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SCHOLARLY ARTICLE

Evaluating the Status of Schistosomiasis in Awgu Local Government Area

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ABSTRACT

This study aimed to evaluate the prevalence of schistosomiasis in Awgu Local Government Area of Enugu State and assess the effectiveness of control strategies implemented in the region. The research focused on factors such as sex, age, socioeconomic status, occupation, and the efficiency of district health center workers in managing the disease. A total of 600 pupils from various towns were examined for schistosomiasis, and the results indicated variations in the disease's incidence among different locations. The findings revealed that Ihe town had the highest percentage of affected population, while Ezere town had the lowest. Farmers were identified as the most vulnerable occupational group, and females in the early age bracket showed higher susceptibility to the disease. District health care workers demonstrated efficiency in handling schistosomiasis cases, as evidenced by a low number of reported deaths. However, the study did not provide specific recommendations for controlling the prevalence of schistosomiasis in Awgu local government. The study highlighted the importance of implementing effective control measures to reduce the incidence of schistosomiasis in the area. Future interventions should focus on improving access to clean water sources, promoting hygienic practices, and providing targeted interventions for high-risk occupational groups. The research contributes to our understanding of schistosomiasis in Awgu local government area and emphasizes the need for continued efforts to prevent and control the disease. By addressing the identified risk factors and improving healthcare interventions, it is possible to mitigate the impact of schistosomiasis and improve the health outcomes of the affected population in the region.

Keywords: *Schistosomiasis Prevalence; Control Strategies; Occupational Vulnerability; Hygienic Practices*

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Background to the Study

Schistosomiasis, also known as bilharzia, is an enteropathogenic disease caused by flukes of the genus Schistosoma. It is a parasitic infection caused by digenetic blood trematode worms of the family Schistosomatidae, and it is considered one of the prevalent neglected tropical diseases (NTDs). It remains a major public health problem in approximately 77 developing countries in the tropics and subtropics, affecting many people in these regions and remaining one of the major parasitic diseases of significant public health importance today. It is considered the second most important human parasitic disease after malaria in terms of morbidity and mortality (Chitsulo et al., 2000). In many areas of sub-Saharan Africa, it continues to hinder the socio-economic development of already impoverished rural communities. "Bilharzia" or "bilharziosis" is the eponym for schistosomiasis, named after Theodor Bilharz, who first described the cause of urinary schistosomiasis in 1851 (Jordan and Webbe, 1982). Nigeria has the greatest number of cases of schistosomiasis worldwide, with about 29 million infected people, among whom 16 million are children, and about 101 million people are at risk of schistosomiasis.

There are five species of flatworms that cause schistosomiasis, with each species causing a different clinical presentation of the disease. Schistosomiasis may localize in different parts of the body, and its localization determines its particular clinical profile (Jordan et al., 1993), as supported by Okon et al. (2010). Schistosoma mansoni and Schistosoma intercalatum cause intestinal schistosomiasis, while Schistosoma haematobium causes urinary schistosomiasis. Schistosoma japonicum and Schistosoma mekongi cause Asian intestinal schistosomiasis (Caatinga et al., 2000). Schistosomes have a typical trematode vertebrate-invertebrate life cycle, with humans being the definitive host. The life cycles of all five human schistosomes are broadly similar. The most common way of contracting schistosomiasis is by wading or swimming in lakes, ponds, and other bodies of water infested with snails (usually of the Biomphalaria, Bulinus, or Oncomelania genera), which are the natural reservoirs of the schistosomiasis pathogen (Caatinga et al., 2000).

Parasite eggs are released into the environment by infected individuals, hatching on contact with fresh water to release the free-swimming miracidium. Miracidia infect freshwater snails by penetrating them. After infection, near the site of penetration, the miracidium transforms into a primary (mother) sporocyst. Germ cells within the primary sporocyst then begin dividing to produce secondary (daughter) sporocysts, which migrate to the snail's hepatopancreas. Once at the hepatopancreas, germ cells within the secondary sporocyst begin to divide again, producing thousands of new parasites, known as cercariae, which are larvae capable of infecting mammals. Cercariae emerge daily from the snail host in a circadian rhythm, dependent on ambient temperature and light. Young cercariae are highly motile, alternating between vigorous upward movements and sinking to maintain their position in the water. Cercarial activity is particularly stimulated by water turbulence, shadows, and human skin chemicals (Andrade and Bina, 1983).

Penetration of human skin occurs after the cercariae have attached to the exposed skin. The parasite secretes enzymes that break down the skin to enable the penetration of the cercarial head. As the cercaria penetrates the skin, it transforms into a migrating schistosomulum stage. The newly transformed schistosomulum may remain in the skin for 1-2 days before locating a post-capillary venule, where it travels to the lungs and undergoes further developmental changes necessary for subsequent migration to the liver. Eight to ten days after penetration of the skin, the parasite migrates to the liver sinusoids. S. japonicum migrates more quickly than S. mansoni and usually reaches the liver within 6-8 days of penetration.

Juvenile S. mansoni and S. japonicum worms develop an oral sucker after arriving in the liver, and it is during this period that the parasite begins to feed on red blood cells. The nearly mature worms pair, with the longer female worm residing in the gynaecophoric channel of the male. Adult worms are about 10 mm long. Worm pairs of S. mansoni and S. japonicum relocate to the mesenteric or rectal veins. S. haematobium schistosomula ultimately migrate from the liver to the perivesical venous plexus of the bladder, ureters, and kidneys through the haemorrhoidal plexus. Parasites reach maturity in 6-8 weeks, at which point they begin to produce eggs. Adult S. mansoni pairs residing in the mesenteric vessels may produce up to 300 eggs per day during their reproductive lives. S. japonicum may produce up to 3,000 eggs per day (Bina and Prata, 1990). Many of the eggs pass through the walls of the blood vessels and the intestinal wall to be passed out of the body in feces. S. haematobium eggs pass through the ureteral or bladder wall and into the urine.

Only mature eggs are capable of crossing into the digestive tract, possibly through the release of proteolytic enzymes, but also as a function of the host immune response, which fosters local tissue ulceration. Up to half of the eggs released by the worm pairs become trapped in the mesenteric veins or are washed back into the liver, where they become lodged. Worm pairs can live in the body for an average of four to five years but may persist for up to 20 years. Trapped eggs mature normally, secreting antigens that elicit a vigorous immune response. The eggs themselves do not damage the body. Rather, it is the cellular infiltration resulting from the immune response that causes the pathology classically associated with schistosomiasis (Bina and Prata, 1990).

Statement of the Problem

In Awgu Local Government Area, many people are affected by schistosomiasis (MOH, 2016). Investigations carried out in Awgu, Aninri, and Oji River by a group of project students from the Department of Physical Health Education, University of Nigeria, Nsukka (2003), found the prevalence of Schistosoma mansoni infection to be 28%, 32%, and 35%, respectively. Another study undertaken by the Schistosomiasis Control Initiative (2007) in the Awgu District region found the prevalence of Schistosoma mansoni infection to be 36%.

The general signs and symptoms of gastrointestinal tract (GIT) infections, such as abdominal pain, diarrhea, abdominal enlargement, and passing blood in the stool, are common in many cases. Despite the common occurrence of abdominal symptoms, the clinical importance of Schistosoma mansoni infection has not been determined. No study has provided data on the prevalence of liver disease in schoolchildren and adults infected with Schistosoma mansoni in the Awgu Local Government Area.

Purpose of the Study

The main purpose of this community-based study was to determine the prevalence of schistosomiasis among the population of Awgu Local Government Area in Enugu State. The study was conducted using clinical, laboratory, and ultrasound examinations, along with the Knowledge, Attitude, and Practices (KAP) questionnaire to collect data. The study primarily focused on evaluating the status of schistosomiasis infection among the population living in the schistosomiasis-endemic area of Awgu Local Government Area in Enugu State.

Research Questions

The following research questions were formulated for the study:

i. What is the incidence of schistosomiasis in Awgu Local Government Area, Enugu State?
ii. What factors affect the incidence of schistosomiasis in Awgu Local Government Area, Enugu State?
iii. How efficient are district health center workers in Awgu at handling the effects of schistosomiasis in Awgu Local Government?
iv. What is the best way to control the prevalence of schistosomiasis in Awgu Local Government?

Review of Related Literature

Conceptual Review

Schistosomiasis is found in tropical countries across Africa, the Caribbean, Eastern South America, East Asia, and the Middle East. Schistosoma mansoni is found in parts of South America, the Caribbean, Africa, and the Middle East, while S. japonicum is found in the Far East. S. mekongi and S. intercalatum are found focally in Southeast Asia and Central West Africa, respectively.

Infection and Transmission

People become infected when the larval forms of the parasite—released by freshwater snails—penetrate the skin during contact with infested water. Transmission occurs when individuals suffering from schistosomiasis contaminate freshwater sources with excreta containing parasite eggs, which hatch in the water. In the body, the larvae develop into adult schistosomes. Adult worms live in the blood vessels, where the females release eggs. Some of the eggs are passed out of the body in the feces or urine, continuing the parasite's lifecycle. Others become trapped in body tissues, causing immune reactions and progressive damage to organs.

Epidemiology

Schistosomiasis is prevalent in tropical and subtropical areas, especially in poor communities without access to safe drinking water and adequate sanitation. It is estimated that at least 90% of those requiring treatment for schistosomiasis live in Africa. There are two major forms of schistosomiasis—intestinal and urogenital—caused by five main species of blood flukes.

Schistosomiasis mostly affects poor and rural communities, particularly agricultural and fishing populations. Women doing domestic chores in infested water, such as washing clothes, are also at risk. Inadequate hygiene and contact with infected water make children especially vulnerable to infection.

Migration to urban areas and population movement are introducing the disease to new regions. Increasing population size and the corresponding need for power and water often result in development schemes and environmental modifications that facilitate transmission. With the rise in ecotourism and travel "off the beaten track," increasing numbers of tourists are contracting schistosomiasis. At times, tourists present with severe acute infection and unusual problems, including paralysis. Urogenital schistosomiasis is also considered a risk factor for HIV infection, especially in women.

Symptoms and Reactions

Symptoms of schistosomiasis are caused by the body's reaction to the worms' eggs. Intestinal schistosomiasis can result in abdominal pain, diarrhea, and blood in the stool. Liver enlargement is common in advanced cases and is frequently associated with an accumulation of fluid in the peritoneal cavity and hypertension of the abdominal blood vessels. In such cases, there may also be enlargement of the spleen.

The classic sign of urogenital schistosomiasis is hematuria (blood in the urine). Fibrosis of the bladder and ureters, and kidney damage, are sometimes diagnosed in advanced cases. Bladder cancer is another possible complication in the later stages. In women, urogenital schistosomiasis may present with genital lesions, vaginal bleeding, pain during sexual intercourse, and nodules in the vulva. In men, urogenital schistosomiasis can induce pathology in the seminal vesicles, prostate, and other organs. This disease may also have other long-term irreversible consequences, including infertility.

The economic and health effects of schistosomiasis are considerable, and the disease disables more people than it kills. In children, schistosomiasis can cause anemia, stunting, and a reduced ability to learn, although the effects are usually reversible with treatment. Chronic schistosomiasis may affect people's ability to work and, in some cases, can result in death. The number of deaths due to schistosomiasis is difficult to estimate because of hidden pathologies, such as liver and kidney failure and bladder cancer. WHO estimates that there are about 200,000 deaths globally each year due to schistosomiasis.

Diagnosis

Schistosomiasis is diagnosed through the detection of parasite eggs in stool or urine specimens. Antibodies and/or antigens detected in blood or urine samples also indicate infection. For urogenital schistosomiasis, a filtration technique using nylon, paper, or polycarbonate filters is the standard diagnostic method. Children with S. haematobium almost always have microscopic blood in their urine, which can be detected using chemical reagent strips. The eggs of intestinal schistosomiasis can be detected in fecal specimens through a technique involving methylene blue-stained cellophane soaked in glycerine or glass slides, known as the Kato-Katz technique. For people living in non-endemic or low-transmission areas, serological and immunological tests may be useful to indicate exposure to infection and the need for thorough examination, treatment, and follow-up.

Prevention and Control

The control of schistosomiasis is based on large-scale treatment of at-risk population groups, access to safe water, improved sanitation, hygiene education, and snail control. The WHO strategy for schistosomiasis control focuses on reducing the disease through periodic, targeted treatment with praziquantel, through the large-scale treatment

(preventive chemotherapy) of affected populations. It involves regular treatment of all at-risk groups. In a few countries with low transmission, the elimination of the disease should be the goal.

Groups targeted for treatment include:

School-aged children in endemic areas

Adults considered to be at risk in endemic areas, and people with occupations involving contact with infested water, such as fishermen, farmers, irrigation workers, and women whose domestic tasks bring them in contact with infested water.

Entire communities living in highly endemic areas

The frequency of treatment is determined by the prevalence of infection in school-age children. In high-transmission areas, treatment may need to be repeated every year for several years. Monitoring is essential to assess the impact of control interventions.

The aim is to reduce disease morbidity and transmission: periodic treatment of at-risk populations will cure mild symptoms and prevent infected people from developing severe, late-stage chronic disease. However, a major limitation to schistosomiasis control has been the limited availability of praziquantel. Data for 2015 show that 28.2% of people requiring treatment were reached globally, with 42.2% of school-aged children requiring preventive chemotherapy for schistosomiasis being treated. Praziquantel is the recommended treatment against all forms of schistosomiasis. It is effective, safe, and low-cost. Even though reinfection may occur after treatment, the risk of developing severe disease is diminished and even reversed when treatment is initiated and repeated in childhood.

Schistosomiasis control has been successfully implemented over the past 40 years in several countries, including Brazil, Cambodia, China, Egypt, Mauritius, the Islamic Republic of Iran, and Saudi Arabia. There is evidence that schistosomiasis transmission was interrupted in Morocco. In Burkina Faso, Niger, Sierra Leone, and Yemen, it has been possible to scale up schistosomiasis treatment to the national level and have an impact on the disease in a few years. An assessment of the status of transmission is being made in several countries. Over the past 10 years, there has been a scale-up of treatment campaigns in many sub-Saharan countries, where most of those at risk live.

WHO Response

WHO's work on schistosomiasis is part of an integrated approach to the control of neglected tropical diseases. Although medically diverse, neglected tropical diseases share features that allow them to persist in conditions of poverty, where they cluster and frequently overlap. WHO coordinates the strategy of preventive chemotherapy in consultation with collaborating centers and partners from academic and research institutions, the private sector, nongovernmental organizations, international development agencies, and other United Nations organizations. WHO develops technical guidelines and tools for use by national control programs. Working with partners and the private sector, WHO has advocated for increased access to praziquantel, to treat more than 100 million children of school age per year, which has been pledged by the private sector and development partners.

Epidemiology

Occurrence in the United States

Acute and chronic schistosomiasis infections are not common in the United States. Although it is estimated that 400,000 infected persons have immigrated to this country, neither susceptible snail species nor chronically infected human reservoirs sufficient to infest freshwater exist. However, pathogenic schistosomes can survive and replicate in human hosts for years or even decades. Therefore, persons who have traveled or immigrated may present to emergency departments (EDs) with active cases of acute or chronic schistosomiasis and/or associated end-organ complications. Most infected patients remain asymptomatic. Acute symptoms are more common in nonimmune travelers due to a severe immune response following exposure.

International Occurrence

Globally, schistosomiasis is a major source of morbidity and mortality. The unique schistosomal life cycle limits endemic areas to tropical and subtropical zones, but these areas exist around the world and may even increase due to certain agricultural practices. Although freshwater lakes and streams are usually identified as the sources of the disease, man-made reservoirs and irrigation systems are increasingly implicated in some countries. Indeed, geographic spread continues due to water resource engineering issues in developing countries and the migration of infected populations. Intestinal schistosomiasis caused by S. mansoni occurs in 52 nations, including Caribbean countries (i.e., Saint Lucia, Antigua, Montserrat, Martinique, Guadeloupe, Dominican Republic, Puerto Rico), eastern Mediterranean countries, South American countries (i.e., Brazil, Venezuela, Suriname), and most countries in Africa.

Other Schistosoma species that can cause intestinal symptoms and disease include S. intercalatum, S. japonicum, and S. mekongi. S. intercalatum is found in 10 countries within the rainforests of central Africa. S. japonicum is endemic in 4 countries in the western Pacific region (i.e., China, Philippines, Indonesia, Thailand). S. mekongi infection occurs in the Mekong River area of Southeast Asia (i.e., Cambodia, Laos, Thailand). Urinary schistosomiasis caused by S. haematobium affects 54 countries in Africa and the eastern Mediterranean.

More than 207 million people in at least 74 countries have active schistosomal infection. Of this population, approximately 60% have disease symptoms, including organ-specific complaints and problems related to chronic anemia and malnutrition from the infection; more than 20 million are severely ill. Disease prevalence is heterogeneous in vulnerable locales and tends to be worse in areas with poor sanitation, increased freshwater irrigation usage, and heavy schistosomal infestation of human, animal, and/or snail populations. However, targeted interventions combining snail control, improved water supply quality, and treatment of infected persons, particularly children, have shown success in diverse endemic areas, including China, Brazil, Egypt, and some areas of sub-Saharan Africa. Interventions based on treating infections annually in humans and domesticated animals while controlling snail populations have decreased disease burden in some areas by an order of magnitude over the last 50 years, but these efforts have plateaued.

A controlled study of enhanced community intervention performed in rural Chinese villages demonstrated significant improvements in human, snail, and wild mouse schistosomiasis infection rates. Along with preexisting programs for annual treatment of farmers and cattle, efforts were made to optimize animal grazing sites, sewage management, drinking water supplies, and health education regarding schistosomiasis.

According to the World Health Organization (WHO), the global distribution of schistosomiasis has changed: it has been eradicated from Japan and the Lesser Antilles islands; transmission has been stopped in Tunisia; and transmission is very low in Morocco, Saudi Arabia, Venezuela, and Puerto Rico. Nevertheless, the human cost of schistosomal infections remains high, and the disease contributes to comorbidity with other infections, including hepatitis, human immunodeficiency virus (HIV), and malaria in endemic regions.

Race-Related Demographics

The frequency of infection among individuals of specific races is based on the geographic distribution of endemic schistosomiasis in large tropical and subtropical regions of Africa, Asia, the Middle East, and the Caribbean. However, all humans appear equally susceptible if exposed to infested freshwater. The frequency of some complications appears to vary geographically during infection with the same worm species (e.g., ascites is more common in the Middle East than in Brazil).

Sex-Related Demographics

Schistosomiasis is more common in males, most likely due to increased exposure to infected water through bathing, swimming, and agricultural activities. S. haematobium causes genital lesions in 30% of infected women, which may increase the risk of HIV transmission.

Age-Related Demographics

The prevalence and severity of schistosomal infections vary with age. Children and adolescents are most often infected and are heavily infested. Infection rates and severity may vary with gender-specific activity at all ages. Congenital infection has been detected, confirming schistosomiasis in newborns. Globally, infections peak in individuals aged 10-19 years, with prevalence in some areas approaching 100%. In persons older than 19 years living in endemic areas, the prevalence of active infection and egg counts slowly decline. This decline may reflect an increasing host immune response or decreasing exposure to contaminated water as individuals age. Reinfection, particularly after high exposure, is possible. Age distribution differs somewhat in infected travelers, with young adults most likely to be exposed and infected.

Prognosis

Early disease usually improves with treatment. Patients with hepatic and urinary disease, even with fibrosis, may improve significantly over months or years following therapy. Renal and intestinal pathology also improves with treatment, as do brain lesions depending on their location and size. Hepatosplenic schistosomiasis carries a relatively good prognosis, as hepatic function is preserved until the end of the disease unless variceal bleeding occurs. Although treatment is indicated for patients with end-stage complications, they are much less likely to benefit from it. Cor pulmonale usually does not improve significantly with treatment. Spinal cord schistosomiasis carries a guarded prognosis. Praziquantel can safely be given to pregnant and lactating women, decreasing the disease burden and improving pregnancy and fetal outcomes. Co-infection of schistosomiasis with hepatitis, HIV, and malaria can raise the risk of hepatocellular carcinoma and increase mortality. Patients with heavier worm burdens are less likely to improve and are more likely to require re-treatment.

Morbidity and Mortality

Acute schistosomiasis is associated with a mortality rate of up to 25% in some series. Although most individuals with chronic schistosomiasis have few or no symptoms, significant morbidity can develop. Hepatosplenic disease with portal hypertension is the most common long-term serious outcome, followed by cardiopulmonary involvement, obstructive nephropathy, bacteremia, and malignancy. Female genital infection can contribute to pregnancy complications. Urogenital schistosomiasis is considered a risk factor for HIV infection, especially in women. End-stage hepatosplenic disease, pulmonary hypertension with cor pulmonale, and central nervous system disease are associated with high mortality rates. Carcinoma of the urinary tract, liver, and gallbladder may cause death. Although effective antihelminthic treatment exists, it may not reverse fibrosis and may not be readily available in endemic areas. Reinfection is extremely common in persons who live in or return to endemic areas, necessitating repetitive treatment to prevent disease progression.

Acute Schistosomiasis (Katayama Syndrome)

Tissue migration of schistosomal larvae may cause a hypersensitivity reaction, with symptoms appearing 2-12 weeks after exposure. Although most clinical manifestations are benign, some are severe and may require hospitalization. Nonimmune travelers are especially prone to this disease manifestation.

Chronic Schistosomiasis

Most patients are asymptomatic or mildly symptomatic and do not require medical attention. Only a small proportion of an endemic population harbors a heavy worm burden that later leads to clinical complications.

Gastrointestinal Schistosomiasis

The most common complication is periportal fibrosis, leading to portal hypertension and gastrointestinal hemorrhage. Liver failure is uncommon, except in persons with concomitant chronic hepatitis or cirrhosis. Among

persons with S. mansoni, S. japonicum, and possibly S. mekongi, 4-8% develop hepatosplenic disease. Co-infection with hepatitis B or C and S. mansoni can lead to rapid progression of liver disease.

Urinary Tract Schistosomiasis

This can lead to renal failure due to obstructive uropathy, pyelonephritis, or bladder carcinoma (usually occurring 10-20 years after the initial infection). In addition, immune complexes containing worm antigens may deposit in the glomeruli, leading to glomerulonephritis and amyloidosis.

Female Genital Schistosomiasis

S. haematobium causes lesions in the female lower genital tract (i.e., cervix, vulva, vagina). Female genital schistosomiasis has been identified as a major social and medical problem that may facilitate the spread of some sexually transmitted diseases, such as HIV and human papillomavirus (HPV).

Coexistence of Sexually Transmitted Infections and Urogenital Schistosomiasis

One study found that among women with S. haematobium infection in Madagascar, 35% may have co-existing sexually transmitted infections, such as Neisseria gonorrhoeae, Chlamydia trachomatis, Mycoplasma genitalium, or Trichomonas vaginalis, compared with 17% of men. This is more common in younger populations (aged 15-24 years) than in older populations. The association becomes stronger with a greater parasite burden. Increased HIV replication and cytokine dysregulation occur when schistosomiasis is present in HIV-positive individuals. In patients on antiretroviral treatment, immune restoration syndrome has been described with symptomatic schistosomiasis.

Pulmonary Arterial Hypertension in Schistosomiasis

This is an important complication that develops in about 7.7% of patients with hepatosplenic disease in S. mansoni, S. japonicum, and possibly S. mekongi infections. The prevalence of the disease worldwide is estimated to exceed 270,000 individuals.

CNS Schistosomiasis

Due to its smaller egg size, S. japonicum causes 60% of all Schistosoma brain infections, with CNS involvement occurring in 2-4% of all S. japonicum infections. It is estimated that one million people in China are infected with S. japonicum. Nodular, enhancing cerebellar lesions can also occur with this species. However, CNS schistosomiasis can also occur with other species. Spinal schistosomiasis typically presents as transverse myelitis and is primarily due to S. mansoni infection, due to the larger egg size. S. haematobium can infect the brain or spinal cord. The distribution of S. mekongi is limited to the Mekong River basin in Laos and Cambodia, where approximately 140,000 people are estimated to be at risk for this infection. Temporal mass lesions causing paraesthesia in the arm and leg, along with dysphagia, have been described in S. mekongi infection. Neurologic symptoms can develop months after the infection, including cauda equina syndrome, anterior spinal artery syndrome, and quadriparesis. Most of the lower spinal cord is affected.

Schistosomiasis in Pregnancy

Schistosomiasis during pregnancy has been associated with anemia and low birth weight. Over the past five decades, the Chinese government has prioritized the control of schistosomiasis, implementing many control programs. These efforts have led to a substantial reduction in the prevalence of Schistosoma japonicum infection in humans, from approximately 11.6 million cases in the mid-1950s to 726,000 cases in 2004. The number of provinces in which this disease is endemic has decreased from 12 to 7. Despite these achievements, progress in disease control has stagnated. National surveys of schistosomiasis in China showed that the prevalence of infection in endemic areas had not substantially changed from 1995 (4.9%) to 2004 (5.1%). More than 80% of current cases are found in the lake and marshland regions of Hunan, Hubei, Jiangxi, Anhui, and Jiangsu provinces, and elimination of transmission

has proven difficult. Past efforts to control snail populations using chemical molluscicides or altering their habitats have led to environmental pollution and damage. The use of synchronous chemotherapy for humans and domestic animals has been only temporarily effective, with high rates of reinfection in both humans and domestic animals. Other factors complicating control efforts include ecological changes in the environment, frequent flooding, and population movement. As a result, the habitats of Oncomelania snail species have increased, leading to more human infections. In 2004, the State Council of China established two targets for the National Schistosomiasis Control Program. First, by 2008, the goal was to reduce the infection rate in humans in all counties where S. japonicum is endemic to less than 5%, including 110 counties with a prevalence exceeding 5%. Second, by 2015, the program aimed to reduce the infection rate in humans to less than 1%. To achieve these targets, the Ministry of Health recognized the urgent need to develop a new schistosomiasis control strategy for China. Based on studies identifying cattle as the primary source of S. japonicum infection for Oncomelania snails and the limited lifespan of infected snails, a comprehensive control strategy was developed. This strategy aimed to reduce the roles of cattle and humans as sources of infection for snails. This report describes the implementation of the strategy in an endemic area over a 30-month period from 2005 through 2007 and assesses its effectiveness. The adoption of this approach as a national strategy to control S. japonicum transmission is also discussed.

Although schistosomiasis has a low mortality rate, it can be highly debilitating. An estimated 600 million people are at risk of schistosomiasis infection, with 200 million estimated to be infected across 74 countries. One hundred and twenty million people experience symptoms such as stunted growth, anemia, and chronic ill health. In sub-Saharan Africa, the current estimated total number of individuals suffering from morbidity and mortality due to schistosomiasis may be as high as 200,000 deaths per year due to non-functioning kidneys, bladder cancer (related to S. haematobium infection), and haematemesis (due to S. mansoni infection). Schistosomiasis is a chronic disease, with the chronic forms being either intestinal or hepatosplenic. The intestinal form may have no symptoms, but blood in the stool is the most common complaint in the absence of hepatosplenic involvement. Pathology associated with S. mansoni and S. japonicum infections includes Katayama fever, hepatic perisinusoidal egg granulomas, Symmers' pipe stem periportal fibrosis, portal hypertension, and occasional embolic egg granulomas in the brain or spinal cord. For S. haematobium infections, pathology includes hematuria, scarring, calcification, squamous cell carcinoma, and occasional embolic egg granulomas in the brain or spinal cord. Bladder cancer diagnosis and mortality are generally elevated in affected areas. Many infections are subclinically symptomatic, with mild anemia and malnutrition being common in endemic areas. Acute schistosomiasis (Katayama's fever) may occur weeks after the initial infection, especially with S. mansoni and S. japonicum.

Manifestations include abdominal pain, cough, diarrhea, eosinophilia, extremely high white blood cell counts, fever, fatigue, and hepatosplenomegaly. Occasionally, central nervous system lesions may occur. Cerebral granulomatous disease may be caused by ectopic S. japonicum eggs in the brain, while granulomatous lesions around ectopic eggs in the spinal cord from S. mansoni and S. haematobium infections may result in transverse myelitis with flaccid paraplegia. Continuing infection may cause granulomatous reactions and fibrosis in affected organs, resulting in manifestations including colonic polyposis with bloody diarrhea (mainly from S. mansoni), portal hypertension with hematemesis and splenomegaly (from S. mansoni and S. japonicum), cystitis and ureteritis (from S. haematobium) with hematuria, which can progress to bladder cancer, pulmonary hypertension (from S. mansoni, S. japonicum, and more rarely S. haematobium), glomerulonephritis, and central nervous system lesions (Caatinga et al., 2000).

Microscopic identification of eggs in stool or urine is the most practical method for diagnosing schistosomiasis. To measure eggs in the feces of presenting patients, the scientific unit used is eggs per gram of stool. Stool examination should be performed when infection with S. mansoni or S. japonicum is suspected, and urine examination should be performed if S. haematobium is suspected. Eggs can be present in the stool in infections with all Schistosoma species (Katz and Zicker, 1975). The examination can be performed on a stool smear (1 to 2 mg of fecal matter). Since eggs may be passed intermittently or in small amounts, their detection can be enhanced by repeated examinations and/or concentration procedures (such as the formalin-ethyl acetate technique). Additionally, for field surveys and investigational purposes, egg output can be quantified using the Kato-Katz technique (20 to 50 mg of fecal matter) or the Ritchie technique.

Eggs can be found in the urine in infections with S. haematobium at the recommended collection time between noon and 3 pm. Detection is enhanced by centrifugation and examination of the sediment. Quantification is possible

by filtering a standard 10 ml of urine through a Nucleopore membrane, followed by egg counts on the membrane. Investigation of S. haematobium should also include a pelvic x-ray, as bladder wall calcification is highly characteristic of chronic infection. Tissue biopsy (rectal biopsy for all species and bladder biopsy for S. haematobium) may demonstrate eggs when stool or urine examinations are negative. The eggs of S. haematobium are ellipsoidal with a terminal spine, S. mansoni eggs are also ellipsoidal but with a lateral spine, and S. japonicum eggs are spheroidal with a small knob (Katz and Zicker, 1975).

Treatment for schistosomiasis involves a single oral dose of the drug praziquantel. While praziquantel is universally used, and is safe and highly effective in curing infected patients, it does not prevent reinfection by cercariae, making it not an optimal treatment for people living in endemic areas. A second drug, oxamniquine, is available for treating Schistosoma mansoni. As with other major parasitic diseases, there is ongoing research into developing a vaccine that would prevent the parasite from completing its life cycle in humans (WHO, 1985). Current methods of controlling the disease include chemotherapy, vector elimination, improved sanitation, and health education.

However, these measures are temporary and expensive, and they have not significantly reduced the disease burden. In addition, widespread use of chemotherapy requires continued repeated treatments and indefinite surveillance. There is also the possibility of drug resistance (Joseph et al., 2004). The use of molluscicides is very expensive and may be harmful to the environment, highlighting the need for a schistosomiasis vaccine to complement drug therapy. Encouragement for developing a schistosomiasis vaccine is based on scientific findings that reinfection mediates partial immunity in human populations in endemic areas. Therefore, a schistosomiasis vaccine should be developed to reduce or delay morbidity following intermittent rounds of chemotherapy (Butterworth, 1994).

Prevention is achieved by eliminating water-borne snails, which are natural reservoirs for the disease. This is typically done by identifying bodies of water, such as lakes and ponds, which are infested, and adding niclosamide, acrolein, copper sulfate, or endod (Phytolacca dodecandra) to the water to kill the snails. In some cases, urbanization, pollution, and the consequent destruction of snail habitats have reduced exposure, leading to a subsequent decrease in new infections (Jordan et al., 1993).

Hepatosplenic schistosomiasis is the most important clinical manifestation of Schistosoma mansoni infection (Bina, 1997). The hepatic lesion is caused by a granulomatous response to eggs of S. mansoni, with subsequent periportal fibrosis, portal hypertension, splenomegaly, esophageal varices, and recurrent hematemesis (Kloetzel, 1962; Arap et al., 1976; Sleigh et al., 1985; Gryseels, 1991a; Abdel and Strickland, 1993). The development of hepatic granulomas is due to the host immune cells—monocytes, lymphocytes, neutrophils, and eosinophils (MLNE)—responding to the deposited schistosome eggs, which is followed by fibrosis of the periportal veins (Smithers and Doenhoff, 1982; Andrade et al., 1989; Boros, 1989). Specificity ranges between 80 and 100 percent, and it either complements or replaces many invasive techniques such as endoscopy, liver biopsy, pyelography, cystoscopy, angiography, and other invasive methods (Abdel-Wahab and Strickland, 1993). The classification adopted by the World Health Organization (Abdel-Wahab et al., 1992) includes ultrasound image patterns of hepatic fibrosis based on the measurement of periportal tract thickness.

Although there has been significant success in the control of schistosomiasis in countries like China, Brazil, and some Sub-Saharan African nations like Tanzania, schistosomiasis has almost doubled in the last decade with the growing population (WHO, 1993), partly due to irrigation projects and the migration of rural populations into urban areas. These and many other factors have led to schistosomiasis being recognized as an important public health problem in large cities of endemic countries (WHO, 1985). It is known that ecological, occupational, and economic factors play an important role in human schistosomiasis (Warren, 1973; Jordan and Webbe, 1982).

Schistosomiasis, being a behavior-related disease, portrays complex interactions between human behavior, social, economic, and cultural beliefs, and the causes of the disease (Huang and Manderson, 1992). Most of the available data on clinical pathology due to Schistosoma mansoni infection and its occurrence come from Brazil, where the disease has been extensively studied.

The acute phase of schistosomiasis due to Schistosoma mansoni infection is associated with the onset of egg-laying by the female parasite about five weeks after infection, and granuloma formation around eggs trapped in the liver and intestinal wall, with hepatosplenomegaly, leucocytosis, and eosinophilia. This phase of infection is often

asymptomatic. However, the clinical syndrome includes fever, nausea, headache, chills, an irritating cough, and, in extreme cases, diarrhea with blood and mucus. This occurs mostly in non-immune individuals, often from urban areas, exposed for the first time in endemic areas, with symptoms lasting from a few weeks to several months. The chronic phase of the disease, which manifests a few years after infection, is either intestinal or hepatosplenic. The intestinal form of schistosomiasis manifests several years after infection, with blood in the stools being the most common complaint (Cheever and Duvall, 1982).

There is a cellular reaction with granuloma formation around eggs trapped in the tissues, followed by subsequent fibrosis (Cheever and Duvall, 1982). All areas of both the small and large intestines may be involved, but the most severe lesions are seen in the large intestine, and rarely in the small intestine, even though large numbers of eggs may be deposited there. Colonic polyps are sometimes seen. The hepatosplenic form of schistosomiasis is also seen several years after infection. The pathology is similar to that seen in the intestines. Most individuals with hepatosplenic schistosomiasis also have splenomegaly. However, hepatosplenic schistosomiasis can occur without enlargement of the spleen (WHO, 1998). In Schistosoma mansoni infection, the current estimated total number of individuals with morbidity and mortality in Sub-Saharan Africa may be as high as 393 million people at risk of infection, with 54 million people infected, 8.5 million with hepatomegaly, 6.3 million with splenomegaly, 290 thousand with ascites, 93 thousand with hematemesis, and 130 thousand deaths from hematemesis annually (Nokes et al., 1999). The current global disability-adjusted life years (DALYs) lost due to schistosomiasis infection stands at 4.5 million (WHO, 2000). Tropical Africa is the most severely affected, accounting for 85% of the cases (WHO, 1993).

In children, schistosomiasis causes growth retardation, anemia, poor school performance, cognitive impairment, and memory deficits (McGarvey et al., 1993; 1996). The highest intensities of infection are found in children between 5 and 16 years old (Bedwani et al., 1998). In adults, the infection affects economic productivity (WHO, 1993; Nokes et al., 1999). The severity of schistosomiasis infection is attributed to host exposure to infection in various water bodies due to a lack of access to safe water and sanitation, as well as the host's immunity in challenging the infection (Butterworth, 1994). As a behavior-related disease, the risk of infection with schistosomiasis is associated with age, sex, and occupation (Gryseels, 1991b). Conditions responsible for severe morbidity, such as liver disease, are not completely understood, although parasite burden seems to be a major determinant (Sleigh et al., 1986). Determining the costs arising from schistosomiasis infections, disability, and death is a subject of ongoing research. Despite the limited data collected on health statistics, conclusions can be drawn about the economic impact of schistosomiasis.

In the Philippines, workdays lost as a result of Schistosoma japonicum infection have been estimated at up to 40 days per infected person per year. In Ghana, Schistosoma haematobium infection contributes to the loss of 4.4 workdays per infected person per year. In Kenya and Zimbabwe, there is about a 10% reduction in exercise performance in children with Schistosoma mansoni infection (WHO, 1993).

There is a delay of 5 to 15 years from the time of Schistosoma mansoni infection to the development of severe disease. Hepatosplenomegaly develops in about 10% of infected people. Liver disease, with esophageal varices and bleeding, is seen in varying degrees, but affects up to 7% of infected individuals in endemic areas, mostly those harboring heavy worm loads (WHO, 1993). Schistosoma mansoni infection has also been associated with Salmonella species and Staphylococcus aureus (WHO, 1998). These organisms are found in the tegument tract of adult schistosomes, suggesting that schistosomiasis serves as a source or reservoir of other infections. Studies have shown that adults have lower intensities of schistosomiasis infection than children, suggesting that resistance develops with age, manifesting around puberty (Joseph et al., 2004).

A study conducted in Brazil on 164 subjects to determine morbidity due to Schistosoma mansoni infection found a 40% prevalence of Schistosoma mansoni infection. The geometric mean egg count (GMEC) ranged from 24 to 1784 eggs per gram of stool. Ultrasound examination detected 5% of subjects with normal liver, 64% with early periportal fibrosis (EPPF), 25% with moderate periportal fibrosis (MPPF), and 6% with advanced periportal fibrosis (APPF). Periportal fibrosis was validated by direct correlation between portal thickness (PT) and portal vein diameter, PT and spleen vein diameter, and PT and spleen size (Amelia et al., 2000).

A study conducted in Egypt investigated 1480 subjects to determine the prevalence of morbidity associated with Schistosoma mansoni infection using physical, parasitological, and ultrasound examinations. Parasitological examination detected a 28% prevalence of Schistosoma mansoni infection. The geometric mean egg count (GMEC)

was 81.3 eggs per gram of stool. Ultrasound examination detected 1.4% of subjects with advanced periportal fibrosis. Splenomegaly and periportal fibrosis (PPF) correlated well with Schistosoma mansoni infection (Abdel-Wahab et al., 2000).

A survey of 792 subjects in Sudan was conducted to determine morbidity due to Schistosoma mansoni infection. Parasitological examination detected a 70% prevalence of Schistosoma mansoni infection. The geometric egg count (GMEC) was less than 100, averaging 34 to 38 eggs per gram of feces. Ultrasound examination detected 58% of cases with early periportal fibrosis (EPPF), 9% with moderate periportal fibrosis (MPPF), and 3% with advanced periportal fibrosis (APPF). Early PPF was detected in 50-70% of children and adolescents. Moderate PPF was detected in 45-58% of men between 21 and 30 years old. Advanced PPF with splenomegaly was detected in 6% of individuals, mostly adult men. These observations led to the suggestion that the intensity of infection, duration, and gender are important factors in hepatic disease progression (Qurashi-Muhamed et al., 1999). In Uganda, 460 subjects were examined for morbidity due to schistosomiasis. Parasitological examination detected an 84% prevalence of Schistosoma mansoni infection. The geometric egg count (GMEC) was 81 eggs per gram of stool. Ultrasound detected 10% of subjects with advanced periportal fibrosis (APPF) (Frenzal et al., 1999).

In Zambia, studies conducted in the Siavonga District by Mubila and Robinson (2002) and Chimbari et al. (2003) showed a Schistosoma mansoni prevalence of 32%. Four years later, another study by the Schistosomiasis Control Initiative (2007) found the prevalence of Schistosoma mansoni infection at 77%.

Methodology

Research Design

A survey research design was employed to conduct the Study.

Area of the Study

The study was conducted in the health centers of Awgu Local Government Area over a period of six months. It was discovered that Awgu Local Government Area comprises approximately 21 district health centers. The villages lacked access to safe water for drinking, industrial purposes, laundry, upkeep, and sanitation facilities. The water sources for various activities, such as domestic use and farming, included nearby streams, lakes, and ponds where many women and children engaged in washing, bathing, swimming, and farming activities. This exposure placed them at a high risk of contracting schistosomiasis and other soil- and water-borne diseases.

Study Population

The study was conducted at the District Health Centers in Awgu Local Government Area. Awgu has a population of 24,431 people according to the National Population Census. Enugu State is located in the South East geographic zone of Nigeria. It lies in the rainforest zone with two major seasons (rainy and dry) and an average temperature of about 28-33°C. The state has a population of 3.5 million people according to the National Population Census. The Awgu Local Government Area comprises 21 towns with 21 district health centers, which are named as follows: Ugbo, Owelli, Obeagu, Ihe, Agbogugu, Agwunta, Ezere, Nkem, Nenwenta, along with private hospitals and two major public hospitals—one situated near the local government headquarters (Awgu General Hospital) and the other in Ezere Town (Abuchi Maternity Home, Ezere). Most of the activities of the majority of the people involve trading and subsistence farming as the soils are fertile, and there are few man-made structures. Other individuals work in shops and administrative buildings within the local government area.

Sample and Sampling Technique

A stratified random sampling method was employed. Awgu Local Government has 15 district health centers. From these 15 district Community Health Care centers, five (5) of them (Community Primary Health Care centers) were randomly selected for the detailed analysis of this project.

Instrument for Data Collection

A non-participant observation method was used as the instrument for data collection for the study. The information sought for was based on the research questions which guided the study.

Validation of the instrument

The instrument (non-participant observation) was validated by three licensed medical doctors through document observation and verification of documented files within the three selected district health centers. They are highly proficient medical personnel from Enugu State University Teaching Hospital (Park Lane) in Enugu.

Method of Data Collection

The data were collected by retrieving the records of patients treated for schistosomiasis disease from the selected hospitals for the study. A letter of introduction and permission was written to the selected hospitals, and the respondents were assured of the confidentiality of the patients' information."

Method of Data Analysis

The frequency and mean records of the sex, age, and socioeconomic status of the patients were used to determine the prevalence status of schistosomiasis disease in Awgu local government.

Results

Table 1: The No. of Cases of Incidence

Towns	*Population*	*No of cases*	*Incidence*	*Per Hundred Thousand People*
Awgu	1135	50 (22%)	0.004890	489
Ezere	962	36 (15.9%)	0.0041580	415.8
Ihe	998	54 (23.8%)	0.00602	601.2
Mmaku	1032	47 (20.8%)	0.0050388	503.876
Isu-Awaa	1102	39 (17.3%)	0.0039319	393.194
Total	**5,229**	**226 (100%)**	**0.0240387**	**2403.07**

Source: Field Survey, 2024

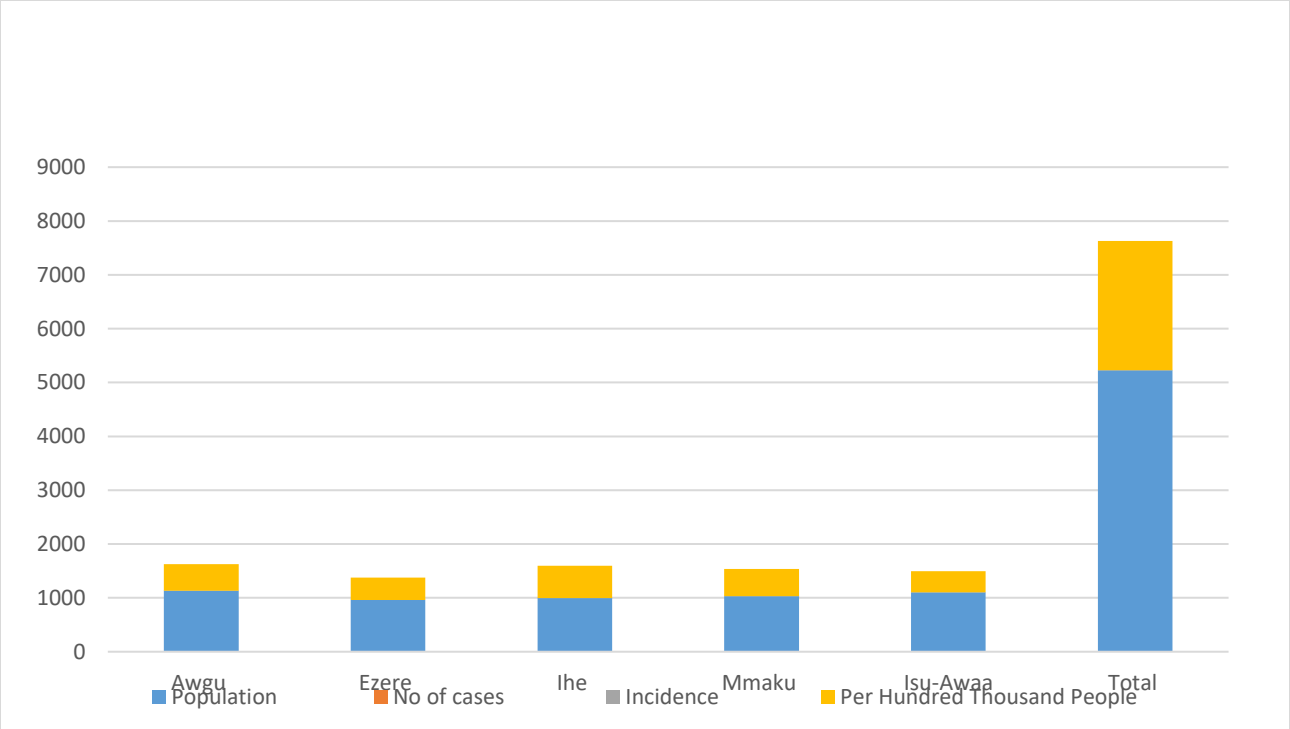

Fig. 1: Stacked Column Chart of Incidence Status

Source: Stata Output from Field Survey, 2024

Table 2: Occupation

Towns	*No of Cases*	*Farmers*	*Civil Servants*	*Students*	*Businessmen*
Awgu	50 (22%)	34 (20%)	6 (42.8%)	4 (14.2%)	6 (42.85%)
Ezere	36 (15.9%)	29 (17%)	1 (7.1%)	5 (17.8%)	1(7.1%)
Ihe	54 (23.8%)	44 (25.8%)	2 (14.2%)	6(21.4%)	2 (14.2%)
Mmaku	47 (20.8%)	35 (20.5%)	3 (21.4%)	7 (25%)	2 (14.2%)
Isu-Awaa	39 (17.3%)	28 (16.4%)	2 (14.2%)	6 (21.4%)	3 (21.4%)
Total	**226 (100%)**	**170 (100%)**	**14 (100%)**	**28 (100%)**	**14 (100%)**

Source: Field Survey, 2024

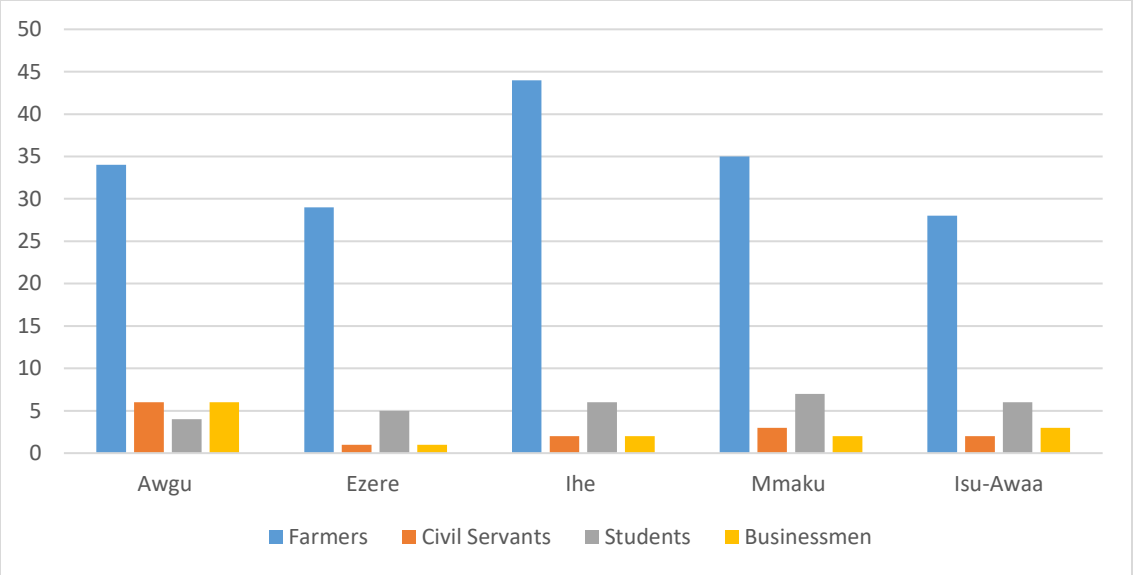

Fig. 2: Clustered Column Chart of Occupation across various towns

Source: Stata Output from Field Survey, 2024

Table 3: Sex

Towns	*No of cases*	*Females*	*Males*
Awgu	50 (22%)	36 (22.3%)	14 (21.5%)
Ezere	36(15.9%)	28 (17.3%)	8 (12.3%)
Ihe	54 (23.8%)	38 (23.6%)	16 (24.6%)
Mmaku	47 (20.8%)	30 (18.6%)	17 (26.1%)
Isu-Awaa	39 (17.3%)	29 (18.0%)	10 (15.3%)
Total	226 (100%)	1611 (100%)	65 (100%)

Source: Field Survey, 2024

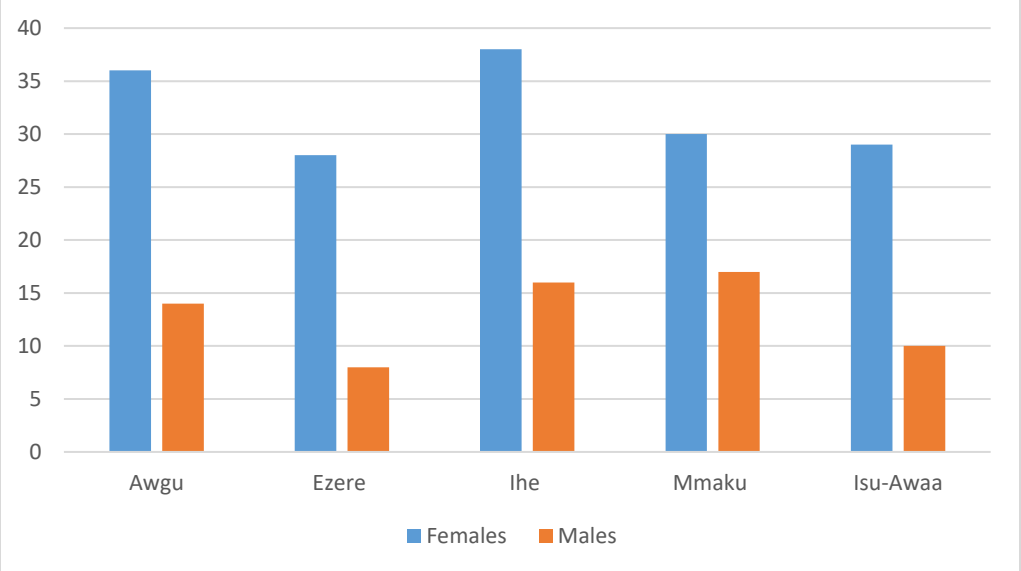

Fig. 3: Clustered Column Chart of gender across various towns
Source: Stata Output from Field Survey, 2024

Table 4: Age

Towns	*No of cases*	*0-20 years*	*21-40 years*	*41-60 years*	*61-80 years*
Awgu	50 (22%)	43(22.4%)	5 (23.8%)	1 (16.6%)	1 (%)
Ezere	36(15.9%)	31 (16.1%)	4 (19.0%)	1 (16.6%)	0 (%)
Ihe	54 (23.8%)	46 (23.9%)	6 (28.6%)	2 (33.3%)	0 (%)
Mmaku	47 (20.8%)	40 (20.8%)	6 (28.6%)	1 (16.6%)	0 (%)
Isu-Awaa	39 (17.3%)	32 (16.6%)	5 (23.8%)	2 (33.3%)	0 (%)
Total	**226 (100%)**	**192 (100%)**	**21(100%)**	**6 (100%)**	**1(%)**

Source: Field Survey, 2024

Table 5: Environment

Towns	*No of Cases*	*(Environment Villages)*
Awgu	50 22%)	Uhuagu, Umuhu, Olocha, Amaofia & Amokwe
Ezere	36 15.9%)	Amaede, Ugontu, Uhuagu, Atara & Iyiugo
Ihe	54 23.8%)	Amagu, Umuogbe, Uhueze, Umushike & Umuoyia
Mmaku	47 20.8%)	Afam, Ikponkpume & Umuchukwu
Isu-Awaa	39 17.3%)	yakwa(Egedu), Umuamanu, Enugu Izi, Obinagu & Ejidu/Ezioka
Total	**226 (100%)**	

Source: Field Survey, 2024

Table 6: The Status of Schistosomiasis

Town	*No. of Cases*	*Duration in Years (2007-2016)*	*Outcome (Recovered)*	*Outcome (Death)*
Awgu	50 (22%)	9 years	34 (17.2%)	6 (31.5%)
Ezere	36 (15.9%)	9 years	32 (16.4%)	2 (10.5%)
Ihe	54 (23.8%)	9 years	50 (25.6%)	4 (21.0%)
Mmaku	47 (20.8%)	9 years	44 (22.5%)	3 (15.7%)
Isu-Awaa	39 (17.3%)	9 years	35 (17.9%)	4 (21.0%)
Total	**226 (100%)**	9 years	**195 (100%)**	**19 (100%)**

Source: Field Survey, 2024.

The table provided presents data on the number of cases, duration in years, and outcomes (recovery or death) for five different towns over a nine-year period (2007-2016).

There were a total of 50 reported cases in Awgu, which accounted for 22% of the total cases across all towns. The duration of the cases spanned nine years. Out of the 50 cases, 34 individuals (17.2%) recovered, while 6 individuals (31.5%) unfortunately died.

In Ezere, there were 36 reported cases, accounting for 15.9% of the total cases. The cases also spanned a duration of nine years. Out of the 36 cases, 32 individuals (16.4%) recovered, and 2 individuals (10.5%) passed away.

The town of Ihe had 54 reported cases, representing 23.8% of the total cases. The cases occurred over a period of nine years. Out of the 54 cases, 50 individuals (25.6%) recovered, while 4 individuals (21.0%) did not survive.

Mmaku had 47 reported cases, making up 20.8% of the total cases. These cases were recorded over a duration of nine years. Among the 47 cases, 44 individuals (22.5%) recovered, and 3 individuals (15.7%) lost their lives.

There were 39 reported cases in Isu-Awaa, accounting for 17.3% of the total cases. The cases occurred over a nine-year period. Out of the 39 cases, 35 individuals (17.9%) recovered, and 4 individuals (21.0%) passed away.

Hence, across all the towns, there were a total of 226 cases reported over the nine-year period. Out of these cases, 195 individuals (100%) recovered, while 19 individuals (100%) died. Overall, the table summarizes the prevalence of

schistosomiasis cases, the outcomes of those cases, and the distribution of cases across different towns over the specified nine-year period.

Summary of the Findings

The study focused on determining the prevalence of schistosomiasis in Awgu Local Government Area in Enugu State, considering factors such as sex, age, socioeconomic status, occupation, and the efficiency of district health center workers in handling the disease. The key findings are as follows:

i. **Prevalence of Schistosomiasis:** The highest percentage of schistosomiasis incidence was found in Ihe town (23.8%), followed by Awgu town (22%), Mmaku town (20.8%), and Isu-Awaa town (17.3%). Ezere town had the lowest percentage of population affected (15.9%). These variations were attributed to differences in hygienic practices and access to clean water sources among the towns.

ii. **Occupation:** Farmers were identified as the most vulnerable group to schistosomiasis due to their direct exposure to contaminated waters in farm lands and the surrounding environment. In Awgu town, farmers accounted for 20% of schistosomiasis cases, followed by civil servants (42.8%), students (14.2%), and businessmen (42.8%). Similar patterns were observed in other towns, indicating the occupational risk associated with farming.

iii. **Gender:** The study revealed that a higher percentage of females in the early age bracket were affected by schistosomiasis compared to males. This suggests that females in this age group may be more vulnerable to the disease.

iv. **Efficiency of District Health Center Workers:** The analysis of reported cases showed that out of 226 cases, only 19 deaths occurred, indicating the effectiveness of district health care workers in handling the effects of schistosomiasis. This suggests that the health care workers in Awgu local government area were efficient in managing the disease within the region.

Conclusion

In conclusion, this study evaluated the status of urinary schistosomiasis in community health centers in Awgu Local Government Areas of Enugu State. The implementation of integrated control strategies, including chemotherapy with praziquantel, resulted in a significant reduction in the prevalence and intensity of schistosomiasis. The prevalence rate decreased from 38.5% to 0.17%, while the intensity decreased from 197 mean ova per 10 mL to 12 mean ova per 10 mL.

The success of the control strategies can be attributed to various factors, including the implementation of the UNICEF free open defecation program in schools, which improved sanitary practices and reduced the contamination of freshwater sources. Mass chemotherapy with praziquantel proved to be safe, easy to use, and cost-effective in controlling the disease in the short term. Concerns about resistance to praziquantel appear to be remote, although there have been reports of low cure rates in certain areas.

Furthermore, health education and health promotion played a vital role in combination with mass chemotherapy programs. Similar to findings in other studies, emphasizing health education and health promotion proved highly successful in reducing the prevalence and intensity of schistosomiasis in the Awgu Local Government Areas. This integrated approach, combined with the availability of a potential schistosome vaccine, holds promise for long-term control and prevention efforts.

Hence, the findings highlight the effectiveness of integrated control strategies, including chemotherapy, improved sanitation practices, and health education, in reducing the burden of schistosomiasis in Awgu Local Government Areas. Continued efforts in implementing and sustaining these interventions, along with further research into vaccines and potential resistance, will be critical in achieving long-term control and eventual eradication of schistosomiasis in the region.

Recommendations

Based on the findings of the study, the following recommendations can be made to enhance the control and prevention of schistosomiasis in Awgu local government area:

i. Continue implementing and strengthening the integrated control strategies that have proven effective, including mass chemotherapy with praziquantel. Ensure the availability and accessibility of praziquantel in healthcare facilities to ensure timely treatment for infected individuals.
ii. Develop and implement targeted health education programs to raise awareness about schistosomiasis transmission, prevention, and treatment. Focus on vulnerable groups, such as schoolchildren and farmers, providing them with information on protective behaviors, such as avoiding contact with contaminated water sources and practicing good hygiene.
iii. Prioritize the improvement of sanitation facilities in schools across Awgu local government area. Ensure access to clean and functional toilets, handwashing stations, and safe water sources. Promote and enforce good hygiene practices among students, teachers, and staff to reduce the risk of schistosomiasis transmission.
iv. Establish robust surveillance systems to monitor the prevalence and intensity of schistosomiasis in the local government area. Conduct regular assessments to evaluate the effectiveness of control interventions, identify areas of improvement, and measure progress towards reducing the disease burden. Utilize the data collected to inform evidence-based decision-making and allocate resources efficiently.

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