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Assessment Of Prevalence and Risk Factors Associated with Extended-Spectrum Beta-Lactamase (ESBL)-Producing *Klebsiella Pneumoniae* Infections Among Pediatric Patients Attending State Specialist Hospital, Maiduguri, Borno State

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Abstract

Extended-spectrum β -lactamase (ESBL)-producing *Klebsiella pneumoniae* is an important cause of multidrug-resistant infections, particularly among pediatric patients. This study determined the prevalence and associated risk factors of ESBL-producing *K. pneumoniae* isolated from pediatric clinical samples at the State Specialist Hospital, Maiduguri, Borno State, Nigeria. A cross-sectional study was conducted from October 2024 to January 2025 involving 256 children. Clinical samples were collected and processed using standard microbiological procedures for the isolation and identification of *K. pneumoniae*. Data were analyzed using the chi-square test in SPSS version 26, with statistical significance set at $p < 0.05$. Of the 256 samples analyzed, the overall prevalence of *K. pneumoniae* was 44.1%. Prevalence was 45.3% among males and 43.8% among females, with no significant sex-based difference ($\chi^2 = 0.048$, $df = 1$, $p = 0.827$). The highest prevalence (47.4%) occurred among children aged 9-11 years and declined with age; however, the association with age was not significant ($\chi^2 = 1.411$, $df = 3$, $p = 0.703$). Respiratory disorders were reported in 74.6% of participants, while lung disease and malnutrition each occurred in 9.0%. Children with urinary disorders recorded the highest prevalence of ESBL-producing *K. pneumoniae* (50.0%). Positivity was lower among immunosuppressed children (11.7%) and absent among those with recent surgery (0.0%). Lower positivity rates were also observed among bedridden children and those with prolonged hospitalization. These findings demonstrate a substantial burden of *K. pneumoniae* and highlight the importance of targeted surveillance, infection-prevention measures, and risk-based clinical management among pediatric patients.

Keywords

Klebsiella pneumoniae,
ESBL,
Prevalence,
Risk factors



Introduction

Infections caused by Extended-Spectrum Beta-Lactamase (ESBL)-producing *Klebsiella pneumoniae* are associated with increased morbidity, prolonged hospitalization, higher treatment costs, and elevated mortality rates due to limited effective antimicrobial options (Xu et al. 2026). Plasmid-mediated gene transfer largely drives their rapid dissemination, facilitating spread across bacterial species and healthcare environments (Xu et al., 2026). Among ESBL-producing organisms, *K. pneumoniae* is one of the most clinically significant pathogens, particularly in hospital settings (Peleg & Hooper, 2015). *K. pneumoniae* is a major cause of nosocomial infections, including pneumonia, bloodstream infections, urinary tract infections, surgical site infections, and meningitis (Peleg & Hooper, 2015). The increasing prevalence of ESBL-producing *K. pneumoniae* (ESBL-KP) is of particular concern due to its association with treatment failure, poor clinical outcomes, and increased mortality, especially among vulnerable populations such as pediatric patients and critically ill individuals (Zarkotou et al., 2021).

Several risk factors have been associated with infections caused by ESBL-KP, including prolonged hospitalization, prior and inappropriate antibiotic use, invasive medical procedures, and the presence of indwelling devices such as intravenous catheters (Demirdag et al., 2020). Additional factors such as intensive care unit (ICU) admission, mechanical ventilation, and endotracheal intubation further increase infection risk (Tuon et al., 2021). The widespread and often unregulated use of antibiotics in healthcare settings has contributed significantly to the emergence and global dissemination of ESBL-KP strains (Xu et al., 2026). Despite these concerns, comprehensive data on the prevalence and risk factors associated with ESBL-KP infections in pediatric populations remain scarce in many regions of Nigeria (Budhram et al., 2020).

In Borno State, socio-economic and security challenges further strain healthcare resources, and data on ESBL-producing *K. pneumoniae* among pediatric patients remain extremely limited or unavailable (Naqid et al., 2020). This lack of localized epidemiological data hinders effective infection control strategies, antimicrobial stewardship, and clinical decision-making. Therefore, this study aims to evaluate the prevalence and risk factors associated with ESBL-producing *K. pneumoniae* isolated from pediatric clinical samples at State Specialist Hospital (SSH), Maiduguri, Borno State.

Materials and methods

Study Area

This study was conducted in Maiduguri metropolis, Borno State. It is situated at latitude and longitude of 11.8846°N, 13.1520°E. Maiduguri shares borders with Konduga Local Government Area to the North-East and Jere Local Government Area to the south and North-West. It occupies an area of 50,778km². Maiduguri has a mean annual rainfall of about 650 mm and a mean annual temperature of about 32 degrees.

Study Design and Study Population

The study was a cross-sectional study conducted to determine the prevalence and risk factors associated with ESBL-producing *K. pneumoniae* isolated from pediatric clinical samples at SSH, Maiduguri, Borno State. Clinical samples, including urine, blood, sputum, and wound swabs, were aseptically collected from children with suspected bacterial infections following standard clinical procedures. All samples were promptly transported to the microbiology laboratory for analysis. The study was conducted among children attending the State Specialist Hospital, Maiduguri, Borno State.

Inclusion Criteria

All children aged 3-14 years attending SSH, Maiduguri, with signed consent forms from parents or guardians were included in the study.

Exclusion criteria

Children not attending SSH, Maiduguri, and those who refused to sign the informed consent form were excluded.

Determination of Sample Size

The Cochran formula (Naing et al. 2006) was used to calculate the sample size for the current investigation. Using the 20% prevalence of *K. pneumoniae* among children reported by Charity et al. (2022), the minimum sample size was estimated as follows:

$$N = \frac{Z^2 pq}{d^2}$$

Where p is the assumed proportion of *K. pneumoniae* infection among children, q is the estimated proportion of *K. pneumoniae* among children, d is the margin of error in predicting p, and $Z_{\alpha/2}$ is the value associated with a 95% confidence level.

$$n = \frac{(1.96)^2 * 0.2 * 0.8}{(0.05)^2}$$

$$n = \frac{0.614656}{0.0025}$$

$$n = 246$$

A minimum sample size of 246 was established. Nonetheless, the determined sample size was adjusted to 256, establishing it as the foundational sample size for the study, mitigating skew in participant selection, and increasing accuracy and precision.

Ethical Issue

The present study rigorously adhered to the ethical criteria established in the Declaration of Helsinki [20], and ethical approval was obtained on 30 December 2024 from the Ethical Committee of State Specialist Hospital Maiduguri, referenced as SSH/GEN/641/Vol. 1.

Data Collection

After the participants provided informed written consent, a structured questionnaire was used to gather sociodemographic information and associated risk

factors. The questionnaire was developed from a previous study and used as a research instrument. Two experts in the field validated the questionnaire content. The questionnaire collected data on associated risk factors, such as chronic or underlying diseases, recent child surgery, prior antibiotic use, duration of hospital stays, and presence of invasive devices.

Sample Collection and Examination

After completing the questionnaire, urine clinical samples were collected in sterile universal containers and inoculated onto cysteine lactose electrolyte-deficient (CLED) agar medium. In contrast, pus and throat swabs were inoculated onto 5% blood agar and MacConkey agar. All inoculation media were incubated aerobically at 37°C for 18-24 hours using standard microbiological techniques and sterile containers.

K. pneumoniae was identified using cultural, morphological, and biochemical examinations. The organism was classified as *K. pneumoniae* based on its colonial morphology and cultural traits, which showed *K. pneumoniae* as a sizable, mucoid, convex, smooth, lactose-fermenting colony. Morphological traits were analyzed by Gram staining. Ultimately, biochemical assays for urease, citrate, indole, coagulase, catalase, and sugar fermentation were conducted.

Data analysis

Version 27 of the IBM Statistical Package for the Social Sciences (SPSS) was used to analyze the collected data. Frequencies, percentages, and chi-square tests were used to evaluate the relationship between the independent and dependent variables. A p-value below 0.05 was considered statistically significant.

Result

Sociodemographic characteristics

Out of 256 samples analyzed, 75.0% (192/256) were females while 25.0% (64/256) were males. In terms of age, 37.9% (97/256) were between 9-11 years, followed by 3-5 years, 21.5% (55/256), while those aged 6-8 years were the least, 19.5% (50/256). Among participants in the present study, more than half (52.7%; 135/256) had a tertiary level of education, followed by those with a secondary level of education

(45.3%; 116/256). Meanwhile, the lowest proportion was among those with no formal education, 0.4% (1/256). Almost half, 42.2% (108/256), were employed, 42.2% (108/256), followed by those who were self-employed, 35.9 (92/256), while the least was observed among those individuals who were unemployed, 21.9% (56/256). In terms of clinical specimens, the majority were swabs, 76.2% (195/256), followed by urine specimens, 12.1% (31/256), while sputum specimens were the least common, 2.0% (5/256), as shown in Table 1.

Table 1: Sociodemographic characteristics of children attending State Specialist Hospital, Maiduguri, Borno State

Characteristics	n (%)	Percentage
Gender		
Male	64	25.0
Female	192	75.0
Age group		
3-5 years	55	21.5
6-8 years	50	19.5
9-11 years	97	37.9
12-14 years	54	21.1
Mothers' educational level		
No formal education	1	0.4
Primary education	4	36.7
Secondary education	116	45.3
Tertiary education	135	52.7
Occupation		
Employed	108	42.2
Self employed	92	35.9
Unemployed	56	21.9
Specimen type		
Blood	25	9.8
Sputum	5	2.0
Swab	195	76.2
Urine	31	12.1

Clinical Profile of the Study Participants

Regarding underlying disease, many participants had respiratory disorders (74.6%; 191/256). At the same time, a few reported other comorbidities, including lung disease (9.0%; 23/256), malnutrition (9.0%; 23/256), Urinary disorder (3.5%; 9/256), and HBSS (2.7%; 7/256). Over half of the children had undergone surgery (53.5%) or were bedridden long-term (53.5%). A significant proportion (23.4%) had

prolonged hospitalization (>7 days), and 74.6% were exposed to invasive devices such as catheters or ventilators. A striking 85.2% received multiple antibiotics. Nearly all children (97.7%) had regular hospital visits, and 96.1% had direct contact with hospital equipment or personnel. Alarming, 63.3% of caregivers did not wash hands after visits, and 94.5% reported exposure to overcrowded wards—conditions that facilitate pathogen transmission (Table 4).

Table 2: Clinical profile of children attending SSH, Maiduguri, Borno State, Nigeria

Characteristics	Number	(%)
Presence of any underlying disease		
CDK	1	0.4
HBSS	7	2.7
Liver cirrhosis	1	0.4
Lung disease	23	9.0
Malnutrition	23	9.0
Respiratory disorder	191	74.6
Urinary disorder	9	3.5
None	1	0.4
Child currently on Immunosuppression therapy		
No	252	98.4
Yes	4	1.6
Did the Child recently undergo surgery, e.g., Abdominal or Urological surgery?		
No	119	46.5
Yes	137	53.5
Has the Child been in a long-term bedridden state?		
No	119	46.5
Yes	137	53.5
Has the Child been hospitalized for more than 7 days in the Intensive Care Unit (ICU) or General Pediatric Ward?		
No	196	76.6
Yes	60	23.4
During the Hospitalization of the Child, were any invasive devices (Urinary Catheters, Mechanical Ventilation, Nasogastric Tubes, Central Venous Catheters) used on the Child?		
No	65	25.4
Yes	191	74.6
Is the Child patient currently on dialysis?		
No	252	98.4

Yes	4	1.6
During hospitalization, was more than one antibiotic prescribed to the Child?		
No	38	14.8
Yes	218	85.2
Within the last three (3) months, did you nurse or visit anyone in the hospital regularly with your Child?		
No	6	2.3
Yes	250	97.7
During your visits to the hospital, did you come into contact with medical equipment or property (Bed handles, Bed Sheets, trolley tables and chairs), or with persons within the hospital facilities?		
No	10	3.9
Yes	246	96.1
After each hospital visit, did you properly wash your hands before leaving the hospital?		
No	162	63.3
Yes	94	36.7
Did you visit anyone in the ward within the last three (3) months? Is it a general (overcrowded ward?		
No	14	5.5
Yes	242	94.5

Results and discussion

Prevalence of *Klebsiella pneumoniae*

Out of 256 samples, *K. pneumoniae* was identified in 44.1%. The prevalence was relatively high among males (45.3%; 29/64) compared with females (43.8%; 84/192), but the difference was not statistically significant ($\chi^2=0.048$, $p=0.827$) (Table 3). However, this contrasts with Ott & Mellata (2022), who reported higher prevalence among female children, potentially due to healthcare-seeking behaviour, urogenital *K. pneumoniae*, hormonal influences on immunity, hygiene practices, or caregiving roles that increase pathogen exposure.

The non-statistically significant difference ($p = 0.827$) may reflect minor variations in exposure, immunity, or other biological or environmental factors. The high prevalence among males is similar to Muhammad *et al.*

(2023), who reported a 51% prevalence in males. *K. pneumoniae* infection in males may be influenced by anatomical and immunological differences, as well as higher rates of hospital-acquired infections, including bloodstream and respiratory infections (CopaJa-Corzo *et al.*, 2026). *K. pneumoniae* was isolated across all age groups and sexes, consistent with Tao *et al.* (2022), who reported isolation across demographic variables in Southeastern Nigeria.

The prevalence was highest among participants aged 9–11 years, 47.4% (46/97), followed by those aged 12–14 years, 46.3% (25/54), and lowest among those aged 6–8 years, 38.0% (19/50). However, statistical analysis revealed no significant association between *K. pneumoniae* and age ($\chi^2 = 1.411$, $df = 3$, $p = 0.703$). The higher prevalence among 9–11-year-olds is consistent with earlier work by Isah *et al.* (2022), although the

difference was not statistically significant ($p = 0.703$). This could be linked to contributing factors such as underdeveloped immune systems, frequent exposure in communal settings (schools, hospital environments), and underlying health conditions that compromise immunity, such as asthma or diabetes, which may be more common in this age group than in younger children (Refay et al., 2026).

The 44.1% prevalence reported in this study is similar to that reported by Chao et al. (2023) among pediatric patients in hospitals across Lagos State, Nigeria. Their findings also showed a higher prevalence among older children aged 10–12 years, aligning with the present study, which found the highest prevalence among children aged 9–11 years. Uzochukwu et al. (2023) reported a slightly lower prevalence of 38% among children aged 5–15 years attending public hospitals in Enugu State, consistent with the present study's lack of a significant association between age and prevalence. Refay et al. (2026) reported a 50% prevalence in Kano State, particularly among children aged 7–12 years, consistent with the present study's observation that older children have higher infection rates.

On the other hand, the 44.1% prevalence rate reported in this study was higher than the 30.5% reported by Odewale et al. (2023) in Oyo State and the 30% reported by Majumder et al. (2025) in Kano State, while a lower prevalence rate of 12.8% was reported in Kaduna by Legba et al. (2023).

The high prevalence of *K. pneumoniae* in this study may reflect poor infection control practices, making it a common cause of hospital-acquired infections (Kumar et al., 2014). This could be linked to contributing factors such as underdeveloped immune systems, frequent exposure in communal settings (schools, hospital environments), and underlying health conditions that compromise immunity, such as asthma or diabetes, which may be more common in this age group than in younger children (Refay et al., 2026). In

terms of maternal education, prevalence was highest among mothers with secondary education (47.4%, 55/116), followed by those with tertiary education (42.2%, 57/135), while no colonization was observed among children of mothers without formal education.

The association was not statistically significant ($\chi^2 = 2.090$, $df = 3$, $p = 0.554$). Prevalence was highest among children of employed mothers (48.1%, 52/108), followed by unemployed mothers (44.6%, 25/56), and lowest among children of self-employed mothers (39.1%, 36/92). Statistical analysis revealed no significant association between *K. pneumoniae* and mothers' occupation ($\chi^2 = 1.646$, $df = 2$, $p = 0.703$). *K. pneumoniae* prevalence was highest in urine specimens (48.4%, 15/31), followed by swab samples (45.6%, 89/195), and lowest in sputum specimens (20.0%, 1/5). However, the findings showed no statistically significant difference ($\chi^2 = 3.081$, $df = 3$, $p = 0.379$) (Table 3).

Table 3: Prevalence of *K. pneumoniae* in clinical samples at SSH, Maiduguri, Borno State, Nigeria

Characteristics	Positive (n= (%))	Negative (%)	χ^2	p-value
Gender				
Male	29 (45.3)	35 (54.7)	0.048	0.827
Female	84 (43.8)	108 (56.3)		
Age group				
3-5 years	23 (41.8)	32 (58.2)	1.411	0.703
6-8 years	19 (38.0)	31 (62.0)		
9-11 years	46 (47.4)	51 (52.6)		
12-14 years	25 (46.3)	29 (53.7)		
Mothers' educational level				
No formal education	0 (0.00)	1 (100)	2.090	0.554
Primary education	1 (25.0)	3 (75.0)		
Secondary education	55 (47.4)	61 (52.6)		
Tertiary education	57 (42.2)	78 (57.8)		
Mothers Occupation				
Employed	52 (48.1)	56 (51.9)	1.646	0.439
Self employed	36 (39.1)	56 (60.9)		
Unemployed	25 (44.6)	31 (55.4)		
Samples type				
Blood	8 (32.0)	17 (68.0)	3.081	0.379
Sputum	1 (20.0)	4 (80.0)		
Swab	89 (45.6)	106 (54.4)		
Urine	15 (48.4)	16 (51.6)		

Clinical and Risk Factors Associated with Prevalence of *K. pneumoniae*

The analysis of associated clinical risk factors showed that children with urinary disorders had the highest proportion of ESBL-producing *K. pneumoniae* infections (50.0%, 1/2), followed by those with malnutrition (33.3%, 2/6), lung disease (27.3%, 3/11), and respiratory disorders (8.7%, 8/92) (Table 4). These differences suggest that certain underlying conditions, especially urinary disorders, may be more common. However, the findings showed no statistically significant difference ($\chi^2 = 8.715$, $df = 5$, $p = 0.121$). No statistically significant associations were observed between ESBL prevalence and patient risk factors

such as chronic disease, immunosuppressive therapy, recent surgeries, or long-term bedridden status ($p > 0.05$). However, urinary disorders (50.0%) and malnutrition (33.3%) were more common among ESBL-positive cases. These findings align with studies in Enugu (Charity et al., 2022) and Lagos (Akinyemi et al., 2021), which highlighted malnutrition and nosocomial infections as contributing factors, though not statistically significant.

Environmental factors such as frequent hospital visits, contact with medical equipment, handwashing practices, or exposure to overcrowded wards were also not significantly associated with ESBL prevalence ($p >$

0.05). However, children whose caregivers did not properly wash hands after hospital visits had a higher prevalence (16.7%), and patients in overcrowded wards had a 12.4% prevalence, consistent with studies by Kumar et al. (2026) and Pechnikova et al. (2026), emphasizing the importance of hygiene and infection control (Mulkern et al., 2026). Table 4 showed the association between selected clinical and risk factors and the prevalence of ESBL-producing *Klebsiella pneumoniae* among children attending State Specialist Hospital, Maiduguri, Borno State, Nigeria. The results showed that none of the assessed clinical and risk factors was statistically significantly associated with ESBL-producing *K. pneumoniae* ($p > 0.05$). This suggests that the clinical characteristics examined did not significantly influence the distribution of ESBL-producing isolates among study participants.

Children with urinary disorders recorded the highest prevalence of ESBL-producing *K. pneumoniae* (50.0%), followed by those with malnutrition (33.3%) and lung diseases (27.3%). In contrast, no ESBL-producing isolates were detected among children with HBSS or those without any underlying disease. Although these variations were observed, the association between underlying disease conditions and ESBL-producing *K. pneumoniae* was not statistically significant ($\chi^2 = 8.715$, $p = 0.121$). This finding is consistent with reports by Odewale et al. (2023), who found that while certain comorbid conditions may increase susceptibility to bacterial infections, they were not independently associated with ESBL production.

The prevalence of ESBL-producing *K. pneumoniae* was higher among children receiving immunosuppressive therapy (50.0%) compared to those not on such therapy (11.7%). However, the association was not statistically significant ($\chi^2 = 2.653$, $p = 0.103$). This finding may be attributed to the small number of children receiving immunosuppressive therapy in the study population. Xu et al. (2026) reported similar observations, noting higher colonization rates among

immunocompromised patients but finding no significant association after statistical adjustment.

Children who had been bedridden for prolonged periods showed a prevalence of 10.3%, compared with 14.5% among those who were not bedridden. Likewise, hospitalization for more than seven days in the intensive care unit or pediatric ward was not significantly associated with ESBL-producing *K. pneumoniae* infection ($\chi^2 = 0.363$, $p = 0.547$). These findings contrast with studies in tertiary healthcare facilities, where prolonged hospitalization has been identified as a major risk factor for ESBL-producing Enterobacteriaceae due to increased exposure to resistant hospital strains (Legba et al., 2023).

This discrepancy may reflect differences in patient populations, infection prevention practices, and sample size. The use of invasive medical devices was associated with a prevalence of 10.2%, while children who had not been exposed to invasive devices showed a higher prevalence of 20.0%. Although invasive procedures are widely recognized as risk factors for healthcare-associated infections, the association observed in this study was not statistically significant ($\chi^2 = 1.713$, $p = 0.191$). Some pediatric studies reported similar findings, where device use alone was not sufficient to predict ESBL infection without prolonged device exposure or other risk factors. The prevalence of ESBL-producing *K. pneumoniae* among children who received multiple antibiotics during hospitalization was 12.1%, compared to 14.3% among those who received a single antibiotic regimen. No significant association was observed ($\chi^2 = 0.053$, $p = 0.818$). This finding differs from previous reports that identified prior antibiotic exposure as a major driver of ESBL emergence and selection pressure within healthcare settings (Okogeri et al., 2020). The lack of significance in the present study may reflect prudent antibiotic use practices or the relatively small number of ESBL-positive isolates detected.

Hospital visitation-related factors also showed no statistically significant associations with ESBL-producing *K. pneumoniae*. Children whose caregivers regularly visited or nursed hospitalized individuals had a prevalence of 11.7%, while those who did not had 50.0% ($\chi^2 = 2.653$, $p = 0.103$). Similarly, contact with hospital equipment or surfaces during visits was not significantly associated with ESBL carriage.

However, children whose caregivers reported not washing their hands properly after hospital visits had a higher prevalence (16.7%) than those who practised hand hygiene (6.4%). Although this difference was not statistically significant ($\chi^2 = 2.675$, $p = 0.102$), it highlights the potential role of hand hygiene in reducing the transmission of multidrug-resistant organisms within healthcare environments.

Furthermore, children whose caregivers had visited overcrowded wards within the previous three months recorded a prevalence of 12.4%. In contrast, no ESBL-producing isolates were detected among those who had

not visited such wards. Nevertheless, the association was not statistically significant ($\chi^2 = 1.055$, $p = 0.304$). This finding suggests that overcrowding alone may not be a sufficient determinant of ESBL transmission, although it remains an important factor in infection prevention and control programs.

Overall, the findings indicate that while certain clinical and healthcare-exposed factors showed relatively higher proportions of ESBL-producing *K. pneumoniae*, none showed a statistically significant association with ESBL occurrence in this study population. The lack of significant associations may be due to the relatively low number of ESBL-positive isolates, small subgroup sample sizes, and effective infection prevention measures in the study setting.

Nevertheless, the observed trends underscore the need for continued surveillance, antimicrobial stewardship, and strict infection control practices to minimize the spread of ESBL-producing organisms among hospitalized children

Table 4: Clinical and Risk factors associated with the prevalence of ESBL-producing *K. pneumoniae* among children attending SSH, Maiduguri, Borno State, Nigeria

Characteristics	Negative (%)	Positive (%)	χ^2	p-value
Presence of any underlying disease				
HBSS	1 (100.0)	0 (0.0)	8.715	0.121
Lung disease	8 (72.7)	3 (27.3)		
Malnutrition	4 (66.7)	2 (33.3)		
Respiratory disorder	84 (91.3)	8 (8.7)		
Urinary disorder	1 (50.0)	1 (50.0)		
None	1 (100.0)	0 (0.0)		
The child is currently on Immunosuppression therapy.				
No	98 (88.3)	13 (11.7)	2.653	0.103
Yes	1 (50.0)	1 (50.0)		
Has the Child been in a long-term bedridden state?				
No	47 (85.5)	8 (14.5)	0.459	0.498
Yes	52 (89.7)	6 (10.3)		

Has the Child been hospitalized for more than 7 days in the Intensive Care Unit (ICU) or General Pediatric Ward?

No	78 (86.7)	12 (13.3)	0.363	0.547
Yes	21 (91.3)	2 (8.7)		

During the Hospitalization of the Child, were any invasive devices (Urinary Catheters, Mechanical Ventilation, Nasogastric Tubes, Central Venous Catheters) used on the Child?

No	20 (80.0)	5 (20.0)	1.713	0.191
Yes	79 (89.8)	9 (10.2)		

Is the Child patient currently on dialysis?

No	98 (87.5)	14 (12.5)	0.143	0.706
Yes	1 (100.0)	0 (0.0)		

During hospitalization, was more than one antibiotic prescribed to the Child?

No	12 (85.7)	2 (14.3)	0.053	0.818
Yes	87 (87.9)	12 (12.1)		

Within the last three (3) months, did you nurse or visit anyone in the hospital regularly with your Child?

No	1 (50.0)	1 (50.0)	2.653	0.103
Yes	98 (88.3)	13 (11.7)		

During your visits to the hospital, did you come into contact with medical equipment or property (Bed handles, Bed Sheets, trolley tables, and chairs), or with persons within the hospital facilities?

No	2 (66.7)	1 (33.3)	0.264	
Yes	97 (88.2)	13 (11.8)		

After each hospital visit, did you wash your hands properly before leaving?

No	55 (83.3)	11 (16.7)	2.675	0.102
Yes	44 (93.6)	3 (6.4)		

Have you visited anyone in the ward within the last three (3) months? Is it a generally overcrowded ward?

No	7 (100.0)	0 (0.0)	1.055	0.304
Yes	92 (86.8)	14 (12.4)		

Conclusion

The increasing prevalence of risk factors associated with Extended-Spectrum Beta-Lactamase (ESBL)-producing strains has reduced the effectiveness of commonly used β -lactam antibiotics, making the selection of appropriate empirical therapy more challenging.

The study investigated the prevalence and associated risk factors of ESBL-producing *K. pneumoniae* among children attending the State Specialist Hospital, Maiduguri. Assessment of risk factors associated with ESBL-producing *K. pneumoniae* infections revealed no statistically significant associations with most sociodemographic and clinical variables.

However, specimen type was significantly associated with ESBL production, suggesting that the likelihood of isolating ESBL-producing strains may vary by infection source. Therefore, infection control measures, routine surveillance, and ongoing antimicrobial stewardship programs should be strengthened to curb the spread of resistant *K. pneumoniae* strains. Determining the prevalence and risk factors associated with *K. pneumoniae* is crucial for identifying children at greater risk of acquiring these resistant organisms.

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