (4.1)	22 (2.8)	1.681 [.652 – 4.331]
Ethnic groups	Yoruba (RC)	204 (93.2)	715 (90.2)	1.000
	Igbo	13 (5.9)	68 (8.6)	1.492 [.808 – 2.756]
	Hausa	0 (0.0)	2 (0.3)	-
	Other ethnic group	2 (0.9)	8 (1.0)	-
Religion	Christianity (RC)	106 (48.4)	366 (46.2)	1.000
	Islam	113 (51.6)	425 (53.6)	1.089 [.807 – 1.470]
	Traditionalist	0 (0.0)	2 (0.2)	-
Education	No formal education (RC)	28 (12.8)	141 (17.8)	1.000
	Primary	65 (29.7)	219 (27.6)	.669 [.409 – 1.093]
	Secondary	67 (30.6)	238 (30.0)	.705 [.433 – 1.149]
	Tertiary	59 (26.9)	195 (24.6)	.656 [.398 – 1.081]
Occupation	Unemployed (RC)	14 (6.4)	24 (3.0)	1.000
	Artisan	79 (36.1)	323 (40.7)	2.385* [1.180 – 4.820]
	Business/Traders	94 (42.9)	390 (49.2)	2.420* [1.206 – 4.857]
	Auxiliary	16 (7.3)	33 (4.2)	1.203 [.494 – 2.928]
	Teaching	13 (5.9)	10 (1.3)	.449 [.156 – 1.289]
	Self-employed	3 (1.4)	13 (1.6)	2.528 [.612 – 10.436]

Figures in parenthesis are in %; Significant at $P < 0.05^*$ or 0.01^{**} ; RC=Reference Category

Those who were artisans and traders were 2.3 and 2.4 times more likely to use modern health care facilities than those who were unemployed. This could be explained in the fact that those who were

Recognition of Pneumonia Symptoms Versus Knowledge of Risk Factors

This mixed-methods study examined caregivers' knowledge, perceptions, and management practices for childhood pneumonia across three LGAs in Oyo State, using the Health Belief Model (HBM) as a guiding framework. The findings reveal that while most caregivers recognised common symptoms of

artisans and traders would have the resources at their disposal to cater for the cost of the health needs of their children who require either treatment or management of pneumonia.

childhood pneumonia – such as cough, fever, and catarrh – there was a significant gap in understanding its biomedical risk factors. Only 18% of respondents associated pneumonia with indoor air pollution or smoke exposure, and just 8.2% linked it to neonatal aspiration. Recognition of critical danger signs - such as chest indrawing and difficulty breathing - was low. This partial awareness is consistent with previous studies from

Nigeria and other LMICs, which similarly report high recognition of basic respiratory symptoms but poor understanding of life-threatening indicators (Ndu *et al.*, 2015; Bakare *et al.*, 2023). Caregivers acknowledge that their children can fall ill, but may not recognise the risk of severe or fatal pneumonia. This low recognition of severe symptoms may explain delays in hospital presentation, especially when caregivers perceive the child's condition as mild or attribute symptoms to common illnesses such as malaria or "cold." When danger signs are not understood as serious, caregivers are less likely to perceive pneumonia as an urgent threat, resulting in prolonged use of home-based or traditional remedies. This is particularly evident in rural settings, where knowledge gaps often coincide with limited access to healthcare.

Perceived Causes, Cultural Interpretations, and Perceived Severity

Caregivers' interpretations of pneumonia included a mix of biomedical and culturally rooted beliefs. While some caregivers associated pneumonia with exposure to cold weather, dust, or heredity, relatively few linked it to clinically established risk factors such as indoor smoke exposure, poor ventilation, or neonatal aspiration. This pattern of mixed interpretations aligns with evidence from earlier qualitative studies in Nigeria showing that pneumonia is often conceptualised through local idioms such as "iba-otutu" or "ilera tutu," which emphasise coldness as the underlying cause (Bakare *et al.*, 2020; Saunders, 2024).

Under the HBM, these beliefs shape perceived severity. For instance, when pneumonia is attributed to exposure to cold air or teething, caregivers may not consider it a serious biomedical condition requiring prompt formal care. Instead, cultural perceptions reinforce the notion that pneumonia can be effectively treated with warmth, herbal mixtures, or spiritual interventions. The belief that pneumonia may result from a spiritual attack or complications during childbirth further illustrates how cultural causation models influence both severity perceptions and care-seeking pathways.

Such beliefs, although culturally meaningful, can discourage caregivers from recognising biomedical risk factors, thereby limiting opportunities for prevention and early detection.

Treatment-seeking Behaviour, Perceived Benefits, and Perceived Barriers

Caregivers displayed pluralistic healthcare practices, relying on both traditional remedies and formal health facilities. This pluralism is influenced by their perceptions of the benefits and barriers of biomedical treatment – two critical HBM constructs.

Caregivers perceived biomedical care as beneficial, especially when symptoms worsened or when they recognise respiratory difficulty. Educated caregivers and urban residents, in particular, were more likely to identify the benefits of hospital treatment, consistent with studies linking maternal education to improved child health outcomes (Bakare *et al.*, 2020).

However, multiple perceived barriers shaped treatment-seeking behaviour:

- Financial constraints (cost of transportation, consultation, and treatment).
- Physical access challenges, particularly in rural LGAs with limited health facilities.
- Household decision-making structures, where mothers often deferred to elder women.
- Negative past experiences with health facilities (long waits, staff attitudes).
- Preference for culturally familiar remedies, such as herbs, steam inhalation, garlic mixtures.

These barriers reduced the likelihood of prompt biomedical care. Traditional remedies were often perceived as more accessible, faster, and aligned with locally understood disease models. Even when caregivers were aware of the benefits of hospital care, perceived barriers—especially in rural communities—delayed or prevented its timely use.

Socio-demographic and Geographic Factors as Modifying Influences

The HBM recognises modifying factors – such as education, income, age, and environment – that influence health beliefs and behaviours. In this study, these structural determinants played a central role.

Caregivers with post-secondary education were significantly more likely to seek timely hospital care, reflecting a greater ability to interpret symptoms and understand the consequences of delayed treatment. Higher-income households also

reported fewer delays, indicating that economic resources strengthen caregivers' capacity to overcome structural barriers.

Geographic disparities further shaped health behaviour. Rural caregivers in Saki West and Afijio were disadvantaged by lower health literacy, fewer health facilities, longer travel distances, and greater reliance on traditional medicine. These findings mirror broader evidence on rural–urban inequities in Nigeria's child health outcomes (Okafor *et al.*, 2021).

Taken together, these factors suggest that pneumonia management is not merely a matter of knowledge or awareness, but is embedded within broader social, cultural, and economic realities that modify caregivers' health behaviour.

Implications for Policy and Practice

The findings reveal the need for pneumonia interventions that are both culturally responsive and structurally inclusive. Interventions must strengthen community health literacy while acknowledging caregivers' belief systems, household power dynamics, and reliance on traditional health actors. Health education should incorporate local terminologies and explanations that resonate with caregivers' worldviews, especially in rural contexts.

Engaging influential community actors – including grandmothers, traditional healers, and patent medicine vendors – can help provide accurate cues to action, a key HBM construct. Strengthening rural health infrastructure, improving affordability of services, and expanding community-based outreach are also essential for reducing delays in care. Policy efforts must therefore integrate behavioural insights with structural interventions to improve pneumonia outcomes.

Strengths and Limitations

This study's mixed-methods design is a major strength, allowing integration of quantitative patterns with rich qualitative narratives that illuminate deeply rooted beliefs and contextual factors. The use of the HBM enhances the explanatory power of the findings. However, reliance on self-reported symptoms poses the possibility of recall bias, and pneumonia cases were not clinically verified. Nonetheless, the qualitative insights provide strong contextual validity.

Conclusion

This study demonstrates that caregivers' management of childhood pneumonia in Oyo State is shaped by a combination of biomedical knowledge, cultural interpretations, socioeconomic constraints, and structural barriers. While basic symptom recognition is high, understanding of biomedical causes and adherence to globally recommended preventive measures remained limited.

Rural caregivers, in particular, faced greater barriers to formal care and were more reliant on traditional remedies, often under the influence of family elders. These pluralistic health practices must be acknowledged in health programming.

Using the Health Belief Model, the study highlights how caregivers' perceptions of susceptibility, severity, benefits, and barriers interact with modifying factors to shape care-seeking behaviour.

To effectively reduce pneumonia-related morbidity and mortality, interventions must blend biomedical education with culturally informed strategies that reflect local realities.

Recommendations

The following actionable recommendations are proposed:

1. **Strengthen Culturally Tailored Health Education:**

Develop and implement pneumonia education campaigns that incorporate local languages, cultural references, and community influencers to bridge gaps in biomedical understanding.

2. **Engage Traditional Healers and Elders:**

Partner with traditional health actors and family elders to encourage early referral and discourage harmful practices, fostering trust in biomedical services.

3. **Expand Access in Underserved Areas:**

Scale up rural health infrastructure, mobile clinics, and community-based outreach to reduce delays in care and improve pneumonia outcomes.

4. **Invest in Maternal Education and Health Literacy:**

Support adult education and antenatal health literacy programmes that empower women to

make informed health decisions for their children.

5. Support Integration of Safe Traditional Remedies:

Conduct further research into commonly used traditional remedies to inform safe, culturally appropriate guidelines that complement biomedical care.

Declarations

Ethics Approval and Consent to Participate

This study received ethical approval from the University of Ibadan Social Sciences and Humanities Research Ethics Committee (UI/SSHEC/2017/0020). Informed verbal and written consent were obtained from all study participants prior to data collection.

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

The authors declare that they have no competing interests.

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Authors' Contributions

- **Emmanuel Oluwaseun Toluwalase** conceptualised the study, led data collection, and wrote the first manuscript draft.
- **Omololu Olugboyega Olufemi and Adegoke Olufunke O.** contributed to the study design and data interpretation, and manuscript review.
- **Ayinmoro Aboluwaji Daniel** assisted with quantitative analysis and manuscript revision.
- **Adejumo Adebayo Olayiwola** provided critical review and validation of behavioural and psychosocial frameworks.

All authors reviewed and approved the final manuscript.

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