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Research Article

Incidence And Risk Factors of Hospital-Acquired Infections in Pediatrics Patients at Tibebe Ghion Specialized Hospital, Ethiopia, 2022; Prospective Follow-Up Study

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Abstract

Background: Hospital-acquired infections are a global issue that impacts both developed and resource-poor countries. Some patients are particularly vulnerable due to the severity of their illness, potential immunosuppression, and the requirement for invasive monitoring and life support equipment. Understanding the incidence and risk factors of hospital-acquired infections in pediatric patients is crucial for developing tailored prevention strategies and improving patient outcomes in Tibebe Ghion Specialized Hospital.

Objectives: The objective of this study was to investigate the incidence and risk factors associated with hospital-acquired infections in pediatric patients admitted to Tibebe Ghion Specialized Hospital in 2022.

Methods: A hospital-based prospective follow-up study was conducted at Tibebe Ghion Specialized Hospital from May 1 to August 1, 2022. The study included pediatric patients from the Pediatric Intensive Care Unit, Neonatal Intensive Care Unit, and General Ward. Data was collected using a structured checklist and analyzed using statistical software. Descriptive statistics and logistic regression were used to analyze the data, and odds ratios with 95% confidence intervals were computed to assess the association between variables.

Result: In this study, a total of 591 pediatric patients were observed over a period of 5,805 patient days. The median age of the patients was 1.8 months. The incidence rate of hospital-acquired infections (HAIs) was found to be 17.4 per 1,000 pediatric days of follow-up. The overall cumulative incidence of HAIs over a three-month period was 17.1%. Several risk factors for HAIs were identified. Children who stayed in the hospital for more than eight days had a significantly higher risk of developing HAIs (AOR: 28.1, 95% CI 9.71-81.38). Additionally, children with underlying disease conditions were found to have a higher risk (AOR: 4.93, 95% CI 2.44 to 9.97), as well as those with invasive medical devices (AOR= 9.4, 95% CI: 5.04-17.68). Among the hospital-acquired infections, hospital-acquired pneumonia was the most common type observed. The most frequently identified etiologic agents responsible for these infections were CONS and Klebsiella pneumoniae. These findings highlight the importance of addressing these risk factors in order to prevent and control HAIs in pediatric patients.

Conclusion: The cumulative incidence of hospital-acquired infections (HAIs) was 17.1% among admitted children. Factors such as longer hospital stays, underlying health conditions, and the presence of invasive medical devices were associated with a higher risk of HAIs. To prevent and control HAIs, hospital management and clinicians should prioritize patients with underlying chronic medical conditions.

Keywords: *Hospital Acquired Infection, Healthcare Associated Infection, Pediatrics*

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1. Background

Hospital-acquired infections (HAIs) are defined as infections that occur during or shortly after a hospital stay, but were not present or in the incubation period at the time of admission. Typically, infections that develop 48 hours or more after admission are considered HAIs, unless they are community-acquired. To detect infections that may not have been apparent during admission, follow-up surveillance for one week after discharge is usually adequate(1).

Hospital-acquired infections (HAIs) pose a significant global health challenge, contributing to patient safety concerns and fueling antimicrobial resistance (AMR) worldwide (2, 3).These infections, often caused by drug-resistant organisms, have severe consequences for patients and their families, including illness, prolonged hospital stays, potential disability, increased costs, and even death(4, 5).

Research conducted in Gabon and Ethiopia has identified the most common types of HAIs, including urinary tract infections (often associated with catheter use), surgical site infections (SSIs), bloodstream infections (BSIs) related to intravascular devices, and pneumonia associated with ventilator use(6, 7).

HAIs occur globally, affecting both developed and resource-poor countries, and are a leading cause of death and increased morbidity among hospitalized patients. They impose a significant burden on patients, their families, and public health, leading to functional disability, emotional stress, and reduced quality of life (8).

The economic costs of HAIs are substantial, with increased hospital stays being the primary contributor to these costs (9). Furthermore, HAIs contribute to higher morbidity, mortality, long-term disability, increased healthcare costs, and the development of antibiotic resistance (10-13).

Children admitted to pediatric intensive care units (PICUs) are particularly vulnerable to HAIs due to their immunocompromised state and the frequent use of invasive devices during their treatment (14).

Globally, it is estimated that hundreds of millions of patients are affected by HAIs each year, regardless of the country's level of development(15). In Europe, the annual number of patients with HAIs was estimated at around 3.2 million, with a prevalence of 6.0% in acute care hospitals(16). The total costs associated with HAIs in Europe were estimated to be approximately 7 billion Euro(17, 18). However, the magnitude of HAIs in African countries, including Ethiopia, remains uncertain due to limited available data (17, 19, 20).

A systematic review conducted in Africa reported HAI prevalence rates ranging from 2.5% to 14.8%, highlighting the need for improved prevention, surveillance, and control strategies in the region(17). In South Africa, the incidence rates of HAIs in non-ICU, PICU, and NICU settings were reported as 7.0, 15.3, and 21.6 per 100 admissions, respectively(21). A study in Kenya revealed an overall risk of nosocomial infections of 5.9 per 1000 admissions, with higher mortality rates compared to community-acquired infections (22). Similarly, a study conducted in southeast Ethiopia found an overall cumulative incidence of 12.7% over 8 months, with prolonged hospital stays and underlying diseases increasing the risk of HAIs (23).

Studies conducted in Jimma, Europe, Turkey, and Ayder Pediatric Intensive Care Unit have provided valuable insights into the incidence, prevalence, and associated risk factors of HAIs (51-54). However, there is a lack of comprehensive data on HAIs among neonatal and pediatric populations in Ethiopia, with previous studies primarily focusing on adults and surgical site infections (24-28). To address this gap and enhance HAI prevention and antimicrobial resistance efforts, it is crucial to gather accurate epidemiological data on the incidence and risk factors of HAIs among pediatric patients in Bahir Dar, TGSH, and other regions of Northwest Ethiopia.

2. Methods

2.1 Study Design and Setting

A prospective follow-up study was conducted from May to August 2022 at Tibebe Ghion Specialized Referral Hospital in Bahir Dar, North West Ethiopia. This hospital is one of the two referral hospitals in the area and serves as the only teaching hospital in Bahir Dar, catering to a population of over 5 million people.

According to the 2020 E.C annual report of Tibebe Ghion Referral Hospital, the average yearly admissions exceed 93,000 patients. Out of these, 3,720 patients were admitted to the pediatric ward, Pediatric Intensive Care Unit (PICU), and Neonatal Intensive Care Unit (NICU). The hospital has a total of 459 inpatient beds, with 52 beds in the pediatric ward, 58 beds in the PICU, and 2 beds in the NICU.

2.2 Study Participants

The study included all patients under 15 years of age who were admitted to the pediatric ward, PICU, and NICU and had a minimum inpatient stay of 48 hours. Patients diagnosed with HAIs and referred from other health institutions were excluded from the study.

2.3 Study variables

The study's dependent variable or outcome variable was the incidence of hospital-acquired infections (HAIs). The independent variables included socio-demographic characteristics such as age, sex, gestational age, birth weight, and residency. Clinical and other related variables were also considered, such as previous hospitalization, duration of hospitalization, insertion of a urinary catheter, presence of peripheral intravenous catheter, mechanical ventilator (intubation), nutritional status, major or minor surgery after admission, chronic co-morbidities, recent antimicrobial use within three months, being on continuous positive airway pressure, and exchange transfusion procedures.

2.4 Sample size determination and sampling procedure

All patients admitted and full fill the inclusion criteria in the study period were included. A total of 591 patients were included in the study.

2.5 Operational Definitions

HAIs: Is an infection develops after 48 hours of admission which was not present at the time of admission.

Presence of invasive medical devices: The presences of one or more of the following medical device; mechanical ventilation, umbilical catheterization, chest tube, NG tube, urethral catheterization, ventriculo-peritoneal shunt.

Under lying medical condition: the presence of one or more of the following chronic medical conditions; congenital or acquired cardiac conditions, systemic hypertension, sever acute malnutrition, retroviral infection, CKD, CLD, congenital malformations (neural tube defects, omphalocele, gastroschiasis)

Previous admission: History of admission for the current or any other problems with in the past three months at any health institution at least for 48 hour.

Previous use of antibiotics: use of any form of antibiotics for the current problem.

2.6 Data collection procedures

All children were clinically evaluated upon admission, and socio-demographic and clinical data were collected using a structured checklist through an individual patient chart investigation approach. Patients who did not show new signs or symptoms of infection within the first 48 hours of admission were included and prospectively followed for the development of HAIs during their hospital stay. Data was collected daily from enrolled patients, and HAIs were confirmed by pediatrician specialists or residents working in the respective NICU, PICU, and pediatric ward.

The data was collected by trained medical internship students, using the Centers for Disease Control and Prevention (CDC)/National Health Care Safety Network surveillance definition for HAIs and physician clinical judgments used in the hospital. The study also recorded the use of antimicrobials and different medical devices at the time of hospital admission and before the diagnosis of HAIs.

2.7 Data quality control.

The data collection tool was adopted from different related pieces of literature based on the available evidences of HAIs. To ensure the quality of data, the data collection tool was pretested at FHCSH with 10% of the sample size, before the data collection period. Training was given a half day for data collectors on the study procedures, and with practical exercise sessions. Data collection was closely supervised by a principal investigator, and the collected data was checked for completeness, accuracy and consistency. In order to minimize the potential effects of confounder variables, multivariable logistic regression model was used, and analyses were adjusted to known confounders.

2.8 Data management

The statistical analysis was conducted using SPSS 25 software. Descriptive statistics were computed to present the frequency distribution of important variables. The cumulative incidence, which represents the probability of developing HAIs over a 3-month study period, was calculated by determining the number of new HAI cases per person in the population. The incidence rate, on the other hand, was estimated by calculating the number of HAI cases per unit of time, with the denominator representing the total time "at-risk" without experiencing HAIs for all children followed for 3 months. The incidence rate of HAIs was reported per 1000 patient days.

To examine the association between the dependent and independent variables, binary logistic regression was performed. Variables that showed a significant association (P value <0.25) in the bivariate logistic regression analysis were considered potential candidates for multivariable logistic regression analysis. This multivariable analysis helped control for confounders in the regression models. These analysis methods were utilized to determine the risk of infection associated with healthcare services and the incidence rate of infection in the hospital.

3. Result

During the study period, a total of 591 pediatric patients were included. Among them, 76.1% came from rural areas. Nearly half of admissions were males, accounting for 54.7% (323 patients). Most patients were admitted before the age of 5, representing 89.3% of the total. The age of admission ranged from 7 hours to 14 years, with a mean age of 1.8 years. Regarding the place of admission, approximately 47.7% of patients were admitted to the neonatal intensive care unit (NICU), while 5.9% were admitted to the pediatric intensive care unit (PICU). (Table 1).

Table 1. Socio-demographic characteristics of Pediatrics patients who were admitted in TGSH from May1- August 1 /2022

Variables	Frequency, n=591	Percent
Address		
Rural	450	76.1
Urban	151	23.9
Sex		
Male	323	54.7
Female	268	45.3
Age		
<1 month	282	47.7
1-12 month	109	18.5
1-5 years	127	21.4
5-10 years	47	8
>10years	26	4.4
Place of admission		
NICU	282	47.7
Ward	274	46.4
PICU	35	5.9

Clinical characteristics

During the study period, the following clinical characteristics were observed:

Most patients (81.7%) had no previous history of hospitalization. Only 18.3% of patients had been hospitalized within the past three months, with an average duration of 6.8 days. Among those with a history of hospitalization, the majority (84.2%) were admitted to primary hospitals, while the remaining 15.8% were admitted to TGSH.

Among the admitted patients, 21.2% had one or more invasive medical devices, such as mechanical ventilations, CPAP, chest tubes, nasogastric tubes, urinary catheters, and umbilical catheters. The most common invasive medical device was the nasogastric tube, accounting for 41.8% of cases. CPAP was the second most common device, while the umbilical catheter was the least common, with a prevalence of 1.6%.

Approximately 16.6% of admitted patients had one or more chronic underlying medical problems at the time of admission. The most common conditions were cardiac conditions (35.2%), followed by congenital malformations (29.6%) and severe acute malnutrition (24.1%).

During the study period, 6.4% of admitted patients underwent surgical procedures. Of these, 79% were emergency surgeries and 21% were elective surgeries.

In terms of hospital stay length, the majority of patients (about 60%) stayed for less than 7 days. The minimum length of stay was 3 days, while the maximum was 60 days. The median length of hospital stay during the study period was 8 days. (Table 2).

Table 2. Clinical characteristics of Pediatrics patients who were admitted in TGSH from May1- August 1 /2022.

Variables	Frequency, n=591	Percent
Previous hospitalization		
Yes	108	18.3
No	482	81.7
Presence of invasive medical device		
Yes	125	21.2
No	466	78.8
Presence of underlying diseases		
Yes	98	16.6
No	493	83.4
Surgical procedure done		
Yes	38	6.4
No	553	93.6
Length of hospital stay		
<8 days	353	59.7
>8days	238	40.3

Incidence and type of Hospital acquired infection

During the study period, 591 pediatric patients were monitored for a total of 5805 patient days. Out of these, 101 patients experienced hospital-acquired infections (HAIs), with no patients having more than one episode of infection. The average time of HAI diagnosis was 6.4 patient days. The overall incidence rate of HAIs was 17.4 per 1000 pediatric days of follow-up, and the cumulative incidence over 3 months was 17.1%. The infected pediatric patients had a mean hospital stay of 18.2 days, while the remaining patients had a shorter stay of 8.1 days.

Among the pediatric patients at Tibebe Ghion Specialized Referral Hospital, hospital-acquired pneumonia (HAP) was the most common type of HAI, accounting for 55.5% of cases. Meningitis accounted for 16.9% of cases, while IV site thrombophlebitis was the least observed HAI, with a proportion of 4.9%. Culture tests were conducted for 38 (37.6%) of the pediatric patients who developed hospital-acquired infections. Among these, 30 (78.9%) had isolated organisms. The most common isolated organisms were CONS and K. Pneumoniae, each accounting for 30% of cases, while Staphylococcus aureus accounted for 6.7%. However, it is important to note that CONS is a known contaminant bacterium in cultures, and the study did not differentiate whether it was a contaminant or not (Table 3).

Table 3. Incidence, type and etiologies of HAIs in Pediatrics patients who were admitted in TGSH from May1- August 1 /2022

Variables	Frequency	Percent
Develop HAIs		
Yes	101	82.9
No	490	17.1
Type of hospital acquired infection		
Pneumonia	56	55.5
Meningitis	17	16.9
UTI	16	15.8
SSI	7	6.9
Thrombophlebitis	5	4.9
Culture done		
Yes	38	37.6
No	63	62.4
Was organism grow from the culture		
Yes	30	78.9
No	8	21.1
Isolated organism		
CONS	9	30
K.Pneuminae	9	30
Enterococcus	6	20
A.Boumani	4	13.3
Staph	2	6.7

Outcome of the admitted pediatrics patients

Out of the admitted pediatric patients, 86.8% (513 patients) showed improvement and were discharged, while 8.6% (51 patients) unfortunately passed away. Among the patients who developed hospital-acquired infections (HAIs), approximately 25% did not survive, and 10% left against medical advice. In contrast, among the patients without HAIs, the mortality rate was approximately 5%, and the rate of leaving against medical advice was 0.14%(Figure 1).

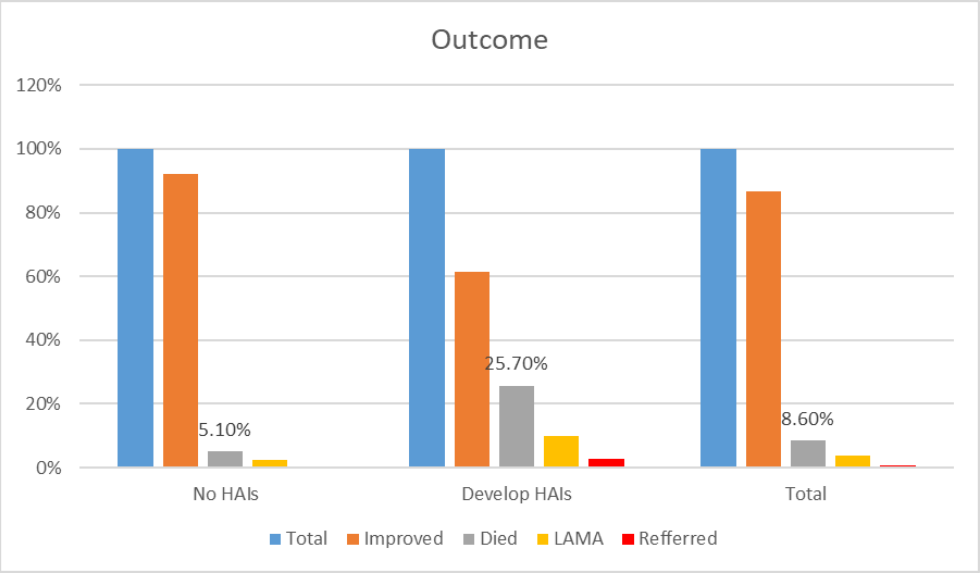

Figure 1. *Outcome of Pediatrics patients who were admitted in TGSH from May1-August 1 /2022*

During the study period, the majority of patients admitted (86.8%) showed improvement and were discharged, while approximately 8.6% unfortunately passed away. Specifically, among the patients admitted to the Neonatal Intensive Care Unit (NICU), 82.1% experienced improvement and were discharged, while 13.1% did not survive. In the Pediatric Intensive Care Unit (PICU), about 17.1% of patients passed away, and 8.6% left against medical advice. For patients admitted to the general ward, a significant proportion (93.4%) showed improvement and were discharged. The mortality rate was 2.9%, and 2.6% of patients chose to leave against medical advice (Figure 2).

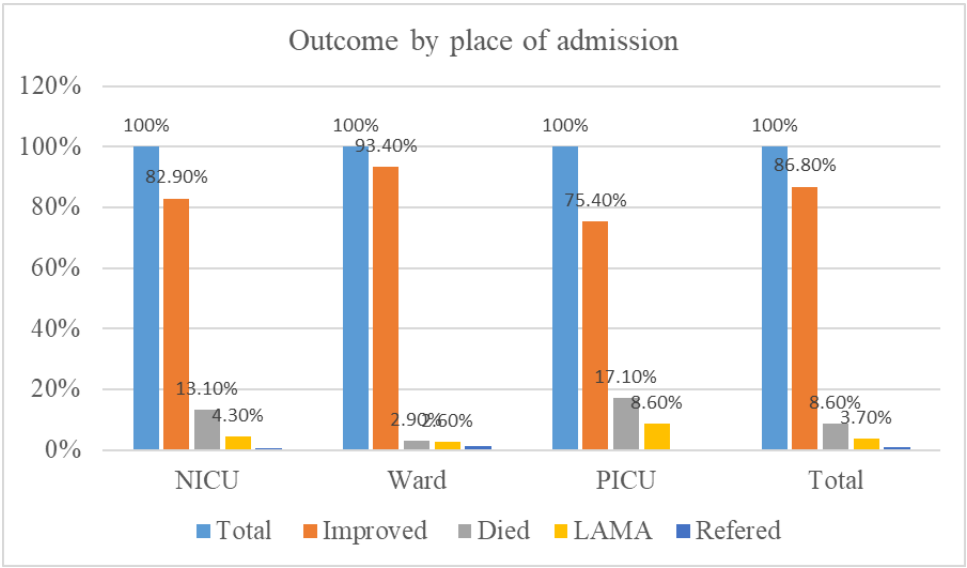

Figure 2*: Outcome of Pediatrics patients with their place of admission in TGSH from May1- August 1 /2022*

Risk factors for hospital acquired infection

Bivariate logistic regression was conducted to analyze the impact of selected variables on the occurrence of hospital-acquired infections (HAIs). The results indicates that the presence of invasive medical devices, underlying chronic health conditions, previous hospitalization, surgical procedures, and total length of hospital stay were significantly associated with HAIs at a significance level of 5%. This means that each of these variables individually contributed significantly to the development of HAIs.

On the other hand, variables such as residence, sex, age, and place of admission did not show a significant association with HAIs in this bivariate logistic regression analysis. Based on these bivariate results, the variables that were considered as candidates for multiple logistic regression analysis were the presence of invasive medical devices, underlying chronic health conditions, previous hospitalization, surgical procedures, and total length of hospital stay. Out of these five variables, three were found to have a significant net effect on the development of HAIs at Tibebe Ghion Specialized Referral Hospital (TGSH). These variables were the presence of invasive medical devices, underlying chronic health conditions, and total length of hospital stay. The remaining two variables, previous hospitalization and surgical procedures, did not show a significant association with HAIs.

Pediatric patients who had one or more invasive medical devices (such as MV, CPAP, NGT, Chest tube, urinary and umbilical catheter) were found to be 9.4 times more likely to develop HAIs compared to patients without such devices (AOR=9.4, 95% CI: 5.04-17.68). Patients with underlying chronic health conditions were 4.93 times more likely to develop HAIs compared to those without such conditions (AOR=4.93, 95% CI: 2.44-9.97). Additionally, patients who stayed in the hospital for more than 8 days (the median hospital stay during the study period) were more likely to acquire hospital infections compared to those with a shorter stay (AOR=28.1, 95% CI: 9.71-81.38). However, it is important to note that this study's definition of length of stay includes both the period before and after the development of HAIs, making it difficult to conclude that longer duration itself is a risk factor for the development of HAIs. (Table 4)

Table 4. Bi-variable and multivariable logistic regression test for the associated factors of Hospital acquired infection in TGSH from May1 –August 1/2022

Variables		Hospital acquired infection		Odds ratio		p- value*
		Yes	No	Unadjusted	Adjusted	
Residency	Rural	70	380	0.654(.407-1.409)		
	Urban	31	110	1		
Sex	Female	52	216	1.346(.887-2.067)		
	Male	49	274	1		
Age	>5years	15	48	1.606(.860-2.998)		
	<5years	86	442	1		
Place of admission	General ward	43	229	0.845(.584-1.302)		
	NICU&PICU	58	261	1		
Presence of invasive medical device	Yes	71	54	19(11.45-31.88)	9.4(5.04-17.68)	<.001
	No	30	436	1	1	
Presence of underlying diseases	Yes	45	53	6.6(4.07-10.761)	4.93(2.44-9.97)	<.001
	No	56	437	1	1	
Previous hospitalization	Yes	40	68	4.069(2.53-6.54)	1.72(.863-3.444)	0.123
	No	61	422	1	1	
Surgical procedures	Yes	18	20	5.09(2.59-10.04)	2.09(.786-5.574)	0.139
	No	83	470	1	1	
Length of hospital stay	>8 days	97	141	60.02(21.6-166.2)	28.1(9.71-81.38)	<.001
	<8 days	4	349	1	1	

* -is the p value of AOR

4. Discussion

It was found that the overall incidence rate of hospital-acquired infections (HAIs) among pediatric patients was 17.4 per 1000 days of follow-up. This rate was lower than a related prospective study conducted in southwest Ethiopia, which reported an incidence of 28.15 HAIs per 1000 patient days(29). The difference in incidence rates could be attributed to the fact that our study only included pediatric patients with a small number of co-morbid conditions, while the study in southeast Ethiopia included adult participants. Furthermore, our finding was also lower than a previous before-and-after study conducted in an Indonesian teaching hospital, which involved children admitted to the Pediatric Intensive Care Unit (ICU) and pediatric ward, and reported an incidence density rate of 29.1 HAIs per 1000 patient days(30). These variations may be due to differences in geographical locations, study settings, and study periods. The study conducted in Indonesia, for instance, was carried out in a hospital with more than ten PICU beds and took a longer duration of 27 months from 2010-2013 (30). The results of this study were similar to those conducted in Brazil, which reported an incidence rate of 15.4 per 1000 patient-days(24), Mexico with a rate of 15 per 1000 patient-days(25), and Madda Walabu University Goba Referral Hospital in southeast Ethiopia, which reported a rate of 17.7 per 1000 patient-days (31).

One of the findings of this study revealed that the overall cumulative incidence of hospital-acquired infections (HAIs) was 17.1%, which was higher than studies conducted by the World Health Organization (WHO) with a pooled estimated incidence of 10.1% in low-income countries(32), Italy with an incidence of 3.6%(24), Iran with an incidence of 7.77% (25), and Butare University Teaching Hospital with an incidence of 12.1%(31). The difference in incidence rates may be due to differences in infrastructure, such as high patient burden, lower human resources, and overcrowding, as well as differences in infection prevention policies and strategies.

Conversely, studies from Turkey and Europe reported a higher incidence rate of HAIs among children, with Turkey reporting an incidence of 22.2%(33) and Europe reporting an incidence of 23.6%(34). These differences may be attributed to differences in setting, population, and the nature of the study, as Europe includes multicenter studies. Infants and neonates are immunologically immature and vulnerable, which may explain the high proportion of HAIs in the NICU, PICU, and pediatric ward, as most patients admitted to intensive care are critical.

The most common type of HAI observed in this study was hospital-acquired pneumonia (HAP), which contributed to 55.5% of the total HAIs. This finding was similar to the study conducted in Tikur Anbessa Hospital, Ethiopia(35), as well as in other settings such as the USA with 48%(30), Europe with 19.4%(36), and Brazil(23, 37).

The study also found that the risk of developing HAIs in the presence of underlying diseases, such as severe acute malnutrition (SAM), cardiac problems, and congenital malformation, was 4.9 times higher than their counterparts. This was consistent with findings from other studies conducted in Ethiopia, Kenya, and Brazil (15, 16, 23, 38), which showed that underlying illnesses increased the susceptibility of patients and predisposed them to infections secondary to the reduction of the patient's immune response.

Another finding in this study showed that there was a statistically significant association between hospital-acquired infections and length of hospital stay. Studies conducted in different countries also supported this finding, as staying longer in the hospital is associated with the development of HAIs, and vice versa, such as in Europe(17), the USA(27, 38), developing countries(18), and in Ethiopia(16, 38). These additional days in the hospital result in challenges in terms of human resources, material resources, and additional costs for the family, institution, community, and country as a whole.

The study also found a statistically significant association between HAIs and the presence of invasive medical devices, revealing that pediatric patients with invasive medical devices are nine times more likely to acquire infections in the hospital than their counterparts. This finding is in line with studies conducted in Madda Walabu, Jimma, and Mekele(16, 38, 39).

Conclusion

Based on the study's findings, the overall cumulative incidence of hospital-acquired infections (HAIs) was 17.1% among admitted pediatric patients in Tibebe Ghion Specialized Hospital. The study identified several risk factors for HAIs, including length of stay in the hospital, underlying disease conditions, and invasive medical devices. Hospital-acquired pneumonia was the most common type of HAI, with CONS and Klebsiella pneumoniae being the most common causative agents.

In light of these results, it is recommended that hospital management and clinicians implement strategies to reduce the length of hospital stay for pediatric patients, particularly for those who are at higher risk of developing HAIs. Additionally, infection prevention and control measures should be strengthened, with particular attention given to patients with underlying chronic medical conditions and those requiring invasive medical devices.

In order to reduce the incidence of HAIs in pediatric patients, it is also recommended that healthcare providers prioritize hand hygiene, ensure appropriate use of antibiotics, and implement environmental cleaning and disinfection protocols. Finally, ongoing surveillance and monitoring of HAIs should be conducted to identify any emerging trends or outbreaks and to inform targeted interventions. By addressing these recommendations, healthcare providers can improve patient outcomes and reduce the economic burden associated with HAIs.

Acronyms and Abbreviations

AMR: Anti-Microbial Resistance; BSI: Blood Stream Infection; CPAP: Continuous Positive Airway Pressure; CSF: Cerebrospinal Fluid; HAIs: Hospital Acquired Infections; HCAIs: hospital Care Associated Infections; ICU: Intensive Care Unit; MDR: Multi-drug Resistance; NGT: Naso-Gastric Tube; NI: Nosocomial Infection; NICU: Neonatal Intensive Care Unit; PICU: Pediatric Intensive Care Unit; SPSS: Statistical Package for Social Science; SSI: Surgical Site Infection; TGSH: Tibebe Ghion Specialized Hospital; USA: United States of America; UTI: Urinary Tract Infections; WHO: World Health Organization

Ethics Approval and Consent to Participate

Ethical clearance was sought from Bahir Dar University, college of medicine and health science, ethical review committee. After explaining about the purpose and the possible benefit of the study, permission to gather data was obtained from the medical directors of Tibebe Ghion referral hospital and head of each unit. Parents/guardians were informed about the objective and purpose of the study and oral assent obtained from each respondent. Confidentiality of information was maintained.

Consent for Publication

Not applicable

Author Contributions

Conceptualization: YL. Formal analysis: YL SZ AB WW NM BT. Development or design of methodology: YL SZ AB WW BS. Entering data into computer software: YL AB. Supervision: YL SZ AB WW. Validation: YL SZ AB WW. Writing original draft: YL SZ AB WW. Writing review & editing: YL SZ BS BT NM WW. All authors read and approved the final manuscript

Availability of data and material

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflict of Interests

The authors have declared that no competing interests exist.

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