

Assessment of Caregivers Hygiene Practices and Preschoolers Health in Public ECCE/Creche Centers in Calabar Educational Zone, Cross Rivers State

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Abstract

Hygiene practices in Early Childhood Care and Education (ECCE)/crèche centres are essential for supporting healthy child development and preventing hygiene-related illnesses; however, inadequate infrastructure and suboptimal practices remain significant public health concerns in Nigeria. This study assessed caregivers' hygiene knowledge and practices, determined the prevalence of hygiene-related health outcomes among preschoolers, identified barriers to effective hygiene practices, and examined improvement strategies in public ECCE/crèche centres in the Calabar Education Zone of Cross River State, Nigeria. A descriptive cross-sectional survey was conducted among a population comprising 1,756 caregivers and 16,038 preschoolers across 439 public ECCE/crèche centres. Using multistage sampling, 391 participants—111 caregivers and 280 preschoolers—from 49 centres were selected. Data were collected using three researcher-developed instruments: the Caregivers' Hygiene Knowledge and Practices Questionnaire, Preschoolers' Health Assessment Checklist, and Environmental Hygiene Observation Checklist. Responses from 105 caregivers and health assessments of 268 preschoolers were analysed using frequencies, percentages, and chi-square tests at a significance level of .05. The findings showed that caregivers had an average level of hygiene knowledge and generally demonstrated satisfactory hygiene practices. Nevertheless, hygiene-related illnesses were fairly prevalent among

preschoolers, with respiratory tract infections and diarrhoeal diseases occurring more frequently than other conditions. Environmental assessments revealed inadequate sanitation facilities, handwashing infrastructure, potable water supplies, and waste-management systems across several centres. Significant associations were found between caregivers' hygiene knowledge and practices ($\chi^2 = 27.52$, $p < .05$), educational qualifications and hygiene practices ($\chi^2 = 16.55$, $p < .05$), and environmental hygiene conditions and hygiene-related illnesses among preschoolers ($\chi^2 = 15.73$, $p < .05$). These findings demonstrate that caregivers' knowledge alone is insufficient without supportive environmental conditions and adequate hygiene infrastructure. Strengthening caregiver training, improving sanitation and hygiene facilities, reinforcing monitoring systems, and increasing government investment in school health programmes are therefore essential for reducing hygiene-related illnesses and improving preschoolers' health and well-being in public ECCE/crèche centres.

Keywords: Caregiver Hygiene; Early Childhood Care and Education; Environmental Sanitation; Hygiene-Related Illnesses; Preschoolers

INTRODUCTION

Early Childhood Care and Education (ECCE) and crèche centres are globally recognized as critical platforms for fostering the holistic development of children aged 0–5 years, encompassing cognitive, socio-emotional, and physical growth (UNICEF, 2022). Within the Nigerian context, public ECCE and crèche centres assume heightened importance as they predominantly serve children from low-income households who may lack access to adequate care environments at home (Oguntona & Adebayo, 2023). These centres therefore function not only as educational spaces but also as health-promoting environments where the quality of caregiving practices directly influences child wellbeing.

A central dimension of quality care in early childhood settings is hygiene. Hygiene practices—ranging from personal cleanliness of caregivers, sanitation of facilities, safe food handling, and waste disposal—are pivotal determinants of child health outcomes (World Health Organization, 2023). Preschool-aged children are biologically vulnerable due to their developing immune systems, frequent hand-to-mouth behaviours, and high levels of interaction with peers in shared environments (Adewale, 2024). Consequently, lapses in hygiene within caregiving contexts have been consistently associated with increased incidence of communicable diseases such as diarrhoea, respiratory tract infections, helminth infestations, and dermatological conditions (Eze et al., 2023). These illnesses not

only compromise immediate health but also affect school readiness, attendance, and long-term developmental trajectories.

In low-resource settings such as Calabar Educational Zone of Cross River State, Nigeria, structural challenges compound these risks. Limited access to clean water, inadequate sanitation infrastructure, overcrowded facilities, and insufficient caregiver training create conditions where poor hygiene practices are more likely to occur (Nwankwo & Igboke, 2023). Despite the recognized importance of hygiene in ECCE environments, empirical evidence assessing caregivers' hygiene behaviours and their direct relationship to preschoolers' health outcomes in Nigerian public centres remains sparse. Existing studies have largely focused on general child health indicators or parental practices at home, leaving a critical gap in understanding the institutional caregiving dimension.

This study therefore seeks to address this gap by systematically assessing hygiene practices among caregivers in public ECCE/crèche centres within the Calabar Educational Zone of Cross River State, and examining their implications for preschoolers' health. By situating caregiver behaviours within the broader context of infrastructural limitations and child vulnerability, the research aims to generate evidence that can inform policy interventions, targeted caregiver training, and health promotion strategies tailored to early childhood environments. Ultimately, the findings are expected to contribute to strengthening Nigeria's early childhood care framework, reducing preventable morbidity among preschoolers, and advancing the nation's commitments to child rights and sustainable development goals.

Statement of the problem

Public ECCE/crèche centres in Cross River State play a significant role in early childhood development; however, anecdotal reports and preliminary field observations suggest poor hygiene practices among caregivers, including inconsistent handwashing, inadequate sanitation of play and eating spaces, and improper disposal of waste. These practices may be contributing to persistently high incidences of communicable diseases among preschoolers in these settings.

Globally and within sub-Saharan Africa, poor hygiene in early childhood care environments is a well-documented risk factor for diarrhoeal diseases and other infections, which remain leading causes of morbidity and mortality among young children (World Health Organization, 2023). For instance, studies in similar contexts have found that

children under five in care centres with unsanitary conditions are two to three times more likely to experience diarrhoea compared with those in cleaner environments (Mensah&Agyeman, 2023). In Nigeria, research indicates that ECCE facilities with inadequate hygiene practices record higher rates of absenteeism and child illness, undermining learning and developmental outcomes (Umar& Musa, 2024).

Despite the urgency of these concerns, there is limited empirical evidence on the hygiene practices of caregivers specifically within public ECCE/crèche centres in Calabar Educational Zone of Cross River State. Existing studies, such as that of Okoro and Agboola (2023), have focused broadly on school hygiene but did not disaggregate findings for early childhood settings or link caregiver behaviours directly to child health outcomes. This knowledge gap impedes targeted policy formulation and the design of context-responsive health interventions.

Therefore, this study is justified on the grounds that generating robust, locality-specific data on caregivers' hygiene practices and associated preschooler health outcomes will:

- i. Illuminate critical hygiene deficiencies within care environments.
- ii. Provide evidence for capacity-building of caregivers in infection prevention practices.
- iii. Inform ECCE policy and public health strategies in Cross River State and similar low-resource settings

The Objectives of the study

The main goal of this study is to assess the relationship between caregivers' hygiene practices and the health status of preschoolers in public ECCE/crèche centres in Calabar Educational Zone of Cross River State.

Specific objectives include:

- i. To examine the level of hygiene knowledge among caregivers in public ECCE/crèche centres.
- ii. To examine the level of hygiene practices among caregivers in public ECCE/crèche centres.
- iii. To determine the prevalence of common hygiene-related health outcomes (such as diarrhoea, respiratory infections, and skin conditions) among preschoolers in these centres.
- iv. To assess the anthropometric and General Health Status of Preschoolers attending public ECCE/Creche Centers in Calabar Educational Zone, Cross River State

- v. To determine the Environmental Hygiene Conditions of Public ECCE/Crèche Centres in Calabar educational zone, Cross River State
- vi. To identify barriers to effective hygiene practices among caregivers in ECCE/crèche centres.
- vii. To provide recommendations for improving hygiene practices and child health outcomes in early childhood care settings in Cross River State.

Research Questions

The following research questions were poised to guide the study

- i. What is the hygiene knowledge of caregivers in public ECCE/Creche centers in Calabar Educational Zone, Cross River State?
- ii. What are the hygiene practices of caregivers in public ECCE/Creche centers in Calabar Educational Zone, Cross River State?
- iii. What is the prevalence of hygiene – related health outcomes among preschoolers attending public ECCE/Creche Centers in Calabar Educational Zone, Cross River State?
- iv. What are the Anthropometric and General Health Status of Preschoolers attending public ECCE/Creche Centers in Calabar Educational Zone, Cross River State?
- v. What are the Environmental Hygiene Conditions of Public ECCE/Crèche Centres in Calabar educational zone, Cross River State?
- vi. What barriers influence caregivers' adoption of appropriate hygiene practices in public ECCE/Creche centers in Calabar Educational Zone of Cross River State?
- vii. What strategies can improve caregivers' hygiene practices and consequently the health outcomes of preschoolers in public ECCE/Creche Centers in Calabar Educational Zone, Cross River State?

Statement of Hypothesis

The following hypotheses were formulated to guide the study:

- i. There is no significant difference in the prevalence of hygiene-related health conditions among preschoolers attending public ECCE/Creche in Calabar Educational Zone, Cross River State Nigeria.
- ii. There is no significant association between selected caregivers characteristics (educational qualification) and hygiene practice.

iii. There is no significant association between environmental hygiene conditions and the prevalence of hygiene-related illness among preschoolers.

Literature Review

Conceptual Review

Hygiene Knowledge among Caregivers

Hygiene knowledge refers to caregivers' understanding of personal hygiene, environmental sanitation, hand hygiene, food safety, infection prevention, and disease transmission within childcare settings. Adequate hygiene knowledge enables caregivers to recognize disease risk factors and implement preventive measures that promote the health and well-being of preschool children. In early childhood education centres, caregivers serve as role models whose knowledge significantly influences children's hygiene behaviours and overall health outcomes (Ismail et al., 2024).

Caregiver knowledge, attitudes, and practices are critical determinants of hygiene outcomes in ECCE settings. Knowledge alone, however, does not always translate into practice. Studies have shown that while many caregivers may possess general awareness of hygiene importance, structural constraints limit effective practice implementation (Mensah&Agyeman, 2023).

For instance, in a qualitative study of ECCE facilitators in urban Accra, caregivers demonstrated high theoretical understanding of handwashing importance, yet lacked access to functioning handwashing stations, soap, or continuous water supply — leading to inconsistent practice (Mensah&Agyeman, 2023). In rural Nigerian preschools, Ekong and Okori (2024) reported similar findings, noting that lack of WASH infrastructure and overcrowding challenged caregivers' ability to maintain hygienic environments even where knowledge was adequate.

Hygiene Practices in ECCE/Crèche Centres

Hygiene practices encompass the routine behaviours adopted by caregivers to maintain cleanliness and prevent disease transmission. These include proper handwashing, safe food handling, environmental cleaning, waste disposal, toilet sanitation, and the regular disinfection of learning materials and play equipment. Effective hygiene practices have

been shown to reduce the occurrence of communicable diseases among preschoolers while promoting safe and healthy learning environments (Pidjadee et al., 2024).

Hygiene practices in early childhood care refer to caregivers' behaviours and routines that prevent infection and promote health. These include effective handwashing with soap, safe food preparation, sanitation of toilets and play areas, appropriate diapering procedures, and waste disposal (World Health Organization, 2023). These practices are grounded in Water, Sanitation, and Hygiene (WASH) frameworks which emphasize that hygienic environments are essential for preventing communicable diseases, particularly among children whose immune systems are still developing (UNICEF, 2022).

According to Luby et al. (2023), consistent hygiene behaviours in childcare settings reduce the incidence of diarrhoeal diseases by up to 50% and respiratory infections by about 25%. Hand hygiene, specifically, has been recognized as one of the most cost-effective interventions for improving child health outcomes across settings ranging from urban to rural ECCE centres (Curtis & Cairncross, 2023).

Hygiene-Related Health Outcomes among Preschoolers

Preschool children are highly susceptible to hygiene-related illnesses because of their developing immune systems and frequent close contact during play and learning activities. Poor hygiene conditions commonly result in diarrhoeal diseases, respiratory tract infections, skin infections, eye infections, and intestinal worm infestations. These illnesses adversely affect children's growth, cognitive development, school attendance, and academic readiness (World Health Organization [WHO], 2022).

Environmental Hygiene in Early Childhood Education Centres

Environmental hygiene refers to the availability and maintenance of clean water, sanitation facilities, handwashing stations, proper waste disposal systems, adequate ventilation, and clean classrooms within educational environments. A hygienic school environment reduces exposure to infectious agents and supports healthy child development. Conversely, inadequate environmental sanitation increases children's vulnerability to communicable diseases and negatively affects learning outcomes (UNICEF & WHO, 2023).

Theoretical Review

This study is anchored on three complementary theoretical foundations that explain how caregivers' hygiene behaviours influence preschoolers' health outcomes in public ECCE/Crèche centres in Cross River State.

Germ Theory of Disease- Louis Pasture (1861)

The Germ Theory of Disease, advanced by scientists such as Louis Pasteur and Robert Koch, posits that specific microorganisms are responsible for infectious diseases. Within early childhood settings, pathogens are easily transmitted through contaminated hands, surfaces, food, water, and shared play materials. Preschoolers are particularly susceptible due to immature immune systems and frequent close contact with peers.

Applied to this study, Germ Theory provides the biological explanation for how inadequate caregiver hygiene practices (e.g., poor handwashing, improper waste disposal, unsanitized play equipment) can directly lead to diarrhoeal diseases, respiratory infections, and skin conditions among children. It establishes the causal health basis linking hygiene behaviours to morbidity patterns in ECCE environments.

Health Belief Model (HBM) - Rosenstock, (1974); Becker, (1978)

This study is anchored on the Health Belief Model (HBM) developed by Rosenstock (1974). The theory posits that individuals are more likely to engage in health-promoting behaviours when they perceive themselves as susceptible to disease, recognize the severity of the health threat, believe that preventive actions are beneficial, and perceive minimal barriers to adopting such behaviours. Within the context of this study, caregivers with adequate hygiene knowledge are expected to appreciate the health risks associated with poor hygiene and consequently adopt appropriate hygiene practices that reduce disease transmission among preschoolers. The model therefore provides an appropriate theoretical explanation for the relationship between caregivers' knowledge, hygiene practices, and children's health outcomes.

In ECCE settings, caregivers' hygiene behaviours are influenced by their perception of children's vulnerability to infection, the seriousness of disease outcomes, the perceived effectiveness of hygiene practices, and environmental or institutional barriers such as lack of water, soap, or training.

The HBM is relevant to this study because it helps explain why some caregivers may not consistently practice adequate hygiene despite awareness of its importance. It also guides the identification of behavioural and structural barriers affecting hygiene compliance.

Social Ecological Model (SEM) – Urie Bronfenbrenner(1979); McLeroy et al.(1988)

The Social Ecological Model posits that health behaviours are influenced by multiple interacting levels:

- i. Individual level (knowledge, skills, attitudes)
- ii. Interpersonal level (caregiver-child interactions)
- iii. Institutional level (ECCE policies, training, supervision)
- iv. Community level (cultural norms, local infrastructure)
- v. Policy level (government standards for ECCE hygiene)

In the context of Cross River State, caregivers' hygiene practices are not determined solely by personal knowledge but also by institutional support, availability of WASH facilities, supervision systems, and public health policies.

The SEM strengthens this study by recognizing that preschoolers' health outcomes are shaped by a complex interaction between caregiver behaviour and environmental structures within ECCE centres.

Integration of Theories in the Study

The theoretical framework assumes that: Germ Theory explains why poor hygiene leads to disease, Health Belief Model explains why caregivers behave the way they do Social Ecological Model explains how institutional and environmental factors shape hygiene practices.

Together, these frameworks provide a comprehensive lens for examining the relationship between caregivers' hygiene practices and preschoolers' health outcomes. They justify investigating not only individual caregiver behaviours but also infrastructural, institutional, and policy-level determinants influencing hygiene compliance in public ECCE/crèche centres in Cross River State.

Empirical Review

Hygiene Knowledge, Practices and Child Health Linkages

Empirical evidence emphasized a direct relationship between hygiene practices and health outcomes among young children. Community-level WASH interventions — when combined with behaviour change strategies — have demonstrated significant reductions in disease burden. For example, Pickering et al. (2023) showed that an integrated WASH programme in rural Tanzania reduced diarrhoeal prevalence among preschoolers by 31% and improved overall child wellbeing.

Research specific to ECCE environments, however, remains limited. Few studies have simultaneously measured caregiver hygiene practices and corresponding preschooler health outcomes, leaving a gap in evidence, especially in Nigerian contexts. Okoro and Agboola (2023) examined school hygiene broadly, but did not disaggregate data by age group nor establish direct correlations between caregiver practices and specific preschool health indicators.

Several empirical studies have demonstrated the importance of caregiver hygiene knowledge and practices in improving children's health outcomes. Ismail et al. (2024) conducted a systematic review and meta-analysis and found that hygiene education programmes significantly improved hygiene knowledge, handwashing practices, and reduced infection-related absenteeism among school children. The study concluded that continuous hygiene education remains an effective strategy for promoting healthy behaviours within educational settings.

Similarly, Pidjadee et al. (2024) reported that infection prevention and control interventions significantly enhanced childcare workers' compliance with recommended hygiene practices in daycare centres. Their review emphasized that caregivers' knowledge and regular training contribute substantially to reducing the spread of communicable diseases among young children.

In another study, Zhang et al. (2024) found that childcare centres with adequate environmental sanitation, effective disinfection protocols, and accessible handwashing facilities recorded lower rates of infectious diseases among children. The authors recommended strengthening hygiene infrastructure and institutional hygiene policies to improve child health outcomes.

Furthermore, Girard et al. (2024) observed that caregivers' educational level and professional competencies significantly influenced hygiene practices in early childhood education settings. The study concluded that caregiver capacity building remains one of the most effective approaches to improving hygiene compliance and promoting healthier childcare environments.

Collectively, these studies suggest that caregiver knowledge, educational attainment, hygiene practices, and environmental sanitation are interrelated determinants of preschool children's health outcomes.

Institutional and Environmental Challenges

The physical environment of ECCE centres — including water availability, sanitation facilities, and cleanliness of play and eating spaces — significantly influences hygiene outcomes. UNICEF (2022) highlights that in many low-resource early learning contexts, inadequate toilet facilities, absence of safe water, and poor waste disposal undermine even well-intentioned hygiene practices.

Nwankwo and Igbokwe (2023) found that schools and ECCE centres in Nigeria's Niger Delta region had limited functional sanitation facilities, with over 60% lacking proper toilets or handwashing stations. The study linked these infrastructural deficiencies with higher rates of skin infections and gastrointestinal illnesses among children.

Prevalence and Impact of Hygiene-related Illnesses Among Preschoolers

Preschool children are disproportionately affected by infectious diseases due to frequent hand-to-mouth contact, underdeveloped immune responses, and close interaction with peers (Adewale, 2024). Globally, diarrhoeal diseases remain a leading cause of mortality among children under five, with poor sanitation and hygiene identified as primary risk factors (World Health Organization, 2023).

In sub-Saharan Africa, several studies have documented a high burden of hygiene-associated illnesses among preschool-aged children. Kwame and Asante (2023) found that in Ghanaian ECCE centres with limited sanitation infrastructure, up to 68% of preschoolers experienced at least one episode of diarrhoea or respiratory infection in a six-month period. Similarly, a study in Kenya reported that the incidence of diarrhoea among children in informal care settings was significantly associated with caregivers' infrequent handwashing and inconsistent cleaning of play areas (Njoroge et al., 2024).

In Nigeria, although comprehensive national data on ECCE-specific health outcomes are limited, broader school health research points to persistent trends. Umar and Musa (2024) observed that poor hygiene behaviours among school staff significantly correlated with higher absenteeism due to infectious illnesses in primary schools — a pattern that likely extends to preschools and crèche environments.

Regional Evidence

In Cross River State and the broader South-South geopolitical zone of Nigeria, empirical research on caregiver hygiene in ECCE/crèche settings is virtually non-existent. Available studies on school health in the region focus largely on primary and secondary school populations (Eze et al., 2023; Nwankwo&Igbokwe, 2023), leaving a critical gap regarding early childhood care. This paucity of localized evidence undermines targeted policy formulation and contextually relevant interventions.

Research Gap

Although previous studies have established the importance of hygiene knowledge, hygiene practices, and environmental sanitation in improving child health, most available studies were conducted outside Nigeria or focused primarily on primary and secondary school settings. Limited empirical evidence exists on the combined assessment of caregivers' hygiene knowledge, hygiene practices, hygiene-related health outcomes among preschoolers, environmental hygiene conditions, barriers to effective hygiene practices, and improvement strategies within public ECCE/crèche centres in Cross River State. This study fills this gap by providing integrated empirical evidence on these variables within the context of public early childhood education centres, thereby providing information for evidence-based educational and public health policy interventions.

METHODOLOGY

Study Design

This study adopted a descriptive cross-sectional survey design to assess caregivers' hygiene practices and their relationship with hygiene-related health outcomes among preschoolers attending public Early Childhood Care and Education (ECCE)/Crèche centres in the Calabar Education Zone of Cross River State, Nigeria. The design was considered appropriate because it enabled the collection of data at a single point in time from a representative sample of caregivers and preschoolers.

Study Area

The study was conducted in the Calabar Education Zone of Cross River State, Nigeria. The zone comprises Akpabuyo, Akamkpa, Bakassi, Biase, Calabar Municipality, Calabar South, and Odukpani Local Government Areas, with a total of 439 public ECCE/Crèche centres. The Zone is characterized by a mix of urban, semi-urban, and rural communities, with diverse socio-economic and cultural settings that influence early childhood care practices.

Calabar educational zone operates public Early Childhood Care and Education (ECCE) centres under the supervision of the State Universal Basic Education framework, in line with national ECCE policy guidelines. However, disparities exist in infrastructure provision, water supply, sanitation facilities, and caregiver training across local government areas.

The climatic conditions (high rainfall and humidity) further heighten vulnerability to hygiene-related illnesses such as diarrhoeal and respiratory infections, making the zone an appropriate context for this investigation.

Population of the Study

The study population comprised 17,795 participants, consisting of 1,756 caregivers responsible for children aged 0–11 months (crèche infants), 12–24 months (young toddlers), 24–36 months (older toddlers), and 3–5 years (nursery/preschoolers) across the 439 public ECCE/Crèche centres within the Calabar Education Zone.

The study also included 16,038 preschoolers, comprising 8,110 males and 7,928 females, as reported in the Cross River State Facts and Figures (2025). The distribution of preschoolers across the seven Local Government Areas was as follows: Akpabuyo, 1,173; Akamkpa, 3,116; Bakassi, 1,032; Biase, 3,574; Calabar Municipality, 2,632; Calabar South, 2,086; and Odukpani, 2,425.

Sample Size and Sampling Technique

A total sample of 391 participants, comprising 111 caregivers and 280 preschoolers, was selected from 49 public ECCE/Crèche centres across the seven Local Government Areas within the Calabar Education Zone.

A multistage sampling technique was employed. In the first stage, participating ECCE/Crèche centres were selected from the seven Local Government Areas. In the

second stage, caregivers were selected from the participating centres using simple random sampling, while preschoolers were selected proportionately from the same centres to ensure adequate representation across age categories.

Instrument for Data Collection

Data were collected using a structured researcher-developed questionnaire administered to caregivers. The questionnaire elicited information on socio-demographic characteristics, hygiene knowledge, hygiene practices, barriers to effective hygiene practices, and strategies for improving hygiene practices. Information on hygiene-related health outcomes among preschoolers was obtained through caregiver reports and available school health records using a structured data extraction checklist.

The instruments of the study are presented thus;

1. Caregivers' Hygiene Knowledge, Practices, Barriers, and Strategies Questionnaire (CHKPBSQ) administered to 111 Caregivers.
2. Preschoolers' Health Assessment Checklist (PHAC) Completed for 280 Preschoolers' using Health records/Caregivers verification
3. ECCE/Creche Environmental Hygiene Observation/Facility Assessment Checklist (EHO/FAC) completed by the researchers through direct observation of the selected centers.

Validity and Reliability of the Instrument

The questionnaire and data extraction checklist were subjected to face and content validity by experts in Early Childhood Education, Public Health, and Measurement and Evaluation. Their observations guided the revision of the instruments before field administration.

The reliability of the questionnaire was established through a pilot study involving caregivers from public ECCE/Crèche centres outside the study area. Internal consistency was determined using Cronbach's alpha coefficient, with a reliability coefficient of 0.81 or above considered acceptable.

Procedure for Data Collection

Ethical approval and administrative permission were obtained from the relevant authorities before data collection. Trained research assistants administered the questionnaires to caregivers during school hours, while information on preschoolers' health

outcomes was extracted from school health records and caregiver reports where applicable. Completed questionnaires were checked for completeness before data entry.

Ethical Considerations

Ethical approval was obtained from the appropriate Institutional Health Research Ethics Committee before commencement of the study. Permission was also obtained from the Cross River State Ministry of Education and the heads of the participating ECCE/Crèche centres. Written informed consent was obtained from all caregivers who participated in the study. Confidentiality and anonymity of participants were maintained throughout the study, and all data were used strictly for research purposes. Information relating to preschoolers was collected only after obtaining the necessary institutional and parental/guardian permissions and was handled in accordance with established ethical guidelines for research involving children.

Method of Data Analysis

Data were coded and analysed using the Statistical Package for the Social Sciences (SPSS) version 27.0. Descriptive statistics, including frequencies, percentages were used to summarize the hygiene practices, barriers, and health outcomes. Inferential statistics, such as Chi-square test of association was employed to examine the relationship between caregivers' hygiene practices and hygiene-related health outcomes among preschoolers. Statistical significance was determined at the 5% level of significance ($p < 0.05$).

RESULTS

Research question one

What are the hygiene knowledge and practices of caregivers in public ECCE/Creche centers in Calabar Educational Zone, Cross River State?

The research question one was summarized using simple percentages and the results is as presented in table 1.

Table 1: Hygiene Knowledge of Caregivers in Public ECCE/Crèche Centres (n=105)

S/N0.:	Hygiene knowledge Item	SA (%)	A (%)	D (%)	SD (%)
1	Hand washing with soap reduces disease transmission	35 (33.3)	48 (45.7)	17 (16.2)	5 (4.8)
2	Children should wash their hands before eating	38 (36.2)	46 (43.8)	16 (15.2)	5 (4.8)

S/N0.:	Hygiene knowledge Item	SA (%)	A (%)	D (%)	SD (%)
3	Safe drinking water prevents infections	32 (30.5)	49 (46.7)	18 (17.1)	6 (5.7)
4	Proper toilet Hygiene reduces disease spread	30 (28.6)	50 (47.6)	6 (5.7)	19 (18.1)
5	Cleaning toys regularly prevents infections	28 (26.7)	51 (48.6)	20 (19.0)	6 (5.7)
6	Food handlers should wash hands before food preparation	36 (34.3)	45 (42.9)	18 (17.1)	6 (5.7)
7	Improper waste disposal increases disease risk	29 (27.6)	50 (47.6)	6 (5.7)	20 (19.0)
8	Regular environmental cleaning promotes Children's health	31 (29.5)	49 (46.7)	6 (5.7)	19 (18.1)
9	Personal hygiene influences children's' health	34 (32.4)	46 (43.8)	19 (18.1)	6 (5.7)
10	Children should be supervised during hand washing.	33 (31.4)	47 (44.8)	6 (5.7)	19 (18.1)

The percentages are the values enclosed in braces

The results indicate that caregivers possessed moderate (average) knowledge of hygiene. Across all the knowledge items, the majority of respondents either agreed (42.9–48.6%) or strongly agreed (26.7–36.2%) with the statements, while relatively fewer respondents disagreed or strongly disagreed. This suggests that although caregivers demonstrate a fair understanding of basic hygiene principles, there remains room for improvement through continuous hygiene education and training programmes.

Research question two

What are the hygiene practices of caregivers in public ECCE/Creche centers in Calabar Educational Zone, Cross River State?

Again, the research question one was summarized using simple percentages and the results is as presented in table 2.

Table 2: Hygiene Practices of Caregivers (n=105)

S/N0:	Hygiene Practices Item	Always	Often	Sometimes	Never
11	Wash hands before handling children	28 (26.7)	49 (46.7)	25 (23.8)	3 (2.7)
12	Wash hands after changing diapers	30 (28.6)	46 (43.8)	26 (24.8)	3 (2.7)
13	Wash hands before meals	27 (25.7)	48 (45.7)	27 (25.7)	3 (2.8)
14	Wash children hands after toilet use	29 (27.6)	47 (44.8)	26 (24.8)	3 (2.8)

S/N0:	Hygiene Practices Item	Always	Often	Sometimes	Never
15	Clean toys regularly	24 (22.9)	46 (43.8)	4 (3.8)	31 (29.5)
16	Disinfect classrooms daily	22 (21.0)	44 (41.9)	4 (3.8)	35 (33.3)
17	Ensure safe drinking water is available	32 (30.5)	45 (42.9)	25 (23.8)	3 (2.8)
18	Dispose of waste properly	31 (29.5)	46 (43.8)	25 (23.8)	3 (2.9)
19	Clean toilet facilities regularly	25 (23.8)	47 (44.8)	29 (27.6)	4 (3.8)
20	Use gloves when necessary during child care	20 (19.0)	43 (41.0)	38 (36.2)	4 (3.8)

The percentages are the values enclosed in braces

The findings indicate that caregivers generally demonstrated moderately good hygiene practices. Across all hygiene practice items, the highest proportions of respondents reported often performing the recommended hygiene practices (41.0%–46.7%), followed by sometimes (23.8%–36.2%), while relatively fewer respondents indicated always (19.0%–30.5%). Only a negligible proportion (2.8%–3.8%) reported never carrying out the recommended hygiene practices. These findings suggest that although hygiene practices among caregivers are generally satisfactory, consistent adherence to recommended hygiene practices is not universal, highlighting the need for regular supervision, refresher training, and improved provision of hygiene facilities in public ECCE/Crèche centres.

Research question three

What is the prevalence of hygiene – related health outcomes among preschoolers attending public ECCE/Creche Centers in Calabar Educational Zone, Cross River State?

Similarly, the research question one was summarized using simple percentages and the results is as presented in table 3a and table 3b.

Table 3a: Hygiene-Related Health Conditions among Preschoolers (n = 268)

S/N	Health Condition	Yes n (%)	No n (%)
1	Diarrhoea	118 (44.0)	150 (56.0)
2	Respiratory tract infection	126 (47.0)	142 (53.0)
3	Skin infection/rashes	87 (32.5)	181 (67.5)
4	Eye infection	74 (27.6)	194 (72.4)
5	Worm infestation	81 (30.2)	187 (69.8)
6	Typhoid fever	45 (16.8)	223 (83.2)
7	Malnutrition associated with poor hygiene	58 (21.6)	210 (78.4)
8	Hospital admission due to hygiene-related illness	36 (13.4)	232 (86.6)

The percentages are the values enclosed in braces

The findings indicate that hygiene-related illnesses were fairly prevalent among preschoolers. Respiratory tract infections (47.0%) and diarrhoea (44.0%) were the most commonly reported health conditions, followed by skin infections (32.5%), worm infestation (30.2%), and eye infections (27.6%). Conversely, typhoid fever (16.8%), malnutrition associated with poor hygiene (21.6%), and hospital admissions (13.4%) were comparatively less prevalent. These findings suggest that although severe hygiene-related illnesses were relatively uncommon, common infectious diseases remain a significant public health concern among preschoolers.

Table 3b: Frequency of Hygiene-Related Illness Episodes among Preschoolers during the Last Six Months (n = 268)

Health Condition	None (%)	Once (%)	2–3 Times (%)	More than 3 Times (%)
Diarrhoea	150 (56.0)	68 (25.4)	40 (14.9)	10 (3.7)
Respiratory tract infection	142 (53.0)	70 (26.1)	46 (17.2)	10 (3.7)
Skin infection	181 (67.5)	46 (17.2)	34 (12.7)	7 (2.6)
Eye infection	194 (72.4)	38 (14.2)	29 (10.8)	7 (2.6)
Worm infestation	187 (69.8)	43 (16.0)	30 (11.2)	8 (3.0)

The percentages are the values enclosed in braces

The results indicate that most preschoolers experienced no episode of the listed hygiene-related illnesses during the previous six months. Among those who experienced illness, most had one episode, while fewer experienced two to three episodes. Only a negligible proportion (2.6%–3.7%) experienced more than three episodes. These findings suggest that although hygiene-related illnesses occurred among preschoolers, repeated episodes were relatively uncommon.

Research Question Four

What are the Anthropometric and General Health Status of Preschoolers attending public ECCE/Creche Centers in Calabar Educational Zone, Cross River State?

In like manner, the research question one was summarized using simple percentages and the results is as presented in table 4.

Table 4: Anthropometric and General Health Status of Preschoolers (n = 268)

S/N	Health Status Indicator	Yes (%)	No (%)
1	Child appears physically healthy	140 (52.2)	128 (47.8)
2	Child appears well nourished	147 (54.9)	121 (45.1)
3	Child has clean finger nails	152 (56.7)	116 (43.3)
4	Child wears clean clothing	137 (51.1)	131 (48.9)
5	Child demonstrates good personal hygiene	150 (56.0)	118 (44.0)

The percentages are the values enclosed in braces

The findings suggest that the general health status of preschoolers was good. More than half of the children were observed to be physically healthy (52.2%), well nourished (54.9%), to have clean fingernails (56.7%), and does demonstrate good personal hygiene (56.0%). Since the anthropometric and general health status of Preschoolers was found to be only averagely good, the findings indicate a need for improved child hygiene promotion and nutritional support within public ECCE/Crèche centres.

Research Question Five

What are the Environmental Hygiene Conditions of Public ECCE/Crèche Centres in Calabar educational zone, Cross River State?

Table 5: Environmental Hygiene Conditions of Public ECCE/Crèche Centres

S/N	Environmental Indicator	Adequate (%)	Inadequate (%)
1	Handwashing facilities	104 (38.8)	164 (61.2)
2	Soap availability	91 (34.0)	177 (66.0)
3	Safe drinking water	109 (40.7)	159 (59.3)
4	Toilet facilities	98 (36.6)	170 (63.4)
5	Waste disposal facilities	102 (38.1)	166 (61.9)
6	Classroom cleanliness	118 (44.0)	150 (56.0)
7	Playground cleanliness	111 (41.4)	157 (58.6)

The percentages are the values enclosed in braces

The findings reveal that environmental hygiene conditions in the public ECCE/Crèche centres were generally inadequate. The majority of centres lacked adequate handwashing facilities (61.2%), soap (66.0%), safe drinking water (59.3%), functional toilet facilities (63.4%), effective waste disposal systems (61.9%), clean classrooms (56.0%), and clean playgrounds (58.6%). These findings underscore substantial infrastructural

deficiencies and highlight the urgent need for increased government investment, improved sanitation facilities, and strengthened environmental hygiene interventions in public ECCE/Crèche centres.

Research Question Six

What barriers influence caregivers' adoption of appropriate hygiene practices in public ECCE/Creche centers in Calabar Educational Zone of Cross River State?

Table 6: Barriers Affecting Hygiene Practices (n=105)

S/N0:	Item	SA	A	D	SD
1	Adequate water supply affects hygiene practices	42 (40.0)	48 (45.7)	4 (3.8)	11 (10.5)
2	Lack of soap and sanitizers limits effective hygiene	39 (37.1)	47 (44.8)	15 (14.3)	4 (3.8)
3	Overcrowding affects proper hygiene practices	35 (33.3)	46 (43.8)	19 (18.1)	5 (4.8)
4	Inadequate training affects caregivers' hygiene practices	37 (35.2)	45 (42.9)	5 (4.8)	18 (17.1)
5	Insufficient funding affects hygiene facilities	46 (43.8)	44 (41.9)	11 (10.5)	4 (3.8)
6	Poor Supervision affects compliance with hygiene standards	33 (31.4)	47 (44.8)	20 (19.0)	17 (16.2)
7	Inadequate waste disposal facilities affect hygiene	38 (36.2)	45 (42.9)	17 (16.2)	17 (16.2)
8	Poor toilet facilities hinder hygiene practices	41 (39.0)	44 (41.9)	16 (15.3)	4 (3.8)

The percentages are the values enclosed in braces

The findings indicate that caregivers perceived several significant barriers to effective hygiene practices in public ECCE/Crèche centres. Across all the identified barriers, the majority of respondents either agreed (41.9%–45.7%) or strongly agreed (31.4%–43.8%) that inadequate water supply, shortage of soap and sanitizers, overcrowding, inadequate training, insufficient funding, poor supervision, inadequate waste disposal facilities, and poor toilet facilities adversely affect hygiene practices. Conversely, relatively few respondents disagreed or strongly disagreed with these statements. These findings suggest that infrastructural, logistical, and institutional challenges continue to impede effective hygiene practices and underscore the need for targeted government

intervention, increased funding, improved facility provision, and continuous capacity building for caregivers.

Research Question Seven

What strategies can improve caregivers' hygiene practices and consequently the health outcomes of preschoolers in public ECCE/Creche Centers in Calabar Educational Zone, Cross River State?

Table 7: Strategies for Improving Caregivers' Hygiene Practices and Health Outcomes of Preschoolers (n=105)

S/N0:	Item	SA	A	D	SD
1	Regular hygiene training should be organized for caregivers.	48 (45.7)	44 (41.9)	10 (9.5)	3 (2.9)
2	Adequate water supply should be provided in ECCE/Creche centers	56 (53.3)	39 (37.1)	8 (7.6)	2 (2.0)
3	Government should provide hygiene materials regularly	54 (51.4)	40 (38.1)	8 (7.6)	3 (2.9)
4	Routine health inspection should be strengthened	47 (44.8)	46 (43.8)	9 (8.6)	3 (2.8)
5	Parents should collaborate with caregivers on children's hygiene	45 (42.9)	48 (45.7)	3 (2.8)	9 (8.6)
6	Children should receive regular hygiene education	49 (46.7)	45 (42.9)	8 (7.6)	3 (2.8)
7	Standard hygiene guidelines should be enforced in all ECCE/Creche centers	52 (49.5)	43 (41.0)	3 (2.8)	7 (6.7)
8	Adequate funding should be provided for hygiene facilities.	58 (55.2)	36 (34.3)	3 (2.8)	8 (7.6)

The findings indicate a strong consensus among caregivers regarding the strategies required to improve hygiene practices and the health outcomes of preschoolers in public ECCE/Crèche centres. The majority of respondents strongly agreed (42.9%–55.2%) or agreed (34.3%–45.7%) with all the proposed strategies, including regular hygiene training, provision of adequate water supply and hygiene materials, strengthened routine health inspections, increased parental involvement, regular hygiene education for children, enforcement of hygiene guidelines, and improved funding for hygiene facilities. Only a small proportion of respondents disagreed or strongly disagreed with these strategies. These findings suggest widespread support for comprehensive interventions involving government, school authorities, caregivers, and parents to strengthen hygiene practices and promote healthier learning environments for preschoolers.

Hypothesis one

There is no significant association between caregivers' hygiene knowledge level and hygiene practice level in public ECCE/Creche Centers in Calabar Educational Zone, Cross River State

Since both variables are categorical after classification (e.g., Poor, Average, Good), the appropriate test is the Chi-square test of independence and was therefore adopted for testing the hypothesis one . the result is as presented in table 7.

Table 7 Chi-square Test of Association between Caregivers' Hygiene Knowledge and Hygiene Practices (n = 105)

Category	Poor O(E)	Fair O(E)	Good O(E)	Total
Poor	8 (2.48)	4 (5.94)	1 (4.58)	13
Average	10 (12.38)	36 (29.71)	19 (22.90)	65
Good	2 (5.14)	8 (12.34)	17 (9.51)	27
Column Total	20	48	37	105

Expected frequency: $E = (\text{Row Total} \times \text{Column Total}) / 105$

Cell	O	E	$(O - E)^2 / E$
Poor×Poor	8	2.48	12.29
Poor×Fair	4	5.94	0.63
Poor×Good	1	4.58	2.80
Average×Poor	10	12.38	0.46
Average×Fair	36	29.71	1.33
Average×Good	19	22.90	0.66
Good×Poor	2	5.14	1.92
Good×Fair	8	12.34	1.53
Good×Good	17	9.51	5.90
Total χ^2			27.52

df=4; Critical $\chi^2=9.488$; Calculated $\chi^2=27.52$; $p < 0.001$; Decision: Reject null hypothesis

Decision

Since the calculated $\chi^2(27.52)$ is greater than the critical value(9.488),the null hypothesis was rejected. There was a statistically significant association between caregivers' hygiene knowledge and hygiene practices. Caregivers with better hygiene knowledge demonstrated significantly better hygiene practices than those with poorer knowledge in public ECCE/Creche centers in Calabar Educational Zone, Cross River State.

Hypothesis two

There is no significant association between selected caregiver characteristics (educational qualification) and hygiene practice in public ECCE/Creche centers in Calabar Educational Zone, Cross River State.

Again, since educational qualification is categorical, and hygiene practice level is categorical; therefore, the chi-square test of independence is appropriate and was adopted in testing the hypothesis two. The result is as presented in table 8.

Table 8 Chi-square Test of Association between Educational Qualification and Hygiene Practices (n = 105)

Category	Poor O(E)	Fair O(E)	Good O(E)	Total
SSCE	6 (2.48)	5 (5.94)	2 (4.58)	13
NCE	8 (5.52)	15 (13.26)	6 (10.22)	29
HND/B.Sc.	5 (8.00)	20 (19.20)	17 (14.80)	42
Postgraduate	1 (4.00)	8 (9.60)	12 (7.40)	21
Column Total	20	48	37	105

Expected frequency: $E = (\text{Row Total} \times \text{Column Total}) / 105$

Cell	O	E	$(O - E)^2 / E$
SSCE×Poor	6	2.48	5.00
SSCE×Fair	5	5.94	0.15
SSCE×Good	2	4.58	1.45
NCE×Poor	8	5.52	1.11
NCE×Fair	15	13.26	0.23
NCE×Good	6	10.22	1.74
HND×Poor	5	8.00	1.13
HND×Fair	20	19.20	0.03
HND×Good	17	14.80	0.33
PG×Poor	1	4.00	2.25
PG×Fair	8	9.60	0.27
PG×Good	12	7.40	2.86
Total χ^2			16.55

df=6; Critical $\chi^2=12.592$; Calculated $\chi^2=16.55$; $p < 0.011$; Decision: Reject null hypothesis

Decision

Since $p = 0.011$, the calculated χ^2 (16.55) is greater than the critical value (12.592), the null hypothesis was rejected. There was a statistically significant association between caregivers' educational qualification and hygiene practices. Caregivers with higher

educational qualifications were demonstrated good hygiene practices than those with lower educational qualifications.

Hypothesis Three

There is no significant association between environmental hygiene conditions and the prevalence of hygiene-related illnesses among preschoolers in public ECCE/Crèche centres in Cross River State.

Chi-square analysis was employed in testing the hypothesis three and the sequence of the result is presented in Table 9.

Table 12: Chi-square Test of Association between Environmental Hygiene Conditions and Hygiene-related Illnesses among Preschoolers

Observed Frequencies			
Environmental hygiene condition	Illness present	Illness absent	Total
Adequate	55	78	133
Inadequate	88	47	135
Total	143	125	268
Observed and Expected Frequencies			
Environmental hygiene	Illness Present O (E)	Illness Absent O (E)	Total
Adequate	55 (70.97)	78 (62.03)	133
Inadequate	88 (72.03)	47 (62.97)	135
Total	143	125	268

Summary of Cell Contributions

Cell	O	E	(O-E) ² /E
Adequate × Illness present	55	70.97	3.593
Adequate × Illness absent	78	62.03	4.112
Inadequate × Illness present	88	72.03	3.541
Inadequate × Illness absent	47	62.97	4.050
Total χ^2			15.296

Degrees of Freedom

$$df = (r - 1)(c - 1) = (2 - 1)(2 - 1) = 1 \times 1 = 1.$$

Decision Rule and Result

At Significance level (α) = 0.05, Critical χ^2 value ($df = 1$, $\alpha = 0.05$) = 3.84, the calculated $\chi^2 = 15.296 \approx 15.30$ and $p < 0.001$. Since $\chi^2_{cal} (15.30) > \chi^2_{critical} (3.841)$, we reject hypothesis three and concluded that There is a statistically significant association between environmental hygiene conditions and the prevalence of hygiene-related illnesses among preschoolers. The result demonstrates that illness was more frequently observed among preschoolers attending centres classified as having inadequate environmental hygiene (88 of 135; 65.2%) than among those attending centres with adequate environmental hygiene (55 of 133; 41.4%).

DISCUSSION

This study investigated caregivers' hygiene knowledge and practices, hygiene-related health outcomes among preschoolers, environmental hygiene conditions, barriers to effective hygiene practices, and strategies for improving hygiene in public Early Childhood Care and Education (ECCE)/crèche centres in Cross River State. Generally, the findings demonstrate that although caregivers possessed moderate knowledge of hygiene and generally reported favourable hygiene practices, important deficiencies in environmental hygiene and institutional support continue to predispose preschoolers to hygiene-related illnesses.

The finding that caregivers possessed an average level of hygiene knowledge and generally practised appropriate hygiene measures suggests that knowledge of hygiene has gradually improved among caregivers in public ECCE/crèche centres. However, the inconsistency observed in some hygiene practices indicates that knowledge alone may not necessarily translate into optimal practice without adequate institutional support and continuous professional development. This finding supports previous evidence that hygiene education and infection prevention programmes significantly improve caregivers' knowledge and promote compliance with recommended hygiene practices (Pidjadee et al., 2024). Similarly, Ismail et al. (2024) reported that school-based hygiene interventions significantly enhanced hygiene knowledge and handwashing practices among caregivers and children, thereby reducing the burden of communicable diseases in educational settings.

Despite the relatively favourable hygiene practices reported by caregivers, the study found that hygiene-related illnesses, particularly respiratory tract infections and diarrhoeal

diseases, remained fairly prevalent among preschoolers. This finding underscores the fact that good individual hygiene practices alone may be insufficient where environmental conditions remain suboptimal. Preschool children are particularly vulnerable to communicable diseases because of their immature immune systems, frequent interpersonal contact, and shared use of learning materials. Comparable findings have been reported by Zhang et al. (2024), who observed that childcare centres with inadequate sanitation and poor environmental hygiene recorded significantly higher rates of infectious diseases among children. Likewise, the World Health Organization (2022) emphasized that inadequate water, sanitation, and hygiene (WASH) facilities remain major contributors to childhood morbidity globally, particularly in low- and middle-income countries.

An important contribution of the present study is the identification of environmental and institutional barriers affecting hygiene practices. The observed inadequacy of potable water supply, handwashing facilities, sanitation infrastructure, waste management systems, and hygiene materials suggests that caregivers often operate under conditions that limit effective implementation of recommended hygiene practices. These findings reinforce the argument that sustainable improvements in child health require investments not only in caregiver education but also in school hygiene infrastructure. Similar observations were reported by UNICEF and WHO (2023), which highlighted inadequate WASH facilities in schools as one of the major impediments to achieving healthy learning environments for young children. Pidjadee et al. (2024) likewise concluded that institutional support and adequate hygiene resources are indispensable for effective infection prevention in childcare settings.

The inferential findings further strengthen the descriptive evidence. The significant association between caregivers' hygiene knowledge and hygiene practices indicates that improvements in knowledge are associated with better hygiene behaviours among caregivers. Similarly, the significant relationship between caregivers' educational qualification and hygiene practices suggests that educational attainment enhances caregivers' capacity to understand and consistently implement recommended hygiene measures. Furthermore, the significant association between environmental hygiene conditions and hygiene-related illnesses confirms that the quality of the childcare environment plays a critical role in determining children's health outcomes. These findings are consistent with the Health Belief Model, which posits that health knowledge influences preventive behaviours, and the Social Ecological Model, which recognizes that individual

health behaviours are shaped by the broader physical and institutional environment. Collectively, the findings agree with those of Ismail et al. (2024), Pidjadee et al. (2024), and Zhang et al. (2024), who independently reported that improvements in hygiene knowledge, environmental sanitation, and institutional hygiene practices contribute significantly to reducing communicable diseases among young children.

The finding is not surprising because the environmental conditions observed in the study showed deficiencies in critical hygiene facilities such as access to safe water, functional handwashing stations, adequate sanitation facilities, proper waste disposal systems, classroom cleanliness, and environmental maintenance. Such deficiencies create favourable conditions for the transmission of diarrhoeal diseases, respiratory infections, skin infections, eye infections, and other communicable diseases commonly affecting preschool-aged children. Consequently, the quality of the physical environment remains an indispensable determinant of child health within early childhood education settings.

This finding is consistent with the systematic review by Pidjadee et al. (2024), which reported that effective infection prevention and control programmes in daycare centres significantly improved hygiene compliance among childcare workers and reduced the transmission of infectious diseases. The authors emphasized that maintaining hygienic childcare environments alongside appropriate caregiver practices is fundamental to preventing communicable diseases among young children.

The finding also corroborates the meta-analysis by Ismail et al. (2024), which demonstrated that school-based hygiene interventions contributed to improved hygiene practices and reduced infection-related absenteeism among children. The review concluded that improvements in environmental hygiene, handwashing facilities, sanitation infrastructure, and hygiene education collectively enhance children's health outcomes and reduce the occurrence of communicable diseases within educational settings.

Furthermore, the finding agrees with the study by Zhang et al. (2024), which found that childcare facilities with stronger disinfection protocols, better hand hygiene practices, and improved environmental sanitation recorded substantially higher compliance with infection prevention measures among staff. The study concluded that maintaining adequate environmental hygiene is a critical component of reducing infectious disease transmission in childcare facilities.

The implication of this finding is that improving environmental hygiene in public ECCE/crèche centres should be accorded priority by government, school administrators, and relevant stakeholders. Provision of potable water, adequate sanitation facilities, functional handwashing stations, effective waste management systems, and routine environmental sanitation programmes would substantially reduce hygiene-related illnesses among preschoolers while creating healthier learning environments. The finding equally supports the principles of the Social Ecological Model, which posits that health behaviours and outcomes are influenced not only by individual knowledge and practices but also by the environmental conditions within which individuals live and learn.

This study demonstrates that improving preschool health requires an integrated approach that combines caregiver capacity development with sustained investment in environmental hygiene infrastructure and institutional support. Strengthening hygiene education, improving water and sanitation facilities, ensuring the regular availability of hygiene materials, and implementing routine monitoring programmes are likely to produce substantial improvements in hygiene practices and reduce hygiene-related illnesses among preschoolers attending public ECCE/crèche centres in Cross River State.

CONCLUSION

This study assessed caregivers' hygiene knowledge and practices, the hygiene-related health outcomes of preschoolers, barriers to effective hygiene practices, and strategies for improving hygiene in public Early Childhood Care and Education (ECCE)/crèche centres in Cross River State, Nigeria. The findings revealed that caregivers possessed an average level of hygiene knowledge and generally demonstrated satisfactory hygiene practices, although inconsistencies remained in the regular application of some recommended hygiene measures. The study also found that hygiene-related illnesses such as diarrhoea, respiratory tract infections, skin infections, eye infections, worm infestation, and malnutrition were still fairly prevalent among preschoolers.

Furthermore, inadequate environmental hygiene conditions and limited hygiene resources constituted major barriers to effective hygiene management in the centres. Inferential analysis further showed that caregivers' hygiene knowledge was significantly associated with their hygiene practices, educational qualification significantly influenced hygiene practices, and environmental hygiene conditions significantly affected the

occurrence of hygiene-related illnesses among preschoolers. The study therefore concludes that improving caregivers' hygiene capacity and strengthening hygiene infrastructure within public ECCE/crèche centres are indispensable for promoting healthier learning environments and improving the health outcomes of preschool children.

Implications for Educational Policy

The findings of this study have important implications for educational policy and practice in Nigeria.

- i. First, hygiene education and infection prevention should be institutionalised as compulsory components of pre-service and in-service training programmes for caregivers and early childhood educators.
- ii. Second, the Federal and State Ministries of Education should develop and enforce minimum hygiene and sanitation standards for all public ECCE/crèche centres through regular inspection and compliance monitoring.
- iii. Third, government should prioritise the provision of safe water, functional sanitation facilities, handwashing stations, and effective waste disposal systems as essential components of quality early childhood education.
- iv. Furthermore, hygiene indicators should be incorporated into school quality assurance and accreditation frameworks to ensure continuous compliance with national health and education standards.
- v. Strengthening collaboration between the Ministries of Education, Health, Water Resources, and relevant development partners would further enhance the implementation of sustainable school hygiene programmes.

Ethical Considerations

Ethical approval for the study was obtained from the Institutional Research Ethics Committee of the before data collection. Approval was also sought from the Cross River State Ministry of Education and the managements of of participating ECCE/crèche centres. Written informed consent was obtained from all participating caregivers, while permission for the use of preschoolers' health records and health assessments was obtained from the school authorities and the Parents Teachers Association. Participation was entirely voluntary, with respondents informed of their right to withdraw from the study at any stage without penalty. Confidentiality and anonymity of participants was maintained throughout the study by assigning identification codes rather than names. All information

obtained was used strictly for research purposes, stored securely, and handled in accordance with internationally accepted ethical principles governing research involving human participants.

Recommendations

Based on the findings of this study, the following recommendations are made:

- i. Government should provide adequate water supply, improved sanitation facilities, functional handwashing stations, and effective waste management systems in all public ECCE/crèche centres.
- ii. Regular training and retraining programmes on hygiene promotion, infection prevention, and environmental sanitation should be organised for caregivers and preschool teachers.
- iii. The Cross River State Ministry of Education should establish routine monitoring and supervision mechanisms to ensure compliance with minimum hygiene standards in public ECCE/crèche centres.
- iv. Hygiene education should be integrated into the Early Childhood Education curriculum to promote healthy hygiene behaviours among preschoolers from an early age.
- v. School administrators should ensure the continuous availability of hygiene materials such as soap, clean water, disinfectants, hand sanitisers, and waste bins within school premises.
- vi. Government and development partners should provide increased financial support for improving hygiene infrastructure and environmental sanitation in public ECCE/crèche centres.
- vii. Parents and communities should actively collaborate with schools in promoting hygiene education and supporting environmental sanitation initiatives to improve children's health outcomes.

Contributions to Knowledge

This study contributes to knowledge in the following ways:

- i. It provides recent empirical evidence on caregivers' hygiene knowledge, hygiene practices, and preschoolers' hygiene-related health outcomes in public ECCE/crèche centres in Cross River State, where empirical evidence remains limited.
- ii. The study establishes the significant relationship between caregivers' hygiene knowledge and hygiene practices, thereby demonstrating the importance of knowledge acquisition in promoting effective hygiene behaviour among caregivers.

- iii. The study demonstrates that caregivers' educational qualification significantly influences hygiene practices within early childhood education settings.
- iv. The study provides empirical evidence that environmental hygiene conditions significantly affect the occurrence of hygiene-related illnesses among preschoolers attending public ECCE/crèche centres.
- v. The study identifies major institutional barriers limiting effective hygiene practices and proposes practical strategies for improving hygiene management and child health outcomes within public early childhood education centres.
- vi. The study offers evidence-based recommendations that could guide policymakers, educational administrators, and public health practitioners in designing interventions aimed at improving hygiene standards and reducing hygiene-related diseases among preschool children.

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