KNOWLEDGE AND ATTITUDE OF NURSES TOWARDS THE MANAGEMENT OF DIPHTHERIA IN THE UNIVERSITY OF BENIN TEACHING HOSPITAL

BY

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COVER PAGE

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NOVEMBER, 2025

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF NURSSING AND MIDWERY COUNCIL OF NIGERIA SCHOOL FOR THE AWAED OF BACHELOR'S DEGREE IN NURSING SCIENCE

SUPERVISOR: PROF. (MRS.) C. E. OMOROGBE

NOVEMBER, 2025

DECLARATION

This is to declare that this research project titled **"KNOWLEDGE OF THE MANAGEMENT OF DIPHTHERIA AMONG NURSES IN UNIVERSITY OF BENIN TEACHING HOSPITAL BENIN CITY NIGERIA"** was carried out by **OGEDENGBE IMOISEME RACHEAL**. It is solely the result of my work except when acknowledged as being derived from other person(s) or resources.

EXAMINATION NUMBER: _____

FACULTY/SCHOOL: DEPARTMENT OF MEDICAL SURGICAL NURSING, FACULTY OF NURSING SCIENCES, UNIVERSITY OF BENIN, BENIN CITY

SIGNATURE: _____

DATE: _____

CERTIFICATION/APPROVAL

This is to certify that this research project by **OGEDENGBE IMOISEME RACHEAL** with examination number ……..... has been examined and approved for the award of Registered Nurse certificate.

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ABSTRACT

Diphtheria remains a serious public health concern, particularly in developing countries, where healthcare systems may face resource and training limitations. Nurses play a critical role in the early recognition, management, and prevention of diphtheria outbreaks. This study was a descriptive cross-sectional survey conducted to assess the knowledge and management practices regarding diphtheria among nurses at the University of Benin Teaching Hospital (UBTH), Benin City, Nigeria. A total of 236 questionnaires were distributed using a stratified sampling technique to ensure fair representation across departments. Out of these, 231 were properly filled and valid for data analysis, giving a response rate of 97.8%. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 26.0. The findings revealed that 82% demonstrated good knowledge, while 83% showed good knowledge of diphtheria management. A significant proportion (82.0%) of the respondents had a positive attitude toward diphtheria management, whereas 18% exhibited negative or indifferent attitudes. However, several challenges were identified. Notably, 70.6% of the nurses reported inadequate availability of personal protective equipment (PPE), 80.1% cited limited access to diphtheria antitoxin, 80.1% indicated insufficient training opportunities, and 69.7% highlighted the absence of clear management protocols as a major obstacle to effective care. In conclusion, while the majority of nurses held a positive outlook toward diphtheria management, gaps in knowledge and numerous systemic challenges were evident. These issues may hinder the effective response to diphtheria outbreaks and impact patient outcomes. It is therefore recommended that regular in-service training be provided to update and reinforce nurses' knowledge and skills. Additionally, improving access to essential supplies such as PPE and antitoxins, along with the development and implementation of clear institutional protocols, is essential for enhancing nurses' capacity to manage diphtheria effectively.

Keywords: Knowledge, Management, Practices, Diphtheria, Nurses

DEDICATION

This work is dedicated to my Mother Mrs Marice Aire Ogedengbe who never failed to show her unwavering support for my educational pursuit.

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TABLE OF CONTENTS

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Diphtheria is a vaccine-preventable, infectious disease caused by *Corynebacterium diphtheriae*, which primarily affects the mucous membranes of the respiratory tract, and less commonly, the skin and other organs (Otshudiema et al., 2021). The disease is transmitted via respiratory droplets, close personal contact, or contact with contaminated objects (Li, 2021). Clinically, diphtheria presents with sore throat, fever, swollen glands, and the hallmark grayish pseudomembrane over the tonsils and throat (Perry, 2021). If untreated, it can lead to severe complications such as myocarditis, neuropathy, and respiratory failure, making timely recognition and management vital.

Despite the availability of effective vaccines, diphtheria has not been completely eradicated and continues to pose public health threats, particularly in low- and middle-income countries (Osarenren et al., 2024). In recent years, Nigeria has witnessed recurrent outbreaks of diphtheria, resulting in significant morbidity and mortality, particularly among children and unvaccinated populations (Olulaja et al., 2023) These outbreaks have been attributed to multiple factors including suboptimal vaccination coverage, weak disease surveillance, inadequate healthcare resources, and misinformation about immunization (Okoebor et al., 2024). The resurgence of diphtheria in Nigeria and other parts of the world underscores the importance of strengthening healthcare systems and reinforcing the role of frontline healthcare workers—especially nurses—in disease detection, isolation, management, and prevention (Aborode et al., 2023). Nurses form

the backbone of patient care and are often the first to come in contact with suspected cases of diphtheria in clinical settings. Their knowledge and prompt clinical decisions are vital in curbing transmission, ensuring timely treatment, and preventing complications or fatalities (Maryniak & Garrett, 2022).

Unfortunately, several studies suggest that the knowledge and preparedness of nurses in managing infectious diseases like diphtheria vary significantly across regions and institutions. For instance, Rokhmah & Ekawati (2024) found that frontline health cadres often lacked adequate knowledge and practical skills in identifying and managing diphtheria cases. Similarly, Sertçelik et al. (2023) reported knowledge gaps among emergency healthcare workers regarding isolation precautions, a critical component in diphtheria control. In Nigeria, where health system challenges are further compounded by resource constraints, inconsistent training, and workload pressures, many nurses may not have received recent training on the clinical management of diphtheria (Adeyanju et al., 2025; Medugu et al., 2023). This is especially concerning given that Nigeria has recorded one of the highest diphtheria case burdens in Africa in the past few years, with widespread outbreaks in multiple states and alarming case fatality rates (Balakrishnan, 2024; Alege et al., 2024).

Moreover, global mobility and displacement due to migration, conflict, and humanitarian crises have facilitated the cross-border spread of diphtheria. Countries such as Germany, Switzerland, and Yemen have reported imported or ongoing outbreaks in recent years, some involving toxin-positive strains of *Corynebacterium* (Badenschier et al., 2022; Kofler et al., 2022; Badell et al., 2021). These trends emphasize the importance of continuous surveillance, awareness, and the readiness of health workers globally—including nurses in Nigeria—to respond effectively to

such outbreaks. From a preventive standpoint, nurses also play a critical role in educating patients and communities on the importance of vaccination. Vaccine hesitancy, often fueled by cultural beliefs, misinformation, and lack of access to accurate health information, continues to undermine diphtheria control efforts (Michael, 2024; Motus & Hastings-Tolsma, 2025). Nurses, through patient education and advocacy, can serve as trusted sources of information to improve vaccine uptake, especially among vulnerable populations such as pregnant women and children (Alghamdi & Hassan Tayyib, 2023; Hebballi et al., 2022).

Given the severity and persistence of diphtheria outbreaks, particularly in Nigeria, it is crucial to assess and improve the level of knowledge among nurses regarding its management. Such an assessment will help identify gaps in current practice, guide future training interventions, and inform hospital policies aimed at strengthening infectious disease response strategies. Furthermore, understanding the preparedness of nurses in managing diphtheria will contribute significantly to national and global efforts to eliminate vaccine-preventable diseases.

This study, therefore, seeks to assess the knowledge of the management of diphtheria among nurses, with the aim of contributing to improved health outcomes, enhanced clinical preparedness, and more effective public health interventions.

1.2 Statement of problem

Each year, diphtheria causes significant morbidity and mortality, with over 20,000 cases recorded globally in recent years, marking a concerning resurgence of the disease (Medugu et al., 2023; Muscat et al., 2022). Despite the availability of an effective vaccine, the resurgence of diphtheria in low-resource settings, particularly in Nigeria, has been attributed to insufficient vaccination coverage, outbreaks in conflict zones, and public health challenges such as weak

healthcare infrastructure and inadequate awareness (Oduoye et al., 2023). Studies have shown that a lack of awareness about the disease's causes, symptoms, transmission, and prevention contributes to the limited response to outbreaks (Rokhmah & Ekawati, 2024). Furthermore, healthcare workers, including nurses, often lack sufficient training in managing patients with diphtheria, resulting in improper treatment and poor patient outcomes (Sertçelik et al., 2023; Rahman et al., 2024). The role of nurses is critical in the management of diphtheria, as they are at the forefront of patient care, including diagnosing, isolating, and providing supportive care (Adeyanju et al., 2025). However, the knowledge of nurses regarding the management of diphtheria remains underexplored, particularly in regions heavily impacted by recurrent outbreaks. Inadequate knowledge about isolation protocols, infection control, and appropriate treatment regimens for diphtheria is a major gap that needs urgent attention (Abdulrasheed et al., 2023). The consequences of this knowledge deficit are far-reaching, affecting not only the health outcomes of the patients but also increasing the risk of transmission in healthcare settings (Michael, 2024).

In response to this problem, it is crucial to assess the current level of knowledge among nurses in Nigerian hospitals regarding the management of diphtheria, including their understanding of the disease's transmission, preventive measures, and standard treatment protocols. Addressing these knowledge gaps through targeted education and training interventions can help mitigate the impact of the disease and prevent further outbreaks (Sertçelik et al., 2023; Oduoye et al., 2023). Furthermore, research is needed to evaluate the effectiveness of such educational interventions in improving the knowledge and practices of healthcare workers and ultimately reducing diphtheria transmission and mortality.

1.3 Objectives of study

The general objective of this study is to assess the knowledge and attitude of nurses towards the management of diphtheria in the University of Benin Teaching Hospital.

The specific objectives of the study are:

1. To assess the knowledge of diphtheria among nurses in the university of Benin Teaching hospital, Benin, Edo state, Nigeria.
2. To assess the knowledge of nurses on the management of diphtheria in the university of Benin Teaching hospital, Benin, Edo state, Nigeria.
3. To assess the attitude of nurses towards the management of diphtheria in the university of Benin Teaching hospital, Benin, Edo state, Nigeria.
4. To identify the Challenges in Diphtheria Management in the university of Benin Teaching hospital, Benin, Edo state, Nigeria

1.4 Research question

1. What is the level of the knowledge of diphtheria among nurses in the university of Benin Teaching hospital, Benin, Edo state, Nigeria?
2. What is the knowledge of nurses on the management of diphtheria in the university of Benin Teaching hospital, Benin, Edo state, Nigeria?
3. What is the Challenge in Diphtheria Management among nurses in University of Benin Teaching hospital, Benin, Edo state, Nigeria?

1.5 Research hypothesis

Ho: There is no significant relationship between the educational level of nurses and their knowledge of the management of diphtheria in the university of Benin Teaching hospital, Benin, Edo state, Nigeria.

1.6 Significance of study

The significance of this study to the nursing profession is multifaceted. Nurses play a central role in the prevention, diagnosis, and treatment of infectious diseases such as diphtheria. By understanding the epidemiology, clinical presentation, and management of diphtheria, nurses can enhance their ability to provide timely care, identify early signs of the disease, and implement effective prevention measures, such as vaccination (Maryniak & Garrett, 2022). The study can also inform nursing practice by highlighting the importance of patient education, particularly in rural and underserved populations, about the signs and symptoms of diphtheria, the importance of immunization, and the need for early intervention (Motus & Hastings-Tolsma, 2025). Furthermore, the research will assist nurses in addressing the challenges posed by disease outbreaks, such as managing infection control procedures in overcrowded healthcare settings and ensuring that vulnerable populations, particularly children, receive the necessary vaccinations (Sertçelik et al., 2023). This study can also guide nurses in working collaboratively with other healthcare professionals to improve vaccination coverage, contributing to the broader goal of disease eradication (Hebballi et al., 2022).

For healthcare providers, the findings of this study are vital in shaping public health interventions and improving clinical practices related to the management of diphtheria. Healthcare workers, particularly in regions with low vaccination coverage, are often on the front

lines in preventing and managing outbreaks (Rahman et al., 2024). By understanding the latest trends in diphtheria, including emerging strains and their varying levels of toxicity, healthcare providers can better prepare for and respond to outbreaks, ensuring timely and effective treatment (Prygiel et al., 2022) The study emphasizes the need for healthcare providers to stay updated on vaccination protocols and the administration of diphtheria antitoxin, which is crucial in reducing case fatalities (Otshudiema et al., 2021). Moreover, it provides healthcare providers with insights into the importance of community engagement and public health campaigns, enabling them to advocate for better vaccination coverage and to work alongside public health authorities to reduce the burden of disease (Rokhmah & Ekawati, 2024).

The significance of this study to society lies in its potential to reduce the overall burden of diphtheria and prevent unnecessary deaths, particularly among children (White, 2024). A greater understanding of the factors driving the resurgence of diphtheria in Nigeria can inform public health policies aimed at improving vaccination coverage, especially in areas that are most vulnerable to disease outbreaks (Abdulrasheed et al., 2023). By increasing awareness of the importance of vaccination and implementing targeted health education campaigns, this study can empower communities to take an active role in protecting themselves and others from diphtheria (Michael, 2024). The findings of the study may also help reduce vaccine hesitancy, particularly in rural or conflict-affected regions where there are lower rates of vaccine uptake (Alghamdi & Hassan Tayyib, 2023). A healthier population resulting from improved immunization rates can have far-reaching benefits, including better economic outcomes, reduced healthcare costs, and a stronger, more resilient society (Adeyanju et al., 2025). Furthermore, the study can inform global public health efforts to eliminate diphtheria and other vaccine-preventable diseases, contributing

to worldwide efforts to improve child health and reduce preventable diseases globally (Osarenren et al., 2024)

1.7 Scope of Study

The scope of this study is focused on evaluating the knowledge of nurses regarding the management of patients with diphtheria at the University of Benin Teaching Hospital (UBTH) , Benin city, Nigeria.

1.8 Operational definition of terms

Nurses: Nurses who provide direct patient care in clinical settings by assessing, monitoring, and implementing treatment plans for patients.

Knowledge of Diphtheria Causes: The understanding of the origin of diphtheria, specifically the bacteria *Corynebacterium diphtheriae* and the factors contributing to the disease.

Knowledge of Diphtheria Signs and Symptoms: Awareness of the clinical manifestations of diphtheria, such as sore throat, fever, and the characteristic grayish membrane in the throat.

Knowledge of Modes of Transmission of Diphtheria: Understanding how diphtheria spreads, primarily through respiratory droplets or physical contact with infected individuals.

Knowledge of Preventive Measures for Diphtheria: Awareness of strategies to prevent diphtheria, such as vaccination and hygiene practices.

Knowledge of Standard Treatment Protocols for Diphtheria: Understanding the recommended medical interventions, including the administration of diphtheria antitoxin and antibiotics.

Awareness of Isolation Techniques for Diphtheria: Knowledge of infection control measures, including patient isolation and the use of appropriate personal protective equipment (PPE).

CHAPTER TWO

LITERATURE REVIEW

This chapter focuses on the review of related literature under the following headings; conceptual review, theoretical review and empirical review. Necessary literature would be gotten from published and unpublished works, articles and journals in this study.

Conceptual Review

2.1.1 Concept of Diphtheria

Diphtheria is a highly contagious, acute bacterial infection primarily affecting the upper respiratory system, though it can also involve the skin and other mucous membranes (Pikul et al., 2021). The disease is caused by *Corynebacterium diphtheriae*, a gram-positive, non-motile, non-spore-forming bacterium typically found in the upper respiratory tract of infected individuals (Prygiel et al., 2022). This bacterium produces a potent exotoxin that is central to the pathophysiology of diphtheria (While diphtheria is a vaccine-preventable disease, it continues to cause outbreaks, especially in areas with low vaccination rates (Adegboye et al., 2023). The disease often begins with mild symptoms such as sore throat, fever, and weakness. However, a hallmark feature of diphtheria is the formation of a thick, grayish-white pseudomembrane that develops on the mucous membranes of the throat, tonsils, and nasopharynx (Arguni et al., 2021). This pseudomembrane, made up of dead tissue, bacteria, and immune cells, can obstruct the airway, potentially leading to respiratory distress or suffocation. The toxin produced by *Corynebacterium diphtheriae* causes local tissue damage and systemic effects, targeting organs like the heart and peripheral nerves. This can result in complications such as myocarditis (heart inflammation), heart failure, and polyneuropathy, which can cause paralysis (Robinson et al., 2023; Badenschier et al., 2022). *Corynebacterium diphtheriae* exists in three primary biotypes:

gravis, mitis, and intermedius. These biotypes differ in their ability to produce the diphtheria toxin, with the gravis strain being the most virulent and associated with more severe disease (Prygiel et al., 2022). The diphtheria toxin is a heat-labile protein that is produced under the influence of a temperate bacteriophage that integrates the toxin gene (*tox*) into the bacterial genome (This integration allows the bacterium to synthesize and release the toxin, which inhibits protein synthesis in cells by inactivating elongation factor-2, a key protein in the translation process, leading to cell death. This contributes to the characteristic pseudomembrane formation in the throat (Badell et al., 2021). Diphtheria is transmitted through direct contact with respiratory secretions from infected individuals, typically through coughing, sneezing, or touching contaminated objects like doorknobs or utensils (Li et al., 2021). In addition to *Corynebacterium diphtheriae*, two other species—*Corynebacterium ulcerans* and *Corynebacterium pseudotuberculosis*—can also produce the diphtheria toxin and cause similar clinical symptoms. These species are primarily zoonotic but can also affect humans (Badenschier et al., 2022).

The clinical presentation of diphtheria varies, with respiratory diphtheria being the most common form. The pseudomembrane in the throat can obstruct the airway and lead to difficulty breathing, while the diphtheria toxin can damage other organs, particularly the heart and nervous system. Myocarditis and polyneuropathy, which can be severe, are common complications from systemic toxin spread (Arguni et al., 2021; Adegboye et al., 2023). The disease may also manifest as cutaneous diphtheria, where the bacteria infect skin wounds or ulcers. While diphtheria was once a leading cause of morbidity and mortality globally, the widespread use of the diphtheria toxoid vaccine has significantly reduced its incidence (Berbers et al., 2021). Vaccines such as the DTP (diphtheria-tetanus-pertussis) vaccine have proven effective in reducing prevalence in regions

with high vaccination coverage. However, outbreaks still occur in areas with low immunization rates or disrupted healthcare systems (Adeyanju et al., 2025)

The resurgence of diphtheria in regions such as Eastern Europe and parts of Africa highlights ongoing challenges like political instability and vaccine misinformation, which contribute to reduced vaccination rates (Balakrishnan, et al., 2024). These factors underscore the importance of sustained global vaccination efforts.

2.1.2 Clinical Manifestations of Diphtheria

Diphtheria presents with a spectrum of clinical manifestations that vary based on the site of infection. The disease is most commonly seen in its respiratory form, but it can also affect the skin and, in rare instances, the eyes or nasopharynx. Understanding these varied clinical features is crucial for early recognition, accurate diagnosis, and timely intervention to prevent complications and halt transmission (Otshudiema et al., 2021).

Respiratory diphtheria: Respiratory diphtheria is the most prevalent and severe form of the disease. It primarily affects the upper respiratory tract and initially resembles common viral or bacterial throat infections, making early clinical differentiation challenging (Arguni et al., 2021; Medugu et al., 2023). The illness often begins with nonspecific symptoms such as a sore throat and pharyngitis. Patients may complain of throat pain, especially when swallowing, and clinicians may observe redness and swelling in the pharyngeal region (Perry, 2021). These early symptoms are often accompanied by fever and malaise—a general sense of discomfort and fatigue—which contribute to the patient's overall feeling of being unwell (Rahman et al., 2024).

As the disease progresses, systemic weakness and increasing fatigue become more prominent, leading to lethargy and reduced physical activity (Balakrishnan, 2024). A defining feature of respiratory diphtheria is the formation of a pseudomembrane, a grayish-white, thick layer that develops on the mucous membranes of the throat, tonsils, uvula, and nasopharynx. This pseudomembrane is composed of necrotic epithelial cells, fibrin, leukocytes, and bacteria. It is adherent and often bleeds when attempts are made to remove it (Arguni et al., 2021; Otshudiema et al., 2021). In severe cases, the membrane can extend into the larynx and trachea, significantly obstructing airflow.

This obstruction can lead to dyspnea, or difficulty breathing, which may progress rapidly to life-threatening respiratory distress (Badenschier et al., 2022). A characteristic stridor, a harsh, high-pitched sound during inspiration, often develops as a result of upper airway narrowing. This sign is particularly concerning as it signals imminent respiratory compromise and requires urgent medical attention (Robinson et al., 2023). Additionally, hoarseness or loss of voice may occur if the inflammation extends to the vocal cords, further complicating the clinical picture (Adegboye et al., 2023).

Beyond local effects, the systemic dissemination of diphtheria toxin is responsible for the most serious complications of the disease. Once absorbed into the bloodstream, the toxin affects distant organs, including the heart, nerves, and kidneys (Robinson et al., 2023). One of the most feared complications is myocarditis, or inflammation of the heart muscle. The diphtheria toxin targets myocardial cells, leading to cellular necrosis, arrhythmias, conduction abnormalities, and in some cases, acute heart failure or sudden cardiac death (Otshudiema et al., 2021; Muscat et al., 2022).

Another systemic manifestation is polyneuropathy, which involves damage to multiple peripheral nerves. Patients may experience symptoms such as limb weakness, sensory loss, and difficulty swallowing. In advanced cases, this can progress to paralysis, including respiratory muscle involvement, which poses a significant mortality risk (Pikul et al., 2021). Although less common, renal involvement has been reported in severe cases of diphtheria. The toxin may impair kidney function, potentially resulting in acute renal failure, especially in the presence of systemic inflammation and hypotension (Sertçelik et al., 2023).

Cutaneous diphtheria: Cutaneous diphtheria represents a milder yet clinically important form of the disease. It occurs when *Corynebacterium diphtheriae* infects open wounds or skin abrasions. Clinically, it presents as painful ulcers with a characteristic grayish pseudomembrane overlying the lesions, often surrounded by redness and swelling (Moghalles et al., 2021; Badell et al., 2021). These ulcers may produce pus and become chronic if not properly treated, potentially leading to secondary bacterial infections and scarring. Although cutaneous diphtheria is generally localized and less likely to result in systemic complications, it remains an important public health concern due to its role in transmission, especially in resource-limited settings (Osarenren et al., 2024).

Nasopharyngeal diphtheria: In rare instances, diphtheria may present in atypical forms. Nasopharyngeal diphtheria involves the nasal passages and pharynx and is characterized by symptoms such as nasal congestion, sore throat, and mucopurulent nasal discharge. A pseudomembrane may form in the nasopharynx, posing a risk of airway obstruction similar to respiratory diphtheria (Alghamdi & Tayyib, 2023).

Ocular diphtheria: Ocular diphtheria, though extremely rare, can manifest as conjunctivitis or keratitis. In such cases, pseudomembrane formation on the conjunctiva can lead to discomfort, visual impairment, and long-term ocular complications if not promptly treated (Prygiel et al., 2022).

Because the symptoms of diphtheria can mimic other conditions, diagnostic confirmation is essential. The clinical diagnosis is often supported by laboratory investigations, including throat swabs and cultures to detect *C. diphtheriae*, PCR testing to identify the presence of the diphtheria toxin gene, and blood tests to evaluate systemic involvement, particularly myocarditis and neuropathy (Kofler et al., 2022; Otshudiema et al., 2021; Muscat et al., 2022).

Timely recognition of the clinical signs and understanding the systemic implications of diphtheria are vital for initiating appropriate treatment, including administration of diphtheria antitoxin, antibiotics, and supportive care. Early intervention not only improves individual outcomes but also plays a critical role in preventing the spread of this potentially life-threatening disease.

2.1.3 Pathophysiology of Diphtheria

Diphtheria is a serious infectious disease caused by *Corynebacterium diphtheriae*, a Gram-positive, non-spore-forming bacterium. The pathogenesis of this illness is primarily driven by the production of a potent exotoxin, which is responsible for many of the hallmark clinical features and potentially fatal complications associated with the disease (Otshudiema et al., 2021). The infection typically begins when the bacterium is transmitted through respiratory droplets, direct contact with an infected person, or contact with contaminated surfaces. Once it enters the body, usually through the mucosal surfaces of the upper respiratory tract, *C. diphtheriae* adheres to

epithelial cells in the nasopharynx, tonsils, or larynx using specialized surface proteins (Li et al., 2021). After colonization, the bacterium begins to produce an exotoxin that plays a central role in disease progression. The diphtheria toxin consists of two subunits: an "A" (active) chain and a "B" (binding) chain. The B chain attaches to receptors on host cells—specifically, the heparin-binding epidermal growth factor (HB-EGF) receptor—allowing the toxin to enter the cell. Once inside, the A chain halts protein synthesis by inactivating elongation factor 2 (EF-2), a protein essential for cellular translation. This disruption leads to cell death and tissue necrosis (Otshudiema et al., 2021).

Locally, the toxin causes significant damage at the site of infection. The destruction of epithelial cells results in inflammation and the formation of a thick, grayish-white pseudomembrane composed of dead tissue, fibrin, immune cells, and bacteria (Arguni et al., 2021). This pseudomembrane is adherent and difficult to remove. In some cases, it may grow large enough to obstruct the airway, leading to breathing difficulties, stridor, and potentially fatal respiratory distress. The infection also prompts a robust inflammatory response. Cytokines and chemokines are released, resulting in redness, swelling, pain, and systemic signs such as fever. However, the danger of diphtheria extends beyond the local tissue due to the systemic spread of the toxin via the bloodstream. Once disseminated, the diphtheria toxin can cause damage to distant organs. Cardiovascular complications are particularly severe, with the toxin targeting heart muscle cells and leading to myocarditis. This condition is characterized by myocardial fiber degeneration, which may cause arrhythmias, conduction block, heart failure, or even sudden death (Badenschier et al., 2022). Approximately 20–30% of patients develop myocarditis, typically within one to three weeks after disease onset.

Neurological complications may also arise. The toxin can affect peripheral nerves, leading to polyneuropathy. This commonly manifests as cranial nerve palsies, such as paralysis of the pharynx or facial muscles, and in some cases, progresses to generalized paralysis. If the diaphragm or respiratory muscles are affected, it can be life-threatening (Badenschier et al., 2022). Although less common, the kidneys can also suffer damage from the circulating toxin. This may present as nephritis or, in severe cases, acute kidney injury, especially when compounded by systemic illness or dehydration. In response to the infection, the body mounts both innate and adaptive immune defenses. The immune system begins producing antibodies capable of neutralizing the diphtheria toxin. However, in many cases, especially where the toxin load is high, tissue damage occurs before the immune response can effectively contain the spread. The innate immune response, involving neutrophils and macrophages, contributes to the localized signs of inflammation, particularly in the throat and adjacent tissues.

If diphtheria is diagnosed early and treated promptly with diphtheria antitoxin and antibiotics, recovery is possible. The toxin is neutralized, the pseudomembrane gradually dissolves, and tissue repair begins. However, in cases where complications like myocarditis or neuropathy have developed, the recovery process may be prolonged. Some patients may suffer long-term effects, such as persistent cardiac dysfunction or permanent nerve damage, which can result in chronic disability or death if not adequately managed (Badenschier et al., 2022).

2.1.4 Epidemiology

The prevalence of diphtheria has decreased rapidly since the introduction of the vaccine. Before 1920, the US reported about 200,000 cases per year. With the implementation of extensive vaccination campaigns, this number has significantly dropped, with only about 1000 cases

reported each year (Osarenren et al., 2024). The majority of cases occur in people with poor socioeconomic standing, congested living arrangements, a history of travel to endemic areas, a lack of vaccinations, and concomitant diseases (Abdulrasheed et al., 2023). Southeast Asia and Africa are two regions where these numbers are even greater (Abdulrasheed et al., 2023). After immunizations were introduced, the number of deaths in the United States dropped from 100 to 200 cases to 0.001 per 100,000 people (Osarenren et al., 2024). Reports from the World Health Organization (WHO) reveal that diphtheria epidemics continue to represent a health danger in poor countries (Harris, 2024). India has had a higher prevalence of diphtheria, partly attributable to difficulty in implementing mass vaccination initiatives (Abdulrasheed et al., 2023). India bears a disproportionate share of the world's diphtheria burden (Abdulrasheed et al., 2023).

There is no sexual or racial preference in Diphtheria (Osarenren et al., 2024). Although diphtheria is typically thought of as a childhood illness that primarily affects children under the age of twelve, it can also infect those over forty and those who have other medical issues (Pikul et al., 2021). For those who are not currently receiving vaccinations and booster doses, the risk of illness increases as protection against the bacteria naturally declines (Aborode et al., 2023).

2.1.5 Causes of Diphtheria

C. diphtheriae is a gram-positive bacillus that does not produce spores and is distinguished by its non-motile, non-encapsulated characteristics (Perry, 2021). Its characteristic club shape creates V- or L-shaped formations or palisades (Perry, 2021). In addition to *C. diphtheriae*, *Corynebacterium ulcerans* can cause cutaneous diphtheria and, in rare instances, respiratory diphtheria (Otshudiema et al., 2021). Exotoxins have a harmful effect on both systemic and localized disease symptoms (Robinson et al., 2023). The genetic code for exotoxins

is carried by viral bacteriophages, which help bacteria spread them (Robinson et al., 2023). *Gravis*, *intermedius*, and *mitis* are the three different strains of *C. diphtheriae* that have been isolated, and they are all able to produce toxins (Prygiel et al., 2022).

The pathogenesis of diphtheria involves various etiological factors, including:

- Incomplete or absent immunization (Aborode et al., 2023)
- Waning immunity over time, rendering older individuals without booster vaccination more susceptible to infection (Aborode et al., 2023)
- Low herd immunity (Aborode et al., 2023)
- Travel to endemic areas (Abdulrasheed et al., 2023)
- Travel to regions experiencing current epidemics (Abdulrasheed et al., 2023)
- Immunocompromised states (Abdulrasheed et al., 2023)
- Low socioeconomic status (Abdulrasheed et al., 2023)
- Large-scale population movements (Abdulrasheed et al., 2023)
- Overcrowded conditions, such as military barracks, jails, and homeless shelters (Abdulrasheed et al., 2023)
- Domestic animals (Abdulrasheed et al., 2023)

Although humans are the primary source of diphtheria infection, some case reports suggest a connection between the disease and livestock (Medugu et al., 2023). *C. diphtheriae* can spread from infected people, including asymptomatic carriers, through respiratory droplets, nasal secretions, and, in rare cases, fomites (Li, 2021). The organism's exotoxin production is the main mechanism through which it exhibits its unique clinical characteristics (Robinson et al., 2023). The exotoxin is a single polypeptide composed of two subunits, A and B (Robinson et al., 2023).

The B subunit facilitates the toxin's binding to the receptor on the cell membrane, while the A subunit possesses enzymatic qualities and cleaves nicotinamide from nicotinamide adenine dinucleotide (NAD) (Robinson et al., 2023). This cleavage inhibits protein production by ribosylating elongation factor 2 (EF-2) with adenosine diphosphate (ADP) (Robinson et al., 2023). Local inflammation in the throat and mouth, caused by the host's reaction to the bacteria, leads to the formation of a robust, gray pseudomembrane—a recognizable feature of the illness (Perry, 2021). The hematologic and lymphatic dissemination of the toxin to different body systems is facilitated by local tissue degradation (Perry, 2021). This diphtheria toxin can harm distant organs such as the heart, kidneys, and nervous system (Perry, 2021). Infections caused by nontoxigenic strains are typically less severe (Perry, 2021).

2.1.6 Treatment/Management

The primary methods of treating diphtheria include the prompt administration of antibiotics and antitoxins (Eisenberg et al., 2021). Patients should also undergo a comprehensive evaluation for any potential respiratory and cardiovascular instability (Eisenberg et al., 2021). In suspected cases of diphtheria, antitoxin should be administered immediately, using clinical judgment, without awaiting laboratory confirmation (Eisenberg et al., 2021). Strict droplet precautions must be implemented, and suspected cases must be isolated (Sertçelik et al., 2023). An airway must be maintained, and the patient should be assessed for indications of respiratory distress (Osarenren et al., 2024). Early management also includes ongoing cardiac monitoring to treat any potential cardiovascular complications (Osarenren et al., 2024).

Diphtheria Antitoxin

Diphtheria antitoxin (DAT), derived from horse antiserum, is a critical component of treatment (Eisenberg et al., 2021). Antitoxin works by neutralizing unbound diphtheria toxin in the blood (Eisenberg et al., 2021). Once the toxin has attached itself to the cell membrane, the antitoxin loses its effectiveness (Eisenberg et al., 2021). Antitoxin can be administered intramuscularly or intravenously, with the dosage determined by the severity of the ailment and the patient's clinical status (Eisenberg et al., 2021). Prior to antitoxin administration, hypersensitivity tests should be performed on the patient, and emergency anaphylaxis medication should be readily available at the patient's bedside (Eisenberg et al., 2021).

Antibiotic Treatment

Erythromycin or penicillin G are the recommended antibiotics for treating diphtheria (Osarenren et al., 2024). Erythromycin should be administered at a dose of 500 mg four times a day for two weeks (Osarenren et al., 2024). For patients weighing 10 kg or less, the intramuscular dosage of Penicillin G is 300,000 units every 12 hours; for patients weighing greater than 10 kg, the dosage is 600,000 units every 12 hours (Osarenren et al., 2024). Oral penicillin V can be started at a dose of 250 mg four times a day for two weeks once the patient is able to take oral medication (Osarenren et al., 2024). Antibiotics must be initiated as soon as possible to eradicate the organism, minimize toxin release, hasten patient recovery, and prevent the spread of the illness to close contacts (Osarenren et al., 2024). Vancomycin or linezolid may be considered in cases of antibiotic resistance (Osarenren et al., 2024).

Contact prophylaxis should be administered to close contacts, including family members and those who have direct contact with the infected patient (Rahman et al., 2024). Prophylaxis should also be administered to medical personnel who come into contact with a patient's respiratory

secretions (Rahman et al., 2024). A single dose of penicillin G is given as follows for contact prophylaxis:

- 600,000 units intramuscularly for individuals younger than 6 years (Rahman et al., 2024)
- 1.2 million units intramuscularly for individuals 6 or older (Rahman et al., 2024)

Alternatively, oral erythromycin can be given at a dose of 500 mg 4 times a day for 7 to 10 days (Rahman et al., 2024). Ensuring timely and comprehensive antibiotic treatment is essential for the individual patient, preventing potential outbreaks and minimizing the risk of complications in the broader community (Alege et al., 2024).

Distinguishing diphtheria from other upper respiratory tract infections with similar presentations is crucial (Osarenren et al., 2024). Relevant differentials to consider during the diagnostic process include:

- Epiglottitis: Characterized by acute inflammation of the epiglottis and surrounding structures (Osarenren et al., 2024)
- Retropharyngeal abscess: Manifests with high-grade fever and requires urgent drainage (Osarenren et al., 2024)
- Angioedema: Presents as generalized swelling involving the lower dermis and subcutaneous/submucosal tissues (Osarenren et al., 2024)
- Infectious mononucleosis: Features fatigue, malaise, sore throat, fever, nausea, anorexia, and cough. The classic presentation in children includes fever, pharyngitis, and lymphadenopathy (Osarenren et al., 2024)

- Pharyngitis: Exhibits sudden onset of sore throat, odynophagia, fever, and cough (Osarenren et al., 2024)
- Oral candidiasis: The grayish pseudomembrane in diphtheria must be differentiated from the whitish appearance of oral candidiasis (Osarenren et al., 2024).
- Vincent angina: Involves infection of the gums, presenting with painful, bleeding gums, and ulcerative gingiva necrosis (Osarenren et al., 2024).

2.1.7 Complications

Myocarditis and neuritis are the most common complications of diphtheria (Osarenren et al., 2024; White, 2024). These complications can significantly contribute to the morbidity associated with the disease (Osarenren et al., 2024). Death is a possibility in 5–10% of cases (White, 2024; Badell et al., 2021), underscoring the severity of diphtheria despite available treatments. Another serious consequence is pseudomembrane formation in the upper respiratory tract, which may result in respiratory obstruction and require immediate mechanical ventilation and intubation (Osarenren et al., 2024; Alege et al., 2024). The pseudomembrane can physically block the airway, leading to life-threatening respiratory distress if not promptly managed (Osarenren et al., 2024).

Cardiac Complications

Myocarditis with cardiac arrhythmias, such as first, second, or third-degree heart block, can be a symptom of diphtheria and frequently results in circulatory collapse (Osarenren et al., 2024; Arguni et al., 2021). The diphtheria toxin's effects on the heart muscle can lead to severe cardiac dysfunction (Osarenren et al., 2024; Alege et al., 2024). A longer P-R interval as well as ST and T wave abnormalities are among the electrocardiogram (ECG) alterations seen in afflicted people

(Osarenren et al., 2024; Hebballi et al., 2022). These ECG changes reflect the toxin-mediated damage to the heart's electrical conduction system (Osarenren et al., 2024).

Neurologic Complications

Encephalitis resulting from diphtheria complications can occur in children, although it is rare (Osarenren et al., 2024; Pikul et al., 2021). While less common, neurological manifestations can significantly impact a patient's long-term recovery (Osarenren et al., 2024). Neurological complications in diphtheria include nerve weakness or paralysis, especially involving the cranial nerves and affecting the nerves in the extremities, resulting in muscle weakness in the extremities; involvement of the pharyngeal muscles and the soft palate can cause regurgitation of foods and fluids through the nose (Osarenren et al., 2024; Michael, 2024). Cranial nerve involvement can lead to a range of symptoms, including difficulty swallowing and speaking, highlighting the diffuse impact of the diphtheria toxin on the nervous system (Osarenren et al., 2024).

2.1.8 Knowledge of Nurses Regarding Diphtheria

Nurses play a pivotal role in the prevention, identification, and management of diphtheria, especially in both clinical and community health settings. Their knowledge and awareness about the disease directly impact patient outcomes, outbreak responses, and public health surveillance. Despite being vaccine-preventable, diphtheria has re-emerged in several regions, highlighting the need for enhanced awareness among frontline healthcare workers (Adeyanju, Frampton, & Hein, 2025; Medugu et al., 2023).

Several studies have shown variability in nurses' understanding of diphtheria, particularly in relation to its clinical features, transmission, and necessary precautions. For instance, Sertçelik et al. (2023) found that healthcare workers, including nurses in emergency departments, often lacked adequate knowledge regarding isolation precautions for infectious diseases like diphtheria. This gap in knowledge can hinder infection control efforts, especially during outbreaks.

Furthermore, immunization knowledge is crucial for nurses, particularly those involved in maternal and child healthcare. Research by Motus and Hastings-Tolsma (2025) emphasizes the importance of improving vaccination coverage, particularly with the Tdap vaccine during pregnancy, where nurses are key agents in patient education. Similarly, Alghamdi and Hassan Tayyib (2023) observed that nurses' awareness and attitudes significantly influence vaccination uptake among pregnant women.

Nurses also need to be proficient in recognizing early signs and symptoms of diphtheria to prevent delayed diagnosis and transmission. Diphtheria often begins with nonspecific symptoms, making clinical recognition challenging without proper training. According to Michael (2024), sociocultural misconceptions and limited health literacy among healthcare workers can further exacerbate delays in diagnosis and treatment.

Education and continuous professional development programs are therefore vital in maintaining a high level of awareness among nurses. Interventions aimed at improving knowledge and correcting misinformation can significantly enhance outbreak preparedness and response. As shown in the work of Rokhmah and Ekawati (2024), frontline health workers who receive proper training are more effective in detecting and reporting suspected cases of diphtheria, particularly in resource-limited settings.

To ensure effective disease control and public health readiness, institutional policies must prioritize nurse training on emerging and re-emerging infectious diseases, including diphtheria. This should include updated guidelines on vaccination, case management, contact tracing, and infection prevention practices. Strengthening nurses' capacity in these areas can greatly reduce the risk of future outbreaks and improve overall health system resilience (Osarenren, Omosigho, & Okesanya, 2024; Abdulrasheed et al., 2023).

2.2 Theoretical framework

2.2.1 Knowledge-Attitude-Practice (KAP) Model

The Knowledge-Attitude-Practice (KAP) model is a widely used theoretical framework in public health, nursing, and behavioral research. It explains how knowledge acquisition influences attitudes, and how these attitudes in turn shape actual practices or behaviors. This model is particularly useful when exploring the relationship between what individuals know, how they feel, and what they do in relation to a specific health issue.

Origin and Structure of the KAP Model

The KAP model emerged from behavioral science and has been extensively applied in assessing health-related behavior change. It operates under the assumption that increasing an individual's knowledge (K) will lead to a change in their attitude (A), which will ultimately result in improved practices (P).

The model is composed of three core components:

1. **Knowledge (K)**

   This refers to a person's level of information or understanding about a specific topic. In the context of this study, knowledge encompasses the nurses' understanding of diphtheria, including its etiology, modes of transmission, signs and symptoms, complications, preventive strategies, and clinical management. Knowledge is the foundation for initiating change in health behavior and is typically acquired through education, training, and experience.

2. **Attitude (A)**

   Attitudes represent a person's feelings, beliefs, or perceptions toward a particular concept or health behavior. In this study, it includes the nurses' attitudes toward infection control,

isolation techniques, early reporting, and adherence to diphtheria management protocols. Attitude plays a mediating role between knowledge and practice, influencing whether knowledge is positively or negatively acted upon.

3. **Practice (P)**

   Practice refers to the actual application of knowledge and attitude in real-life scenarios. For nurses, this includes the use of personal protective equipment (PPE), patient isolation, reporting notifiable diseases, administration of diphtheria antitoxin or antibiotics, and strict adherence to hospital infection control protocols. It represents the observable behaviors that result from knowledge and attitude.

2.2.2 Application of the KAP Model to the Study

The Knowledge-Attitude-Practice (KAP) model provides a suitable framework for examining the cognitive, emotional, and behavioral dimensions of nurses' responses to the management of diphtheria. This study adopts the KAP model to understand how the level of knowledge among nurses influences their attitudes and, consequently, their actual clinical practices in the context of diphtheria management within the University of Benin Teaching Hospital, Benin City, Edo State. In this study, the knowledge component of the model focuses on assessing what nurses know about diphtheria, including its causes, transmission routes, signs and symptoms, complications, preventive measures, and standard treatment protocols. Understanding the nurses' level of knowledge is critical, as it serves as the foundation upon which effective attitudes and practices are built. A lack of knowledge could lead to mismanagement of patients or poor infection control practices, which could, in turn, contribute to the spread of the disease within the hospital setting. The attitude component examines the nurses' perceptions, beliefs, and feelings toward diphtheria

and its management. Even when nurses possess the necessary knowledge, their personal attitudes—whether positive or negative—can greatly influence how they respond to patients with diphtheria. This includes their willingness to adhere to infection prevention protocols, their sense of urgency in reporting suspected cases, and their overall disposition toward caring for patients with communicable diseases. Negative or indifferent attitudes, even in the presence of adequate knowledge, can hinder the application of proper practices. The practice component evaluates the actual behaviors and clinical practices of nurses in managing patients with diphtheria. This includes the use of personal protective equipment (PPE), isolation of infected patients, administration of antitoxins or antibiotics, and documentation and reporting of cases in line with institutional guidelines. This component of the model helps identify whether knowledge and attitudes are effectively translated into consistent, evidence-based clinical actions.

By applying the KAP model, this study is able to explore not only what nurses know, but also how they feel and what they actually do in practice. This holistic approach is essential for identifying gaps and challenges in diphtheria management among nurses. For instance, the study may reveal that some nurses have good knowledge of diphtheria but are constrained by systemic barriers such as lack of resources, workload pressure, or absence of continuous training programs. In such cases, improving practice would require both attitudinal reorientation and structural support.

2.3 Empirical review

Knowledge on diphtheria.

In a study by Mercogliano et al. (2023) focused on healthcare workers' knowledge and attitudes toward the Tdap booster in an academic hospital in Southern Italy. Although the study

concentrated on vaccination uptake, it revealed significant gaps in knowledge and attitude, especially among non-medical staff. Given that only 34.5% of healthcare workers had received the booster and many showed limited understanding of its importance, the study supports the idea that even clinical personnel may lack comprehensive knowledge of diphtheria's causative agent (Corynebacterium diphtheriae) and its implications. This reinforces the need for continuous professional education for nurses, who play a central role in recognizing and responding to early clinical signs.

In another study by Alghamdi and Hassan Tayyib (2023), knowledge and awareness related to pertussis vaccination during pregnancy were assessed among women in Saudi Arabia. While the primary population was pregnant women, the study's findings emphasize the general gap in understanding about vaccine-preventable diseases such as diphtheria, tetanus, and pertussis. Only 33.8% of participants were aware of the availability of a vaccine during pregnancy, and fewer understood its role in preventing neonatal infection. Although not conducted on nurses, the findings underscore the widespread lack of disease-specific knowledge, which may extend to healthcare providers—including nurses—thus highlighting the need for improved education about disease causes and symptomatology in both clinical and community settings.

In Indonesia, Rokhmah and Ekawati (2024) explored the relationship between knowledge, attitudes, and behaviors of health cadres in identifying suspected diphtheria cases. This cross-sectional study involving 92 participants found that education and age significantly influenced awareness and proactive behavior in disease detection. These findings suggest that similar variables may influence nurses' knowledge of diphtheria, particularly regarding its etiology and clinical manifestations. The study implies that more experienced and educated health workers are

better positioned to recognize early signs and symptoms, which is critical for prompt diagnosis and care.

In another Indonesian study, Prameswari (2023) examined maternal behavior regarding diphtheria immunization across rural and urban areas. While the target population consisted of mothers, the research identified key factors—such as education level, reference groups, and attitude—that influenced disease understanding and immunization behavior. These findings are relevant to nurses, as they often serve as educators and advocates for immunization. A nurse's knowledge of diphtheria's causes and symptoms directly impacts their ability to educate patients and recognize early signs of infection, especially in underserved areas.

Rahman, Hendrati, and Suroto (2024) analyzed close contact management during a diphtheria outbreak in Madiun City. Their findings emphasize the operational challenges in managing communicable diseases and highlight the need for frontline healthcare workers—including nurses—to possess accurate knowledge of disease transmission and symptom progression. Nurses are often the first to observe patients and report changes, making their awareness of early diphtheria signs—such as sore throat, low-grade fever, and pseudomembrane formation—crucial for timely intervention.

knowledge regarding the management of diphtheria

In a study conducted by Eisenberg et al. (2021**)** on the clinical management and outcomes of diphtheria, the authors carried out a retrospective study at the Médecins Sans Frontières Rubber Garden Diphtheria Treatment Center in Cox's Bazar, Bangladesh, covering the period from December 2017 to September 2018. Diphtheria cases were diagnosed using the World Health

Organization clinical case criteria, and high-acuity patients received diphtheria antitoxin (DAT). The safety and outcomes of DAT administration were evaluated, and the presence of adverse events was compared across variables such as age, duration of illness, and dosage. Among 709 patients treated, 98% recovered, while adverse effects occurred in 25% of the cases, most of which were mild and self-limiting, including rash, cough, and itching. Only **3**% experienced severe hypersensitivity, and mortality was less than 1%, with no deaths attributed directly to the antitoxin. The study concluded that DAT is safe and effective when administered with proper monitoring, and emphasized the importance of trained nursing staff for continuous patient assessment during treatment. These findings underline the need for nurses to be well-informed about monitoring protocols, adverse event recognition, and emergency response procedures associated with DAT use.

Attitude of nurses towards the management of diphtheria

In a study conducted by Mercogliano et al. (2023) titled “Knowledge and attitude factors associated with the prevalence of Tdap (tetanus, diphtheria, and acellular pertussis) booster vaccination in healthcare workers in a large academic hospital in Southern Italy in 2022,” the researchers employed a cross-sectional design using a validated anonymous questionnaire to assess knowledge, attitudes, and Tdap booster coverage among healthcare workers (HCWs) at the University Hospital "Federico II" in Naples. The study utilized multivariable logistic and linear regression models, adjusting for variables such as age, sex, profession, department, and job seniority. Out of 206 HCWs surveyed, 69.4% were medical doctors, and only 34.47% had received the Tdap booster. The results showed that HCWs with 5–9 years of experience had significantly lower odds of being vaccinated compared to newly employed staff. Additionally,

non-medical professionals and those in non-clinical departments demonstrated a lower attitude score toward vaccination. The study concluded that enhancing public health strategies and increasing awareness about the importance of decennial Tdap boosters is essential to protect high-risk populations.

Similarly, Uba et al. (2025) carried out a study titled “Health facility capacity and Health-care worker knowledge, attitudes, and practices of hepatitis B vaccine birth-dose and maternal tetanus-diphtheria vaccine administration in Nigeria: A baseline assessment.” The study used a cross-sectional design involving multistage sampling to select 80 public health facilities and 158 HCWs across Adamawa and Enugu States. Data were collected using a structured facility assessment tool and standardized questionnaire. Results revealed that 73.8% of the facilities had policies on HepB-BD and Td vaccination, yet implementation was inconsistent, with only 61.3% administering HepB-BD within 24 hours of birth. A significant number of HCWs held misconceptions, such as believing tetanus could be sexually transmitted or prevented by avoiding food sharing. The study concluded that implementation gaps and poor HCW knowledge pose significant barriers to effective vaccination coverage in Nigeria, calling for targeted training and policy reinforcement.

In another study by Elmahdy and Anwer (2024) titled “Assessment of nurses' knowledge, attitude and practice regarding nutritional care management of diabetic patients in Benha University Hospital,” a cross-sectional survey was administered to nurses in the medical and surgical departments of Benha University Hospital between June and July 2023. A validated self-administered questionnaire was used to assess KAP levels. Descriptive statistics and multiple linear regression identified predictors of knowledge, attitudes, and practices. Nurses over 41 years and those aware of the National Diabetes Guidelines had significantly higher knowledge

scores. However, only 44% were satisfied with their nutrition education during training, and 86% had never attended a refresher course. Although attitudes toward dietary management were generally positive, knowledge and practice levels were moderate to poor. The authors concluded that continuous education and training are needed to bridge these gaps in diabetes care.

Further, Rokhmah and Ekawati (2024) conducted a study titled “The Relationship of Knowledge, Attitudes and Actions of Cadres in the Discovery of Suspected Cases of Diphteria in the City of Probolinggo, Indonesia.” This study adopted a quantitative cross-sectional approach with simple random and cluster sampling methods, targeting posyandu cadres across six health center areas. Using the Slovin formula, a sample of 92 respondents was selected from a population of 1,095 cadres. Results indicated that most cadres were aged 41–50, predominantly housewives, with over 10 years of experience, and had a high school education. The Chi-square test analysis revealed that age and education significantly influenced cadre behavior, while employment and years of service did not. The study concluded that targeted educational interventions could enhance cadres' roles in identifying and preventing diphtheria cases.

Challenges and gaps in diphtheria management

In a descriptive observational study by Rahman, Hendrati, and Suroto (2024), the researchers analyzed health problems related to the management of close contacts of diphtheria cases in Madiun City, Indonesia, using the CARL (Capability, Accessibility, Readiness, Leverage) prioritization method. The research identified the top priority issue as the administration of chemoprophylaxis and re-immunization for close contacts of confirmed cases. Despite identifying four diphtheria cases in a six-month period, the implementation of preventive treatment was challenged by non-health professionals supervising drug adherence and poor

compliance due to side effects from erythromycin. The study concluded that more effective training for health workers and behavioral interventions for patients were needed. This suggests a gap in nurses' involvement and knowledge of contact management protocols, particularly in educating patients, monitoring adherence, and managing drug side effects.

In a global update, Harris (2024) reported on the first-ever diphtheria treatment guidelines released by the World Health Organization (WHO). These guidelines recommend the administration of diphtheria antitoxin without routine skin sensitivity testing and favor the use of azithromycin over penicillin as the first-line antibiotic therapy. The recommendations stress the importance of timely intervention based on the severity and duration of symptoms, highlighting how early treatment reduces complications and mortality. These updates necessitate that nurse remain informed about current clinical protocols, including correct dosage administration, early symptom identification, and appropriate isolation procedures for infected patients.

Further supporting the role of nurses in prevention and treatment, Musalyants (2023), in a doctoral dissertation, explored the modern principles and methods of disease prevention in nursing, focusing on the role of nurses in managing infectious diseases like diphtheria. The study used observational and analytical methods and included a survey of 239 participants. It emphasized the role of clinical assessment, physical examination, patient observation, and health education in infectious disease control. The study concluded that for nurses to be effective in disease prevention and care, they must be proficient in clinical decision-making, skilled in early detection, and competent in-patient communication and infection control practices.

In a recent study by (Hayat et al., 2024), a case report was presented where severe myocarditis in a 17-year-old patient with diphtheria was evaluated using ECG and cardiac imaging methods. The findings emphasized that public health initiatives aimed at improving vaccination coverage are crucial for preventing diphtheria and its severe complications. The study underscored the necessity of enhanced surveillance and comprehensive management strategies to reduce the burden of diphtheritic myocarditis in affected regions (Hayat et al., 2024).

Similarly, (Ang et al., 2022) examined the seroprevalence of IgG antibodies against diphtheria among migrant workers in Singapore from 2016 to 2019. This investigation highlighted that for herd immunity to be effective, a minimum vaccination rate of 85% is essential. The research pointed out significant gaps in knowledge about diphtheria epidemiology, which contribute to public health challenges related to its management (Ang et al., 2022). This underscores the context where effective vaccination strategies must also consider the sociopolitical dynamics influencing health outcomes, as related by Aḥmad et al. (2024), who identified that targeted initiatives in regions such as conflict-ridden areas of Pakistan are critical for controlling disease outbreaks (Aḥmad et al., 2024).

Furthermore, gaps in the management of diphtheria were also highlighted by (Shaikh et al., 2024), who illustrated a case in a pediatric emergency setting. The authors emphasized the importance of early recognition and management of diphtheria, alongside the necessity for booster doses within the Expanded Program on Immunization (EPI) to prevent the re-emergence of this potentially fatal disease (Shaikh et al., 2024). Unfortunately, the antibiotic resistance observed in cases of toxigenic Corynebacterium diphtheriae, as reported by (Janssen et al., 2025), creates substantial complications in treatment and underscores the need for ongoing surveillance to adapt treatment protocols accordingly (Janssen et al., 2025).

To compound these challenges, (Omojuyigbe et al., 2024) outlined the resurgence of diphtheria in Nigeria, attributing the rise to multiple factors including vaccination gaps and inadequate diagnosis management, which makes timely responses significantly challenging (Omojuyigbe et al., 2024). Their findings reiterated the necessity of strategic public health planning and collaboration to enhance vaccination rates among high-risk populations, thereby addressing the critical barriers in diphtheria management.

Management of diphtheria faces significant hurdles including vaccination coverage, public health knowledge gaps, and rising antibiotic resistance. A multi-faceted approach involving improved surveillance, timely public health initiatives, and education about the disease can substantially mitigate these challenges. It is evident that collaboration among health authorities, increased awareness, and resource allocation are essential to restoring effective control of diphtheria—thus preventing its resurgence.

2.4 Summary of literature review

The literature reviewed in this study explores the current understanding of diphtheria, its clinical manifestations, and the theoretical framework guiding the assessment of nurses' knowledge in managing the disease. Diphtheria is a highly contagious and potentially fatal bacterial infection caused by *Corynebacterium diphtheriae*, primarily affecting the upper respiratory tract but also capable of manifesting in cutaneous and systemic forms. The disease's pathophysiology centers around the production of a potent exotoxin, which can lead to serious complications including myocarditis and neuropathy. Despite the availability of effective vaccines, diphtheria continues to pose a threat in regions with low vaccination coverage, including parts of Africa.

Clinical manifestations of diphtheria vary depending on the site of infection, with respiratory diphtheria being the most severe form. It typically begins with nonspecific symptoms such as sore throat, fever, and malaise, progressing to the formation of a characteristic pseudomembrane in the throat which can obstruct the airway and cause life-threatening respiratory distress.

The theoretical underpinning of this study is based on the Knowledge-Attitude-Practice (KAP) model, which highlights the relationship between what nurses know about diphtheria management, their attitudes towards it, and their actual practices in clinical settings. This model provides a useful framework for understanding the gaps that may exist in knowledge and behavior among healthcare professionals, which can influence patient outcomes.

The review of empirical literature further shed light on previous studies examining nurses' knowledge and practices related to diphtheria, with particular focus on similar healthcare settings and geographical contexts.

CHAPTER THREE

METHODOLOGY

This chapter describes the research methodology that the researcher adopted in conducting this study. The various components of research methodology were discussed under their respective headings, including research design, study setting, target population, sample and sampling technique, instruments of data collection, validity and reliability of instruments, method of data collection, method of data analysis, and ethical considerations.

3.1 Research design

A descriptive survey design was used for this study. Cross -sectional studies are observational studies that analyze data from a population at a single point in time. They are often used to measure the prevalence of health outcomes, understand determinants of health, and describe features of a population (Wang & Cheng, 2020). The study's design comprised a description of the occasions, circumstances, and occurrence rates of particular phenomena over the course of the study period.

3.2 Research Setting

This study was carried out in University of Benin Teaching Hospital (UBTH), Benin City, Edo State. UBTH is a tertiary healthcare facility which was established in 1973. It is located in Ugbowo, Egor Local Government Area. Edo State comprise of 18 local government areas. Egor Local government area where University of Benin Teaching Hospital is located falls within the southern senatorial district of Nigeria. UBTH offers both clinical and diagnostic services and offers a wide range of services, which makes it an important healthcare facility in the state,

region and the nation at large. It is estimated that UBTH has a bed capacity of over nine hundred and ten (910) (UBTH, 2024). UBTH has nineteen (19) clinical departments and three (3) Medical Laboratory Department and 3 emergency departments. These departments offer emergency services for the general/primary health needs of the people. They offer both outpatient and in-patient services and they are staffed with health professionals such as Doctors, Nurses and paramedics to carry out their daily routines.

3.3 Target Population

The target population comprises of 721 nurses working in the selected unit in University of Benin Teaching Hospital (UBTH), Ugbowo, Benin City.

Table 3.1 Number of Nurses in clinical areas

Units	**Number of nurses**
Accident and Emergency Unit A	88
Accident and Emergency Unit B	76
Surgical Unit	92
Obstetrics and Gynecology	90
Medicine Unit A	82
Medicine Unit B	69
Clinic Unit A	45
Clinic Unit B	33
Total	**575**

(*source, Human Resources Department, February 2025)*.

3.4 Sample Size Determination

The sample size was calculated as indicated below:

Using Taro Yamane's Formula

$$n = \frac{N}{1+N\,(e)^2}$$

Where

N= Population under study

E= Constant 0.05%) margin error

$$n = \frac{575}{}$$

$$n = \frac{1+575\ (0.05)}{1+575\ (0.0025)}$$

$$n = \frac{575}{1+1.44}$$

$$n = \frac{575}{2.44}$$

n=235.7

Therefore, the sample size is approximately 236.

3.5 Sampling Technique

The stratified sampling technique was used in this study. Stratified sampling is a probability sampling technique where the population is divided into homogeneous subgroups or "strata" based on shared characteristics such as gender, age, income, education level or unit

Proportional sampling calculation

Units	**Determination of sample size in each level**	**Sample size per level**
Accident and Emergency Unit A	88/575x236	36
Accident and Emergency Unit B	76/575x236	31
Surgical Unit	92/575x236	38
Obstetrics and Gynecology	90/575x236	37
Medicine Unit A	82/575x236	34
Medicine Unit B	69/575x236	28
Clinic Unit A	45/575x236	18
Clinic Unit B	33/575x236	14
Total	**575**	**236**

Inclusion criteria,

- Nurses currently employed at UBTH.
- Nurses working in wards where infectious diseases are managed.
- Nurses with at least one year of clinical experience.
- Nurses willing to participate and provide informed consent.

3.6 Instrument for Data Collection

The instrument for data collection in this study was self-structured questionnaire. This was developed based on the objectives of the study. The questionnaire was made up of five sections with. Questions were carefully drafted, sequenced and constructed in a bid to get in-depth information that is useful and relevant to the study.

Section A: consist of the demographic data of the participants (Age, Marital Status, Current Educational Level, Ethnicity).

Section B: knowledge of diphtheria among nurses

Section C: knowledge regarding the management of diphtheria among nurses

Section D: Challenges and Gaps in Diphtheria Management

3.7 Validity of the Instrument

The instrument's validity pertained to its capability to accurately measure the intended construct or concept (Surucu & Maslakci, 2020). Researchers assessed various validity types such as content, construct, criterion, and face to evaluate the instrument's accuracy. For this research, face and content validity was utilized to validate the research tool. The questionnaire was examined for validation by both the project supervisor and a field

expert, and necessary adjustments were implemented by the researcher before starting the main study.

3.8 Reliability of the Instrument

- The reliability of an instrument referred to its stability and consistency in delivering uniform outcomes when assessing the same criteria under identical circumstances (Surucu & Maslakci, 2020). It essentially gauged how consistently the instrument produced similar results across multiple trials. A reliable instrument is one that could produce the same results if the behavior was measured again by the same scale. The Cronbach's alpha reliability technique will be employed in this study. This researcher conducted reliability testing on the instrument by distributing 15 questionnaires, which constituted 10% of the total sample size of 150, to working nurses of Faith MediPlex (which are outside the sampled population). A coefficient of 0.71 was obtained and the instrument was considered reliable.

3.9 Method of Data Collection

A well-structured questionnaire was administered to the nurses working in medical and surgical unit until the required sample size of 150 was achieved. The nurses were approached at their various unit. The purpose of the study was explained to them, and the instrument for data collection was administered. Data collection was conducted by the researchers. The data collection was taken during break periods, and on-the-spot retrieval of the administered copies of the questionnaire was ensured such that all copies were collected on the same day. Data collection lasted for about two weeks.

3.10 Method of Data Analysis

The data collected was analyzed using the Statistical Package for the Social Sciences (SPSS) version 27.0. Descriptive statistics such as mean, frequency, and percentages were computed to summarize the data. Hypothesis testing was conducted using the Chi-square test of association, with the level of significance set at $p < 0.05$. The results of the analyses were presented using tables, graphs, frequencies, and percentages to provide a clear overview of the findings.

3.11 Ethical Considerations

Ethical approval was obtained from the Health Research Committee, University of Benin Teaching Hospital, Benin City. Permission was obtained from the various ward managers before proceeding with the research. Before data collection began, participants received detailed explanations about the research's purpose, content, and implications. They were assured of confidentiality, ensuring the protection of their personal and private information. Throughout the research, ethical guidelines were strictly adhered to, including the following considerations:

- **Confidentiality:** Respondents' information was treated confidentially, with no request for names or addresses in the questionnaire. Participants were made to understand that their responses are confidential and solely used for research purposes. No personal identifiers were used in any document or questionnaire to maintain anonymity.
- **Voluntary Participation:** Participants were informed of their right to voluntary participation without facing penalties or bias. They can choose to withdraw or decline to provide information at any point if they feel uncomfortable or unsure.

- **Avoidance of Plagiarism:** Proper citation of all authors used in the study was ensured, both within the content and in the reference page.

CHAPTER FOUR

RESULTS

This chapter deals with the representation of data collected regarding the knowledge of the management of diphtheria among nurses in University of Benin Teaching Hospital Benin City Nigeria. A total of 236 questionnaires were distributed to nurses working in the selected unit in University of Benin Teaching Hospital (UBTH), Ugbowo, Benin City, 231 were properly filled and valid for data analysis, giving a response rate of 97.8%.

Table 4.1: Socio-demographic characteristics of respondents

Variable	Frequency (n = 231)	Percent (%)
Age		
Below 25 years	19	8.23
25–34 years	103	44.6
35–44 years	72	31.2
45 years and above	37	16.0
Gender		
Male	68	29.4
Female	163	70.6
Highest Qualification		
Diploma in Nursing	84	36.4
Bachelor of Nursing Science (BNSc)	96	41.6
Postgraduate Nursing Qualification	39	16.9
Others	12	5.19
Years of Experience		
Less than 5 years	41	17.7
5–10 years	76	32.9
11–15 years	66	28.6
Above 15 years	48	20.8
Unit/Department		
Emergency Unit	52	22.5
Intensive Care Unit	38	16.5
Pediatric Unit	47	20.3
Medical-Surgical Unit	69	29.9
Others	25	10.8

Table 4.1 shows the socio-demographic characteristics of the respondents. The data reveals that the majority (44.6%) were aged between 25 and 34 years, followed by 31.2% in the 35–44 age group. Respondents aged 45 years and above constituted 16.0%, while those below 25 years accounted for the least proportion at 8.23%. In terms of gender, most respondents were female (70.6%), with males making up 29.4%. Regarding educational qualifications, 41.6% held a Bachelor of Nursing Science (BNSc), 36.4% had a Diploma in Nursing, and 16.9% possessed postgraduate nursing qualifications. A small percentage (5.19%) had other qualifications. In terms of years of experience, 32.9% had worked for 5–10 years, 28.6% for 11–15 years, and 20.8% had over 15 years of experience. Only 17.7% had less than 5 years of professional experience. The distribution across hospital units showed that the highest proportion of respondents worked in the Medical-Surgical Unit (29.9%), followed by the Emergency Unit (22.5%), Pediatric Unit (20.3%), and Intensive Care Unit (16.5%). The remaining 10.8% were assigned to other departments.

Answering Research Questions

Research Question 1: What is the level of the knowledge of diphtheria among nurses in the university of Benin Teaching hospital, Benin, Edo state, Nigeria?

Table 4.2: Knowledge of diphtheria among nurses

Items	Frequency (n = 231)	Correct	Wrong	Mean	Remark
What is the causative organism of diphtheria?		199 (86.1)	32 (13.9)	1.9	Good
(a) Corynebacterium diphtheriae	102 (44.2)				
(b) Streptococcus pneumonia	65 (28.1)				
(c) Mycobacterium tuberculosis	64 (27.7)				
What is the primary mode of transmission of diphtheria?		183 (79.2)	48 (20.8)	1.8	Good
(a) Through respiratory droplets	183 (79.2)				
(b) Through contaminated water	26 (11.3)				
(c) Through sexual contact	22 (9.5)				
Which of the following is a common clinical feature of respiratory diphtheria?		204 (88.3)	27 (11.7)	1.9	Good
(a) Formation of a thick gray membrane in the throat	204 (88.3)				
(b) Bloody diarrhea	15 (6.5)				
(c) Skin ulcers on the lower limbs	12 (5.2)				
Which age group is most commonly affected by diphtheria in unvaccinated populations?		176 (76.2)	55 (23.8)	1.8	Good
(a) Children under 5 years old	176 (76.2)				
(b) Adults over 50 years old	29 (12.6)				
(c) Teenagers aged 13–19	26 (11.3)				
Which vaccine provides protection against diphtheria?		212 (91.8)	19 (8.2)	1.9	Good
(a) DPT vaccine	212 (91.8)				
(b) BCG vaccine	11 (4.8)				
(c) MMR vaccine	8 (3.5)				
Which of the following is a serious complication of diphtheria if left untreated?		187 (81.0)	44 (19.0)	1.8	Good
(a) Myocarditis	187 (81.0)				
(b) Appendicitis	24 (10.4)				
(c) Jaundice	20 (8.7)				

Table 4.2 Cont'd

Items	Frequency (n = 231)	Correct	Wrong	Mean	Remark
How soon after exposure do diphtheria symptoms typically appear?		168 (72.7)	63 (27.3)	1.7	Good
(a) 2 to 5 days	168 (72.7)				
(b) 10 to 14 days	36 (15.6)				
(c) 3 to 4 weeks	27 (11.7)				
What is the role of the pseudomembrane in diphtheria?		174 (75.3)	57 (24.7)	1.8	Good
(a) It obstructs the airway and may lead to breathing difficulties	174 (75.3)				
(b) It enhances immune response	30 (13.0)				
(c) It protects the throat lining from irritation	27 (11.7)				
Which of the following is a risk factor for diphtheria infection?		194 (84.0)	37 (16.0)	1.8	Good
(a) Incomplete vaccination	194 (84.0)				
(b) High blood sugar	18 (7.8)				
(c) Daily consumption of red meat	19 (8.2)				
Which body system is primarily affected by respiratory diphtheria?		206 (89.2)	25 (10.8)	1.9	Good
(a) Respiratory system	206 (89.2)				
(b) Digestive system	13 (5.6)				
(c) Urinary system	12 (5.2)				
		Grand Mean		**1.8**	**Good**

Mean Cut-off =1.5

Table 4.2 shows the knowledge of diphtheria among nurses. The highest mean score of 1.9 was recorded for the items on the causative organism of diphtheria (86.1% correct), common clinical feature (88.3%), vaccine providing protection (91.8%), and the body system primarily affected by respiratory diphtheria (89.2%). This was followed by a mean score of 1.8 for questions on the primary mode of transmission (79.2%), most commonly affected age group (76.2%), serious complication if left untreated (81.0%), the role of the pseudomembrane (75.3%), and risk factor for infection (84.0%). The lowest mean score of 1.7 was observed for the question on the typical

symptom onset period after exposure (72.7%). The grand mean of 1.8 indicates a good overall knowledge of diphtheria among the respondents.

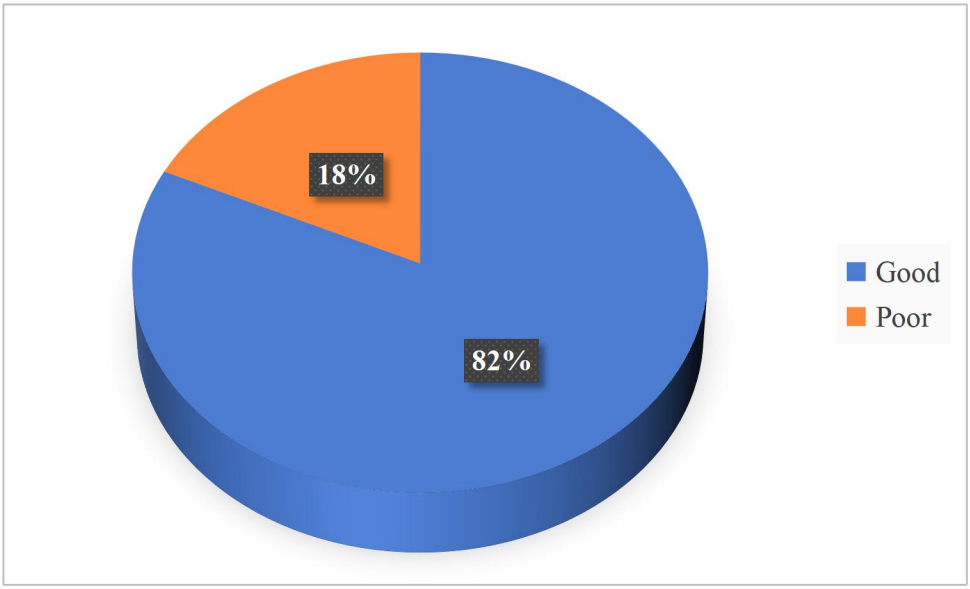

Figure 4.1: Pie chart showing knowledge of diphtheria among nurses

Figure 4.1 shows that out of 231 nurses, 190 (82%) demonstrated good knowledge of diphtheria, while 41 (18%) had poor knowledge.

Research Question 2: What is the knowledge of nurses on the management of diphtheria in the University of Benin Teaching hospital, Benin, Edo state, Nigeria?

Table 4.3: Knowledge on the management of diphtheria among nurses

Items	Frequency (n = 231)	Correct	Wrong	Mean	Remark
What is the first step in managing a suspected case of diphtheria in a hospital setting?	197 (85.3)	197 (85.3)	34 (14.7)	1.9	Good
(a) Isolate the patient to prevent transmission	197 (85.3)				
(b) Start tuberculosis medication	18 (7.8)				
(c) Refer the patient to the outpatient department	16 (6.9)				
Which medication is used to neutralize the diphtheria toxin?	203 (87.9)	203 (87.9)	28 (12.1)	1.9	Good
(a) Diphtheria antitoxin	203 (87.9)				
(b) Paracetamol	14 (6.1)				
(c) Amoxicillin	14 (6.1)				
Which class of antibiotics is commonly used in the treatment of diphtheria?	189 (81.8)	189 (81.8)	42 (18.2)	1.8	Good
(a) Macrolides (e.g., erythromycin)	189 (81.8)				
(b) Antifungals	20 (8.7)				
(c) Diuretics	22 (9.5)				
What is the purpose of administering diphtheria antitoxin?	192 (83.1)	192 (83.1)	39 (16.9)	1.8	Good
(a) To neutralize the circulating toxin and prevent complications	192 (83.1)				
(b) To boost appetite	19 (8.2)				
(c) To increase platelet count	20 (8.7)				
When should antibiotic therapy for diphtheria ideally be initiated?	174 (75.3)	174 (75.3)	57 (24.7)	1.8	Good
(a) As soon as diphtheria is clinically suspected	174 (75.3)				
(b) Only after confirmatory lab results	33 (14.3)				
(c) After three days of observation	24 (10.4)				

Table 4.3 Cont'd

Items	Frequency (n = 231)	Correct	Wrong	Mean	Remark
In managing a diphtheria patient, what is an essential nursing consideration?	186 (80.5)	186 (80.5)	45 (19.5)	1.8	Good
(a) Monitoring for signs of airway obstruction	186 (80.5)				
(b) Encouraging the patient to exercise	23 (10.0)				
(c) Applying hot compress to the chest	22 (9.5)				
What should be done if a nurse suspects diphtheria in a patient?	199 (86.1)	199 (86.1)	32 (13.9)	1.9	Good
(a) Notify infection control and initiate isolation protocols	199 (86.1)				
(b) Allow the patient to mingle with others	15 (6.5)				
(c) Discharge the patient with antibiotics	17 (7.4)				
Which of the following is a critical follow-up action after managing a diphtheria patient?	182 (78.8)	182 (78.8)	49 (21.2)	1.8	Good
(a) Monitoring close contacts and offering prophylaxis	182 (78.8)				
(b) Advising the patient to use herbal remedies	27 (11.7)				
(c) Recommending weight gain supplements	22 (9.5)				
What is the role of nurses in preventing diphtheria transmission in hospitals?	207 (89.6)	207 (89.6)	24 (10.4)	1.9	Good
(a) Enforcing infection control measures such as hand hygiene and PPE	207 (89.6)				
(b) Referring all care to doctors only	13 (5.6)				
(c) Allowing family visits without restriction	11 (4.8)				
How long should a diphtheria patient be isolated after starting antibiotics?	191 (82.7)	191 (82.7)	40 (17.3)	1.8	Good
(a) Until two consecutive negative throat cultures	191 (82.7)				
(b) Until fever subsides	24 (10.4)				
(c) For exactly 24 hours regardless of symptoms	16 (6.9)				
		Grand Mean		**1.8**	**Good**

Mean Cut-off = 1.5

Table 4.3 shows the knowledge on the management of diphtheria among nurses. The highest mean score of 1.9 was recorded for the items on the first step in managing a suspected case (85.3%), the medication used to neutralize the diphtheria toxin (87.9%), what should be done if a nurse suspects diphtheria (86.1%), and the role of nurses in preventing transmission in hospitals (89.6%). This was followed by a mean score of 1.8 for the class of antibiotics commonly used (81.8%), the purpose of administering diphtheria antitoxin (83.1%), when to initiate antibiotic therapy (75.3%), essential nursing considerations (80.5%), critical follow-up action (78.8%), and isolation duration after starting antibiotics (82.7%). The grand mean of 1.8 indicates a good level of knowledge on diphtheria management among the respondents.

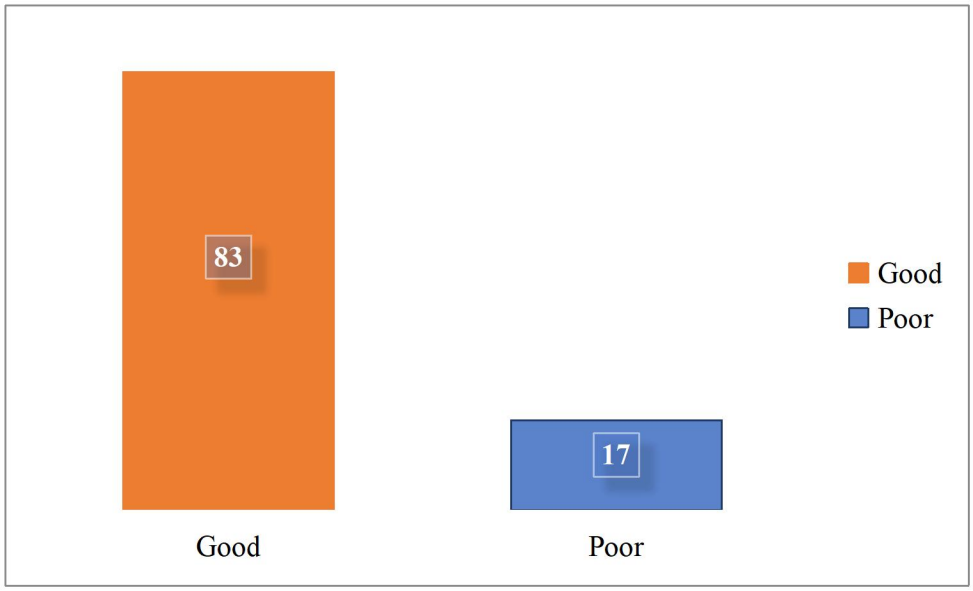

Figure 4.2: Bar chart showing knowledge on the management of diphtheria among nurses

Figure 4.2 reveals that 192 nurses (83%) had good knowledge of diphtheria management, whereas 39 nurses (17%) had poor knowledge.

Research Question 2: What is the attitude of nurses towards the management of diphtheria in the University of Benin Teaching hospital, Benin, Edo state, Nigeria?

Table 4.4: Attitude of nurses towards the management of diphtheria

Statements	Strongly Agree	Agree	Disagree	Strongly Disagree	Mean	Remark
Nurses play a vital role in the early detection and management of diphtheria.	134 (58.0)	76 (32.9)	15 (6.5)	6 (2.6)	3.5	Positive
I feel confident in my ability to manage a case of diphtheria effectively.	88 (38.1)	101 (43.7)	31 (13.4)	11 (4.8)	3.2	Positive
Managing diphtheria cases is an important part of my professional responsibility.	121 (52.4)	79 (34.2)	22 (9.5)	9 (3.9)	3.4	Positive
I am willing to participate in training programs on diphtheria management.	143 (61.9)	70 (30.3)	13 (5.6)	5 (2.2)	3.5	Positive
I believe diphtheria can be effectively managed in our hospital.	97 (42.0)	96 (41.6)	27 (11.7)	11 (4.8)	3.2	Positive
I would prefer to avoid managing diphtheria cases due to fear of infection.	36 (15.6)	58 (25.1)	95 (41.1)	42 (18.2)	2.4	Negative
Proper use of PPE makes me feel safe managing diphtheria cases.	119 (51.5)	82 (35.5)	20 (8.7)	10 (4.3)	3.3	Positive
Continuous education on infectious diseases like diphtheria is necessary for nurses.	152 (65.8)	62 (26.8)	12 (5.2)	5 (2.2)	3.6	Positive
				Grand Mean	**3.2**	**Positive**

Mean Cut-off = 2.5

Table 4.4 shows the attitude of nurses towards the management of diphtheria, with the highest mean score of 3.6 for the statement "Continuous education on infectious diseases like diphtheria is necessary for nurses," followed by a mean of 3.5 for both "Nurses play a vital role in the early detection and management of diphtheria" and "I am willing to participate in training programs on

diphtheria management." The mean for "Managing diphtheria cases is an important part of my professional responsibility" is 3.4, while "Proper use of PPE makes me feel safe managing diphtheria cases" scored a mean of 3.3. "I feel confident in my ability to manage a case of diphtheria effectively" and "I believe diphtheria can be effectively managed in our hospital" both had means of 3.2. The lowest mean, 2.4, was recorded for "I would prefer to avoid managing diphtheria cases due to fear of infection." Overall, the grand mean of 3.2 indicates a positive attitude towards diphtheria management among the nurses.

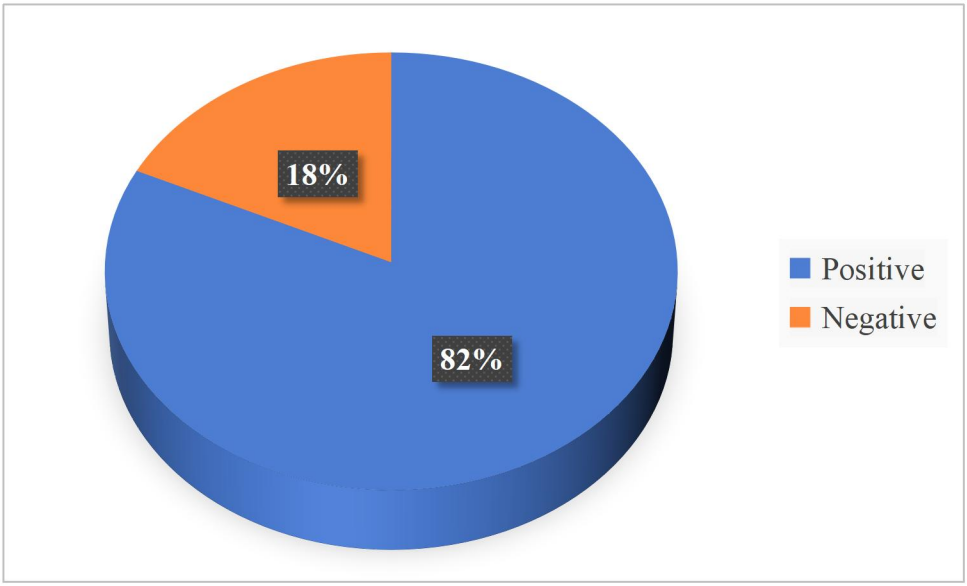

Figure 4.3: Pie chart showing attitude of nurses towards the management of diphtheria

The pie chart (Figure 4.3) illustrates the attitude of nurses towards the management of diphtheria. A significant majority, 189 nurses (82%), expressed a positive attitude, while 42 nurses (18%) reported a negative attitude.

Research Question 3: What is the Challenge in Diphtheria Management among nurses in University of Benin Teaching hospital, Benin, Edo state, Nigeria?

Table 4.5: Challenges in diphtheria management among nurses

Items	Strongly Agree	Agree	Disagree	Strongly Disagree	Mean	Remark
There is inadequate training on diphtheria management for nurses in this hospital.	101 (43.7)	84 (36.4)	29 (12.6)	17 (7.4)	3.2	High
Limited availability of diphtheria antitoxin hinders effective patient care.	88 (38.1)	97 (42.0)	28 (12.1)	18 (7.8)	3.1	High
There are insufficient infection control resources (e.g., gloves, masks, isolation units) in my unit.	72 (31.2)	91 (39.4)	42 (18.2)	26 (11.3)	2.9	High
I find it difficult to recognize the early signs and symptoms of diphtheria.	56 (24.2)	79 (34.2)	64 (27.7)	32 (13.9)	2.7	High
The hospital does not have a clear protocol for managing suspected diphtheria cases.	69 (29.9)	92 (39.8)	43 (18.6)	27 (11.7)	2.9	High
Delays in laboratory confirmation of diphtheria affect patient outcomes.	104 (45.0)	78 (33.8)	32 (13.9)	17 (7.4)	3.2	High
There is a lack of regular in-service training on infectious disease management, including diphtheria.	112 (48.5)	76 (32.9)	26 (11.3)	17 (7.4)	3.2	High
Work overload makes it difficult for nurses to properly monitor diphtheria patients.	93 (40.3)	88 (38.1)	31 (13.4)	19 (8.2)	3.1	High
Communication gaps between nurses and doctors affect the management of diphtheria cases.	97 (42.0)	81 (35.1)	33 (14.3)	20 (8.7)	3.1	High
There is a need for more public health education on diphtheria prevention and control.	108 (46.8)	83 (35.9)	27 (11.7)	13 (5.6)	3.2	High

Table 4.5 Cont'd

Items	Strongly Agree	Agree	Disagree	Strongly Disagree	Mean	Remark
I feel confident managing diphtheria if provided with the right resources and training.	87 (37.7)	94 (40.7)	32 (13.9)	18 (7.8)	3.1	High
Poor documentation and reporting affect follow-up care for diphtheria patients.	91 (39.4)	83 (35.9)	34 (14.7)	23 (10.0)	3	High
There is inadequate collaboration among healthcare professionals during diphtheria case management.	78 (33.8)	89 (38.5)	37 (16.0)	27 (11.7)	2.9	High
Fear of contracting the disease affects how some nurses manage diphtheria cases.	62 (26.8)	74 (32.0)	58 (25.1)	37 (16.0)	2.7	High
The hospital administration provides sufficient support in managing infectious diseases like diphtheria.	41 (17.7)	72 (31.2)	64 (27.7)	54 (23.4)	2.4	Low
			Grand Mean		**3.0**	**High**

Mean Cut-off = 2.5

Table 4.5 presents the challenges in diphtheria management among nurses. The highest mean score of 3.2 was observed in the items on inadequate training on diphtheria management (43.7%), delays in laboratory confirmation affecting outcomes (45.0%), lack of regular in-service training (48.5%), and the need for more public health education (46.8%). This was followed by a mean of 3.1 in items on limited availability of diphtheria antitoxin (42.0%), work overload (40.3%), communication gaps (42.0%), and confidence in managing diphtheria with adequate resources (40.7%). A mean score of 3.0 was recorded for poor documentation and reporting (39.4%). Items with a mean of 2.9 included insufficient infection control resources (39.4%), unclear hospital protocols (39.8%), and inadequate collaboration among healthcare professionals (38.5%). A

mean score of 2.7 was found in items on difficulty recognizing early signs and symptoms (34.2%) and fear of contracting the disease (32.0%), while the lowest mean score of 2.4 was recorded for hospital administrative support (31.2%). The grand mean of 3.0 indicates a high level of perceived challenges among the nurses.

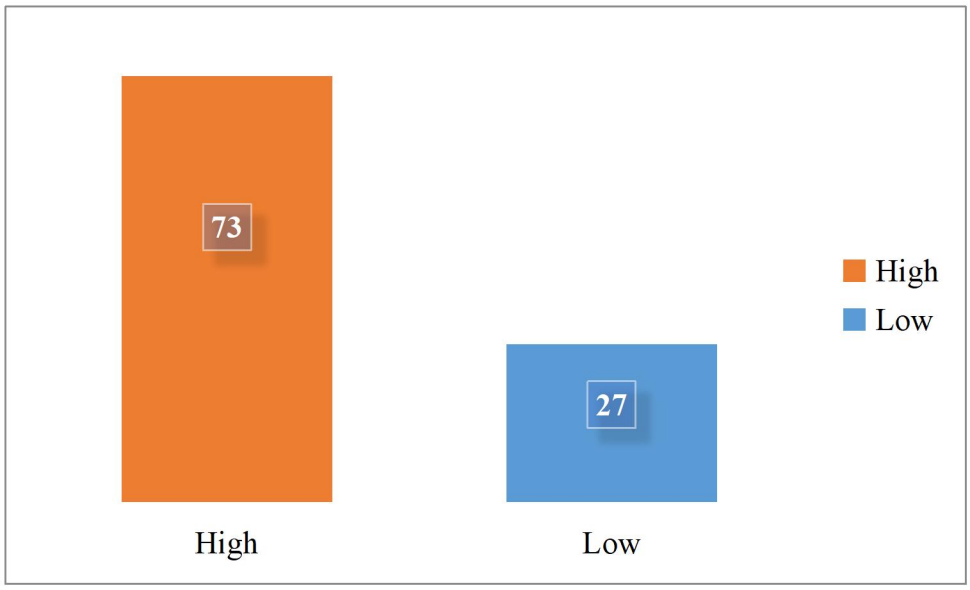

Figure 4.3: Pie chart showing challenges in diphtheria management among nurses

Figure 4.3 shows that 168 nurses (73%) experienced high levels of challenges in managing diphtheria, while 63 nurses (27%) reported low levels of challenges.

Hypothesis Testing

There is no significant relationship between the knowledge of diphtheria among nurses and their knowledge of the management of diphtheria in the university of Benin Teaching hospital, Benin, Edo state, Nigeria.

Table 4.6: Relationship between the knowledge of diphtheria among nurses and their knowledge of the management of diphtheria

Knowledge	Knowledge		Test Statistics (χ^2)	df	P value	Decision
	Good(%)	**Poor(%)**				
Good(%)	190(80.5)	41(17.4)	0.060	1	0.8	Accepted
Poor(%)	192(81.4)	39(16.5)				

Table 4.5 shows no significant relationship between nurses' knowledge of diphtheria and their knowledge of its management, as indicated by a Chi-square value of 0.060, degrees of freedom (df) = 1, and a p-value of 0.8. The null hypothesis was accepted.

CHAPTER FIVE

DISCUSSION AND FINDINGS

This chapter discusses the major findings of the research compared with the literature reviewed, the implication for nursing, summary, conclusion, Recommendations and Suggestions for further Studies.

5.1. Discussion of major Findings

The study assessed the knowledge of the management of diphtheria among nurses in University of Benin Teaching Hospital Benin City Nigeria. The study revealed that the majority of nurses (44.6%) were aged 25-34 years, followed by 31.2% in the 35-44 age bracket. This age distribution aligns with Rokhmah and Ekawati's (2024) findings that age significantly influences awareness and proactive behavior in disease detection. The predominance of younger to middle-aged nurses suggests a workforce that may be more adaptable to new protocols and guidelines, as suggested by recent WHO updates (Harris, 2024). The gender distribution showed a female predominance (70.6%) versus male nurses (29.4%), reflecting the typical gender distribution in nursing globally. This demographic aspect wasn't specifically addressed in the reviewed literature but could be relevant to understanding care delivery patterns and professional development needs. The educational profile revealed that 41.6% held Bachelor's degrees, while 36.4% had diplomas, and 16.9% possessed postgraduate qualifications. This educational distribution is particularly relevant when considered alongside Mercogliano et al.'s (2023) findings regarding knowledge gaps among healthcare workers. The relatively high proportion of degree holders suggests potential for better clinical decision-making, supporting Musalyants' (2023) emphasis on the importance of educational preparation in infectious disease management. The experience distribution showed that 32.9% had 5-10 years of experience, while 28.6% had

11-15 years. This experience profile is significant when considered against Rahman and Ekawati's (2024) findings that more experienced health workers are better positioned to recognize early signs and symptoms. The substantial proportion (20.8%) with over 15 years of experience suggests a strong foundation for mentoring less experienced staff in managing complex cases like diphtheria. The largest proportion of nurses worked in Medical-Surgical units (29.9%), followed by Emergency (22.5%) and Pediatric units (20.3%). This distribution is particularly relevant given Eisenberg et al.'s (2021) findings on the importance of proper monitoring during DAT administration and Hayat et al.'s (2024) emphasis on managing severe complications like myocarditis. The significant representation from critical care areas (16.5% in ICU) suggests capacity for managing severe cases, though this may be challenged by the resource limitations identified in various studies.These demographic characteristics provide important context for understanding the knowledge levels and management challenges identified in the study. The relatively young, well-educated workforce with varied experience levels suggests potential for improved diphtheria management, provided the challenges identified by Omojuyigbe et al. (2024) and others regarding resource availability and systematic support are addressed.

Knowledge of diphtheria among nurses

The study revealed that nurses generally demonstrated good knowledge of diphtheria, with 82% showing good understanding while 18% displayed poor knowledge. This finding aligns with but shows better results than Mercogliano et al.'s (2023) study, which identified significant knowledge gaps among healthcare workers in Southern Italy. Regarding specific knowledge areas, nurses showed strong understanding of the causative organism, with 86.1% correctly identifying Corynebacterium diphtheriae. This is particularly noteworthy when compared to

Rahman and Ekawati's (2024) findings in Indonesia, which emphasized how education significantly influenced disease awareness among health workers. The study found that 79.2% of nurses correctly identified respiratory droplets as the primary transmission mode. This knowledge is crucial for proper disease management, as highlighted by Rahman, Hendrati, and Suroto (2024) in their analysis of close contact management during outbreaks. Clinical feature recognition was strong, with 88.3% of nurses correctly identifying the characteristic gray throat membrane. This high level of awareness is essential for early detection, supporting Musalyants' (2023) emphasis on the importance of clinical assessment and physical examination skills in infectious disease control. Knowledge of complications was also good, with 81% correctly identifying myocarditis as a serious complication. This understanding aligns with recent findings by Hayat et al. (2024), who documented severe myocarditis cases in diphtheria patients and stressed the importance of early recognition. Vaccine knowledge was particularly strong (91.8% correct responses), contrasting with Alghamdi and Hassan Tayyib's (2023) findings of poor vaccination awareness in the general population. This suggests that nurses are well-positioned to address the vaccination gaps identified by Omojuyigbe et al. (2024) in their study of diphtheria resurgence. jThe grand mean of 1.8 (against a cut-off of 2.5) indicates overall good knowledge levels among nurses. However, areas requiring attention include incubation period knowledge (72.7% correct) and pseudomembrane role understanding (75.3% correct). These gaps could impact early detection and management, particularly relevant given Eisenberg et al.'s (2021) emphasis on timely intervention for optimal treatment outcomes.

Knowledge of nurses on the management of diphtheria

The study revealed that 83% of nurses demonstrated good knowledge of diphtheria management, while 17% showed poor knowledge. This finding represents a more favorable outcome compared to the challenges identified in Rahman, Hendrati, and Suroto's (2024) study, which highlighted significant operational difficulties in managing communicable diseases. Regarding isolation protocols, 85.3% of nurses correctly identified patient isolation as the first management step. This high awareness of isolation procedures aligns with current WHO guidelines as reported by Harris (2024), though it shows better understanding than the practical implementation challenges described in various outbreak settings. Knowledge of diphtheria antitoxin (DAT) was strong, with 87.9% correctly identifying it as the toxin neutralizer. This theoretical knowledge corresponds well with Eisenberg et al.'s (2021) findings from Bangladesh, where DAT administration proved 98% effective when properly monitored. However, it's worth noting that theoretical knowledge doesn't always translate to practical application, as highlighted in various field studies. Regarding antibiotic therapy, 81.8% correctly identified macrolides as the primary treatment. This knowledge aligns with WHO's updated guidelines favoring azithromycin over penicillin (Harris, 2024). However, the timing of antibiotic initiation showed lower awareness (75.3% correct responses), suggesting a potential gap in emergency response protocols. The study found high competency (89.6%) in understanding infection control measures, notably better than the operational challenges described by Rahman et al. (2024) in their analysis of close contact management. However, the lower score (78.8%) in contact tracing and prophylaxis knowledge echoes the challenges identified in their study regarding non-health professionals supervising drug adherence. Nurses showed good understanding (82.7%) of isolation duration requirements and culture-based clearance protocols. This is particularly relevant given the

concerns raised by Janssen et al. (2025) regarding antibiotic resistance in toxigenic C. diphtheriae strains. The overall grand mean of 1.8 (against a cut-off of 1.5) indicates good knowledge levels in management protocols. However, certain areas like timing of antibiotic initiation and contact management showed relatively lower scores, aligning with Musalyants' (2023) findings on the importance of clinical decision-making and infection control practices. These findings suggest that while theoretical knowledge is generally good, there might be gaps between knowledge and practical application, particularly in areas requiring rapid decision-making and complex patient management, as highlighted in various case studies and outbreak reports from the literature.

Attitude of nurses towards the management of diphtheria

The findings regarding nurses' attitudes towards diphtheria management reveal both encouraging trends and areas requiring attention when compared to previous studies. Here's a detailed discussion: The data shows that 82% of nurses demonstrated a positive attitude towards diphtheria management, with a grand mean of 3.2 (above the 2.5 cut-off), indicating generally favorable dispositions. This contrasts interestingly with Mercogliano et al.'s (2023) findings, where healthcare workers showed lower engagement with preventive measures, as evidenced by only 34.47% receiving Tdap boosters. 91% of nurses (combining "Strongly Agree" and "Agree" responses) acknowledged their vital role in early detection and management. This high recognition aligns with Rokhmah and Ekawati's (2024) emphasis on the importance of healthcare workers' awareness in disease detection. However, there's a notable gap between role recognition and confidence levels, as only 82% expressed confidence in managing cases effectively. The strongest positive response was for continuous education (93% combined positive responses,

mean=3.6), reflecting awareness of the need for ongoing learning. This corresponds with Elmahdy and Anwer's (2024) findings highlighting the importance of continuous education, where 86% of their study participants had never attended refresher courses. A significant finding is that 41% of nurses expressed some level of agreement with preferring to avoid diphtheria cases due to fear of infection (mean=2.4, the lowest in the survey). This mirrors Rahman, Hendrati, and Suroto's (2024) observations about challenges in contact management and highlights the need for better support systems. 84% of nurses believed in their hospital's capacity to manage diphtheria effectively. This confidence level is notably higher than what was reported in Uba et al.'s (2025) study, where significant implementation gaps were identified in healthcare facilities. The high willingness to participate in training programs (92% positive responses) suggests a strong commitment to professional development. This contrasts positively with Mercogliano et al.'s (2023) findings, where lower attitude scores were observed among non-medical professionals. These findings suggest that while nurses generally maintain positive attitudes toward diphtheria management, there are still important areas for improvement, particularly regarding confidence levels and infection concerns. The results underscore the need for targeted interventions in training and support systems, aligning with the recommendations from previous studies about enhancing healthcare worker preparedness and safety assurance.

Challenges in Diphtheria Management

The study revealed that 73% of nurses experienced high levels of challenges in diphtheria management, while 27% reported low levels. This significant proportion of nurses facing challenges aligns with various studies highlighting operational difficulties in managing diphtheria cases. The findings showed high challenges (mean=3.2) regarding inadequate training,

supporting Mercogliano et al.'s (2023) findings of significant knowledge gaps among healthcare workers. Limited availability of diphtheria antitoxin (mean=3.1) echoes concerns raised in Eisenberg et al.'s (2021) study, though their context focused more on administration safety than availability. Insufficient infection control resources (mean=2.9) and unclear management protocols (mean=2.9) emerged as significant challenges. These findings parallel Rahman, Hendrati, and Suroto's (2024) observations about operational challenges in outbreak management, particularly regarding resource allocation and standardized procedures. Delays in laboratory confirmation (mean=3.2) were identified as a major challenge, corresponding with the concerns raised by Shaikh et al. (2024) regarding early recognition and management. This is particularly significant given the emergence of antibiotic-resistant strains documented by Janssen et al. (2025). Work overload (mean=3.1) and communication gaps between healthcare providers (mean=3.1) were prominent challenges. These findings align with Musalyants' (2023) emphasis on the importance of effective clinical decision-making and interprofessional communication in infectious disease control. The strong agreement on the need for public health education (mean=3.2) reflects similar concerns raised by Alghamdi and Hassan Tayyib (2023) regarding general awareness gaps. This is particularly relevant given Omojuyigbe et al.'s (2024) findings on the relationship between education and disease resurgence. Fear of disease contraction (mean=2.7) and confidence issues in management (mean=3.1) highlight the psychological aspects of care delivery, aspects not extensively covered in previous studies but crucial for effective disease control. The lowest score was for hospital administrative support (mean=2.4), suggesting a disconnect between institutional support and frontline needs. This mirrors broader systemic challenges identified in various studies, particularly in resource-limited settings. The overall grand mean of 3.0 (against a cut-off of 2.5) indicates high levels of challenges across

multiple domains. These findings suggest that despite good knowledge levels shown in previous objectives, practical implementation faces significant barriers, supporting Ahmad et al.'s (2024) observations about the complex interplay between knowledge, resources, and effective disease management.

5.2 Implications to Nurses

The findings of this study carry several important implications for nurses, particularly those involved in the prevention and management of infectious diseases such as diphtheria. Firstly, the generally high level of knowledge demonstrated by nurses—both in understanding the disease and in its management—highlights the critical role that nurses play in the frontline detection, treatment, and control of diphtheria. With over 80% of respondents showing good knowledge in both areas, it is evident that nurses are well-positioned to contribute significantly to the reduction of diphtheria morbidity and mortality, especially in healthcare settings like the University of Benin Teaching Hospital. However, the study also uncovered specific gaps in knowledge, such as limited awareness of the timing for initiating antibiotic therapy and lower scores related to contact tracing and prophylaxis procedures. These gaps suggest that while theoretical understanding is strong, practical and procedural knowledge—particularly in fast-paced clinical environments—requires strengthening. This underlines the need for continuous professional development programs that focus not just on theoretical updates but also on applied training through simulations, workshops, and case-based learning. Moreover, the high proportion of nurses reporting significant challenges in managing diphtheria, such as inadequate training, lack of resources, and unclear protocols, points to systemic issues that hinder effective nursing practice. These barriers can impact nurses' ability to deliver timely and efficient care, especially in outbreak situations. Addressing these challenges requires institutional commitment to

improving the availability of critical resources like diphtheria antitoxin, ensuring access to standardized management protocols, and fostering an environment that supports interprofessional communication and teamwork.

5.3 Summary

This study explored the knowledge and management practices of nurses regarding diphtheria at the University of Benin Teaching Hospital, shedding light on their readiness and capacity to respond to this preventable but potentially deadly disease. The findings revealed that a significant majority of nurses possessed a good level of knowledge about diphtheria, including its causes, symptoms, modes of transmission, and prevention strategies. This level of awareness is critical in ensuring prompt identification and response to suspected cases.

In terms of management, the study showed that many nurses were familiar with standard treatment protocols, such as isolation procedures and the administration of antibiotics. However, some areas—like the appropriate timing for initiating treatment, managing contacts, and recognizing complications—still showed moderate knowledge levels, pointing to the need for further training and practical reinforcement.

Challenges identified in the course of the study included inadequate resources, lack of up-to-date training, fear of infection, and poor interprofessional collaboration. These issues, if not addressed, could compromise the effectiveness of nurses in managing diphtheria cases, especially during outbreaks.

5.4 Conclusion

The study demonstrated that nurses at the University of Benin Teaching Hospital possess a generally good level of knowledge regarding the causes, symptoms, transmission, and prevention of diphtheria, as well as its management. Their understanding of critical areas such as the role of diphtheria antitoxin, isolation protocols, and infection control measures highlights a commendable level of preparedness to handle diphtheria cases. However, gaps remain in specific aspects of clinical practice, such as the timing of antibiotic administration and comprehensive contact tracing.

The findings also revealed significant challenges faced by nurses in the effective management of diphtheria, including limited access to essential resources, insufficient training opportunities, delayed laboratory confirmations, and inadequate institutional support. These challenges highlight the urgent need for systemic improvements in infrastructure, continuous professional development, and enhanced support from hospital administration.

Ultimately, while the knowledge base among nurses is strong, the translation of this knowledge into effective practice depends heavily on addressing these systemic barriers. Strengthening institutional support, improving access to essential supplies, and providing regular, targeted training are crucial steps toward ensuring that nurses are fully equipped to respond to diphtheria outbreaks and safeguard public health.

5.5 Limitations of the Study

Despite the valuable insights gained from this study, several limitations must be acknowledged. First, the study was conducted solely at the University of Benin Teaching Hospital, which may limit the generalizability of the findings to other healthcare institutions in Nigeria or different

geographic settings. The experiences and resources available to nurses in this facility may differ significantly from those in rural or less-equipped healthcare centers.

Also, the reliance on self-reported data through questionnaires may introduce bias, as participants might have overestimated their knowledge or underreported challenges due to social desirability or fear of professional judgment. This could affect the accuracy and objectivity of the results.

5.6 Recommendations

Based on the findings of this study, several recommendations are proposed to enhance nurses' knowledge and practices regarding the management of diphtheria.

1. Organize regular training workshops and seminars on infectious disease management, with emphasis on diphtheria. These programs should be tailored to address identified knowledge gaps and equip nurses with evidence-based practices.
2. Hospital administrators and policymakers should integrate diphtheria management modules into the standard in-service training curricula to ensure that both newly recruited and experienced nurses remain updated on evolving treatment protocols and guidelines.
3. Foster partnerships between healthcare institutions and public health agencies to enhance the dissemination of accurate information. These collaborations should also include organizing joint awareness campaigns and simulation exercises to promote readiness and effective outbreak response.
4. Ensure nurses have easy access to updated educational resources such as manuals, posters, and digital platforms that can serve as quick references in clinical settings.

5.7 Suggestions for Further Study

This study has provided valuable insights into the knowledge and practices of nurses regarding the management of diphtheria; however, further research is necessary to build on these findings and address existing gaps.

Moreover, research should be expanded to include a larger and more diverse population of healthcare workers across different regions and healthcare settings. Comparative studies involving nurses in urban versus rural hospitals, public versus private institutions, or different levels of care (primary, secondary, and tertiary) would offer a broader understanding of disparities in knowledge and practice.

It is also recommended that qualitative studies be conducted to explore the underlying reasons behind inadequate knowledge or poor practices among nurses. In-depth interviews or focus group discussions could reveal contextual, institutional, or personal barriers that quantitative studies may not fully capture.

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APPENDIX 1

DEPARTMENT OF NURSING SCIENCE

UNIVERSITY OF BENIN

BENIN CITY, EDO STATE

QUESTIONNAIRE

Dear respondent,

I a final year student of the above-named institution carrying out a research on **KNOWLEDGE OF THE MANAGEMENT OF DIPHTHERIA AMONG NURSES IN UNIVERSITY OF BENIN TEACHING HOSPITAL BENIN CITY NIGERIA.**

Please answer all questions honestly. Tick (✓) the appropriate option or provide your answer where required. All responses are confidential and will only be used for academic purposes.

Section A: Demographic Data

1. How old are you? Below 25 years [ ],25–34 years [ ], 35–44 years[ ], 45 years and above[ ].

2. Gender: Male [ ] ,Female[ ].

3. Highest Qualification: Diploma in Nursing [ ], Bachelor of Nursing Science (BNSc)[ ], Postgraduate Nursing Qualification[ ],Others (please specify): _____.

4. Years of Experience: Less than 5 years [ ], 5–10 years [ ], 11–15 years [ ], Above 15 years [ ].

5. Unit/Department: Emergency Unit [ ], Intensive Care Unit [ ], Pediatric Unit [ ], Medical-Surgical Unit [ ], Others (please specify): _____

Knowledge of Diphtheria

1. What is the causative organism of diphtheria? (a) Corynebacterium diphtheria (b) Streptococcus pneumonia (c) Mycobacterium tuberculosis
2. What is the primary mode of transmission of diphtheria? (a) Through respiratory droplets from an infected person (b) Through contaminated water (c) Through sexual contact

3. Which of the following is a common clinical feature of respiratory diphtheria? (a) Formation of a thick gray membrane in the throat (b) Bloody diarrhea (c) Skin ulcers on the lower limbs
4. Which age group is most commonly affected by diphtheria in unvaccinated populations? (a) Children under 5 years old (b) Adults over 50 years old (c) Teenagers aged 13–19
5. Which vaccine provides protection against diphtheria? (a) DPT (Diphtheria, Pertussis, Tetanus) vaccine (b) BCG vaccine (c) MMR (Measles, Mumps, Rubella) vaccine
6. Which of the following is a serious complication of diphtheria if left untreated? (a) Myocarditis (b) Appendicitis(c) Jaundice
7. How soon after exposure do diphtheria symptoms typically appear? (a) 2 to 5 days (b) 10 to 14 days (c) 3 to 4 weeks
8. What is the role of the pseudomembrane in diphtheria? (a) It obstructs the airway and may lead to breathing difficulties (b) It enhances immune response (c) It protects the throat lining from irritation
9. Which of the following is a risk factor for diphtheria infection? (a) Incomplete vaccination (b) High blood sugar (c) Daily consumption of red meat
10. Which body system is primarily affected by respiratory diphtheria? (a) Respiratory system (b) Digestive system (c) Urinary system

Section B: Knowledge on the Management of Diphtheria

1. What is the first step in managing a suspected case of diphtheria in a hospital setting? (a) Isolate the patient to prevent transmission (b) Start tuberculosis medication (c) Refer the patient to the outpatient department

2. Which medication is used to neutralize the diphtheria toxin? (a) Diphtheria antitoxin (b) Paracetamol (c) Amoxicillin
3. Which class of antibiotics is commonly used in the treatment of diphtheria? (a) Macrolides (e.g., erythromycin) (b) Antifungals (c) Diuretics
4. What is the purpose of administering diphtheria antitoxin? (a) To neutralize the circulating toxin and prevent complications (b) To boost appetite (c) To increase platelet count
5. When should antibiotic therapy for diphtheria ideally be initiated? (a) As soon as diphtheria is clinically suspected (b) Only after confirmatory lab results (c) After three days of observation
6. In managing a diphtheria patient, what is an essential nursing consideration? (a) Monitoring for signs of airway obstruction (b) Encouraging the patient to exercise (c) Applying hot compress to the chest
7. What should be done if a nurse suspects diphtheria in a patient? (a) Notify infection control and initiate isolation protocols (b) Allow the patient to mingle with others (c) Discharge the patient with antibiotics
8. Which of the following is a critical follow-up action after managing a diphtheria patient? (a) Monitoring close contacts and offering prophylaxis (b) Advising the patient to use herbal remedies (c) Recommending weight gain supplements
9. What is the role of nurses in preventing diphtheria transmission in hospitals? (a) Enforcing infection control measures such as hand hygiene and PPE (b) Referring all care to doctors only (c) Allowing family visits without restriction

10. How long should a diphtheria patient be isolated after starting antibiotics? (a) Until two consecutive negative throat cultures (b) Until fever subsides (c) For exactly 24 hours regardless of symptoms

Section C: Attitude of Nurses Towards the Management of Diphtheria

Statements	Strongly Agree	Agree	Disagree	Strongly Disagree
1. Nurses play a vital role in the early detection and management of diphtheria.				
2. I feel confident in my ability to manage a case of diphtheria effectively.				
3. Managing diphtheria cases is an important part of my professional responsibility.				
4. I am willing to participate in training programs on diphtheria management.				
5. I believe diphtheria can be effectively managed in our hospital.				
6. I would prefer to avoid managing diphtheria cases due to fear of infection.				
7. Proper use of PPE makes me feel safe managing diphtheria cases.				
8. Continuous education on infectious diseases like diphtheria is necessary for nurses.				

Challenges in Diphtheria Management

Items	Strongly Agree	Agree	Disagree	Strongly Disagree
There is inadequate training on diphtheria management for nurses in this hospital.				
Limited availability of diphtheria antitoxin hinders effective patient care.				
There are insufficient infection control resources (e.g., gloves, masks, isolation units) in my unit.				
I find it difficult to recognize the early signs and symptoms of diphtheria.				
The hospital does not have a clear protocol for managing suspected diphtheria cases.				
Delays in laboratory confirmation of diphtheria affect patient outcomes.				
There is a lack of regular in-service training on infectious disease management, including diphtheria.				
Work overload makes it difficult for nurses to properly monitor diphtheria patients.				
Communication gaps between nurses and doctors affect the management of diphtheria cases.				
There is a need for more public health education on diphtheria prevention and control.				
I feel confident managing diphtheria if provided with the right resources and training.				
Poor documentation and reporting affect follow-up care for diphtheria patients.				
There is inadequate collaboration among healthcare professionals during diphtheria case management.				
Fear of contracting the disease affects how some nurses manage diphtheria cases.				
The hospital administration provides sufficient support in managing infectious diseases like diphtheria.				

APPENDIX II

RELIABILITY OF INSTRUMENT ON KNOWLEDGE OF THE MANAGEMENT OF DIPHTHERIA AMONG NURSES IN UNIVERSITY OF BENIN TEACHING HOSPITAL BENIN CITY NIGERIA

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.71	0.70	30

Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
What is the causative organism of diphtheria? (a) Corynebacterium diphtheria (b) Streptococcus pneumonia (c) Mycobacterium tuberculosis	53.4931	15.077	-.047	.701
What is the primary mode of transmission of diphtheria? (a) Through respiratory droplets from an infected person (b) Through contaminated water (c) Through sexual contact	54.1111	15.302	.204	.210
Which of the following is a common clinical feature of respiratory diphtheria? (a) Formation of a thick gray membrane in the throat (b) Bloody diarrhea (c) Skin ulcers on the lower limbs	53.4167	15.126	-.061	.185
Which age group is most commonly affected by diphtheria in unvaccinated populations? (a) Children under 5 years old (b) Adults over 50 years old (c) Teenagers aged 13–19	87.3188	27.590	-.123	.099

Which vaccine provides protection against diphtheria? (a) DPT (Diphtheria, Pertussis, Tetanus) vaccine (b) BCG vaccine (c) MMR (Measles, Mumps, Rubella) vaccine	87.4813	26.138	.053	.092
Which of the following is a serious complication of diphtheria if left untreated? (a) Myocarditis (b) Appendicitis(c) Jaundice	53.4931	15.077	-.047	.565
How soon after exposure do diphtheria symptoms typically appear? (a) 2 to 5 days (b) 10 to 14 days (c) 3 to 4 weeks	53.2986	14.141	.055	.196
What is the role of the pseudomembrane in diphtheria? (a) It obstructs the airway and may lead to breathing difficulties (b) It enhances immune response (c) It protects the throat lining from irritation	53.4167	15.126	-.061	.185
Which of the following is a risk factor for diphtheria infection? (a) Incomplete vaccination (b) High blood sugar (c) Daily consumption of red meat	87.3188	27.590	-.123	.099
Which body system is primarily affected by respiratory diphtheria? (a) Respiratory system (b) Digestive system (c) Urinary system	87.4813	26.138	.053	.092
What is the first step in managing a suspected case of diphtheria in a hospital setting? (a) Isolate the patient to prevent transmission (b) Start tuberculosis medication (c) Refer the patient to the outpatient department	87.2313	27.034	-.044	.078
Which medication is used to neutralize the diphtheria toxin? (a) Diphtheria antitoxin (b) Paracetamol (c) Amoxicillin	87.3188	27.590	-.123	.099
Which class of antibiotics is commonly used in the treatment of diphtheria? (a) Macrolides (e.g., erythromycin) (b) Antifungals (c) Diuretics	87.3188	27.590	-.123	.099

What is the purpose of administering diphtheria antitoxin? (a) To neutralize the circulating toxin and prevent complications (b) To boost appetite (c) To increase platelet count	87.4813	26.138	.053	.092
When should antibiotic therapy for diphtheria ideally be initiated? (a) As soon as diphtheria is clinically suspected (b) Only after confirmatory lab results (c) After three days of observation	53.4931	15.077	-.047	.165
In managing a diphtheria patient, what is an essential nursing consideration? (a) Monitoring for signs of airway obstruction (b) Encouraging the patient to exercise (c) Applying hot compress to the chest	87.4500	25.582	.125	.071
What should be done if a nurse suspects diphtheria in a patient? (a) Notify infection control and initiate isolation protocols (b) Allow the patient to mingle with others (c) Discharge the patient with antibiotics	87.3188	27.590	-.123	.099
Which of the following is a critical follow-up action after managing a diphtheria patient? (a) Monitoring close contacts and offering prophylaxis (b) Advising the patient to use herbal remedies (c) Recommending weight gain supplements	87.4813	26.138	.053	.092
What is the role of nurses in preventing diphtheria transmission in hospitals? (a) Enforcing infection control measures such as hand hygiene and PPE (b) Referring all care to doctors only (c) Allowing family visits without restriction	87.3188	27.590	-.123	.099
How long should a diphtheria patient be isolated after starting antibiotics? (a) Until two consecutive negative throat cultures (b) Until fever subsides (c) For	87.4813	26.138	.053	.092

exactly 24 hours regardless of symptoms				
	87.3188	27.590	-.123	.099
	87.4813	26.138	.053	.092
There is inadequate training on diphtheria management for nurses in this hospital.	86.3125	25.587	.034	.056
Limited availability of diphtheria antitoxin hinders effective patient care.	87.6438	27.325	-.076	.081
There are insufficient infection control resources (e.g., gloves, masks, isolation units) in my unit.	87.5938	26.658	.058	.077
I find it difficult to recognize the early signs and symptoms of diphtheria.	87.3188	27.590	-.123	.099
The hospital does not have a clear protocol for managing suspected diphtheria cases.	87.4813	26.138	.053	.092
Delays in laboratory confirmation of diphtheria affect patient outcomes.	86.2813	26.719	-.064	.095
There is a lack of regular in-service training on infectious disease management, including diphtheria.	86.3500	25.675	.024	.090
Work overload makes it difficult for nurses to properly monitor diphtheria patients.	86.3000	24.714	.114	.081

Comment: The reliability analysis using Cronbach's Alpha, yielding a result of 0.71, for the overall scale. Additionally, the Cronbach's Alpha of 0.52 when the items are standardized. These values suggest a good level of internal consistency among the items in this scale.

HEALTH RESEARCH ETHICS COMMITTEE (HREC)

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PROTOCOL NUMBER: ADM/E 22/A/VOL.VII/2025/2273

PROPOSAL TITLE: **"KNOWLEDGE AND ATTITUDE OF NURSES TOWARDS THE MANAGEMENT OF DIPTHERIA IN THE UNIVERSITY OF BENIN TEACHING HOSPITAL, BENIN CITY"**

PRINCIPAL INVESTIGATOR(S): OGEDENGBE IMOISEME RACHEAL

DEPARTMENT/INSTITUTION: DEPARTMENT OF NURSING SCIENCES, SCHOOL OF BASIC MEDICAL SCIENCES UNIVERSITY OF BENIN, BENIN CITY, EDO STATE

DATE CONSIDERED: AUGUST 18TH, 2025

DECISION OF THE COMMITTEE: APPROVED

THIS APPROVAL DATES 18/8/2025 TO 17/8/2026. IF THERE IS DELAY IN STARTING THE RESEARCH, PLEASE INFORM THE HREC SO THAT THE DATES OF APPROVAL CAN BE ADJUSTED ACCORDINGLY

REMARK:

CHAIRMAN: PROF. (MRS) A.N. OFILI **SIGNATURE & DATE**..... 18/8/2025

SUPERVISOR (S): PROF. (MRS.) C.E OMOROGBE

DECLARATION BY INVESTIGATOR(S):
PROTOCOL NUMBER (please quote in all enquiries)
Note that no participant accrual or activity related to this research may be conducted outside of these dates. All informed consent forms used in this study must carry the HREC assigned number and duration of HREC approval of the study. In multiyear research, endeavor to submit your annual re-port to the HREC early in order to obtain renewal of your approval and avoid disruption of your research. No changes are permitted in the research without prior approval by the HREC except in circumstances outlined in the Code. The HREC reserves the right to conduct compliance visit your research site without previous notification

Signature & Date.....