CHAPTER - 5

IMMUNIZATION & INFECTIOUS DISEASE CONTROL IN PEDIATRIC NURSING

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Abstract:

Protecting children from infectious diseases is a cornerstone of pediatric nursing, where immunization and infection control play pivotal roles. Vaccination remains one of the most effective strategies to prevent life-threatening illnesses, significantly reducing childhood morbidity and mortality. This chapter delves into the significance of immunization, the recommended vaccine schedules, and the nurse's crucial role in educating parents, dispelling myths, and ensuring vaccine adherence. Additionally, it highlights essential infection control measures such as stringent hand hygiene, isolation precautions, and hospital-based strategies to curb

healthcare-associated infections. Nurses serve as frontline advocates, not only administering vaccines but also fostering awareness and implementing robust infection prevention protocols. By integrating evidence-based practices, pediatric nurses can create a safer healthcare environment, mitigating the spread of infectious diseases. This chapter equips nurses with comprehensive knowledge and practical strategies to safeguard children's health, reinforcing their role as protectors of the most vulnerable population.

Keywords: Immunization, Infection Control, Childhood Diseases, Isolation Precautions, Role of Nurses in Immunization, Preventive Pediatric Nursing, Safety Protocols.

Running Head Suggestion: Shielding Little Lives- Immunization & Infection Control

Introduction:

5.1 Overview of Immunization and Infectious Control:

5.1.1. Immunization: Definition and Purpose:

Immunization is the process by which an individual's immune system is strengthened to resist a specific infectious disease, typically through the administration of a **vaccine**. It enables the body to recognize and combat pathogens (such as viruses or bacteria) effectively, providing protection against future infections.

Immunization is a simple yet powerful way to protect children from serious diseases. It works by helping the body's immune system recognize and fight harmful germs before they can cause illness. Vaccines, which are carefully developed to be safe and effective, train the body to build immunity without making a child sick. For children, immunization is a key part of staying healthy, preventing dangerous infections like measles, polio, and whooping cough. It not only protects the child receiving the vaccine but also helps keep entire communities safe by reducing the spread of diseases—a concept known as herd immunity.

Table no. 1: Purposes of Immunization

Purpose	Description	Examples
Disease Prevention	Protects individuals from infections and reduces illness severity	Measles, tetanus, flu, hepatitis B vaccines
Eradication	Eliminates diseases globally through high vaccination coverage	Smallpox (eradicated in 1980), polio (nearly eradicated).
Herd Immunity	Reduces disease spread in communities by immunizing a critical population.	Protects newborns, elderly, and immunocompromised individuals
Public Health Protection	Prevents epidemics, lowers healthcare costs, and ensures global health security.	COVID-19 vaccination campaigns, HPV vaccine to prevent cervical cancer.
Maternal & Infant Protection	Shields pregnant women and newborns from vaccine-preventable diseases	Tdap (whooping cough), rubella vaccine to prevent congenital disabilities
Travel Safety	Prevents disease transmission across borders for travelers.	Yellow fever, typhoid, cholera vaccines.

This table shows how important vaccines are in keeping us safe and healthy. They help prevent diseases, stop outbreaks, and even wipe out some illnesses completely—like smallpox. Vaccines also protect vulnerable people in the community, including babies and older adults,

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through herd immunity. They're especially helpful for pregnant women and travelers too. From measles to COVID-19 and yellow fever, vaccines play a big role in protecting both individuals and the world at large.

5.1.2. Infection Control:

The **World Health Organization (WHO)** emphasizes that infection prevention and control (IPC) is a fundamental aspect of pediatric healthcare, crucial for reducing the burden of infectious diseases in children. Newborns and young children are among the most vulnerable populations due to their immature immune systems, frequent hospital visits, and exposure to various pathogens in healthcare and community settings. According to WHO, **effective infection control strategies** include rigorous hand hygiene, vaccination programs, appropriate use of personal protective equipment (PPE), and environmental sanitation. Special attention is given to antimicrobial resistance (AMR), which poses a growing threat to pediatric health. WHO also highlights the importance of **isolation precautions** in managing highly infectious diseases and reducing hospital-acquired infections (HAIs). Nurses play a **key role in infection control**, ensuring strict adherence to WHO guidelines, educating caregivers, and implementing best practices to safeguard children's health. Strengthening IPC measures is essential for reducing child mortality and achieving global health goals.

5.1.3 Review of Literature

Immunization and infection control are fundamental aspects of pediatric nursing, backed by extensive research emphasizing their role in reducing childhood morbidity and mortality. Studies by the World Health Organization (WHO) highlight that vaccination prevents 3.5–5 million deaths annually from diseases such as measles, diphtheria, and pneumonia. Research by Gates et al. (2021) further underscores the impact of herd immunity in reducing disease transmission and protecting immunocompromised individuals. Infection control in hospital settings is another critical area of study. A systematic review by Allegranzi et al. (2020) found that implementing stringent hand hygiene and sterilization

protocols reduced hospital-acquired infections (HAIs) in neonatal intensive care units (NICUs) by up to 50%. Similarly, a study by Patel et al. (2019) demonstrated that educational interventions for nurses improved compliance with infection prevention strategies, leading to a significant decline in HAIs among pediatric patients. Community-based immunization programs have also been widely researched. A study by Rosenstock et al. (2022) found that targeted awareness campaigns increased HPV vaccination rates in rural populations, reducing cervical cancer risks. These findings reinforce the critical role of nurses in immunization advocacy, infection control implementation, and public health education, ensuring safer healthcare environments for children.

5.2. Research Objectives:

1. To assess nurses' knowledge of immunization and infection control.
2. To evaluate the impact of vaccination in preventing childhood diseases.
3. To identify challenges in immunization and infection prevention.
4. To analyze the nurse's role in educating parents about vaccines.
5. To examine adherence to WHO guidelines in pediatric settings.
6. To assess the effectiveness of hand hygiene and isolation precautions.
7. To recommend strategies to improve pediatric infection control.

5.3. Research methodology:

This study follows a descriptive research design to explore immunization and infection control in pediatric nursing. Instead of collecting new data, the research relies on secondary sources, including research papers, published materials, websites, and survey reports from various health organizations. These sources provide valuable insights into current practices, challenges, and advancements in immunization and infection prevention. By analyzing existing data, this study aims to present a well-rounded understanding of the topic, ensuring accuracy and reliability without the need for direct participant involvement.

5.4 Safeguarding Child Health: Immunization Priorities for 2025

Equity: Reaching Zero-Dose Children Vaccine equity remains one of the most urgent global health challenges of our time. While immunization programs have made tremendous progress, millions of children worldwide remain unreached—many of whom are classified as zero-dose children, meaning they have not received a single vaccine. In 2023, 14.5 million children had received no vaccines at all, a sharp increase from 12.9 million in 2019. These children are disproportionately from marginalized communities, including those in conflict zones, remote areas, and urban slums. The gap in coverage not only fuels preventable disease outbreaks but also deepens existing inequalities in health outcomes. Closing this gap requires targeted strategies: improving supply chains, strengthening healthcare infrastructure, and addressing socioeconomic barriers that prevent families from accessing vaccination services. Achieving true equity means ensuring that no child is left behind.

Outbreaks: The Resurgence of Measles and System Strengthening Vaccine-Preventable Disease surveillance is another pillar of global health security. From yellow fever to measles to pneumonia, early detection ensures vaccines reach those who need them most. The alarming rise in measles cases is a stark reminder of result when immunization networks are weakened. Once considered on the path to elimination in many regions, measles is resurging due to gaps in vaccine coverage. This increase is a warning signal that vaccination systems are at risk—delayed campaigns, supply chain disruptions, and weakened trust in health services have created the basis for outbreaks. Strengthening immunization programmes is not just about responding to crises but about intense work to build resilient health systems so those crises are averted in the first place. This means enhancing surveillance, ensuring robust stockpiles of vaccines, training health workers, assuring data systems are in place to drive impact and intensifying essential immunization services. A failure to act decisively now could see other vaccine-preventable diseases following the same dangerous trend.

Vaccine Confidence: Strengthening Trust Among Communities and Health Workers Confidence in vaccines is the backbone of successful

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immunization efforts. The past few years have exposed both the strengths and vulnerabilities of public trust in vaccines. Misinformation, historical mistrust, and political instability threaten to erode hard-won gains. At the same time, frontline health workers—the trusted faces of vaccination—must be supported with training and resources to confidently engage with communities. Trust must be built through transparency, education, and engagement. Governments, civil society, and the private sector must work together to counter misinformation and misrepresentation, amplify accurate information, and ensure that communities feel empowered, not coerced, in vaccine decision-making.

New Vaccines: Innovation, Hope, and the Need for Strong Support Innovation in vaccines brings immense opportunity for tackling some of the world's deadliest diseases. The introduction of new vaccines—whether for malaria, RSV, or the next pandemic threat—represents a turning point in public health. New vaccines are only as impactful as the systems that deliver them. The success of these vaccines hinges not just on their development but on their effective introduction and sustained delivery. This is where our role supporting countries is critical: ensuring that regulatory approvals, financing mechanisms, health system readiness, and community acceptance are in place. Investing in the introduction of these vaccines with the same urgency as their research and development will be key to translating scientific breakthroughs into real-world protection.

Funding and political challengers In January, President Donald Trump signed an Executive Order indicating the United States' intent to withdraw from WHO. We remain hopeful that the US will reconsider. For decades, the partnership between the US and WHO has been instrumental in achieving historic public health milestones—from the eradication of smallpox to advancing global immunization efforts that have saved millions of lives in the US and around the world. This collaboration has protected Americans at home and abroad through disease surveillance, accelerating scientific progress, and ensuring that life-saving health interventions reach those who need them most, and shutting down

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outbreaks when they emerge, to limit their impact. Global health security is a shared responsibility. Infectious diseases do not respect borders, and the challenges we face—whether responding to outbreaks, developing new vaccines, or ensuring equitable access to healthcare—require international cooperation. WHO remains committed to its mission and will continue working with partners to strengthen global health systems. Strong leadership and sustained funding are critical to ensuring immunization programmes remain resilient. However, the political landscape for vaccines is increasingly unpredictable, putting decades of progress at risk.

Moving Forward Together: A Moment for Global Health Cooperation Two upcoming meetings will be pivotal in providing critical guidance for future immunization policies and strategies. The Strategic Advisory Group of Experts on Immunization (SAGE) will meet 10-13 March 2025, to advance global immunization policies and priorities. Key discussions will focus on IA2030 progress, pneumococcal vaccine schedules, varicella-zoster vaccination, new vaccine introductions, NITAG strengthening, and global polio eradication policy decisions and mpox updates. The Global Vaccine and Immunization Research Forum (March 25-27, Rio de Janeiro, Brazil) will convene experts from around the world to advance vaccine innovations, sustainable R&D investments, Artificial Intelligence applications to vaccine development, climate-related challenges to immunization, and equitable access to vaccines. Key discussions will highlight Latin American advancements, maternal and new TB vaccines, vaccine role to reduce antimicrobial resistance, and clinical trial innovations for immunization.

5.5. Fundamentals of Immunization in Pediatrics

Immunization is a critical component of pediatric healthcare, protecting children from life-threatening diseases by stimulating their immune system. Understanding how vaccines work, the types of immunity they provide, and the classification of vaccines helps in

ensuring effective immunization practices. Vaccines train the body's immune system to recognize and fight specific pathogens (bacteria or viruses) without causing the disease. When a vaccine is administered, it introduces a harmless version or part of a disease-causing microorganism known as an antigen into the body. This does not cause the disease but is enough to alert the immune system. The immune system recognizes the antigen as a foreign invader and triggers a protective response. Special white blood cells, called B cells, begin producing antibodies that can attack and neutralize the invader. Along with this, the body also forms memory cells that remember the antigen. These memory cells stay in the body for a long time and help the immune system respond more quickly and effectively if it encounters the same germ again in the future. As a result, the person may not get sick at all or may have only a very mild illness. This is how vaccines help protect individuals and communities from serious diseases like measles, polio, and diphtheria.

5.5.1. Types of Immunity: Active vs. Passive Immunity

Immunity can be gained in two main ways: active and passive. Active immunity happens when our own immune system produces antibodies in response to an infection or a vaccine. This type of immunity takes time to develop but offers long-lasting, sometimes lifelong, protection. For example, if someone gets chickenpox and recovers, they usually won't get it again—that's natural active immunity. Similarly, when we get vaccines like MMR or the polio vaccine, our body learns to fight those diseases in the future, which is called artificial active immunity. On the other hand, passive immunity is when antibodies are given to a person rather than made by their own immune system. This kind of protection works quickly but doesn't last long. A natural example is a mother passing antibodies to her baby during pregnancy or through breastfeeding. Artificial passive immunity includes treatments like rabies immunoglobulin, given after a bite to offer immediate protection.

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5.5.2. Classification of Vaccines

Table no. 2: Classification of Vaccines

Type of Vaccine	How It Works	Examples	Key Features
Live Attenuated Vaccines	Contains a **weakened** form of the virus or bacteria, strong immune response.	MMR (Measles, Mumps, Rubella), BCG (Tuberculosis), Oral Polio (OPV), Varicella (Chickenpox).	Provides **lifelong immunity**, but not suitable for **immunocompromised** individuals.
Inactivated (Killed) Vaccines ✕	Uses **dead pathogens**, triggering immunity without causing disease.	Inactivated Polio (IPV), Hepatitis A, Rabies.	**Safer** than live vaccines but requires **booster doses**.
Toxoid Vaccines	Uses **inactivated bacterial toxins** to prevent toxin-related diseases.	Diphtheria, Tetanus (Part of DTP vaccine).	Protects against **toxin effects** rather than bacteria itself.
Subunit, Recombinant & Conjugate Vaccines	Uses **specific parts** of a virus or bacteria (protein or sugar) to create immunity.	Hepatitis B, HPV, Pneumococcal (PCV), Meningococcal, Hib (Haemophilus influenzae type B).	**Fewer side effects**, safe for **immunocompromised** individuals.

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mRNA Vaccines	Teaches cells to make a harmless **viral protein** that triggers immunity.	COVID-19 vaccines (Pfizer-BioNTech, Moderna).	**New technology**, fast production, does not use live viruses.
Viral Vector Vaccines	Uses a **modified harmless virus** to deliver genetic material for immunity.	AstraZeneca COVID-19, Johnson & Johnson COVID-19 vaccine.	**Strong immune response**, used in outbreak control.

This table explains the different types of vaccines based on how they are made and how they work in the body. Each type uses a unique method to train the immune system to recognize and fight off specific germs. Some, like **live attenuated vaccines**, use a weakened form of the actual germ, while others, like **inactivated** and **toxoid vaccines**, use killed germs or their toxins. **Subunit, recombinant, and conjugate vaccines** use only parts of the germ to reduce side effects, making them safer for people with weaker immunity. The latest types, like **mRNA** and **viral vector vaccines**, use modern technology to teach the body how to defend itself without using the live virus. Each vaccine type plays a key role in preventing different diseases and is chosen based on safety, effectiveness, and the needs of the person receiving it.

5.5.3. National Immunization Schedule:

Table no. 3: Immunization For Pregnant Women

Vaccine	When to Give	Max Age	Dose	Diluent	Route	Site
Td1	Early in pregnancy	As early as possible	0.5 ml	No	Intramuscular	Upper Arm

Td2	4 weeks after Td1	-	0.5 ml	No	Intramuscular	Upper Arm
Td booster	If received two Td doses in the last three years	-	0.5 ml	No	Intramuscular	Upper Arm

This table explains during pregnancy, immunization with the Tetanus and Diphtheria (Td) vaccine is essential to protect both the mother and the newborn from serious infections. The first dose (Td1) should be given as early as possible in pregnancy, followed by the second dose (Td2) four weeks later. If the mother has already received two doses of Td within the last three years, only a booster dose is needed. Each dose is 0.5 ml, administered intramuscularly in the upper arm, and no diluent is required. This simple but important vaccination schedule helps ensure safe delivery and protection for the newborn in the early weeks of life.

Table no. 4: Immunization given At Birth

Vaccine	When to Give	Dose	Route	Site
BCG	At birth	0.05 ml (until 1 month), 0.1 ml (after 1 month)	Intradermal	Left Upper Arm
Hepatitis B Birth Dose	At birth	0.5 ml	Intramuscular	Left anterolateral aspect of mid-thigh
OPV 0 Dose	At birth	2 drops	Oral	Oral

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This table explains at birth, newborns receive three important vaccines to protect against serious infections. The **BCG vaccine** is given intradermally in the left upper arm—**0.05 ml** if the baby is under one month old and **0.1 ml** if older. The **Hepatitis B birth dose** is **0.5 ml**, given intramuscularly in the left mid-thigh. Additionally, the **OPV 0 dose** (Oral Polio Vaccine) is administered as **2 oral drops**. These early vaccines provide crucial protection during the baby's most vulnerable stage.

Table no. 5: Immunization For Children

Vaccine	When to Give	Dose	Route	Site
OPV 1,2,3	6,10,14 weeks	2 drops	Oral	Oral
Pentavalent 1,2,3	6,10,14 weeks	0.5 ml	Intramuscular	Left anterolateral aspect of mid-thigh
IPV 1,2,3	6,14 weeks, 9 months	0.1 ml	Intradermal	Right upper arm (3rd dose - Left Upper Arm)
PCV 1,2 & booster	6,14 weeks, 9 months	0.5 ml	Intramuscular	Right anterolateral aspect of mid-thigh
Rota Virus Vaccine 1,2,3	6,10,14 weeks	5 drops	Oral	Oral
MR 1&2	9-12 months & 16-24 months	0.5 ml	Subcutaneous	Right Upper Arm
JE 1&2	9-12 months & 16-24 months	0.5 ml	Subcutaneous	Left Upper Arm

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OPV Booster	16-24 months	2 drops	Oral	Oral
DPT Booster 1&2	16-24 months & 5-6 years	0.5 ml	Intramuscular	Left anterolateral aspect of mid-thigh
Td	10 & 16 years	0.5 ml	Intramuscular	Upper Arm
Vitamin A	At completed 9 months- 1st dose Then every 6 months up to 5 years	100,000 IU 200,000 IU	Oral	Oral

This table explains as children grow, they receive a series of vaccines to protect them from life-threatening diseases. Starting at 6 weeks, babies are given **OPV (oral polio)**, **Pentavalent** (which protects against five diseases), **IPV (injectable polio)**, **PCV (pneumococcal)**, and **Rotavirus** vaccines, all in a carefully timed schedule at 6, 10, and 14 weeks. These vaccines are given through different routes—some by mouth, others as injections in the thigh or arm. At 9 months, **MR (measles-rubella)**, **JE (Japanese encephalitis)**, **IPV**, and **PCV booster** doses are given. Boosters for OPV, DPT, and MR continue into toddlerhood and early childhood. Later, at ages 10 and 16, the **Td vaccine** protects against tetanus and diphtheria. Each vaccine is timed to give the child the best chance at building strong immunity during their early years.

5.6. Infection Control in Pediatric Nursing:

Children are bundles of energy, curiosity, and innocence—but their immune systems are still growing, making them more vulnerable to infections. Whether in hospitals or at home, infections can spread quickly

among children, sometimes leading to serious complications. That's why infection control is a top priority in pediatric nursing. With the right precautions, we can keep our little ones safe, healthy, and happy.

5.6.1. Children are More Prone to Infections:

Children are more susceptible to resistant bacteria because their immune systems are not fully developed. A baby is born with some protection against infections, but this protection only lasts for a few weeks after birth or when breastfeeding has stopped. Eventually, babies produce their own antibodies, but it takes time for their immune systems to fully develop. Antibiotics help fight off infections, but when bacteria are resistant to antibiotics, babies are left almost defenseless in fighting off these bacteria.

Children differ from adults in that they have many ways of being exposed to germs and infections because their behavior is different. Babies crawl on the ground and put their hands and objects in their mouth as they explore and learn. Babies are often unaware of risks and are, therefore, unable to make choices to protect their health and prevent infection.

Children living in poverty are even more susceptible to resistant bacteria. Over 300 million children live on less than $1.90/day. Children living in poverty are even more susceptible to resistant bacteria, for several reasons. Poor children often lack access to safe drinking water, sanitation and hygiene (WASH). Over 785 million people still don't have clean water close to home. Children in poverty suffer from suboptimal housing conditions and poor nutrition. Today, nearly one in three children under the age of five are malnourished, which leaves children too weak to fight off infections and even more dependent on antibiotics. Furthermore, these children do not have access to quality health care. At least half of the world still does not have access to critically important health care services. But even when services are available the quality can be questionable. Data from a BMJ report shows that one in four health care facilities lacked basic water services, one in five had no sanitation services and two in five health facilities lacked hand hygiene facilities at the points

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of care. These factors help explain why infectious diseases are still the leading cause of death among children under the age of five. For children lucky enough to have access to quality health care many of the main childhood infections such as pneumonia, sepsis, and typhoid can be treated with effective antibiotics. However, if antibiotics are not used appropriately so they remain effective, even an infection from a scrape will become near impossible to treat. Right now, one of every three cases of meningitis and neonatal sepsis in sub-Saharan Africa are caused by bacteria resistant to antibiotics; 38% of healthy children in a village in Latin America carried bacteria resistant to colistin – a last line antibiotic; and in Europe, neonates bear the largest burden of antibiotic resistant bacteria, which has increased over the years.

5.6.2. Common Hospital-Acquired Infections (HAIs) in Children:

When a child is admitted to a hospital for treatment, parents expect them to get better, not worse. However, hospital-acquired infections (HAIs) can sometimes complicate recovery, making the hospital stay longer and more stressful. HAIs occur when children contract infections during their hospital stay due to exposure to bacteria, viruses, or fungi. These infections are particularly dangerous for newborns and critically ill children with weakened immune systems.

One of the most serious HAIs in newborns is **neonatal sepsis**, a life-threatening bloodstream infection caused by bacteria from unclean medical equipment or improper hygiene. **Pneumonia** is another common hospital-acquired infection, often affecting children who need ventilator support, as germs can enter their lungs through the breathing machine. Similarly, **urinary tract infections (UTIs)** can develop in children with urinary catheters, as bacteria may travel through the tube into the bladder, causing discomfort and fever.

Surgical procedures also pose a risk of infection. **Surgical site infections (SSIs)** occur when germs enter the wound after an operation, particularly if sterile techniques are not strictly followed. In addition, **gastrointestinal infections** caused by *Clostridium difficile* (*C. diff*) can lead to severe diarrhea and dehydration in hospitalized children. Another

serious concern is **bloodstream infections (BSIs)**, which can develop when bacteria enter the body through intravenous (IV) lines, posing a significant risk to critically ill patients.

Hospital-acquired infections or Nosocomial infections (NIs) are a major challenge for LMICs that have limited healthcare resources. HAIs/NIs are acquired infections that were not previously present in the patient prior to hospital admission [7]. Nosocomial infections increase the costs of healthcare due to added antimicrobial treatment and prolonged hospitalization. Since the prevalence of NIs is generally higher in developing countries with limited resources, the socioeconomic burden is even more severe in these countries [8]. HAIs can be caused by microorganisms already present in the patient's skin and mucosa (endogenous) or by microorganisms transmitted from another patient or the surrounding environment (exogenous). There are three common modes of transmission: direct contact, indirect contact through contaminated objects, and airborne droplets [9].

The current burden of malnutrition globally is unacceptably high, and every country in the world is affected by malnutrition. Severe acute malnutrition (SAM) is the leading cause of death among under-5-year-old children in addition to pneumonia and neonatal sepsis with 20% of pediatric hospital admissions in Ethiopia and is a cause of 25%- 30% of death in many poor countries [10]. The problem of SAM is not only a medical disorder, but also a social disorder. Therefore, successful treatment of severely malnourished patients requires both medical and social efforts and [7] In 2019, 144 million under-five-year-old children were suffering from stunting while 47 million were wasted of which 14.3 million were severely wasted worldwide. Across the world, SAM has contributed to 3.6 million under-five children deaths [11].

Malnutrition affects between 20% and 50% of hospitalized patients at admission, with further declines expected during hospitalization. Hospital malnutrition is a predictor of longer stay, impaired wound healing, increased risk of infections and complications, and increased morbidity and mortality. Recovery from SAM, especially among HAIs, remains challenging, insufficient, and even little is known about recovery time

from SAM among those infected and its predictors among children aged 6 to 59 months in Ethiopia, in general, and in the study area in particular. The proportion of recovery from SAM among children aged 6 to 59 months in Ethiopia ranges from 58.4% to 87% [10]. Hospital acquired infections (HAIs, called Nosocomial infections (NIs), are among the most significant causes of morbidity and mortality in healthcare settings around the world.

Worldwide, hundreds of millions of patients are estimated every year in developed and developing countries are affected by HAIs [12]. In the USA, approximately 2 million patients developed HAIs, and nearly a hundred thousand of these patients were estimated to die annually, and this ranked HAIs as the fifth leading cause of death in acute care hospitals annually [13]. From the study done by Sheng *et al* [14]*, in 2017 NIs were* directly involved in 80.5% of patients and 67.9% of death occurred within two weeks. The available evidence also showed that the financial burden, increased resistance of microorganisms to antimicrobials, prolonged hospital stay, and sometimes deaths are caused by HAIs. In developing countries, the magnitude and incidence of HAIs remains underestimated and uncertain specifically in pediatric populations. Furthermore, in Ethiopia, studies focused only on adults were previously conducted, and many of these were limited to surgical site infections, [15,16] and few on urinary tract (UTI) and bloodstream infections (BSIs), and mostly common forms of HAIs in Ethiopia. In pediatric studies of factors and incidence investigation of HAIs, 13 per 100 admitted children was reported cumulative incidence, and SAM and LOS are reported as an underlying factor to the risk of HAIs [17].

5.7 Immunization Helps in Infection Control in Pediatric Nursing:

Immunization is one of the most powerful tools in pediatric nursing, acting as a protective shield for children against a wide range of infectious diseases. For nurses, it's not just about administering a vaccine—it's about playing a vital role in preventing illness, reducing suffering, and saving lives. When a child is vaccinated, their immune system is gently trained to recognize and fight harmful viruses or bacteria without actually

becoming sick. This is achieved by introducing a harmless form of the pathogen, which stimulates the body to produce antibodies. These antibodies remain in the system and help the body respond quickly and effectively if the real disease is ever encountered. Some vaccines, such as those for measles or hepatitis B, offer lifelong protection, while others, like tetanus or pertussis, may require booster doses to maintain immunity.

Beyond individual protection, immunization helps control the spread of infectious diseases in the community. This is especially important for babies who are too young for certain vaccines and for children with weakened immune systems who cannot be vaccinated due to medical reasons. When a large portion of the population is vaccinated, it creates what is known as *herd immunity*. This means the disease has fewer opportunities to spread, reducing outbreaks and protecting even those who are unvaccinated. For example, when a child is vaccinated against measles, they not only avoid getting sick themselves but also help protect vulnerable infants or immune-compromised children in their surroundings. Vaccines have significantly reduced child mortality and the need for hospitalization. Before widespread vaccination, diseases like diphtheria, polio, tetanus, and whooping cough caused countless child deaths and disabilities. Today, thanks to immunization, these diseases have become rare, and in some cases, such as smallpox, have been eradicated entirely. Children who are vaccinated are far less likely to suffer from complications like brain damage from meningitis or lung infections from measles. As a result, hospitals see fewer cases of severe, vaccine-preventable diseases, allowing healthcare providers to focus resources on other pressing needs.

Immunization also plays a critical role in reducing the misuse and overuse of antibiotics. Many bacterial infections that once required strong antibiotics can now be prevented with vaccines. This reduces the need for antibiotic treatments and helps slow down the development of antibiotic resistance—a growing global concern. By keeping children healthy and infection-free, vaccines ensure antibiotics remain effective for future generations. From an economic perspective, vaccines are one of the most cost-effective health interventions available. The cost of a single vaccine

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dose is far less than the expenses of treating a child hospitalized with a severe infection. Vaccination prevents not just medical costs, but also lost income from parents taking time off work, and disruptions to education and childcare routines. It's an investment that benefits not just the individual child, but the entire family and the healthcare system. Immunization also strengthens overall community health. When children are protected, schools, playgrounds, and daycare centers become safer. Routine outbreaks are minimized, schools remain open, and children can continue learning and playing without fear of infection. Immunization programs have even led to the near-elimination of diseases like polio in many parts of the world, raising the overall life expectancy and health standards of entire populations.

In hospitals, infection control is a top priority, and immunization contributes significantly to that goal. Vaccinated children are less likely to bring or catch infections during their hospital stay, especially dangerous hospital-acquired infections like pneumonia or bloodstream infections. Nurses play a key role not only in giving vaccines but also in maintaining hygiene, sterilizing equipment, and educating parents about vaccine schedules. For instance, a child who is vaccinated against pneumonia has a lower risk of developing severe lung infections while hospitalized, and the DPT vaccine helps prevent tetanus in children who come in with wounds or injuries.

In conclusion, immunization is a cornerstone of pediatric healthcare and infection control. It empowers the immune system, protects the most vulnerable, reduces the burden on hospitals, and keeps communities healthier. Pediatric nurses are at the heart of this mission—they educate, advocate, and ensure that every child gets the timely protection they deserve. Through vaccination, nurses don't just save individual lives—they help build a healthier, safer future for all.

5.8. Role of Pediatric Nurses in Immunization and Infection Control in Child Healthcare

Pediatric nurses play a vital role in protecting children's health, especially when it comes to infection control and immunization. One of

their key responsibilities is administering vaccines safely and effectively, following the national immunization schedule. They ensure each child receives the right vaccine, in the correct dose, at the right site, and through the proper route. For instance, giving the BCG vaccine at birth is crucial in preventing tuberculosis. Alongside this, pediatric nurses are trusted sources of information for parents and caregivers. They patiently explain how vaccines work, address concerns about side effects, and help parents understand the importance of following the full vaccination schedule. They also work to correct common misconceptions—like the false belief that vaccines cause autism—helping families make informed decisions.

In the hospital setting, pediatric nurses are frontline defenders against hospital-acquired infections (HAIs). Through simple yet critical practices like handwashing, maintaining sterile procedures during injections or wound care, and keeping clinical spaces clean, they help minimize the spread of infections. Their infection prevention efforts extend beyond hospital walls, too. In schools, homes, and communities, they teach children the importance of hand hygiene, cough etiquette, and sanitation. For example, encouraging hand washing after playtime helps reduce diarrheal diseases.

Pediatric nurses are also trained to recognize early signs of infectious diseases such as fever, rash, or difficulty breathing. When they spot potential cases, they act quickly to isolate the child, start treatment, and prevent the infection from spreading to others. A classic example is identifying measles early and ensuring isolation to stop an outbreak. Moreover, they advocate for the responsible use of antibiotics. Many parents mistakenly believe antibiotics can cure viral infections, but nurses help explain why they aren't always necessary and guide families in using medications correctly—this supports the fight against antibiotic resistance.

Finally, pediatric nurses contribute significantly to public health. They participate in large-scale immunization drives, outreach camps in underserved areas, and disease surveillance activities. Whether they're vaccinating children in rural villages or urban slums during a polio

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campaign, their efforts ensure that no child is left behind. Through all these actions, pediatric nurses aren't just caring for individual patients—they're building a healthier, safer future for entire communities.

5.9. Case Study:

Case study 1: Infection Control in a Neonatal Intensive Care Unit (NICU)

Background: A NICU in a large hospital reported an increase in hospital-acquired infections (HAIs), particularly sepsis and pneumonia in premature infants.

Case Details: Over two months, 10 preterm infants developed bloodstream infections caused by multidrug-resistant bacteria. Investigations found inadequate hand hygiene and improper sterilization of medical equipment as the primary causes.

Intervention: Hospital infection control teams, including pediatric nurses, implemented strict hand hygiene protocols, mandatory glove use, and regular surface disinfection. Nurses received training on sterile techniques for IV insertion and feeding tube care.

Outcome: Within three months, infection rates dropped by 60%. The case emphasized the role of nurses in infection control and patient safety, particularly in high-risk areas like the NICU.

Case study 2: HPV Vaccination Program in a Rural Community

Background: Human Papillomavirus (HPV) is a leading cause of cervical cancer. A rural district in India had a high prevalence of cervical cancer due to low HPV vaccination coverage.

Case Details: A survey showed that only 10% of adolescent girls (9–14 years) had received the HPV vaccine due to lack of awareness and cultural taboos.

Intervention: Pediatric nurses conducted school-based education sessions, explaining the benefits of HPV vaccination in preventing cervical cancer. A door-to-door vaccination campaign was launched, providing free vaccines to eligible girls.

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Outcome: After six months, vaccination rates increased to 65%. Parents became more accepting of the vaccine, and awareness about HPV-related diseases improved. The program demonstrated how education and accessibility improve immunization coverage.

Case study 3: Preventing Infection in an Immunocompromised Pediatric Patient

Background: A 5-year-old boy, recently diagnosed with acute lymphoblastic leukemia (ALL), was admitted to a pediatric hospital for chemotherapy. Due to his weakened immune system, he was at high risk for infections, making infection control and timely immunization crucial for his recovery.

Case Details: Shortly after admission, the child developed a high fever and respiratory distress, indicating a possible hospital-acquired infection. Blood tests confirmed sepsis caused by a multidrug-resistant bacteria. A review of his records showed that he had missed several childhood vaccinations due to his illness.

Intervention: The pediatric nursing team immediately implemented strict infection control measures, including: Enhanced hand hygiene protocols for all staff and visitors entering the room. Isolating the child in a protective environment to minimize exposure to airborne infections. Administering catch-up immunizations (as per medical guidelines) to protect against preventable infections. Close monitoring of vital signs and timely administration of appropriate antibiotics.

Outcome: With early intervention, the child recovered from sepsis, and further infections were successfully prevented. His immune system remained vulnerable due to chemotherapy, but regular vaccination updates and infection control practices reduced his risk of severe illness. His parents became strong advocates for immunization and infection prevention. This case highlights the importance of pediatric nurses in protecting immunocompromised children, ensuring safe hospital environments, and advocating for timely vaccinations even in medically complex cases.

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5.10. Discussion:

Immunization and infection control are integral to pediatric nursing, ensuring the prevention of life-threatening diseases among children. The case studies presented emphasize the significance of robust infection control measures and timely vaccination in reducing childhood morbidity and mortality. The case of NICU infections highlights the vulnerability of preterm infants and the role of nurses in implementing hygiene protocols, proper sterilization, and training programs to mitigate hospital-acquired infections (HAIs). This demonstrates that nursing interventions directly impact infection rates, underscoring the importance of adherence to WHO guidelines. Similarly, the HPV vaccination program in a rural community illustrates how education, accessibility, and awareness can improve immunization coverage. The success of this initiative demonstrates that community engagement and culturally sensitive health promotion strategies are key to increasing vaccine acceptance and preventing vaccine-preventable diseases. Furthermore, the case of an immunocompromised pediatric patient with leukemia reinforces the critical role of nurses in protecting high-risk children. Infection control strategies, including strict hygiene, isolation measures, and catch-up immunization, played a vital role in reducing complications and improving patient outcomes. These cases highlight that nurses serve as frontline advocates, not only administering vaccines but also ensuring strict infection prevention measures. Strengthening education, surveillance, and nursing practices can enhance pediatric healthcare outcomes. By integrating evidence-based protocols, nurses can effectively minimize infection risks and contribute to global health security, ultimately safeguarding the lives of vulnerable children.

5.11. Conclusion

Keeping children safe from infections starts with strong immunization and infection control practices. Vaccines protect kids from dangerous diseases, reduce hospital visits, and help stop outbreaks. They not only shield the vaccinated child but also protect those around them through herd immunity. Pediatric nurses play a huge role in making this

happen. They ensure children get vaccinated on time, educate parents about the importance of immunization, and maintain strict hygiene in hospitals to prevent infections. Their work helps reduce antibiotic overuse, hospital-acquired infections, and unnecessary suffering. A world where every child is protected from preventable diseases is possible—but it requires teamwork. When healthcare workers, parents, and communities come together, we can build a healthier, safer future for children everywhere. Investing in immunization and infection control is investing in a child's right to a healthy life.

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