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Minireview papers
Leveraging on Prompt Proactive and Preventive Integrated Strategies for Meningitis Control in Nigeria

Abstract

Background: Given the escalating morbidity and mortality recorded annually due to meningitis outbreak in Nigeria, it is fast becoming a disease of public health concern.

Objectives: This study described and discussed preventive strategies based on the disease pattern to generate information on the concept of prompt, proactive, and preventive integrated strategies (PPPIS).

Methods: The study was a narrative overview of relevant literatures obtained through hand search, databases, and authoritative materials.

Results: Meningitis was reported in 5 states of Northern Nigeria with 1407 suspected cases and 211 deaths between January 2016 and March 2017. This figure rose to 13, 420 suspected cases in 23 states with 1, 069 deaths, and a fatality ratio of 8% in May 2017.

Conclusion: Meningitis has become an increasing contributor to disease burden with high mortality, morbidity, and economic consequences. Adoption of prompt, proactive, and preventive strategies among other integrated approach could stem and reverse the trend.

Keywords: Disease prevention, integrated approach, meningitis, Nigeria

Introduction

Meningitis is a medical emergency characterized by infection of the meninges with the presence of pus and inflammatory cells in the cerebrospinal fluid and marked with high morbidity and mortality. The causative organisms vary from bacteria, to virus, fungus, protozoa, chemicals, or neoplasia depending on patients' age. However, epidemic meningitis is usually associated with Neiserria meningitides. Clinical features include vomiting, fever, headache, photophobia, and alterations in level of consciousness. Other features include fever of unknown origin, stroke-like syndrome, seizures, acute psychosis, and dementia. Complications vary from subdural pus collection, cranial nerve palsies, epilepsy, heat stroke, and syndrome of inappropriate anti-diuretic hormone secretion. It is a major cause of morbidity and mortality especially among children in developing countries [1-6].

Approximately 8.7 million people were affected by meningitis globally leading to 379000 deaths in 2015 and 464000 deaths in 1990 [7, 8]. It was known to be prevalent in Europe and America between 1805 and 1874, and became prevalent in Asia, Africa, and Australia in 1875. In sub-Saharan Africa, seasonal hyper-endemicity is recorded at the peak of dry season between

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January and May before the unset of rainy season within the African meningitis belt. Weekly incidence rates of 10/100 000 has been recorded and sometimes exceeded 100/100 000 locally [9-12]. The first incidence was reported in Algeria in 1840 [13]. In late 18th century and early 19th century, the epidemic was reported in the western coast of Africa at Cape Coast [14, 15]. PPPIS entails the use of the right proactive and preventive strategies promptly for the right disease prevention or control in a continuum while leveraging on all available and rational preventive and treatment measures. This study described and discussed preventive strategies based on the disease pattern to generate information on the concept of prompt, proactive, and preventive integrated strategies (PPPIS).

Methods

This study was synthesized with information obtained from PubMed, Medline, hand se3arch of related reference materials, and official documents. The search took place between December 2016 and March 2017. The search terms were meningitis, control, prevention, Disease prevention, integrated approach, and Nigeria. The search terms were used individually and in series using AND/OR. Truncation and adjacency searching were employed. Publications in English Language with unambiguous and clearly detailed methods were considered. All studies without clearly defined and logical methods were excluded.

Results

Nigeria was ranked 187 of the 191 countries in the world rated scale for health system in 2016. The life expectancy at birth for male/female was 53/56 in 2015. The total expenditure on health per capita (Intl $, 2014) was 2014 while the total expenditure on health per capita (Intl $, 2014) was 217, and Total expenditure on health as percentage of GDP (2014) was 3.7. Table 1 below summaries meningitis outbreak in Nigeria from 1996 to 2017.

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Table 1: A summary of Meningitis outbreak in Nigeria

Year	Month	Suspected cases	Deaths	Location (State)
1996	December to June	108, 568		
1996		15, 733	2411	12 states: Adamawa, Bauchi, Benue, Cross River, Kano, Kaduna, Katsina, Kebbi, Kwara, Niger, Sokoto, and Taraba.
2003/4	December to June	659		
2004	January to March	327	46	Jigawa
2005	January to June	657		
2006	January to June	5731		
2007	January to June	2642		
2008	December to June	6835		
2009	December to June	128	2000	5 states in north west and north central
2009	January to February	5323	333	
2009	December to June	54766	2449	16 northern states
2010	December to June	2983		
2011	December to June	1165		
2012	December to June	1206		
2013	December to June	871		
2013/14	December to June	128	2046	
2015	January to March	652	50	Kebbi and Sokoto
2016	December to June	300	336	
2017	March	12000	211	5 States: Kastina, Sokoto, Zamfara, Kebbi, and Niger
2017	January to March	1966	282	15 states
2017	January to May	13420	1069	23 states

December to June: This represents from December of the previous year to December of present year

Discussion

Nigeria has witnessed major epidemic outbreak of meningitis from 1970 to 2017. However, the highest prevalence was recorded in first half of 1996 when 109, 580 cases were reported out of which 11, 717 died [16, 17]. From December 2016 to March 2017, epidemiological survey of meningitis in 5 states of Northern Nigeria revealed 1407 suspected cases and 211 deaths, a case fatality rate of 15%. By April 2017, the 6 states of Sokoto, Kebbi, Kastina, Yobe, Zamfara, and Niger were affected with an estimated 8,057 suspected cases, 230 confirmed cases and 813 deaths, an epidemic threshold. Children within the age of 5 to 14 years were predominantly affected and constituted more than half of the suspected cases [18-20]. Of the 230 confirmed cases, 157 were confirmed with serotype C of *Neisseria meningitides*. This same serotype was found to be responsible for the 2014 and 2015 outbreaks in Nigeria. Other strains of *Neisseria*

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meningitidis namely A, B, W, and Y which cause meningitis globally have been unpopular in Nigeria except serotype A whose vaccine is available [21, 22]. On the second week of May 2017, 13, 420 suspected cases were reported in 23 states with 1, 069 deaths, and fatality ratio of 8% [23].

The number of suspected cases and death has been relatively high though irregular as shown in Table 1. This underscores the need for strategies to contain and begin to reverse the trend. Its predominant localization to key states in the northwest and north central could be utilized in concentrating efforts during prevention and control without prejudice to other states. Table 1 further suggests inconsistency in documentation of data e.g., documentation of yearly number of deaths may have been inconsistent. Consistencies in documentation helps in proper audit trail and follow up. It is invaluable in quantification for programs and services. Meningitis occurs predominantly between December and June during dry season in Nigeria characterized by high temperature distribution. *Neisseria* spp, *Haemophilus influenzae, Streptococcus pneumonia* have been implicated in the outbreak of meningitis over the years while *Neisseria meningitidis* sero group A caused epidemics in the past [24-27]. This information underscores the need for sustained and massive immunization campaign drive and coverage. The disease control unit necessary for immunization should not continue with the reactive approach of immunization response or coverage when cases have reached near epidemic dimension, proactive response is of great essence with the requisite conjugate vaccines covering the serotypes. Hence, the threshold strategy that allows the disease to progress to detectable threshold. Provisions should be made for identified serotypes, which the vaccines could not cover adequately to take care of reactive cases. This process should be maintained in a continuous cycle [28-33].

This should be tailored to sustained vaccines supply with quality assurance measures to ensure good quality and stability while maintaining good tracking of monitoring and evaluation in the immunization coverage. Disease surveillance update should be prompt and regular to detect and report initial cases promptly. Preference should be given to prophylactic conjugate vaccines with additional property of limiting transmission while conferring long lasting immunity [34-37]. The influence of socio-cultural determinants is disease should be considered as another means of epidemic control. Some tribes where vaccinees refuse to accept vaccines from immunization vaccinators of opposite gender could be a limiting factor. Others where permission has to be taken from the family head before their subjects could access immunization all combine to adversely affect immunization coverage [38-39]. These could be addressed through routine interaction of relevant authorities with village heads and their subjects based on the principle of health education and community mobilization. Mumps meningitis, which occurs in 15% of mumps cases, recorded marked decline following prompt immunization against mumps [40].

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Socioeconomic and demographic factors have been noted as another cause to be critically considered. Overcrowding and poor living conditions is common among outbreak locations. This is very common among pilgrims, military camps, refugee camps, internally displaced people's camp, and slums. Countries like Sudan, Chad, and Morocco have recorded meningitis outbreaks associated with returning pilgrims in 1988, 1988, and 1989 while Saudi Arabia had a similar case in 1987. This underscores the need to observe global best practices at every port of entry and immigration points in line with international health recommendations considering that diseases cross borders. The attack rate of most meningitis epidemics in sub-Saharan Africa exceed 1% before being reported. There is dire need follow the trend of most developed countries where it is much lower through improved warning systems and early detection of localized and widespread epidemics, regular data review, prompt reporting and rapid communication, investigation of affected cases, case definition, rapid assessment, and information dissemination across board [41- 43]. Preventive strategies should be proactive to be effective. Any preventive mechanism in disease control no matter how expensive or effective can lead to loss of lives and disabilities if it is not prompt. A proactive preventive mechanism that is not prompt will also be limited. Hence, the principle of Prompt, Proactive, and Preventive Integrated Strategies (PPPIS) should never be compromised. This will help to prevent or minimize casualties in supposed epidemic outbreak. Strengthening health systems through the primary healthcare development agency and inter sectoral collaboration. Development and implementation of a comprehensive National Strategic Health Development Plan (NSHDP) through the National Health Bill and scaling up meningitis intervention plan as one of the priority interventions could be a booster to the entire mechanism.

Conclusion

Meningitis has become a major contributor of disease burden in Nigeria annually. High incidence of fatality that occurs annually despite reasonable information on the disease trend and patterns occasioned the need to consider salient preventive mechanisms. The concept of Prompt and Proactive Preventive Integrated Strategies (PPPS) is essential in forestalling disease outbreaks from progressing to epidemic dimensions. All preventive mechanisms must be prompt, proactive, prompt, and integrated leveraging on all existing strategies. This approach should be applied in a continuum and repeated uninterrupted cycles in meningitis prevention and control for meaningful outcomes to be achieved. Given the rising trend of morbidity and mortality associated with meningitis in Nigeria, integrated strategies in its prevention should be prompt, proactive, and maintained in a continuum among other integrated approach could stem and reverse the trend.

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