

Knowledge, Preventive Practices, and Public Health Control Measures of Infectious Diseases Among Secondary School Students in Nigeria

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Abstract

Infectious diseases remain a significant threat to public health, particularly among secondary school students in Nigeria, where knowledge gaps and limited resources can exacerbate transmission. This study explores the level of knowledge, preventive practices, and the effectiveness of public health control measures related to infectious diseases among secondary school students in Nigeria. A cross-sectional survey was conducted across selected secondary schools, utilizing structured questionnaires to assess students' knowledge of common infectious diseases, their preventive behaviors, and their awareness of public health interventions. Results from the findings of this study reveal that while a majority of students possess basic awareness of infectious diseases such as malaria, typhoid fever, and tuberculosis, comprehensive understanding of transmission routes and prevention strategies is lacking. Preventive practices, including hand hygiene and use of protective measures, are inconsistently applied, often hindered by inadequate facilities and cultural misconceptions. Public health control measures, such as health education campaigns and vaccination programs, show variable reach and impact, with urban schools generally exhibiting better outcomes than their rural counterparts. The study underscores the urgent need for enhanced health education, improved infrastructure, and consistent implementation of control measures. Strengthening partnerships between schools, health authorities, and communities is recommended to foster sustainable improvements in knowledge and practices, ultimately reducing the burden of infectious diseases among Nigerian secondary school students.

Keywords: Infectious Diseases, Secondary School Students, Preventive Practices, Public Health Control Measures, and Nigeria.

1. Introduction

Infectious diseases continue to pose a serious and persistent global challenge, especially in low- and middle-income countries where public health systems often struggle to meet needs. The World Health Organization (WHO) [1] highlights that diseases such as COVID-19, Lassa fever, and measles remain significant threats despite advances in medical interventions.

Among vulnerable populations, adolescents, particularly secondary school students are at heightened risk due to their social behaviors, educational context, and evolving cognitive development. Nigeria, with its vast and diverse population, frequently experiences outbreaks that disproportionately affect young people [2]. These students often engage in behaviors like close physical contact, sharing personal items, and inconsistent hygiene practices, all of which facilitate disease transmission.

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Additionally, adolescents are influenced by peer norms and cultural beliefs, which can either support or hinder preventive behaviors.

Schools offer a unique and powerful setting for health promotion and disease prevention. As places where students spend much of their time, they provide structured environments for delivering health education and implementing public health interventions. Research shows that school-based programs can significantly improve adolescents' knowledge of infectious diseases, increase adoption of preventive behaviors such as handwashing and vaccination, and reduce transmission within the school community and beyond [3]. The COVID-19 pandemic further underscored the potential of schools in disease control but also laid bare critical gaps. School closures, disruptions in learning, and the uneven roll-out of health protocols exposed deficiencies in health literacy and preparedness among students, indicating a pressing need for more comprehensive and resilient school-based health strategies [4].

Nigeria faces substantial challenges in implementing effective public health measures within its educational system. Many schools lack basic infrastructure such as clean water, sanitation facilities, and access to health services, which constrains students' ability to practice recommended preventive behaviors [5]. The shortage of trained health personnel and educators with expertise in health education further limits the delivery of accurate and timely information. Moreover, socio-cultural dynamics, including stigma, misinformation, and traditional beliefs often shape students' attitudes and behaviors in ways that can undermine public health efforts [5]. Compounding these issues are stark disparities between urban and rural schools: urban institutions may benefit from better infrastructure and outreach, while rural schools often operate under resource constraints and lower health literacy levels [4]. These systemic and contextual challenges highlight the urgent need for equitable, context-sensitive interventions that address the full spectrum of barriers to effective disease prevention in schools.

Despite policy initiatives and programs by agencies such as the National Primary Health Care Development Agency (NPHCDA), research focused specifically on knowledge, preventive practices, and public health control measures among Nigerian secondary school students remains limited. Existing studies suggest that factors influencing adolescents' behaviors include their age, gender, prior exposure to health information, school policies, and the availability of supportive infrastructure [6]. However, comprehensive research that evaluates both individual-level knowledge and the effectiveness of school-based control measures especially in light of recent outbreaks like COVID-19 and Lassa fever, is lacking. Evidence is needed to guide the development of interventions that are both evidence-based and culturally appropriate, tailored to the unique needs of adolescents in diverse Nigerian contexts.

Strengthening collaborations between schools, health authorities, and communities will be essential to bridge knowledge gaps, enhance preventive practices, and foster sustainable improvements in adolescent health outcomes.

2. Epidemiology of Infectious Diseases in Nigerian Adolescents

Infectious diseases continue to exert a considerable burden on the adolescent population in Nigeria, with both endemic and emerging diseases presenting significant public health concerns. Adolescents in Nigeria are particularly susceptible to infections such as malaria, tuberculosis, typhoid fever, hepatitis, and, more recently, COVID-19 and Lassa fever. Malaria remains the leading cause of morbidity and mortality among Nigerian youth, accounting for a substantial proportion of outpatient visits and school absenteeism [7]. The high prevalence of vector-borne diseases can be attributed to environmental factors, such as inadequate waste management, stagnant water, and poor housing conditions, which create favorable breeding grounds for disease vectors like mosquitoes [8]. In addition, outbreaks of measles and meningitis have been documented among school-aged children, further stressing the vulnerability of this group to vaccine-preventable diseases [9].

Recent years have witnessed the emergence and re-emergence of infectious diseases that pose threats to adolescent health. The COVID-19 pandemic, for example, has significantly disrupted educational activities and heightened awareness of respiratory infections among secondary school students. Although adolescents generally experience less severe clinical manifestations compared to adults, they play a crucial role in community transmission due to their social mobility and interactions [10]. Similarly, periodic outbreaks of Lassa fever, a viral hemorrhagic illness endemic to West Africa, have affected adolescents, particularly in rural areas with poor access to healthcare and health education. Poor vaccination coverage, misinformation, and infrastructural deficits have contributed to the recurrence of outbreaks, underscoring gaps in Nigeria's infectious disease surveillance and control systems [11].

The epidemiology of infectious diseases among Nigerian adolescents is also shaped by socio-economic, geographic, and gender-related factors. Rural-urban disparities are marked, with adolescents in rural communities facing higher risks due to limited health infrastructure, lower literacy levels, and poorer access to public health interventions [12]. Gender differences further influence vulnerability; for instance, adolescent girls may be at increased risk for certain infections due to early marriage, limited autonomy, and restricted access to health information. Socio-economic status plays a pivotal role, as poverty exacerbates exposure to risk factors and hinders access to preventive services such as vaccination, clean water, and sanitation [13].

Collectively, these complexities highlight the need for multifaceted approaches to understanding and addressing the epidemiology of infectious diseases in the adolescent population, emphasizing the importance of targeted surveillance, equitable resource allocation, and culturally sensitive health interventions.

2.1 Prevalence and Incidence Data on Malaria

Malaria remains the most prevalent infectious disease affecting Nigerian adolescents, contributing significantly to school absenteeism, morbidity, and in some cases, mortality. According to the Nigeria Malaria Indicator Survey [14], the prevalence of malaria among children aged 6 months to 14 years was approximately 43%, with regional differences showing the highest rates in the North-East and North [11-13]. While national surveys focus primarily on children under five, several studies suggest that adolescents, particularly those in secondary schools, are at heightened risk due to increased mobility, reduced use of insecticide-treated nets (ITNs), and behavioral factors such as outdoor activities during peak mosquito hours [14]. In endemic areas, malaria peaks during the rainy season, when vector breeding is most intense, exacerbating the burden among school-aged populations [14] (Figure 1).

Despite progress in malaria control, the incidence among school-aged youth remains high, especially in rural and underserved communities. It was reported that Nigeria accounted for approximately 27% of global malaria cases, and adolescents are recognized as a key “reservoir” for ongoing transmission [12]. A school-based study in Osun State found that nearly 38% of secondary school students tested positive for malaria parasites, underscoring the importance of including adolescents in surveillance and intervention efforts [13]. The persistence of malaria in this age group reflects gaps in preventive measures, such as inconsistent ITN use and limited health education about malaria transmission and prevention [11, 14].

Reporting and surveillance challenges further complicate the true estimation of malaria's incidence among adolescents. Many cases are managed at home or in informal settings and are not reported to health authorities, leading to underestimates in national data [11]. Additionally, national surveillance and control programs have traditionally targeted children under five and pregnant women, leaving adolescents underrepresented. This gap emphasizes the need for adolescent-focused malaria education, expanded diagnostic capacity in schools, and improved reporting systems [12]. Addressing these issues is vital for reducing malaria transmission and improving the health and educational outcomes of Nigerian secondary school students.

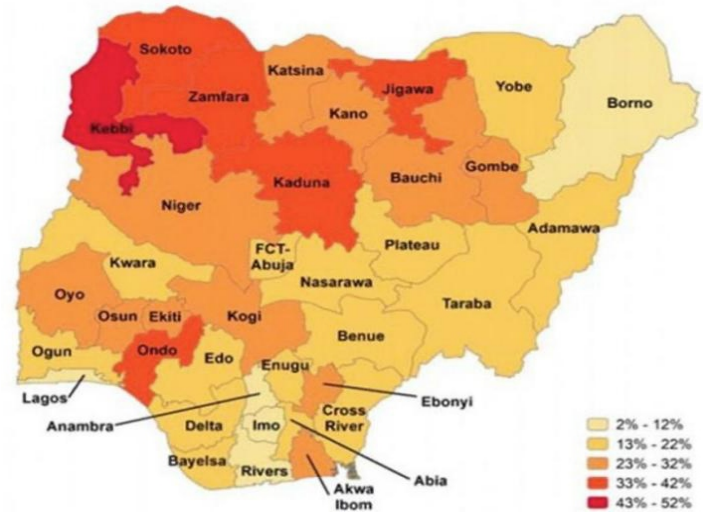


Figure 1. Map of Nigeria showing distribution of confirmed malaria cases in Nigeria

Source: Adapted and modified [12]

2.2 Prevalence and Incidence Data on COVID-19

The COVID-19 pandemic has had a significant, multifaceted impact on Nigerian adolescents, affecting not just health but also education and psychosocial well-being. As of December 2022, Nigeria recorded over 266,000 confirmed COVID-19 cases and more than 3,150 deaths, though age-disaggregated data remain limited [12]. Adolescents generally experienced milder clinical symptoms than adults, but data from [13] indicate that around 10% of positive cases were in the 10–19-year age group. The indirect effects have been substantial: school closures, remote learning, and reduced social interaction have all contributed to mental health challenges and learning losses among secondary school students [11-13].

Studies investigating knowledge and preventive practices among Nigerian adolescents reveal mixed results. A survey in Enugu State found that while 98% of secondary school students were aware of COVID-19, only 42% demonstrated good knowledge of its transmission, and 69% reported consistent preventive practices such as mask-wearing and hand hygiene [15]. Factors influencing these practices include parental education, socioeconomic status, and urban versus rural location, with urban schools generally reporting better adherence to protocols [8]. Vaccine rollout to adolescents began in late 2021, but uptake has been hampered by vaccine hesitancy, misinformation, and logistical barriers in reaching rural schools [11-13] (Figure 2). Surveillance and reporting of COVID-19 in Nigerian schools faced challenges due to limited testing capacity and prioritization of symptomatic adults and frontline workers [13]. Outbreaks in school settings were sporadically reported but likely under-recognized. The pandemic highlighted the urgent need for robust school-based surveillance, more comprehensive health education, and mental health support for students [14, 15]. Moving forward, integrating routine infectious disease monitoring and health promotion into school curricula will be essential to building resilience and preparedness for future outbreaks.

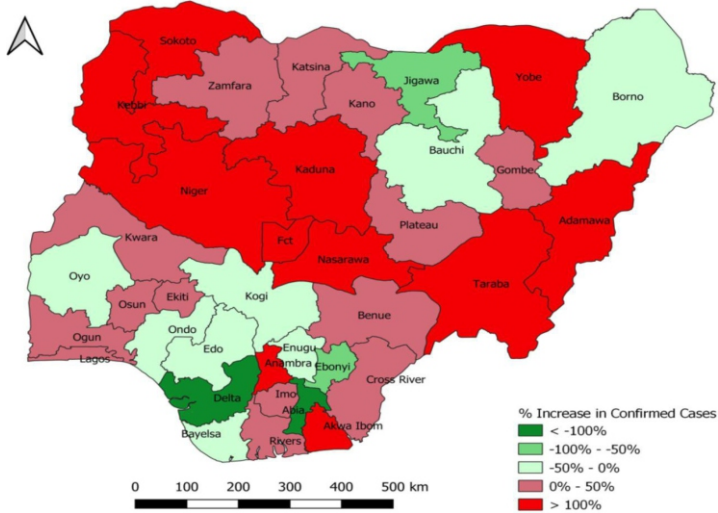


Figure 2. Map of Nigeria showing distribution of confirmed COVID-19 cases in Nigeria
Source: Adapted and modified from [7]

2.3 Prevalence and Incidence Data on Lassa Fever

Lassa fever continues to be a recurrent public health concern in Nigeria, particularly in the so-called “Lassa belt” of Edo, Ondo, and Ebonyi states [13]. In 2022, the NCDC reported over 1,170 confirmed cases and 200 deaths, with a case fatality rate of 17% [13] (Figure 1). While the majority of cases are in adults aged 21–30, adolescents and secondary school students living in endemic regions face significant risks due to poor housing, rodent exposure, and limited awareness about transmission [16]. Outbreaks are most common during the dry season, when rodent-human contact increases, and food insecurity drives risky storage practices both at home and in schools [17].

Surveillance for Lassa fever among adolescents is hampered by non-specific symptoms, which are often mistaken for malaria or typhoid. A study in Edo State found that only 33% of secondary school students were aware of Lassa fever symptoms, and less than 20% knew appropriate preventive measures [18]. Diagnostic capacity has improved with the expansion of laboratory networks, but rural schools still lack access to timely testing and care [13, 19]. Many cases are underreported, especially among school-aged populations, due to challenges in healthcare access, stigma, and limited teacher awareness of the disease [18] (Figure 3).

In response, public health authorities and international partners have intensified community-based education, rodent control, and surveillance, but sustainable progress depends on ongoing investment and integration with school health programs [19]. Health education campaigns targeting students, teachers, and parents are critical for improving early recognition and prevention of Lassa fever outbreaks among adolescents. Increasing surveillance coverage, enhancing diagnostic access, and incorporating Lassa fever education into the curriculum can help protect Nigeria's vulnerable secondary school population.

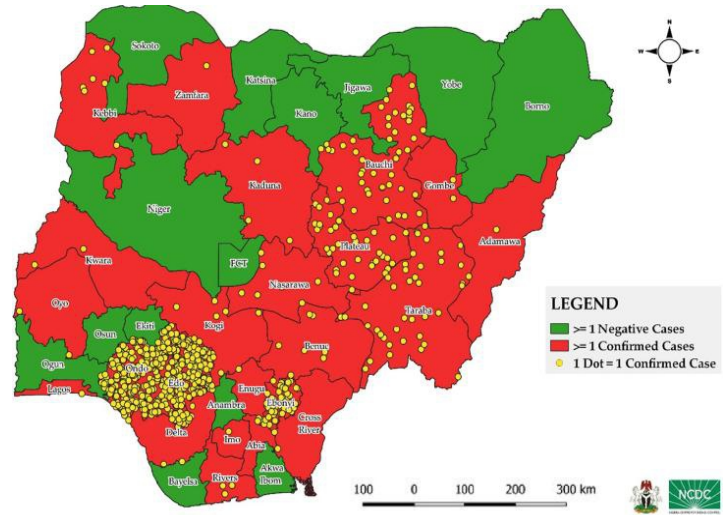


Figure 3. Map Nigeria showing distribution of confirmed Lassa fever cases in Nigeria
Source: Adapted and modified from [14]

3. Risk Factors Specific to Secondary School Students

Secondary school students in Nigeria are situated at a developmental crossroads that exposes them to various infectious disease threats, notably COVID-19, Lassa fever, and malaria [19]. The convergence of adolescent behavioral patterns, systemic and infrastructural shortcomings, and socio-economic inequalities amplifies the risks faced by this group. Given the centrality of secondary schools as gathering points for large numbers of young people, these environments can accelerate the transmission of infectious diseases, affecting not only students but their families and communities as well [20].

Historically, Nigeria has grappled with a high burden of malaria, periodic outbreaks of Lassa fever, and, more recently, the global impact of COVID-19 [21]. These three diseases represent both endemic and emerging threats that challenge the resilience of the country's health and education systems. Understanding the specific risk factors that operate within secondary schools is crucial for designing interventions that are both effective and sustainable, and for safeguarding the health and educational prospects of Nigeria's youth [22].

The social, cultural, and infrastructural landscape of secondary schools means that risk factors for infectious diseases are rarely isolated. Instead, they interact in complex ways, with behavioral norms influencing how students respond to health messages, and environmental conditions either mitigating or compounding the impact of systemic vulnerabilities [23]. This complexity necessitates a holistic approach to risk assessment and management, one that is sensitive to local context and responsive to evolving threats.

3.1 Behavioral and Social Risk Factors

The adolescent years are marked by increased autonomy, risk-taking, and a strong desire for social belonging, all of which shape behavior in ways that heighten vulnerability to infectious diseases.

COVID-19, for example, spreads efficiently in environments where mask-wearing and social distancing are inconsistently practiced; a common scenario in secondary schools, where students often gather in large groups and interact closely with their peers [24]. The urge to socialize and participate in group activities often outweighs adherence to preventive protocols, especially when peer norms do not reinforce safe practices.

In the context of malaria, behavioral risk is associated less with direct human-to-human transmission and more with activities that increase exposure to mosquito bites. Adolescents may participate in sports or socialize outdoors during the evening, coinciding with peak mosquito activity. The use of insecticide-treated nets (ITNs) is relatively low among secondary school students, who may perceive these tools as uncomfortable, unnecessary, or primarily for young children and pregnant women [25]. This misunderstanding, coupled with a lack of targeted health messaging, perpetuates vulnerability to malaria infection among adolescents.

Lassa fever introduces another behavioral dimension: the role of hygiene and food safety practices. Students who eat food exposed to rodents or share snacks and drinks in unsanitary conditions are at greater risk. The informal sharing of personal items; cups, cutlery, or stored food, can facilitate indirect transmission if these objects are contaminated with rodent excreta. Furthermore, a culture of silence or stigma surrounding illness, especially for diseases perceived as severe or shameful, can delay reporting and care-seeking, thus allowing the disease to spread silently through the school population [26].

3.2 Environmental and Infrastructural Risk Factors

Many Nigerian secondary schools are plagued by overcrowding and poor ventilation, which increase the risk of outbreaks from airborne and droplet-borne diseases like COVID-19 and, to a lesser extent, Lassa fever. In classrooms where physical distancing is not feasible, and windows remain closed for security or weather reasons, the concentration of infectious particles rises, enabling rapid person-to-person spread [27]. The absence of reliable handwashing stations, soap, and clean water compounds this risk, as students are unable to perform basic hygiene measures that are critical for curbing transmission.

For malaria, the environmental risk is closely linked to vector ecology. Schools located near stagnant water, refuse dumps, or poorly drained areas provide ideal breeding grounds for mosquitoes [28]. Students attending such schools face heightened exposure, especially if the environment is not regularly fumigated or if protective measures such as ITNs are not provided for use in boarding facilities. Efforts to control malaria transmission are undermined when school grounds are neglected, and when local authorities fail to implement routine vector control measures [29].

Lassa fever risk is exacerbated by infrastructural decay and inadequate sanitation.

Buildings with cracks, gaps, or poor waste management attract rodents, the primary vectors of the Lassa virus. Inadequate food storage and the practice of eating in classrooms further elevate risk, as food left uncovered can be contaminated by rodent urine or droppings. Schools without proper refuse disposal systems often see an upsurge in rodent populations, making environmental management a critical component of Lassa fever prevention [26]. The intertwining of environmental and infrastructural deficiencies therefore sustains a fertile ground for disease transmission.

3.3 Socio-Economic and Cultural Risk Factors

Socio-economic status directly influences a student's ability to adopt preventive behaviors and access essential health resources. For both COVID-19 and Lassa fever, students from low-income families are less likely to have personal hygiene items like soap, hand sanitizer, and face masks, which are vital for minimizing exposure and transmission [15]. In the case of malaria, financial constraints may prevent families from purchasing ITNs or seeking medical attention promptly, leading to more severe illness and higher transmission risk within households and schools.

Cultural beliefs and practices can either support or undermine public health initiatives. In some communities, malaria may be attributed to supernatural causes or exposure to cold, leading to reduced perceived need for preventive measures like ITNs [16]. For Lassa fever and COVID-19, stigma and fear of ostracization can be powerful barriers to early reporting and treatment. When students hide symptoms or avoid disclosing illness due to community attitudes or misinformation, outbreaks are harder to control and can escalate rapidly within the school environment.

Gender dynamics add another layer of complexity to socio-economic and cultural risk. Adolescent girls may face unique barriers such as early marriage, limited autonomy, or lack of access to menstrual hygiene products, which can restrict their participation in health education and preventive practices [17]. Disparities in educational attainment between genders can also result in lower health literacy among girls, further increasing vulnerability to all three diseases. Interventions must therefore be sensitive to these cultural and gender-specific determinants to achieve comprehensive risk reduction.

3.4 Systemic and Educational Risk Factors

Systemic weaknesses in the educational and healthcare systems directly contribute to the heightened risk of infectious diseases among secondary school students. Health education curricula are often outdated or superficial, offering little practical information about transmission, symptoms, and prevention of COVID-19, Lassa fever, or malaria [18]. Teachers may lack up-to-date training, and the absence of dedicated school health personnel means that early detection and intervention are frequently delayed or missed entirely.

At the policy level, adolescents are often overlooked in national health strategies, with most public health campaigns focusing on children under five and pregnant women [24]. This neglect is evident in lower vaccination rates for COVID-19 among secondary school students and insufficient distribution of ITNs for malaria prevention. Surveillance systems are similarly weak, with underreporting of cases especially in rural and underserved areas resulting in a lack of timely data to guide outbreak response and resource allocation [13].

Access to healthcare services is also a significant barrier. Many secondary schools lack links to nearby health facilities, making referral and treatment for suspected cases of COVID-19, Lassa fever, or malaria cumbersome. In rural or marginalized communities, this problem is compounded by distance, transportation costs, and limited awareness of available services. As a result, students may only receive care when symptoms become severe, by which point the opportunity for effective disease containment has often been lost [14].

3.5 Disease-Specific Risk Profiles

Malaria remains the most prevalent infectious disease among Nigerian secondary school students. Transmission risk is highest in settings where students are exposed to mosquitoes due to environmental neglect, poor infrastructure, and insufficient use of ITNs. The disease contributes to high rates of absenteeism, academic underperformance, and, in severe cases, mortality. Despite Nigeria's efforts to reduce malaria prevalence, adolescent populations remain underrepresented in intervention campaigns and surveillance systems [15].

COVID-19 has highlighted gaps in adolescent health knowledge and prevention practices. While awareness is generally high, especially in urban areas, consistent application of preventive measures remains a challenge. Studies from Enugu State have shown that only around 42% of secondary school students possess good knowledge of COVID-19 transmission, and just 69% practice core preventive behaviors regularly [16]. The impact of the pandemic has included not only direct health consequences but also significant disruptions to learning, social development, and mental health.

Lassa fever, though less common than malaria or COVID-19, poses a serious threat in endemic areas. Outbreaks are often traced to poor food storage, environmental neglect, and low levels of disease awareness among students [17]. In Edo State, for example, only a third of surveyed students could identify Lassa fever symptoms, and fewer than 20% understood appropriate preventive measures. The high case fatality rate, coupled with the challenges of early detection, underscores the urgent need for improved health education, environmental management, and rodent control in and around secondary schools [18].

4. Preventive Practices Among Secondary School Students Against Selected Infectious Diseases

Infectious diseases remain a significant public health challenge for adolescents in Nigeria, particularly within the secondary school population. This age group is at increased risk due to their close contact in school environments, limited health literacy, and, at times, inadequate access to sanitation and preventive resources [5]. The burden of diseases such as malaria, typhoid fever, tuberculosis, and, more recently, COVID-19 underscores the urgent need for effective preventive practices among secondary school students. Despite ongoing public health campaigns, there exists a considerable gap between knowledge and practice, with many students possessing only superficial understanding of disease transmission and prevention [17]. As a result, secondary schools are not only vulnerable sites for outbreaks but also represent strategic targets for intervention and education.

The role of schools in promoting health and disease prevention has gained increased attention since the COVID-19 pandemic exposed the vulnerabilities of educational institutions to infectious disease outbreaks. Recent research highlights the success of school-based interventions that combine health education with improved access to hygiene facilities. For example, a study by Okeke et al. [19] found that students in schools with structured hygiene programs and regular monitoring were significantly more likely to practice proper handwashing and utilize preventive tools such as face masks and sanitizers. However, the implementation of such programs remains inconsistent across regions, often hampered by resource limitations and varying levels of administrative commitment [4]. These disparities emphasize the need for both policy-level support and community engagement to ensure that preventive measures are both effective and sustainable.

Furthermore, cultural beliefs, misconceptions, and socioeconomic factors continue to influence students' attitudes and behaviors regarding infectious disease prevention. Studies have shown that while the majority of secondary school students recognize the importance of vaccinations and hygiene, a substantial proportion harbor doubts about vaccine safety or underestimate the risks of common practices such as sharing personal items [6, 8]. Peer influence, parental attitudes, and access to accurate information all play pivotal roles in shaping preventive behaviors. As such, a multifaceted approach that involves educators, parents, and the wider community is essential for bridging the gap between knowledge and effective practice, ultimately reducing the prevalence and impact of infectious diseases among Nigerian adolescents.

4.1 Hygiene Behaviors (Handwashing, Use of Sanitizers, Personal Items)

Proper hygiene practices form the foundation of infectious disease prevention among secondary school students.

Handwashing with soap and water is regarded as one of the most effective and accessible interventions for reducing transmission of respiratory and gastrointestinal diseases [10]. However, studies continue to reveal gaps between awareness and actual behavior. While many students can recite the importance of hand hygiene, the frequency and thoroughness of handwashing remain suboptimal, especially after using the toilet or before eating. Barriers such as lack of running water, limited access to soap, and crowded washrooms further exacerbate these challenges, particularly in public and rural schools [5]. Targeted education programs, installation of functional handwashing stations, and routine supervision by staff are recommended strategies to help bridge the gap between knowledge and practice.

The use of hand sanitizers has become increasingly prominent, especially in response to the COVID 19 pandemic. Alcohol based sanitizers provide a viable alternative in settings where water is scarce or during periods when students commute between classes or activities [12]. Nonetheless, the distribution and consistent use of sanitizers are limited by financial constraints, fluctuating supply, and, at times, misconceptions about their efficacy. Some students may substitute sanitizers for proper handwashing, not realizing that sanitizers are less effective when hands are visibly dirty or greasy. Educational campaigns should thus clarify the complementary roles of hand sanitizers and soap, while school administrations must prioritize regular supply and equitable access to these resources.

The sharing of personal items such as towels, water bottles, and grooming tools remains a common but overlooked risk factor for disease transmission in secondary schools. Despite widespread health messaging, students often engage in sharing due to social norms, convenience, or lack of personal items [8]. This behavior can facilitate the spread of skin infections, fungal diseases, and even respiratory illnesses. Comprehensive health education should reinforce the dangers of sharing personal items, while school policies can encourage students to label their belongings and bring their own supplies where feasible. Peer-led advocacy and support from parent-teacher associations have also shown success in discouraging risky sharing behaviors among adolescents [11].

4.2 Vaccination Uptake

Vaccination is a cornerstone of infectious disease prevention and has dramatically reduced the burden of vaccine-preventable diseases globally. However, in the context of Nigerian secondary schools, vaccination uptake among adolescents remains suboptimal, partly because most national immunization programs focus on early childhood [7]. Diseases such as meningitis, hepatitis B, and human papillomavirus (HPV) are particularly relevant for this age group, yet coverage for these vaccines is limited by lack of awareness, inadequate school-based vaccination campaigns, and systemic gaps in health infrastructure.

Studies suggest that integrating adolescent vaccination into school health programs could significantly improve coverage and reduce disease outbreaks [14].

Barriers to vaccine uptake among secondary school students are multifaceted, involving not only logistical challenges but also socio-cultural resistance. Misconceptions about vaccine safety, fear of side effects, and misinformation often spread via social media or within communities undermine confidence in immunization [12]. Parental attitudes and religious beliefs also influence students' willingness to receive vaccines, especially for those that are considered new or associated with reproductive health, such as HPV. Addressing these barriers requires persistent community engagement, transparent communication about vaccine safety, and involvement of trusted local leaders and healthcare professionals.

School-based vaccination campaigns, when properly organized, have proven effective in increasing uptake and normalizing immunization among adolescents. Collaboration between ministries of health and education is essential for planning and executing these campaigns efficiently [3]. Additionally, providing vaccinations during school hours and ensuring that students and parents are well-informed about schedules and benefits can reduce logistical obstacles. Peer education, involvement of teachers, and outreach to parents through meetings or informational materials have also been identified as best practices for improving adolescent vaccine acceptance and uptake [5].

4.3 Use of Preventive Tools (Masks, Mosquito Nets, Safe Water Practices)

The adoption of preventive tools such as face masks, insecticide-treated mosquito nets, and safe water practices is critical for reducing infectious disease transmission among secondary school students. During the COVID-19 pandemic, the use of face masks became a primary intervention for minimizing respiratory disease spread in schools [6]. Although compliance varied, schools that enforced mask mandates and provided free or subsidized masks observed fewer outbreaks and increased student awareness of respiratory hygiene. However, challenges persist regarding comfort, sustained use, and the misconception that masks alone are sufficient for protection, underscoring the need for continuous education.

Malaria prevention remains a top priority in Nigeria, where adolescents are at high risk, particularly in boarding schools and rural areas. The consistent use of long-lasting, insecticide-treated mosquito nets has been shown to reduce malaria incidence among students, yet studies reveal that utilization rates remain below targets due to discomfort, insufficient supply, and lack of understanding about proper net maintenance [5]. School-based distribution and demonstration programs, in combination with curriculum-integrated malaria education, are effective strategies to enhance net uptake and correct use [12].

Access to safe water and the promotion of proper water handling practices are also vital for preventing waterborne diseases such as cholera and typhoid fever. Many secondary schools, especially those in rural or peri-urban areas, face challenges related to water quality and supply, leading students to consume contaminated water or neglect personal hygiene [13]. Interventions including the provision of clean drinking water, regular monitoring of water sources, and education on the importance of boiling or filtering water have been linked to reductions in disease incidence. Schools should also promote the cleaning of water storage containers and discourage risky behaviors such as sharing cups or bottles [8].

4.4 Barriers to Effective Preventive Practices

Despite widespread awareness campaigns and the availability of preventive measures, numerous barriers hinder the consistent adoption of effective practices among secondary school students. Resource limitations are a persistent issue, with many schools lacking adequate water, soap, sanitizers, and basic health infrastructure [5]. In densely populated or underfunded schools, hygiene facilities may be insufficient for the number of students, leading to overcrowding and neglect of proper handwashing. Budgetary constraints also affect the supply and maintenance of preventive tools such as mosquito nets and personal protective equipment.

Socio-cultural factors remain significant obstacles, including traditional beliefs, stigma, and misinformation about disease causation and prevention. For example, some communities may attribute malaria to supernatural causes rather than mosquito bites, leading to resistance against proven interventions like bed nets [12]. Similarly, myths and misconceptions about vaccines or the use of face masks and sanitizers can undermine public health efforts. Peer pressure and the desire to conform to group norms may also discourage students from adopting preventive behaviors, particularly if such practices are perceived as “uncool” or unnecessary.

Institutional challenges further compound these barriers. Teachers and school administrators may lack adequate training in health promotion, limiting their ability to enforce or model best practices [14]. Policies and guidelines may exist but are often poorly implemented due to weak monitoring and evaluation systems. Overcoming these obstacles requires a holistic approach involving investment in school infrastructure, continuous health education, community engagement, and regular evaluation of program effectiveness. Partnerships with local health authorities, non-governmental organizations, and parents are essential for creating a supportive environment that fosters lasting behavior change among students [3].

5. Public Health Control Measures in Schools

5.1 Role of School Health Programs

School health programs play a foundational role in infectious disease control by establishing structured platforms for promoting and maintaining student health. These programs typically encompass health screenings, immunization drives, hygiene promotion, and routine health checks, all of which foster a culture of disease prevention within the school environment [24]. In Nigeria, the implementation of comprehensive school health programs has been associated with improved health outcomes, reduced absenteeism due to illness, and the early identification of potential outbreaks [23]. Despite their proven benefits, the reach of such programs remains inconsistent across the nation, primarily due to resource limitations and varying commitment levels among educational authorities.

A robust school health program is usually multidisciplinary, involving teachers, school nurses, and sometimes community health workers who collaborate to deliver holistic care and health education to students [5]. These programs often integrate health services directly into the school routine, making preventive care more accessible and less stigmatized for students. For example, routine deworming, vitamin supplementation, and targeted health talks have been integrated into some Nigerian school curricula, resulting in increased student awareness and uptake of preventive practices [5]. The presence of a dedicated health officer or nurse within schools has also been shown to facilitate prompt responses to emerging health issues and ensure adherence to established health policies.

However, challenges persist in maintaining and scaling up effective school health programs. Funding constraints, insufficient training for staff, and a lack of standardized guidelines often limit the scope and effectiveness of these initiatives [12]. Moreover, in some rural and underserved areas, schools may lack the basic infrastructure required to support health programs, such as clean water, functional toilets, and private spaces for health consultations. Strengthening school health programs thus requires government investment, regular training for educators, and the establishment of clear protocols tailored to the specific needs and realities of Nigerian schools [3].

5.2 Screening and Surveillance

Screening and surveillance are critical components of infectious disease control in school settings, enabling the early detection and management of potential outbreaks. Routine health screening, such as temperature checks, symptom questionnaires, and visual inspections can identify students displaying signs of illness before they interact widely with peers [5]. During the COVID-19 pandemic, many Nigerian schools adopted daily screening protocols, which, when consistently implemented, helped reduce in-school transmission and facilitated timely referral to healthcare services [12].

Despite their importance, the sustainability and thoroughness of such measures often depend on available resources, staff training, and community cooperation.

Surveillance systems in schools not only monitor individual cases but also track trends in absenteeism, reportable diseases, and unusual symptom clusters. Data collected through these systems can inform health authorities about emerging threats, prompting rapid public health interventions and targeted awareness campaigns [14]. However, surveillance efforts may be hindered by inadequate record-keeping, limited digital infrastructure, and reluctance from families to report illnesses due to stigma or fear of exclusion. To address these challenges, schools must cultivate a culture of transparency and confidentiality, and authorities should provide incentives and support for regular data reporting and review [4].

Moreover, effective screening and surveillance require close collaboration between schools and local healthcare providers. Establishing clear communication channels allows for seamless referral of suspected cases, confirmation of diagnoses, and implementation of containment measures such as isolation or targeted disinfection [12]. Investments in digital health tools like electronic attendance systems and health reporting apps can further enhance surveillance capacity, providing real-time data for rapid response. Ultimately, a well-coordinated screening and surveillance system is indispensable for minimizing the impact of infectious diseases within the school community.

5.3 Health Education Interventions

Health education is a cornerstone of public health control in schools, equipping students with the knowledge and skills necessary for lifelong disease prevention and health promotion. Comprehensive health education programs address a range of topics, including hygiene behaviors, modes of disease transmission, the importance of vaccination, and the correct use of preventive tools [23]. Research indicates that schools that integrate regular health education sessions into their curricula report higher rates of preventive behaviors among students, such as consistent handwashing, mask usage, and reduced sharing of personal items [6]. These interventions are most effective when interactive, participatory, and reinforced by visual aids, demonstrations, and peer-led activities. Peer education, in particular, has emerged as a powerful strategy for health promotion in Nigerian secondary schools. By training selected students to lead health clubs or awareness campaigns, schools leverage the influence of peer networks to disseminate accurate health information and model positive behaviors [20]. Studies show that peer-led interventions increase student engagement and can address sensitive topics such as sexual health and vaccination more effectively than traditional teacher-led sessions [21]. Additionally, involving parents and community leaders in health education reinforces messages at home and in the wider community, creating a supportive environment for behavior change.

Despite these successes, challenges remain in ensuring the quality and consistency of health education interventions. Some schools lack trained personnel or appropriate teaching materials, while others face resistance from students or parents due to cultural beliefs or misinformation [12]. To address these gaps, government agencies and non-governmental organizations must invest in teacher training, provide culturally sensitive educational resources, and conduct regular evaluations of program effectiveness. A dynamic, inclusive approach to health education is essential for equipping students with the tools they need to protect themselves from infectious diseases.

5.4 Collaboration with Public Health Agencies

Collaboration between schools and public health agencies is essential for a coordinated and sustained response to infectious disease threats. Public health agencies provide technical guidance, resources, and training to support the implementation of school-based health initiatives [22]. This partnership enables schools to stay informed about emerging health threats, access up-to-date protocols for disease prevention and outbreak response, and participate in mass vaccination campaigns or health screenings [23]. Such collaborations have proven especially valuable during the COVID-19 pandemic, when rapid information sharing and resource mobilization were critical to reducing disease spread in educational settings.

Public health agencies also play a pivotal role in monitoring and evaluating the effectiveness of school health programs. Through regular supervision, data collection, and feedback, they help schools identify gaps, adapt interventions, and sustain progress over time. For instance, the involvement of local health departments in routine surveillance and outbreak investigations ensures that schools receive timely support and that public health measures are aligned with broader community strategies [24]. This integrated approach not only enhances the capacity of individual schools but also strengthens the resilience of the public health system as a whole. However, effective collaboration is often challenged by bureaucratic barriers, resource limitations, and communication gaps between the education and health sectors [25]. To overcome these obstacles, government policies should institutionalize cross-sectoral partnerships, allocate dedicated funding for joint initiatives, and establish clear roles and responsibilities for all stakeholders. Building trust through regular meetings, joint training sessions, and shared accountability can further enhance collaboration, ensuring that the benefits of public health control measures are fully realized in Nigerian schools.

5.5 Challenges and Gaps

Despite ongoing efforts to enhance knowledge, promote preventive practices, and implement public health control measures against infectious diseases in Nigerian secondary schools, numerous challenges and gaps continue to hinder progress.

These obstacles ranging from cultural beliefs and stigma to resource constraints and policy implementation barriers not only undermine the effectiveness of existing interventions but also perpetuate the vulnerability of students to infectious disease outbreaks. Understanding these challenges is essential for developing more robust and sustainable strategies to protect adolescent health in the school environment.

Cultural beliefs and stigma present major obstacles to the adoption of effective preventive practices and public health measures among secondary school students in Nigeria. Deeply rooted traditional beliefs about the causes and treatment of diseases often conflict with modern scientific understanding, leading to resistance against proven interventions such as vaccination, use of mosquito nets, or even basic hygiene practices [12]. For instance, some communities attribute malaria or other infectious diseases to spiritual causes, resulting in a preference for traditional remedies over biomedical solutions. Stigma further complicates the situation, as students with visible symptoms of infectious diseases may be isolated or bullied, discouraging timely disclosure and early treatment [8]. Fear of being labeled as “unclean” or “infected” may deter students from participating in school-based screenings or reporting symptoms, ultimately enabling silent transmission within school environments. Health education interventions often struggle to overcome these deep-seated attitudes, particularly when they are not tailored to the local context or delivered by trusted community figures. Addressing these barriers requires culturally sensitive communication strategies, involvement of community and religious leaders, and the integration of traditional perspectives with biomedical approaches to foster a more accepting and informed school community [20].

Resource limitations constitute a significant barrier to the implementation of effective infectious disease control measures in Nigerian secondary schools. Many schools, especially those in rural or underserved areas, lack the basic infrastructure required to support preventive practices, such as functional handwashing stations, clean toilets, safe drinking water, and reliable waste disposal systems [27]. Inadequate funding affects not only the development and maintenance of these facilities, but also restricts the supply of essential materials like soap, hand sanitizers, face masks, and insecticide-treated nets. Furthermore, limited access to healthcare services means that students who fall ill may experience delays in diagnosis and treatment, increasing the risk of transmission within schools [28]. The shortage of trained health personnel such as school nurses or health officers, further undermines the capacity for effective surveillance, health education, and prompt response to outbreaks. Persistent resource deficits lead to a reliance on external support or ad hoc interventions, which are often unsustainable and fail to address the root causes of vulnerability among secondary school students.

Even when policies and guidelines exist for infectious disease control in schools, gaps in implementation undermine their effectiveness and sustainability. At the national and state levels, policies may be well-articulated but lack practical mechanisms for regular monitoring, accountability, and enforcement [29]. Bureaucratic bottlenecks, fragmented communication between health and education sectors, and insufficient inter-sectoral coordination further hinder the roll-out of comprehensive school health programs [2]. Schools may receive inconsistent directives or lack clarity on their roles in disease prevention, leading to varied practices across regions and institutions. Implementation gaps are also exacerbated by insufficient training for teachers and administrators, who may not feel empowered or adequately supported to enforce health protocols or respond to suspected cases of infectious diseases. Additionally, the absence of routine program evaluation and feedback mechanisms means that successful interventions are not scaled up, while challenges persist unaddressed. Overcoming these policy and implementation barriers requires political will, dedicated funding, regular capacity-building for school staff, and the establishment of robust monitoring and evaluation frameworks to ensure that strategies for infectious disease control are translated into consistent, impactful action at the school level [20].

6. Recommendations

In light of the persistent challenges and gaps in controlling infectious diseases among secondary school students in Nigeria, it is imperative to propose actionable recommendations that can bridge knowledge gaps, strengthen policy implementation, and foster active student involvement. The following recommendations are grounded in recent research and best practices, offering a roadmap for schools, policymakers, and communities to collaboratively enhance the health and safety of young learners.

6.1 Strategies to Improve Knowledge and Awareness

A key strategy for improving knowledge and awareness is the integration of comprehensive, age-appropriate health education into the standard school curriculum. This should include modules on infectious disease transmission, symptoms, prevention, and the importance of timely reporting and treatment [21]. Lessons should use interactive teaching methods, such as demonstrations, peer education, and health clubs, to ensure material is both engaging and memorable. Collaborations with local health professionals for periodic workshops or seminars can provide students with current, evidence-based information and debunk prevalent myths. Additionally, leveraging digital platforms and mobile health (mHealth) technology through SMS reminders, informational apps, or educational videos can further enhance students' access to reliable health information, particularly in areas with limited teacher expertise [22]. Community involvement is equally critical in reinforcing health knowledge among students.

Schools should actively engage parents, religious leaders, and community stakeholders in health promotion efforts, ensuring that messages delivered within the school are echoed at home and in the broader community [8]. Regular parent-teacher meetings focused on health topics, distribution of informational leaflets, and community sensitization campaigns can help align perceptions and encourage supportive environments for preventive behaviors. Such multi-layered communication strategies are essential for overcoming cultural barriers and creating a unified front against misinformation and stigma.

6.2 Policy Recommendations for Schools and Governments

To address systemic challenges, governments should prioritize the allocation of dedicated funding for school health infrastructure and preventive materials, such as handwashing stations, soap, sanitizers, and mosquito nets [2]. Policies must mandate the presence of trained health personnel, such as school nurses and establish clear, standardized protocols for routine screenings, outbreak response, and health record-keeping. Regular monitoring and evaluation frameworks should be instituted at both state and national levels to track program implementation, identify bottlenecks, and scale up successful interventions. Inter-sectoral collaboration between the ministries of health and education is essential for aligning school health initiatives with broader public health goals [20].

Furthermore, schools should be empowered with the autonomy and resources to adapt public health interventions to their specific contexts. This includes the flexibility to tailor health education content, screening protocols, and preventive materials to local needs and cultural sensitivities. Policymakers should also incentivize schools that demonstrate exemplary health practices through recognition programs or additional funding, fostering a culture of healthy competition and continuous improvement. Importantly, all policies must emphasize the protection of student privacy and the reduction of stigma, ensuring that health interventions do not inadvertently lead to exclusion or discrimination.

6.3 Enhancing Student Engagement and Participation

Enhancing student engagement requires the creation of platforms that empower students to take active roles in health promotion and disease prevention activities within their schools. Establishing peer-led health clubs, student health committees, and ambassador programs can harness the influence of social networks to reinforce positive behaviors and provide mutual support [21]. Students should be given opportunities to participate in designing and implementing health campaigns, developing educational materials, and leading discussions on health topics. Such involvement fosters ownership, boosts confidence, and ensures that interventions are relevant to the realities and preferences of adolescents.

Recognition of student contributions through awards, certificates, or leadership roles can further motivate ongoing participation and advocacy. Regular feedback mechanisms, such as suggestion boxes, surveys, or student forums, should be instituted to capture students' perspectives on health interventions and identify barriers to participation. This participatory approach helps tailor programs to student needs and uncovers context-specific challenges that may not be apparent to adults [2]. Schools should also collaborate with external organizations to offer extracurricular activities such as drama, art, or sports that incorporate health themes, making engagement both educational and enjoyable. By fostering a sense of agency and belonging, these strategies can transform students from passive recipients into active champions of school health.

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7. Conclusion

The fight against infectious diseases among secondary school students in Nigeria remains a multifaceted challenge that demands coordinated and sustained efforts. The current landscape reveals significant gaps in knowledge, preventive behaviors, and the implementation of public health control measures, all of which are influenced by cultural beliefs, resource limitations, and policy barriers. However, recent research underscores that targeted school health programs, comprehensive health education, and collaborative partnerships with public health agencies can make a measurable difference in improving awareness and reducing disease incidence among adolescents. The progress seen in schools that have received sustained investment in infrastructure, training, and community involvement serves as evidence that positive change is both possible and scalable. Moving forward, it is crucial to build on these successes by institutionalizing health education within school curricula, securing adequate funding, and fostering student engagement in health initiatives. Policymakers, educators, parents, and community leaders must work collaboratively to dismantle barriers and create environments where preventive practices are not only taught but also consistently practiced and reinforced. By prioritizing the health and well-being of secondary school students, Nigeria can not only curb the spread of infectious diseases within educational settings but also lay the foundation for healthier generations and stronger communities in the years to come.

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Conflict of Interest

The authors declared that there are no conflicts of interest.

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