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Study of Acute Flaccid Paralysis Surveillance System, River Nile State, Sudan, 2021

*A thesis submitted for **PhD** in public health (**epidemiology**)*

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الآيـــــــــــــــــــة

﴿ قَالَ الَّذِي عِنْدَهُ عِلْمٌ مِنَ الْكِتَابِ أَنَا آتِيكَ بِهِ قَبْلَ أَنْ يَرْتَدَّ إِلَيْكَ طَرْفُكَ فَلَمَّا رَآهُ مُسْتَقِرًّا عِنْدَهُ قَالَ هَذَا مِنْ فَضْلِ رَبِّي لِيَبْلُوَنِي أَأَشْكُرُ أَمْ أَكْفُرُ وَمَنْ شَكَرَ فَإِنَّمَا يَشْكُرُ لِنَفْسِهِ وَمَنْ كَفَرَ فَإِنَّ رَبِّي غَنِيٌّ كَرِيمٌ ﴾ [النمل: 40]

Dedication

To the spirit of my father

To my mother

To my wife

To my son

To my brothers

To my friends

To each science student

Acknowledgement

Praise is to **Allah**, peace and blessings are upon our Prophet **Mohammad**, peace is upon him.

I would like to express my thanks to everyone who helped and supported me in carrying out this research.

Thank all those working in the field of AFP surveillance, River Nile State, in particular: **Eiman E, Alhadi A, Ammar M, Ibrahim KH, Othman M, Sahar A and Hamdi** who helped me to conduct this study.

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Abstract

Background The acute flaccid paralysis surveillance is one of the four basic elements in the global initiative for polio eradication. This system is based on reporting and testing cases of acute flaccid paralysis in laboratories accredited by the World Health Organization, indicators have been developed to evaluate and monitor performance, [1]. Hence the need to study the components of the system, evaluate performance, its efficiency, and its conformity with the standards adopted by the World Health Organization, in order for it to be adopted as a good system, its results can be accredited to certify that the country is polio-free or not. The system is the only tool to certify Sudan free of polio.

Material and methods; A facility-based retrospective and descriptive study was conducted regarding Surveillance System's Structure and AFP surveillance data, in addition to AFP surveillance workers; who included head system at the level of River Nile State, all reporting sites/units, workers who were reporting the AFP cases and officers at localities level. A Total of 50 health facilities for surveillance were visited and interviews were conducted with a total of 59 health workers who participated in the AFP Surveillance System. The data were gathered from participants by using pre tested questionnaire, designed and developed according to WHO framework, and data was analyzed by using **SPSS** version 22.

Results; The AFP surveillance system in the River Nile State had high efficiency in terms of the established infrastructure and performance of the system's activities were; from 2017 to 2020 the reported non polio AFP cases was mean rate 4.02/100000 children under 15 years of age; the most AFP reported cases less than 10years; the males was 73.3% of reported cases, The completeness of reports and surveillance documents found was more than 80%, the active surveillance strategy was 92% at health facilities, the knowledge about AFP surveillance activities was 100% at all levels. Health workers knowledge regarding modern surveillance computer skills was low because the lack of some elements as the computer and its equipments.

Recommendations; The study recommended strengthening some elements of the system and increasing the frequently of training during the working for workers, especially on the computer applications skills.

المستخلص

خلفية: يعتبر ترصد الشلل الرخو الحاد أحد العناصر الأساسية الأربعة في المبادرة العالمية لاستئصال شلل الأطفال. يعتمد هذا النظام على الإبلاغ عن حالات الشلل الرخو الحاد واختبارها في المعامل المعتمدة من قبل منظمة الصحة العالمية، وقد تم تطوير مؤشرات لتقييم ومتابعة الأداء، [1]. ومن هنا ظهرت الضرورة لدراسة البرنامج بولاية نهر النيل وتقييم أدائه، كفاءته ومدى توافقه مع المؤشرات التي اعتمدتها منظمة الصحة العالمية من أجل إعتماده كنظام جيد يمكن إعتماد نتائجه للإشهاد بخلو البلاد من شلل الأطفال من عدمه.

منهجية الدراسة : تم إجراء دراسة استرجاعية – وصفية قائمة على المرافق المستهدفة بترصد الشلل الرخو الحاد، قواعد البيانات والعاملين في مجال ترصد الشلل الرخو الحاد. تم تضمين القائمين على أمر النظام على مستوى ولاية نهر النيل، جميع مواقع /وحدات التبليغ، العاملين في تلك الوحدات ومديري النظام على مستوى المحليات. تم اختيار إجمالي 50 منشأة صحية خاضعة للترصد وإجراء مقابلة مع العاملين بالنظام على جميع المستويات(59 عامل صحي). تم جمع البيانات من المشاركين باستخدام استبيان تم اختباره مسبقاً، ثم تم تصميمه وتطويره وفقًا لإطار منظمة الصحة العالمية ، وتم تحليل البيانات باستخدام برنامج التحليل الاحصائي للعلوم الاجتماعية"نسخة22".

النتائج: يتمتع نظام مراقبة الشلل الرخو الحاد في ولاية نهر النيل بكفاءة عالية من حيث البنية التحتية وأداء أنشطة النظام؛ من 2017 إلى 2020 كان متوسط حالات الشلل الرخو الحاد غير ناتج عن فيروس الشلل 4,02 لكل 100 ألف طفل دون سن 15 عامًا؛ 73,3% من الحالات المبلغة عبارة عن ذكور، كان اكتمال التقارير ووثائق المراقبة التي تم العثور عليها أكثر من 80 ٪؛ استراتيجية الترصد النشط يتم تنفيذها بنسبة 92% في المرافق الصحية، كانت المعرفة بأنشطة ترصد الشلل الرخو الحاد 100٪ على جميع المستويات، كانت معرفة العاملين الصحيين فيما يتعلق بمهارات استخدام الحاسوب منخفضة بسبب نقص بعض العناصر مثل الحاسب الآلي ومعداته.

التوصيات؛ أوصت الدراسة بتقوية بعض عناصر النظام وزيادة جرعة التدريب للعاملين أثناء العمل خاصة في مجال الحاسوب.

List of abbreviation

AFP	**A**cute **F**laccid **P**aralysis
WHO	**W**orld **H**ealth **O**rganization
OPV	**O**ral **P**olio **V**accine
NGOs	**N**on **G**overnmental **O**rganizations
GPEI	**G**lobal **P**olio **E**radication **I**nitiative
RNA	**R**ibose **N**ucleic **A**cid
PV1	**P**olio **V**irus type1
PV2	**P**olio **V**irus type2
PV3	**P**olio **V**irus type3
GBS	**G**uillain–**B**arré **S**yndrome
TM	**T**ransverse **M**yelitis
EV	**E**nvironmental **S**urveillance
VDPV	**V**accine **D**erived **P**olio **V**irus
CVDPVs	**C**irculating **V**accine **D**erived Polio Virus
IPV	**I**nactivated **P**olio **V**accine
CDC	Revise **C**entral of **D**iseases **C**ontrol and prevention
IHR	**I**nternational **H**ealth Regulation
PPV	**P**ositive Predictive **V**alue
PPVcd	**P**ositive **P**redictive **V**alue of cases detection
PPVod	**P**ositive **P**redictive **V**alue of outbreak detection
NPEV	**N**on **P**olio **E**ntero- **V**irus
VPDs	**V**accine **P**reventable **D**iseases

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Chapter one

Introduction

Problem statement

Justification

Objectives

1.1- Introduction

Acute Flaccid Paralysis (AFP) is a clinical syndrome characterized by a sudden onset of weakness of a limb, described as flaccid (reduced tone) in a child below 15 years of age,[1]. AFP mimics the clinical presentation of poliomyelitis; hence AFP surveillance was adopted globally as a key strategy for monitoring the progress of the polio eradication initiative,[2]. Any disease eradication initiative relies on highly sensitive surveillance to guide programmatic action. This is especially important for polio eradication, since only one out of 200 infections with poliovirus results in clinically apparent paralytic disease. To identify and eliminate the remaining pockets of wild poliovirus transmission, surveillance must detect and investigate as many cases of paralytic poliomyelitis as possible. To achieve eradication, high levels of polio vaccine coverage must be sustained worldwide, which is dependent on an adequate vaccine supply, [3]. A good AFP surveillance system serves as a sensitive instrument for detecting potential poliomyelitis cases and thus alerting health managers and clinicians to timely institute appropriate interventions to interrupt any poliovirus transmission. Effective AFP surveillance is also crucial for verifying, with confidence, the absence of wild poliovirus circulation in countries that are no longer reporting cases of poliomyelitis, [4]. (AFP) surveillance was adopted by World Health Organization (WHO) to monitor progress towards poliomyelitis eradication. AFP surveillance helps to detect reliably areas where poliovirus transmission is occurring. Thus, AFP surveillance data will guide targeted immunization activities in areas with continued wild poliovirus circulation. Additionally, surveillance data is accepted as the most reliable way to monitor how effectively routine and supplementary OPV immunization has succeeded in decreasing poliovirus transmission. Ultimately, surveillance data will be the basis for certification of polio eradication, [4].

1.2- Problem statement

In Sudan there are challenges to the surveillance system, as Insecurity, forced displacement, frequent nomadic population movement and inaccessibility in some areas make it challenging for health workers to consistently reach all children with vaccines to build immunity. To cater for specific surveillance challenges associated with reaching high risk groups, special strategies have been devised at state, locality and administrative unit levels. Examples include active searches for AFP cases and sample collection by community based surveillance officers in areas with access issues, the mapping of the movement of displaced populations, and establishing regular communication with nomadic community focal points who report AFP cases via mobile phone. In refugee camps, vaccination posts have provided an opportunity to screen for children with AFP, and collaboration and sensitization of non-government organizations (NGOs) staff has helped to improve reporting of AFP cases. Eighteen states were assessed throughout the review, with visits to 90 health facilities, families of 16 children with AFP, and high-risk special populations conducted. Using standardized tools, teams assessed the quality of case investigation, active surveillance and surveillance documentation as well as plans for outbreak preparedness and response. Overall conclusions were that solid structures for AFP surveillance are in place in Sudan at all levels. The system is meeting global AFP surveillance targets and it is unlikely for polio to circulate undetected, however, there are gaps that need to be addressed, [5].

1.3- Justification

The AFP surveillance system based on reporting and testing cases of acute flaccid paralysis in World Health Organization accredited laboratories; where indicators have been developed to assess and monitor performance.

In the study area, there is a complete system for AFP Surveillance, but no study has been conducted to evaluate it in the past, hence the need to study the components of the system and evaluate its performance, efficiency and conformity with the standards approved by the World Health Organization in order for it to be adopted as a good system, its results can be accredited to certify that the country is polio-free or not. This system is the only tool to prove that Sudan is free of polio.

Continuous surveillance of acute flaccid paralysis in the state; It is a task that requires skill and constant funding if we are to achieve our goal. Where there is a great achievement - all future generations are free from the threat of polio.

1.4- Objectives:

1.4.1- General objective

To Study the Acute Flaccid Paralysis Surveillance System in River Nile state, 2018- 2020

1.4.2- Specific objectives

1.4.2.1- To assess the structural components of AFP surveillance system.

1.4.2.2- To assess the performance of core activities for AFP Surveillance system.

1.4.2.3- To identify the support functions of AFP surveillance system.

Chapter two

Literature review

2- Literature review

2.1- Background

Poliomyelitis is a highly contagious viral disease that attacks the nervous system. The most vulnerable are children under the age of five years, but early vaccination can prevent infection. Almost every child among 200-400 children is at risk of paralysis and even death. Poliomyelitis is one of the most serious diseases in the world, the largest public-private health partnership that has resulted in a 99 per cent reduction in poliomyelitis. Poliomyelitis exists only in the poorest and most marginalized communities in the world, where it remains among the most vulnerable children, [6].

In the normal context of the poliovirus infection, the polio virus remains in the stool for several weeks. Searching for poliovirus in wastewater or other wastewater was used to detect the poliovirus in the environment. It was pointed out that environmental surveillance could be used as one approach to assessing the elimination of the spread of polio virus in a given human group and to proving the ultimate success of polio eradication. The potential benefits of environmental surveillance are being assessed under the conditions of developing countries. However, the principles of sampling and detection methods used have been somewhat different, often non-quantitative, and have not been identified for use in WHO polio laboratory network, [7].

Acute flaccid paralysis (AFP) is defined as the sudden onset of paralysis / weakness in any part of the body of a child under 15 years old, or any person at any age is whom the clinician suspected polio. The term acute flaccid paralysis (AFP) is often used to describe a sudden onset, as is the case with polio. AFP is the most common sign of acute polio and is used for surveillance during an outbreak of polio. AFP is also associated with a number of other disease-causing agents including enteroviruses, echo viruses, West Nile virus, and

adenoviruses, among others, [8]. Acute flaccid paralysis (AFP) is a clinical syndrome characterized by rapid onset of weakness, including (less frequently) weakness of the muscles of respiration and swallowing, progressing to maximum severity within several days to weeks. The term "flaccid" indicates the absence of spasticity or other signs of disordered central nervous sys- tem motor tracts such as hyper reflexia, clonus, or extensor plantar responses. When applied to voluntary muscles, "paralysis" means loss of contraction due to interruption of motor pathways from the cortex to the muscle fiber. It is preferable to use the term "paresis" for slight loss of motor strength and "paralysis" or "plegia" for severe loss of motor strength. The differential diagnosis of AFP varies considerably with age. No single operational clinical case definition of AFP or paralytic poliomyelitis that combines both high sensitivity and high specificity has emerged, [9]. AFP surveillance helps to detect reliably areas where poliovirus transmission is occurring. Thus, AFP surveillance data will guide targeted immunization activities in areas with continued wild poliovirus circulation. Additionally, surveillance data is accepted as the most reliable way to monitor how effectively routine and supplementary OPV immunization has succeeded in decreasing poliovirus transmission. Ultimately, surveillance data will be the basis for certification of polio eradication. Any surveillance systems should meet their objectives as efficiently as possible. Meeting each of these objectives involves evaluating surveillance from different perspectives. The overall purpose of evaluating public health surveillance is to promote the most effective use of health resources. Evaluation is critical to strengthen surveillance and response systems, and should be an integral part of these systems. Its fosters accountability while ensuring that the surveillance and response systems meet the objectives for which they were developed, [10]. WHO framework for monitoring and evaluating surveillance and response systems for communicable diseases commonly used for purpose of guiding the

evaluation process of public health surveillance systems. This framework can identify the major element of evaluation process**.**

2.2- Causes of acute flaccid paralysis

2.2.1- Polio viruses; Polioviruses are classified into three distinct serotypes (type 1, type 2, and type 3) based on their reaction with reference panels of neutralizing anti sera**.** They belong to the genus enterovirus in the family picornaviridae. Polioviruses are stable at acid pH and can survive for weeks at room temperature and for many months at 0°C to 8°C. As with other enteroviruses, polioviruses are resistant to ether, 70% alcohol and other laboratory disinfectants. Treatment with 0.3% formaldehyde, 0.1 N HCl, or free residual chlorine at a level of 0.3 to 0.45 parts per million rapidly inactivates polioviruses, as does exposure to a temperature of 50°C or higher or to ultraviolet light**.** Early work identified two distinct types of antigens in harvests from virus infected cells, which were designated as D antigen and C antigen. D antigen is largely but not exclusively associated with infectious virus and C antigen with empty capsids**.** More recent investigations have revealed the complexity of the antigenic structure of polioviruses. The poliovirus virion is small, with a diameter of 27 to 30 nm, and contains a single stranded molecule of RNA. A thin 20-sided shell composed of four virion proteins (VP1, VP2, VP3, VP4) surrounds the RNA**.** Several sites involved in virus neutralization have been identified on the surface of the poliovirus. For example, a site composed of amino acids 89 to 100 of VP1 is a major immunogenic site for type 2 and type 3 polioviruses, as judged by monoclonal antibodies induced in mice, [11].

2.2.2- Guillain–Barré syndrome (**GBS**); Guillain-Barré syndrome (GBS) is an autoimmune disease and a post-infection disease. The syndrome includes several pathological subtypes, the most common of which is multifocal demyelization disorder of peripheral nerves. In this review, the main clinical aspects and essential features of GBS are discussed along with

diagnostic and treatment approaches. Furthermore, the pathophysiology of GBS is reviewed, with an emphasis on symptom production and disease, [12]. Some are affected by changes in the function of the autonomic nervous system, which can lead to dangerous abnormalities in heart rate and blood pressure. The cause is unknown. The underlying mechanism involves an autoimmune disorder in which the body's immune system mistakenly attacks the peripheral nerves and damages their myelin insulation. Sometimes this immune dysfunction is triggered by an infection or, less commonly by surgery and rarely by vaccination. The diagnosis is usually made based on the signs and symptoms, through the exclusion of alternative causes, and supported by tests such as nerve conduction studies and examination of the cerebrospinal fluid, [13]. There are a number of subtypes based on the areas of weakness, results of nerve conduction studies and the presence of certain antibodies. It is classified as an acute polyneuropathy.[14] In those with severe weakness, prompt treatment with intravenous immunoglobulins or plasmapheresis, together with supportive care, will lead to good recovery in the majority. Recovery may take weeks to years. About a third has some permanent weakness (Williams). Globally, death occurs in about 7.5% of those affected. Guillain – Barré syndrome is rare, at one or two cases per 100,000 people every year. Both sexes and all parts of the world have similar rates of disease, [12]. The syndrome is named after the French neurologists Georges Guillain and Jean Alexandre Barré, who described it with French physician André Strohl in 1916, [15].

2.2.3- Transverse myelitis (TM); It is a rare neurological condition in which there is inflammation of the spinal cord. Transverse means that the inflammation extends across the entire width of the spinal cord. Partial myelitis and partial myelitis are terms used to define myelitis that affects part of the width of the spinal cord, [16]. TM is characterized by weakness and numbness of the limbs, deficits in sensation and motor skills, dysfunctional urethral and anal sphincter activities, and dysfunction of the autonomic nervous system that

can lead to episodes of high blood pressure. Signs and symptoms are variable and reflect the level of the affected spinal cord. The underlying cause of transverse myelitis is unknown. The spinal cord inflammation seen in TM has been associated with various infections, immune system disorders, or damage to nerve fibers, by loss of myelin, [16].

2.2.4- Peripheral neuropathy; often shortened to neuropathy, is a general term describing disease affecting the peripheral nerves, meaning nerves beyond the brain and spinal cord. Damage to peripheral nerves may impair sensation, movement, gland or organ function depending on which nerves are affected; in other words, neuropathy affecting motor, sensory, or autonomic nerves result in different symptoms. More than one type of nerve may be affected simultaneously. Peripheral neuropathy may be acute (with sudden onset, rapid progress) or chronic (symptoms begin subtly and progress slowly), and may be reversible or permanent. Common causes include systemic diseases (such as diabetes or leprosy), hyperglycemia-induced glycation, vitamin deficiency, medication (eg, chemotherapy, or commonly prescribed antibiotics including metronidazole and the fluoroquinolone class of antibiotics (Ciprofloxacin, Levaquin, Avelox etc.), traumatic Injury, including ischemia, radiation therapy, excessive alcohol consumption, immune system disease, coeliac disease, non-celiac gluten sensitivity, or viral infection. It can also be genetic (present from birth) or idiopathic (no known cause), [17].

2.2.5- Enterovirus; is a genus of positive-sense single-stranded RNA viruses associated with several human and mammalian diseases. Enteroviruses are named by their transmission-route through the intestine (enteric meaning intestinal), [18]. Serologic studies have distinguished 71 human enterovirus serotypes on the basis of antibody neutralization tests. Additional antigenic variants have been defined within several of the serotypes on the basis of reduced or nonreciprocal cross-neutralization between variant strains. On the basis of their

pathogenesis in humans and animals, the enteroviruses were originally classified into four groups, polioviruses, Coxsackie A viruses (CA), Coxsackie B viruses (CB), and echoviruses, but it was quickly realized that there were significant overlaps in. the biological properties of viruses in the different groups. Enteroviruses isolated more recently are named with a system of consecutive numbers: EV68, EV69, EV70, EV71, etc, [19]**.** Poliovirus, as well as coxsackie and echovirus, is spread through the fecal-oral route. Infection can result in a wide variety of symptoms, including those of: mild respiratory illness (the common cold), hand, foot and mouth disease, acute hemorrhagic conjunctivitis, aseptic meningitis, myocarditis, severe neonatal sepsis-like disease, acute flaccid paralysis, and the related acute flaccid myelitis, [20].

2.2.6- Botulism; The Clostridium botulinum bacteria are the cause of botulism. Vegetative cells of C. botulinum may be ingested. Introduction of the bacteria may also occur via endospores in a wound. When the bacteria are in vivo, they induce flaccid paralysis. This happens because C. botulinum produces a toxin which blocks the release of acetylcholine. Botulism toxin blocks the exocytosis of presynaptic vesicles containing acetylcholine (ACh), [21]**.** When this occurs, the muscles are unable to contract, [22]**.** Other symptoms associated with infection from this neurotoxin include double vision, blurred vision, drooping eyelids, slurred speech, difficulty swallowing, dry mouth, and muscle weakness. Botulism prevents muscle contraction by blocking the release of acetylcholine, thereby halting postsynaptic activity of the neuromuscular junction. If its effects reach the respiratory muscles, then it can cause respiratory failure, leading to death**,** [23].

2.2.7- Curare; Curare is a plant poison derived from - among other species - Chondrodendron tomentosum and various species belonging to the genus Strychnos, which belongs to the rainforests of South America. Some of the indigenous peoples of the region -

particularly Macusi - crush and cook the roots and stems of these plants and some other plants and then mix the resulting decoction with other phytotoxins and animal poisons to form a syrupy liquid into which the arrowheads are dipped. And their blow arrows tips. Curare has also been used medicinally by South Americans to treat insanity, dropsy, edema, fever, kidney stones, and bruises. Curare acts as a neuromuscular blocking agent that induces flaccid paralysis. This toxin binds to acetylcholine (ACh) receptors found in the muscles, preventing them from binding to ACh. As a result, ACh builds up within the neuromuscular junction, but since ACh cannot bind to the receptors in the muscles, the muscles cannot be stimulated. This toxin must enter the bloodstream for it to work. If the ALCAR affects the muscles of the respiratory system, its effects may become life-threatening, putting the victim at risk of suffocation, [21]**.**

2.3- Poliovirus surveillance

The public health importance of a health-related event and the need to have that event under surveillance can be described in several ways. Health-related events that affect many persons or that require large expenditures of resources are of public health importance. However, health-related events that affect few persons might also be important, especially if the events cluster in time and place (e.g., a limited outbreak of a severe disease). In other instances, public concerns might focus attention on a particular health-related event, creating or heightening the importance of an evaluation. Diseases that are now rare because of successful control measures might be perceived as unimportant, but their level of importance should be assessed as a possible sentinel health-related event or for their potential to reemerge. Finally, the public health importance of a health-related event is influenced by its level of preventability, [24].

Surveillance is most important part of the whole polio eradication initiative. Without surveillance, it would be impossible to pinpoint where and how wild poliovirus is still

circulating, or to verify that the virus has been eradicated. Surveillance identifies new cases and detects importation of wild polio virus**,** [25]**.** Poliomyelitis surveillance provides the information for programmatic action. It serves as a method for assessing the effectiveness of immunization strategies and as a tool for guiding efforts toward eradication of the disease and the virus. Surveillance is based on the detection, reporting, clinical investigation, and virologic testing of stool specimens from all patients with acute flaccid paralysis (AFP). Successful surveillance depends on the cooperation of public health workers, clinicians, epidemiologists, and virologists. Poliovirus surveillance provides the evidence for certification of eradication. Surveillance systems of proven sensitivity are required to document the absence of wild virus isolations from AFP patients, healthy children, and the environment. Key to poliovirus eradication and its certification is a global network of high-quality poliovirus laboratories capable of detecting wild virus when and where it occurs. Building the network began in 1986 in the Americas, the first region to declare its intention to eradicate poliomyelitis, and has continued in the other regions of the World Health Organization (WHO), following the global resolution of 1988**,** [26]. Sensitive surveillance systems are essential to polio eradication. They enable the identification of any residual viruses and are a crucial basis for certification of eradication. This section outlines the steps that will be taken to further build and maintain a comprehensive polio surveillance system for eradication**,** [27].

2.4- Polio eradication and endgame strategic plan, 2013 – 2018

This programme is a comprehensive long – term strategy that addresses what is needed to deliver a polio free world by 2018. The plan has four objectives:

2.4.1- Detect and interrupt all poliovirus transmission; this objective is to stop all wild polio transmission by the end of 2014 by enhancing global poliovirus surveillance, effectively implementing national emergency plan to improve OPV campaign quality in the

remaining endemic countries, and ensuring rapid outbreak response. It also includes stopping any new polio outbreak due vaccine-derived polio virus (VDPV) within 6 months of the index case.

2.4.2- Strengthen immunization system and withdraw oral polio vaccine; This objective will help hasten the interruption of wild poliovirus transmission, reduce the risk of wild and VDPV importation and spread and help build a strong system for the delivery of other life saving vaccines. To eliminate all VDPV risks, in the long- term all OPV must be removed from routine immunization programmes.

2.4.3- Contain and Certify; Before certifying eradication, laboratories and vaccine production facilities worldwide must properly contain all virus samples to protect against future outbreaks. Both recently infected and polio-free countries must address gaps in surveillance in order to detect suspected polio cases and confirm that transmission has been stopped. All regions must surpass three years without a case to attain polio free status, with eradication certification possible the following year.

2.4.4- Plan Polio's Legacy; the polio program provides a blueprint for accessing the most marginalized and hard-to-reach communities in the world. Sharing this expertise can benefit other health and development initiatives. For example, according to a 2010 study published in Vaccine, the program is estimated to have already produced tens of billions of dollars in savings by delivering vitamin A during polio campaigns. The program's sophisticated global surveillance and response network is used to combat other vaccine-preventable diseases, as well as to provide assistance during humanitarian emergencies. The plan calls for the responsible transfer of the polio program's assets to ensure lasting public health benefits.[28]

2.5- Environmental surveillance of poliovirus circulation

Environmental surveillance has been used successfully in monitoring enteric virus circulation and assessing the extent or duration of epidemic PV circulation in specific

populations. The rationale for environmental surveillance is based on the characteristic PV excretion pattern**.** Infected individuals excrete PVs in faeces for periods up to several weeks, whether or not they are symptomatic and therefore, large numbers of PVs may remain infectious in the environment for varying lengths of time depending on the immediate conditions, [6].

Wild-type PVs and cVDPVs have been detected in the environment even in the absence of reported cases of AFP, which is of major concern, since these PVs might be transmitted and continue to circulate in a non-immune population after the cessation of polio vaccination, [29]. A study conducted by Divizia and colleagues (1999), confirmed the environmental circulation in Albania of recombinant PV strains (Sabin-like PV type 2/wild PV type 1), sustained by a massive immunisation effort and by the presence in the environment of a PV type 1, isolated from a river 2 months before the first case of symptomatic AFP. An unusual highly diverged derivative of the Sabin PV type 2 strain was isolated from environmental samples during routine screening for wild-type PV in Israel, The extensive genetic divergence of the isolate from its parental Sabin PV type 2 vaccine strain suggested that the virus had replicated in one or more individuals for approximately 6 years, [30]. According to other studies, VDPVs (with 1.4% nucleotide divergence from the vaccine strain) were isolated from sewage and river water in Japan within 3 months following OPV vaccination, and several of these VDPV type 1 and 3 isolates showed increased neurovirulence, [31].

More recently, two Sabin-like PVs were found by environmental surveillance 8 and 11 months after any OPV vaccine was used in New Zealand and showed 99.8% as well as99.9% homology with Sabin PV type 2 vaccine strain in the VP1 region. This suggested that these PVs could have been excreted by recently vaccinated children (one or two months) visiting from a country using OPV**.** Furthermore, a highly evolved VDPV type 3 strain harbouring a

13% sequence drift from Sabin PV type 3 vaccine strain has been isolated from sewage in Estonia, [32].

Research has shown that PV isolates in the environment are genetically and epidemiologically related to those circulating in the community,[30]. Thus, the properties of PV isolates from sewage and river water would reflect those of PVs excreted from humans after OPV immunization and for susceptible individuals, VDPVs have the potential to be the causative agents of poliomyelitis, [33]. However, it is difficult to address the risk of infection from the environment, since there is little chance that individuals come into direct contact with raw sewage**.** In contrast, access to river water or any other water source (used by the community for domestic purposes) is easy and therefore, susceptible individuals should be regarded as at greater risk of infection from such water sources**.** Nonetheless, although it is possible to eliminate wild-type PV from the human community and environment, it will be difficult to eradicate poliomyelitis completely as long as OPV is not replaced by IPV, [29].
It is evident that environmental surveillance is still epidemiologically important, because the results of virus surveillance retrospectively reflect the properties of virus circulating in the community and it assesses the potential risk of infection from the environment as well as. The examination of composite human faecal samples through environmental surveillance links PV isolates from unknown individuals to populations served by the wastewater system**.** In addition, environmental surveillance provides valuable information, particularly in urban populations where AFP surveillance is absent and where persistent PV circulation or re-introduction is suspected**,** [29].

2.6- AFP surveillance system

An AFP surveillance system is conducted to increase case yield of poliomyelitis. This includes collection of 2 stool samples within 14 days of onset of paralysis and identification of virus, and control of the outbreak and strengthening immunization in that area.

AFP cases rather than just “suspected poliomyelitis”, serves many purposes;

First, AFP surveillance substantially increases the sensitivity of the surveillance system and allows it to detect paralytic poliomyelitis due to wild poliovirus transmission in the population.

Secondly, AFP surveillance provides objective data with which to monitor the quality of surveillance in an individual country or large population group. AFP Surveillance also helps to monitor progress in polio eradication when polio exists in a country as well as helps to define when polio is gone from the country or area.

Finding and reporting children with acute flaccid paralysis (AFP); the first links in the surveillance chain are the staff in all health facilities from district health centres to large hospitals. They must promptly report every case of acute flaccid paralysis (AFP) in any child under 15 years of age. In addition, public health staffs make regular visits to hospitals and rehabilitation centres to search for AFP cases which may have been overlooked or misdiagnosed. In areas with few formal health workers, some countries use “community” surveillance, where pharmacists, traditional healers or clerics may serve as a source of information on paralysed children. The number of AFP cases reported each year is used as an indicator of a country’s ability to detect polio – even in countries where the disease no longer occurs. A country’s surveillance system needs to be sensitive enough to detect at least one case of AFP for every 100 000 children under 15 – even in the absence of polio.

Transporting stool samples for analysis; In the early stages, polio may be difficult to differentiate from other forms of acute flaccid paralysis, such as Guillin- Barré Syndrome, transverse myelitis, or traumatic neuritis. All children with acute flaccid paralysis (AFP) should be reported and tested for wild poliovirus within 48 hours of onset, even if doctors are confident on clinical grounds that the child does not have polio. To test for polio, faecal

specimens are analysed for the presence of poliovirus. Because shedding of the virus is variable, two specimens – taken 24-48 hours apart – are required. Speed is essential, since the highest concentrations of poliovirus in the stools of infected individuals are found during the first two weeks after onset of paralysis. Stool specimens have to be sealed in containers and stored immediately inside a refrigerator or packed between frozen ice packs at 4–8 degrees celsius in a cold box, ready for shipment to a laboratory. Undue delays or prolonged exposure to heat on the way to the laboratory may destroy the virus. Specimens should arrive at the laboratory within 72 hours of collection. Otherwise they must be frozen (at -200 degrees celsius), and then shipped frozen, ideally packed with dry ice or cold packs. The procedure is known as the “reverse cold chain”.

Isolating poliovirus; In a laboratory, virologists begin the task of isolating poliovirus from the stool samples. If poliovirus is isolated, the next step is to distinguish between wild (naturally occurring) and vaccine-related poliovirus. This is necessary because the oral vaccine consists of attenuated live polioviruses and resembles wild virus in the laboratory. If wild poliovirus is isolated, the virologists identify which of the two surviving types of wild virus is involved. Wild poliovirus type 2 has not been recorded since 1999.

Mapping the virus; Once wild poliovirus has been identified, further tests are carried out to determine where the strain may have originated. By determining the exact genetic makeup of the virus, wild viruses can be compared to others and classified into genetic families which cluster in defined geographical areas. The newly-found poliovirus sequence is checked against a reference bank of known polioviruses, allowing inferences about the geographical origin of the newly found virus. When polio has been pinpointed to a precise geographical area, it is possible to identify the source of importation of poliovirus – both long-range and

cross-border. Appropriate immunization strategies can then be determined to prevent further spread of the poliovirus,[27]**.**

2.7- Structure of the AFP surveillance system

The structure of the surveillance system is defined by legislation (laws, and regulations, including IHR 2005), the strategy for implementing activities, the implementers and stakeholders, and how they relate to each other and to the various networks and partnerships.

The indicators that measure different aspects of the structure of a system constitute part of the evaluation indicators, [34].

2.7.1- Legislation1 for surveillance

Public health legislation and regulations, including IHR 2005 (for example, regulations governing notifiable diseases and other communicable diseases of public health importance) provide the regulatory framework for the implementation of surveillance and response systems. Some of these laws and regulations have become outdated and may require some amendments. Periodic review and evaluation will establish the relevance, adequacy and need for update.

The IHR 2005 constitute an important component of public health legislation and aim to ensure adequate measures for the protection of public health and strengthening of the global public health response to the international spread of diseases. Their purpose is to ensure maximum security against the international spread of diseases with a minimum interference with the international traffic and trade. Member States to develop and enhance their capacities for surveillance, reporting, notification, verification, response, and collaboration, and their activities concerning designated airports, ports and ground crossings after an initial assessment, [35].

2.7.2- Surveillance strategy

The surveillance strategy depends on the diseases under surveillance, the objectives of the surveillance system, the methods for conducting surveillance and how the surveillance data are used to inform public health policy and practice. For example, an early warning surveillance system needs to be more comprehensive while a system that serves a programme monitoring function could be conducted through sentinel sites.

In a multi-disease surveillance system, a limited degree of integration and coordination may be required for efficiency. Some countries have also embarked on a structured approach to strengthening national surveillance systems through prioritization of diseases for surveillance, systematic assessments of existing systems, development of action plans to strengthen the systems, implementation of these plans, and monitoring and evaluation, [36].

2.7.3- Implementers and stakeholders

The important surveillance levels are central, intermediate (province /region, district) peripheral (sub-district, health facility) and community level. Each of these levels may comprise formal and private health-care providers that may or may not be included in the surveillance system.

Other stakeholders and implementers include the disease-specific programmes, public health laboratories, and public health training institutions. The roles and responsibilities of the implementers and stakeholders, and how they relate to each other should be clearly articulated. The flow of surveillance data through the system, and the dissemination and utilization of information needs to be clear and known to implementers and stakeholders, and the mechanism for response should be well coordinated across the different levels of surveillance, [37].

2.7.4- Networking and partnership

Surveillance of communicable diseases requires concerted efforts and collaboration between stakeholders and partners in and between countries. At country level, intersectoral collaboration and coordination between key partners is crucial for the implementation of effective and comprehensive surveillance systems.

Various surveillance networks and partnerships exist at country level and between countries.

The laboratory network is a good example of a country-level network, while collaboration on surveillance and response activities between countries bordering one another represents intercountry networking. Intersectoral collaboration is a necessity in order to implement early warning and response functions.

2.8- Surveillance quality

The quality of the surveillance system is defined by attributes such as completeness, timeliness, usefulness, sensitivity, positive predictive value (PPV), specificity, representativeness, simplicity, flexibility, acceptability, and reliability.

While monitoring will help identify changes in the attributes over time, periodic evaluations should assess the extent of the improvements in the quality of surveillance systems, the data they generate, and the type and quality of the public health responses to the information.

Surveillance attributes can be evaluated using quantitative and qualitative methods.

Centers for Disease Control and Prevention and the framework for evaluating public health surveillance systems for early detection of outbreaks illustrate some of the approaches;

2.8.1- Completeness

Completeness in surveillance can have varying dimensions and may include the following:

- Completeness of reporting sites/surveillance forms
- Completeness of case reporting
- Completeness of surveillance data

2.8.1.1- Completeness of reporting sites/surveillance forms

Completeness of reporting sites refers to the proportion of reporting sites that submitted the surveillance report irrespective of the time when the report was submitted. This is measurable in situations where the surveillance system is such that the number of reporting sites or expected surveillance reports is known, as in the case of "zero reporting". Examples include zero reporting of notifiable conditions, weekly or monthly reporting of surveillance data.

2.8.1.2 Completeness of case reporting

Completeness of case reporting refers to the match between the number of cases reported and the actual number of cases. This can be obtained by comparing the number of the reportable conditions reported to the next higher level over a period of time with the number of cases recorded in the patient register over the same period of time. The capture and recapture method can also be used to estimate the completeness of case reporting.

In a system where the level of reporting of detected cases is very high, the completeness of case reporting will be directly related to the sensitivity of the surveillance system.

2.8.1.3- Completeness of surveillance data

Completeness of surveillance data is the match between the expected minimum data requirement and what is reported. The following questions are useful in determining completeness of surveillance data and its implications on public health actions;

- Are all the data on each of the required variables in a surveillance form collected, registered and compiled?
- If not, which are the variables that are not routinely collected and what is the problem in their collection?
- What is the implication of the missing data on the quality of the surveillance data?
- How can this problem be resolved?

2.8.2 Timeliness of reporting

The single most important measure of timeliness is whether data are submitted in time to begin investigations and implement control measures. Timeliness of reporting should be measured against standards developed by each country.

Important aspects of timelines of reporting in a communicable disease surveillance system include:

- Timeliness of immediate notification, i.e. within 24 hours
- Timeliness of weekly reporting
- Timeliness of monthly reporting

2.8.3- Usefulness of the surveillance data and the surveillance system

Surveillance data have many potential uses. The usefulness of the surveillance data and the system should be evaluated in the context of the two key surveillance functions i.e. early warning and routine programme monitoring. An early warning system serves to:

- Detect outbreaks of diseases in a timely manner
- Inform appropriate and effective public health responses
- Determine the distribution and spread of disease
- Illustrate the epidemiology of new diseases
- Provide information to categorize the outbreak as of national or international importance
- Provide data to evaluate control measures.

The surveillance systems for monitoring effectiveness of control programmes serve to:

- Estimate disease burden
- Identify risk groups
- Determine incidence trends over time
- Measure outcomes and impacts of preventive and public health interventions

- Evaluate the overall control interventions.

Evaluations should determine the extent to which surveillance objectives are being met.

The section below contains examples of how to assess the usefulness of public health data and surveillance systems.

2.8.3.1- Usefulness of surveillance data in an early warning system

As indicated above, surveillance systems with an early warning function mainly serve to provide data that can be used to detect and respond to outbreaks or public health threats in a timely and appropriate manner.

To evaluate the actual usefulness of the data for this purpose, the surveillance data in an early warning system over the previous year should be reviewed to identify cases and suspected outbreaks for which an epidemiological response was required. For the suspected outbreaks, it should be determined whether:

- The suspected outbreaks were detected early by the system
- Epidemiological investigations were undertaken
- The response was initiated in a timely manner
- The surveillance data were used to guide the public health response.

In addition, the factors that led to inappropriate or lack of use of surveillance data should be determined.

2.8.3.2- Usefulness of surveillance data with a programme monitoring function

Evaluators should ask both the surveillance staff and the end users of the data to list the different ways they have been able to use the data, e.g. for case detection, planning, policy, etc. They should also ask them to specify factors relating to lack of use of the data and identify the data elements that are not useful.

2.8.4- Simplicity of the system

Simplicity refers to the structure of the system and the ease of implementation. As part of the structure, the simplicity of information flow from its point of generation to the end users should be considered. The structure for response to ensure that all the different structures are complementary to one another should also be reviewed.

In terms of implementing the system, the amount and type of information collected, ease of collection, compilation, analysis, reporting, and ease of using the reporting format should all be considered.

Analyzing the simplicity of a surveillance system does not easily lend itself to quantitative evaluation, and remains a largely subjective process. The evaluation team can determine the perceived simplicity of the system from the persons responsible for operating and managing the existing system. Some of the suggested questions to be posed include:

- In your experience/judgment do you believe any part of the surveillance system is unnecessarily complicated?
- What changes to the system do you believe would make it easier to implement while still achieving its purpose?

Depending on the responses to these initial questions, the evaluators can follow up with more specific questions to determine the features of the system which are identified as problematic, what changes could be made and why the changes might improve the system.

2.8.5- Acceptability of the system

Acceptability of a system is a reflection of the willingness of the surveillance staff to implement the system, and of the end users to accept and use the data generated through the system.

Evaluation of the acceptability should establish if the staff implementing the surveillance system, or who otherwise support the system, views it as appropriate to their needs. In cases

where the system is found to be inappropriate, suggestions for improvements to make it more acceptable by the implementers and end users of the data should be made.

2.8.6- Flexibility of the surveillance system

Flexibility refers to the ability of the system to be adapted to changing needs such as the removal or inclusion of additional diseases, modification of the reporting frequency, data requirement needs, etc. An early warning system may need to be adapted from time to time to meet additional case detection needs, for example by:

- Adapting the system to the required data collection needs for signals and alerts
- Collecting exposure information and data requirements for outbreak management
- Increasing coverage by increasing data sources or data providers
- Modifying the case definitions in use
- Redefining the alert and action threshold values.

The system should also be flexible enough to shift from providing the needs for outbreak detection to outbreak response and control.

The following questions could help in ascertaining the flexibility of a surveillance system:

- Could you please describe how your system was adapted to changes and new challenges?
- Are there existing elements that make your system difficult to adapt?
- Briefly describe circumstances when it was not possible to adapt the surveillance system and why it was not possible to adapt it.

2.8.7 Sensitivity in surveillance

Sensitivity in surveillance refers to the proportion of actual cases in a population that are detected and notified through the system. Sensitivity is particularly important in an early warning system designed to detect outbreaks. It is usually not practical to obtain highly accurate estimates of sensitivity as this requires the true number of cases in the population be

known, something that is almost impossible, and that the diagnosis of reported cases be confirmed to eliminate “false positives.”

Sensitivity in surveillance can be described at three different levels:

2.8.7.1- Sensitivity of the surveillance case definition

This refers to the ability of the case definition to identify all possible cases in the community. A surveillance case definition is very sensitive but it may create problems by increasing the number of false positives. A laboratory-confirmed case definition may not be very sensitive in countries where laboratory testing is not widely available.

2.8.7.2- Sensitivity of the detection of events for public health response

This refers to the proportion of cases detected and reported through the system. It includes the use of "thresholds" which should trigger intervention.

2.8.7.3 Sensitivity of the notification system

This refers to the proportion of cases meeting the case definition (regardless of the sensitivity of the case definition itself) that are detected and notified as they should be.

2.8.8 - Specificity in surveillance

Specificity refers to the proportion of persons without the disease that are considered by the surveillance system as not having the disease.

Very low specificity would result in the surveillance system indicating many "false" outbreaks, and the staff spending a lot of resources to verify and investigate.

2.8.9- Positive predictive value

The positive predictive value (PPV) is the proportion of people the surveillance system indicates as having the disease who actually have it. All positives PPV = true positives

The PPV for surveillance can be viewed in three different ways:

2.8.9.1 The PPV of the case definition

The positive predictive value of the case definition (PPVcd) is the proportion of actual cases that meet the case definition (PPVcd). This is calculated as: total number of actual cases PPVcd = cases meeting case definition

The higher the PPVcd, the better is the case definition. The PPVcd is affected by the sensitivity and the specificity of the case definition, and the prevalence of the condition in the population.

Improving the specificity of the case definition would involve making the case definition more restrictive (which may decrease its sensitivity).

A low PPVcd means that either the case definition is not adequate or is not applied appropriately. In this case, it may be necessary to review the case definition in use and update or recommend the training of clinical staff in its proper use.

2.8.9.2- The PPV of case detection

The positive predictive value of detecting cases (PPVdc) is the proportion of diseased persons that are detected (clinically or through laboratory confirmation) by the surveillance system.

2.8.9.3- The PPV of outbreak detection

The PPVdo of detecting outbreaks refers to the proportion of the alerts detected by the system that were indeed confirmed after initial verification. Total alerts received / detected PPVdo = total alerts confirmed as outbreaks

The higher the PPVo, the better is the surveillance system. If the value of the PPVdo is low then the thresholds used for triggering an alert should be made more specific (higher values) without impairing the sensitivity too much.

2.8.10- Representativeness of the surveillance system

Representativeness refers to the degree to which the reported cases reflect the occurrence and distribution of all the cases in the population under surveillance. Geographical representativeness is particularly important in an early warning system to ensure detection of outbreaks of infectious diseases. In a situation where the reported cases of a particular health condition in a population are not representative of all the cases that are occurring in that population, the disease prevention and health promotion priorities may be inappropriate and inadequate compared to the actual needs.

Because the true frequency and distribution of the health condition in a population is usually unknown, it is impossible to measure representativeness accurately. If population-based studies have been conducted and reliable estimates made, then evaluators can compare the frequency and distribution reported by the surveillance system to that established by those studies. The degree to which the reported data corresponds to the data from population-based studies is a measure of the representativeness of the reported data. However, if such population-based data are not available, evaluators must decide whether the importance of knowing the representativeness of the reported data is sufficient to recommend and/or implement one or more of the following:

- A population-based study of the incidence or prevalence of a particular disease or syndrome. This would provide the most useful data, but is time-consuming and very costly.
- A study of the demographic characteristics of clinic/health facility attendees and a comparison of this information with that of census data for the same jurisdiction. This is the easiest to do if reliable census data exist. It will not measure representativeness, but it will measure the degree of opportunity for the reported data to be representative.

- A study to determine the proportion or characteristics of the population that seek medical care from non-governmental facilities. This, combined with follow-up evaluation, will provide information that can be used directly to adjust projections of the occurrence of the health condition in the population.
- A study of reporting of notifiable conditions by different care providers e.g. nongovernmental, military, private, etc.
- A study of the diagnostic and reporting practices of the health service.
- A study on health-seeking behavior among the public, [8].

2.9- WHO-recommended surveillance standard of poliomyelitis

2.9.1- Rationale for surveillance

Poliomyelitis is targeted for **eradication**. Highly sensitive surveillance for acute flaccid paralysis (AFP), including immediate case investigation, and specimen collection are critical for the detection of wild poliovirus circulation with the ultimate objective of polio eradication. AFP surveillance is also critical for documenting the absence of poliovirus circulation for polio-free certification

2.9.2- Recommended case definition

- **Clinical case definition**

Any child under 15 years of age with AFP* or any person of any age with paralytic illness if polio is suspected

- **Case classification**

- **Suspected case:** A case that meets the clinical case definition

- **Confirmed case:** was defined as any person with symptoms of AFP and a spinal cord lesion largely restricted to grey matter on magnetic resonance imaging scanning Including Guillain-Barré syndrome.

2.9.3- Recommended types of surveillance

- Aggregated data on AFP cases should be included in routine monthly surveillance reports
- Designated reporting sites at all levels should report at a specified frequency (e.g. weekly or monthly) even if there are zero cases (often referred to as "zero reporting")
- All outbreaks should be investigated immediately
- All AFP cases under 15 years of age or with paralytic illness at an age where polio is suspected should be reported immediately and investigated within 48 hours, and two stool specimens should be collected 24-48 hours apart and within 14 days of the onset of paralysis
- Active surveillance: Regular weekly visits should be made to selected reporting sites that are most likely to admit acute flaccid paralysis patients (e.g. major hospitals, physiotherapy centers) to look for unreported AFP cases

2.9.4- Recommended minimum data elements

Aggregated data

- Number of third doses of oral polio vaccine (OPV3) administered to infants
- Number of AFP cases

Case-based data

(To be linked to specimen-based data for analysis)

- Unique identifier
- Geographical area (e.g. district and province names)
- Date of birth
- Sex: (male, female, unknown)
- Date of paralysis
- Date of notification
- Date of case investigation
- Total polio vaccine doses received: (yes, no, unknown)
- Fever at onset of paralysis: (yes, no, unknown)
- Progression of paralysis within four days: (yes, no, unknown)
- Asymmetric paralysis: (yes, no, unknown)
- Date of 60-day follow-up examination
- Findings at 60-day follow-up: (residual weakness, no residual weakness, lost to follow-up, death before follow-up, unknown)
- Final classification: (confirmed, compatible, discarded)

Specimen-based data; (To be linked to case-based data for analysis)

- Unique identifier
- Specimen number: (first specimen, second specimen, other, unknown)
- Date of onset of paralysis
- Date of last OPV dose
- Date of collection of stool specimen

- Date stool specimen sent to laboratory
- Date stool specimen received in laboratory
- Condition of stool: (good, poor, unknown)
- Date final culture results sent from laboratory to EPI
- Date intratypic differentiation results sent from laboratory to EPI
- Results
- Polio type1 isolated? Yes wild, yes Sabin, yes, pending intratypic differentiation, yes mixture of wild and Sabin, no polio type 1 isolated, specimen not processed, unknown
- Polio type 2 isolated? (Yes wild, yes Sabin, yes, pending intratypic differentiation, yes mixture of wild and Sabin, no polio type 1 isolated, specimen not processed, unknown)
- Polio type 3 isolated? (Yes wild, yes Sabin, yes, pending intratypic differentiation, yes mixture of wild and Sabin, no polio type 1 isolated, specimen not processed, unknown)
- Non-polio enterovirus (NPEV) isolated? (Yes, no NPEV isolated, specimen not processed, unknown)

2.9.5- Recommended data analyses, presentations, reports

Aggregated data

- Cases and incidence rate by month, year and geographical area
- OPV3 coverage by year and geographical area
- Completeness/timeliness of monthly reporting

Case-based data

Same as aggregated data plus the following:

- Confirmed cases by age group, sex, immunization status, geographical area, month and year
- Confirmed cases from which wild poliovirus was isolated, by geographical area, sex, month and year
- Compatible cases by geographical area and month
- All suspect cases by final classification
- Non-polio enterovirus isolation rate

2.9.6- Principal uses of data for decision-making

- Track wild poliovirus circulation
- Use data for classifying cases as confirmed, polio-compatible or discarded (see special aspects section)
- Monitor routine coverage, as well as performance of surveillance (by means of the standard indicators listed above) in all geographical areas and focus efforts in low-performing geographical areas
- Monitor seasonality to determine low season of poliovirus transmission in the interest of planning national immunization days (NIDs)
- Identify high-risk areas with a view to planning mop-up immunization campaigns
- Provide evidence to certification commissions of the interruption of wild poliovirus circulation

2.9.7- Special aspects

The scheme in the following illustration should be used to classify AFP cases. Countries should use the clinical classification until their surveillance performance meets the following three criteria:

- A non-polio AFP rate of at least 1/100 000 children under 15 years of age
- Two adequate specimens collected from at least 60% of detected AFP cases
- All specimens processed in a WHO-accredited laboratory

2.9.8- other criteria

- Percentage of all expected monthly reports that were received: target >=90%
- Percentage of AFP cases investigated within 48 hours: target >=80%
- Percentage of AFP cases with two adequate stool specimens collected 24-48 hours apart and <=14 days="" after="" onset:="" target="">=80%
- Percentage of specimens arriving at the laboratory in good condition: target >=80%
- Percentage of specimens arriving at a WHO-accredited laboratory within three days of being sent: target >=80%
- Percentage of specimens for which laboratory results sent within 28 days of receipt of specimens: target >=80%.

2.10- AFP surveillance system in Sudan

Sudan initiated polio eradication efforts in 1994. The last endogenous wild poliovirus case was reported in 2001. An importation in 2004 led to an outbreak that spread to other countries in the Horn of Africa. The last case in the 2004–2005 outbreak was reported in June 2005. Sudan subsequently had importations of wild poliovirus in 2007 and 2008, with

one and two cases, respectively. The last wild poliovirus outbreak was in 2009, when an importation led to five cases in two states. The genomic sequencing indicated a link with wild poliovirus circulating in South Sudan. The last reported wild poliovirus case was reported in March 2009. Sudan has been polio-free since then.

Routine immunization

The Expanded Programme on Immunization started in 1976. The strength of the routine immunization programme and high level of population immunity have been the key factors to limiting circulation of wild poliovirus despite repeated importations over the last decade.

National immunization days

Since 1994, Sudan has conducted national immunization days. Following the last outbreak which ended in 2009, Sudan has conducted national immunization days at least twice annually and subnational immunization days in high-risk states (e.g. Darfur states bordering Chad) to boost population immunity. Post-campaign finger-marking by independent monitoring routinely demonstrates coverage rates above 90%.

Acute flaccid paralysis surveillance

Although acute flaccid paralysis surveillance was started in 1996, Sudan intensified surveillance activities in 1999. The acute flaccid paralysis surveillance system consistently meets global certification standards at national and subnational levels for both the non-polio acute flaccid paralysis case rate (≥2 per 100 000) and stool specimen adequacy (80%) , [38].

2.11- Supplementary methods to increase surveillance sensitivity

With time, innovative surveillance methods and strategies were developed to adapt to settings where the application of traditional approaches could not yield satisfactory

sensitivity. In countries affected by conflict or complex emergencies such as Afghanistan, Somalia and South Sudan, active surveillance cannot be conducted in many areas because of limited availability and usage of health facilities. Instead, AFP surveillance has successfully been extended into communities through setting up networks of community-level AFP focal points and AFP 'informants' (i.e., village leaders, teachers, pharmacy keepers, traditional healers, mullahs) who report the occurrence of AFP cases to district and province-level surveillance teams. Community surveillance for AFP is also successfully being used in hard-to-access areas of countries not affected by conflict. Other supplementary methods to increase the sensitivity of surveillance include the collection of stool specimens from healthy direct contacts of AFP cases and / or from nearby communities, particularly when specimen collection from the index case is delayed beyond two weeks after the onset of paralysis. If poliovirus is isolated from a direct contact of a virus-negative AFP case, a scenario which does occur several times each year in the remaining infected areas, the index case is confirmed as polio. Also, in areas with low surveillance quality, or whenever surveillance needs to be enhanced such as following the detection of a new outbreak, national programs may conduct special 'AFP case search activities' during supplementary immunization campaigns, or by visiting health facilities and conducting retrospective record searches. Such searches help to improve surveillance, particularly if they show that AFP cases were missed in the past, [39].

2.12- Previous studies

Multi of studies in this field were reviewed, analyzed and compared with this study such as:

Study (a) about: ***Acute flaccid paralysis in North East Delta, Egypt was a retrospective analysis of prospectively collected surveillance data, 2009- 2017***.

The study objectives were to examine the annual incidence of reported AFP cases, the seasonal and geographical variations of AFP, the level of AFP surveillance performance indicators and the differential diagnosis of reported AFP cases during the study period.

Study was a record-based descriptive study.

Shows that the reported non-polio AFP rate was at least 2.8/100,000 every year, MOHP hospitals were the main source of AFP case reporting (57.1%) of cases.

Published at "Journal of Infection and Public Health" available at http://www.elsevier.com/locate/jiph .

Study (b) about*:* ***Strengthening the Acute Flaccid Paralysis (AFP) Surveillance Component of the Polio Eradication Initiative through Short Message Service (SMS) Reminders; Experience from Sokoto State, Nigeria 2014***.

To ascertain the awareness of AFP case definition and detection by health care workers and evaluate the impact of SMS-based reporting on the AFP surveillance system.

The experimental study has a one-group pretest-posttest design. It was conducted in three stages. The first stage was the baseline assessment of the knowledge, attitude, and practice (KAP) of the health care workers. The second stage entailed two interventions, the first part being the training of both focal points and clinicians and the second part being the use of SMS reminders for AFP reporting for a period of 36 weeks in addition to the routine method. The third stage of the study was the follow-up assessment of health care worker awareness and knowledge of AFP and the surveillance process.

The study showed improved knowledge gap of health care workers on AFP surveillance between pre and post intervention. It shows that this approach of improved surveillance will

be effective in countries in hard to reach, access compromised or countries/place without sufficient surveillance staff.

It was published at "Europe PMC Author Manuscripts ". Available at **http://europepmc.org/Funders/**

Study (c) about*: Evaluation of Ondo State acute flaccid paralysis surveillance system (2009-2013).*

To describe the key attributes and the process of operation, determine the efficiency and effectiveness of the surveillance system and to make appropriate recommendations for improving the surveillance system.

The evaluation was conducted using the Center for Disease Control and prevention (CDC) Updated Guidelines for Evaluating Public Health Surveillance System, 2001". The evaluation included interview of stakeholders, review of relevant document and resource materials and the analysis of 2009 – 2013 data from the Ondo state AFP surveillance system.

The AFP surveillance system in Ondo State is simple, flexible and sensitive (annualized NPAFP rate of 3.8/100,000 children less than 15 years in 2009, 4.0/100,000 in 2010, 4.3/100,000 in 2011, 4.1/100,000 in 2012 and 6.4/100,000 in 2013). The system is representative, stable and generates high quality data (97%, 98%, 97%, 98% and 99% from 2009-2013. Partner agencies provided 90 – 95% of the system's operating resources. The system is acceptable to stakeholders but has a low positive predictive value (1.2% cumulatively from 2009 to 2013). The state has however not recorded any case of WPV since2010.

Published at 17th International Congress on Infectious Diseases / International Journal of Infectious Diseases 45S (2016) 1–477. Available at file:///C|/Users/nokia/Documents/alhaj%20saad.Data/PDF/0928132020/dx.doi.org/10.1016/j.ijid.2016.02.640

Study (d) about: ***Surveillance of acute flaccid paralysis in Akwa Ibom State, Nigeria 2004-2009.***

Carried out to describe the characteristics of reported acute flaccid paralysis cases between 2004 and 2009, evaluate the performance of the acute flaccid paralysis surveillance system using indicators recommended by the World Health Organization.

A retrospective study was conducted among children, 0-15 years, by the World Health Organization (WHO) and Epidemiology unit of State Ministry of Health (SMOH), Uyo.

This study showed high levels of surveillance performance with some challenges in reverse the cold chain system

Published at "Pan African Medical Journal – ISSN: 1937- 8688" available at www.panafrican-med-journal.com.

Study (e) about: ***Sensitivity of Acute Flaccid Paralysis Surveillance in Nigeria (2006-2015).***

Was conducted a retrospective review of AFP surveillance performance in Nigeria between 2006 and 2015 from the AFP database at the WHO Country Office. Also reviewed rapid surveillance assessment reports conducted in various states of the country within the reporting period to identify surveillance strengths and gaps as well as recommendations put forward to improve polio surveillance performance.

The AFP surveillance performance in Nigeria during the reporting period demonstrated high level of sensitivity that can be relied upon to timely detect polio outbreak.

Available at http://infectious-diseases-and-treatment.imedpub.com/archive.php

Study (f); about: ***Strategies for Improving Polio Surveillance Performance in the Security-Challenged Nigerian States of Adamawa, Borno, and Yobe During 2009–2014.***

To identify areas of polio transmission and promptly detect possible cases of importation in these states, to identify strategies that were implemented to improve polio surveillance.

Was conducted a retrospective review of acute flaccid paralysis surveillance in the security-compromised states between 2009 and 2014, using the acute flaccid paralysis database at theWorld Health Organization Nigeria Country Office.We also reviewed the reports of surveillance activities conducted in these security-challenged states,

The strategies implemented in the security-challenged states improved the quality of polio surveillance during the review period.

Published at "The Journal of Infectious Diseases" available at http://creativecommons.org/licenses/by/3.0/igo/legalcode

Study (g); about: ***Evaluation of the acute flaccid paralysis (AFP) surveillance system in Mwenezi district, Masvingo, 2018: a descriptive study***

Was evaluated the AFP surveillance system in Mwenezi district.

Conducted a surveillance system evaluation using the updated Centers for Disease Control guidelines for evaluating public health surveillance systems. Was interviewed health workers in Mwenezi district and looked at AFP records from January to December 2017

The main reasons for failure to report a case in 2017 were the vastness of the district with bad road networks as well as lack of a dedicated vehicle to carry out EPI outreach activities. About a quarter, 24%, of the health workers did not know the specimen that is used in AFP diagnosis. The AFP surveillance system in Mwenezi district was performing poorly due to lack of active search of cases in the community caused by disruption of EPI outreach activities.

Available at https://doi.org/10.1186/s13104-018-3981-6

Study; (h) about: ***Evaluation of Acute Flaccid Paralysis Surveillance System's Structure at Al-Russafa Health Directorate in Baghdad City***

Aimed to evaluation of Acute Flaccid Paralysis Surveillance (AFP) System's Structure at Al-Russafa Health directorate in Baghdad City

Descriptive study using evaluation approach conducted to measure the efficiency of AFP Surveillance System structure for period from November 27th 2014 to June 30th 2015. The study adopted the non-probability multi-stage sampling approach. As nineteen health facilities under surveillance are chosen and interview is conducted with a total of 50 health worker how are involved in the AFP Surveillance System. The data are gathered from sample by using questionnaire specifically developed for each of sample stage.

The study results indicates that the certain of system's structure component are efficient and available such as the system owns a legal authorization and availability of field's guide that is used in AFP surveillance. On the other hand, the study proved that some of system's structure elements need to strengthen and enhance such as unavailability of special budget line, lack of necessary materials to work and lack of training for workers in the system.

Published at "Iraqi national journal of nursing specialties, 2016

Study; (i) about: ***Evaluation of acute flaccid paralysis surveillance system in Kerkuk governorate***

Aimed of the present study is to evaluate the acute flaccid paralysis surveillance system in Kerkuk Governorate

Was used Program evaluation of the Directorate of health, primary health care districts (sectors), hospitals, and primary health care centers in Kerkuk Governorate. All the responsible personnel for the acute flaccid paralysis surveillance system were interviewed and included in addition to the relevant records. Ordinary percentages were used in the description of acute flaccid paralysis cases. While rates were used in the evaluation of the performance indicators.

The study revealed a sensitive acute flaccid paralysis surveillance system (Non polio acute flaccid paralysis rate 3.98 and 3.1 in 2005 and 2006 respectively) with clear field guidelines.

All the performance indicators were high indicating a high quality surveillance system in Kerkuk Governorate.

Authored by; Dr. Zaid M. Yassen - Department of Community Medicine, Mosul College of Medicine, University of Mosul

Study; (j) about: ***Evaluation of the Acute Flacid Paralysis (AFP) Surveillance System in Bikita District Masvingo Province 2010***

A descriptive cross-sectional study was carried out in Bikita district. A pre tested interviewer-administered questionnaire was used to elicit information from health workers to determine their knowledge on the operations and usefulness of the surveillance system.

Health worker's knowledge on AFP was low and all interviewed workers needed training surveillance. The system was found to be flexible but unacceptable. Reasons for failure to detect AFP cases could be, no cases reporting to the centers, lack of knowledge on health workers hence failure to recognize symptoms, high staff turnover.

Found at: http://www.biomedcentral.com

Chapter three

Material and methods

3- Material and methods:

3.1- Study Design:

A retrospective- descriptive facility based study is conducted on Surveillance System's Structure and AFP surveillance data base, River Nile state in the period of time 2018- 2020

3.2- Study area

River Nile State is located north of Khartoum State. It is located between latitudes 16-22 north and longitude 30-32 east, and has an area of 124 thousand square kilometers. It has a population of about 1,212,000 people.

River Nile State relies on traditional and modern agriculture for its economy. Among the most important agricultural products are soybeans, vegetables and fruits. In the River Nile State, there is the cement industry, which is a flourishing industry. Mica is one of the most important untapped minerals. The country is very rich in this important mineral, as there are some other minerals, such as gold, which people extract in traditional ways, [40].

There are about 1962 schools in the state, and there are three universities and a number of research centers. There are about 34 hospitals and about 156 health centers, [41], [42].

3.3- Study population

The study population comprised all reporting sites/units, "N= 50 sites" from all the levels and worker who are reporting the AFP cases, "N= 50 focal persons", localities officers, "N= 6 officers" and state level," N= 3"

3.4- Sample size

Total coverage of surveillance officers and workers in the AFP surveillance system, were covered as; All health facilities under AFP surveillance in the state, focal persons

working in health facilities, department officers in localities and system coordinators at the state level.

3.5- Data collection tools and analysis procedures:

Multiple tools were used for this study including the group discussion with system coordinators, chick list of observations, analysis form for records and questionnaire for officers and focal persons

3.5.1- Questionnaire design; Questionnaire designed and developed according to WHO framework for communicable diseases surveillance, it is contain on variables relate with AFP surveillance as;

- Structure variables; including: (organization, legislation, strategy, available offices, existing plans of actions, coordination, network, lab facilities)
- Surveillance resources; including: (doctors, public health officers, lab technicians, medical assistance, nurse and statisticians)
- Operational resources; including: (financial, materials, supplies) were Supplies include; (register book, forms, case definition, guidelines, posters, transport and communication means)
- Cases detection and registration variables
- Diagnosis confirmation variables
- Reporting, information, dissemination, response and feedback variables
- Supervision variables
- Indicators of AFP surveillance system

Then it was amended to suit the study method and the respondents**.** After designated the questionnaire in its first form, it was presented to specialists to assess the structure and face

validity**.** Then it was distributed to some personnel as small sample (n=10) to measure the reliability and stability by use Alpha Cronbach's test.

3.5.2- Interview design; this tool designed to interview with AFP surveillance coordinators at state level and contains the follows;

- The health facilities selected for surveillance?
- Other sites than the health facilities covered by the surveillance system?
- The time period between one visit and another according to the type of center (upper, middle, lower, and additional)
- Other sectors that participate in the surveillance system and their role in achieving the goals of the system and implementing its activities
- Challenges facing the system in the state in terms of material, human and legal resources, as well as society and its customs and traditions

3.5.3- Chick list design; this tool used to observation some elements that exist at all levels of study population contains the follows;

- AFP surveillance documents
- Supportive functions of AFP surveillance system

3.5.4- Data analysis

Data analyzed by use **SPSS** version 22, include multi of statistics needed in this study as:

Frequencies tables; to show data include percentages and frequencies

Cross tabulations; to know the relationship between two or more variables

Chi- square/ P value test; used in some variables to know Significance between variables

Alpha Cronbach's test; It was performed as a pre-test of the study tool to find out the stability rate.

3.6- AFP surveillance indicators

- a non-polio AFP rate of at least 1/100 000 children under 15 years of age
- two adequate specimens collected from at least 60% of detected AFP cases
- all specimens processed in a WHO-accredited laboratory
- Percentage of all expected monthly reports that were received: target ≥ 90%
- Percentage of AFP cases investigated within 48 hours: target ≥ 80%
- Percentage of AFP cases with two adequate stool specimens collected 24-48 hours apart and ≤ 14 days after onset: target ≥ 80%
- Percentage of specimens arriving at the laboratory in good condition: target ≥ 80%
- Percentage of specimens arriving at a WHO-accredited laboratory within three days of being sent: target ≥ 80%
- Percentage of specimens for which laboratory results sent within 28 days of receipt of specimens: target ≥ 80%.

3.7- Ethical considerations are;

- The study was approved by Shendi university
- Consent was obtained Ministry of health
- From the heads of health facilities to be studied
- Information collected from references was documented by **EndNote x7**

Chapter four

Results

4- Results

Table 1; Distribution of AFP reporting sites in River Nile State by localities, type, priority and job of focal person,2020, (N = 50)

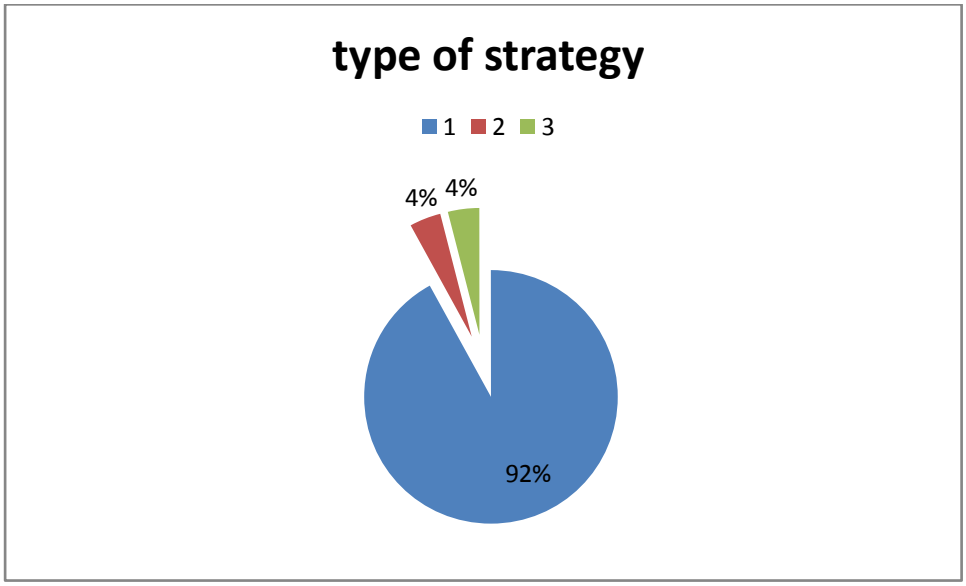
Subject	Count	Percent
Localities		
Shendi	8	16.0%
Almatama	7	14.0%
Aldamer	10	20.0%
Atbra	12	24.0%
Barbar	6	12.0%
Abuhamd	6	12.0%
Albuhira	1	2.0%
Total	**50**	**100%**
Reporting center	**Count**	**Percent**
Hospitals	28	56.0%
Health centers	19	38.0%
Clinics	3	6.0%
Total	**50**	**100%**
Reporting sites priority	**Count**	**Percent**
High priority	5	10.0%
Medium priority	5	10.0%
Low priority	8	16.0%
Additional surveillance sites	32	64.0%
Total	**50**	**100%**
focal persons	**Count**	**Percent**
Doctors	11	22.0%
Nurses	7	14.0%
Immunization technicians	25	50.0%
Nutritionist	1	2.0%
Statisticians	6	12.0%
Total	**50**	**100%**

Table 2; Structure of the AFP surveillance system (strategy and legislation) at health facilities level, (N= 50)

AFP surveillance structure	Respondents' answers	
	Yes	Percent
The mandatory of AFP surveillance	50	100%
Presence of AFP strategy	50	100%
Presence of plan strategy for system assessment	50	100%
Presence of regulation	50	100%
Presence of active law	50	100%
Presence of data regulation	47	94%
Presence of coordination with reporting sites	50	100%
Presence of coordination with localities	50	100%
Presence of partners for AFP surveillance system	42	84%
Presence of support from other sectors	42	84%
Presence of coordination with other sectors	46	92%
Presence of job description	50	100%
Presence of training	50	100%
Presence of budget	16	32%
Presence of budget support	0	0
Presence of enough budget	9	18%
Presence of enough personnel	19	38%

Table 3; Structure of the AFP surveillance system (strategy and legislation) at localities level, (N= 6)

Structure of the AFP surveillance system	Respondents' answers	Percent
Presence of mandatory AFP surveillance	6	100%
Presence of AFP strategy	6	100%
Presence of plan strategy for system assessment	6	100%
Presence of regulation	6	100%
Presence of active law	6	100%
Presence of data regulation	6	100%
Presence of coordination with reporting sites	6	100%
Presence of coordination with localities	6	100%
Presence of partners for AFP surveillance system	6	100%
Presence of support from other sectors	6	100%
Presence of coordination with other sectors	6	100%
Presence of job description	6	100%
Presence of training	6	100%
Presence of budget	6	100%
Presence of budget support	0	0.0
Presence of enough budget	0	0.0
Presence of enough personnel	2	33.0%



N= 56 **1 active surveillance** **2 inactive surveillance** **3 selected areas**

Figure 1; shows AFP surveillance strategy. The active surveillance strategy is the most used strategy in the surveillance program as it was 92% at localities and health facilities levels.

Table 4; Supportive functions of AFP surveillance system at health facilities level, (N= 50)

Supportive functions	Observed supportive elements	
	Count	Percent
Presence of separated AFP surveillance room	34	68.0%
Presence of AFP surveillance officers	43	86.0%
Presence of data entry officer	13	26.0%
Presence of AFP surveillance supervisor	47	94.0%
Presence of lab	40	80.0%
Presence of lab technician	40	80.0%
Presence of lab guide	40	82.0%
Presence of electricity	50	100.0%
Presence of transport car	3	6.0%
Presence of telephone	12	24.0%
Presence of calculator	18	36.0%
Presence of computer	5	10.0%
Presence of printer	0	0
Presence of internet line	0	0
Presence of last version of AFP surveillance guide	48	96.0%

Table 5; Supportive functions of AFP surveillance system at localities level, (N= 6)

Supportive functions	**Observed supportive elements**	
	Count	Percent
Presence of separated AFP surveillance room	6	100.0%
Presence of AFP surveillance officers	6	100.0%
Presence of data entry officer	6	100.0%
Presence of AFP surveillance supervisor	6	100.0%
Presence of electricity	6	100.0%
Presence of transport car	6	100.0%
Presence of telephone	6	100.0%
Presence of calculator	6	100.0%
Presence of computer	6	100.0%
Presence of printer	1	16.6%
Presence of internet line	0	0.0
Presence of last version of AFP surveillance guide	6	100%

Table 6; Core activities for AFP Surveillance system at health facilities level, (N= 50)

Core activities	**Existed elements**	
	Count	Percent
Presence of AFP surveillance guide-line	50	100%
An easy-to-use AFP surveillance guide-line	50	100%
Uses the AFP surveillance guide in surveillance activities	50	100%
AFP surveillance guide-line contain the report guideline	50	100%
AFP surveillance guide-line contain decision making-guide	50	100%
Modern AFP surveillance guide-line guideline	50	100%
presence of focal person	50	100%
Employed focal person	45	90%
Presence of deputy for focal person	39	78%
Monitoring the cases in out clinic records	48	96%
Monitoring the cases in other records	37	74%
Presence of trained focal person	48	96%
Personnel have computer skills	21	42%
Personnel has data interring skills	20	40%
Personnel have design tables skills	19	38%
Personnel have good relationship	48	96%
Presence the copies of reports	49	98%
Presence of active surveillance visits	42	84%
Presence of systematic surveillance visits	30	60%
Presence of sign in the visit form	26	52%

Table 7; Core activities for AFP Surveillance system at localities level, (N= 6)

Core activities	**Existed elements**	
	Count	Percent
Presence of AFP surveillance guide-line	6	100.%
An easy-to-use AFP surveillance guide-line	6	100.%
Uses the AFP surveillance guide in surveillance activities	6	100.%
AFP surveillance guide-line contain the report guideline	6	100.%
AFP surveillance guide-line contain decision making-guide	6	100.%
Presence of modern AFP surveillance guide-line guideline	6	100.%
Monitoring the cases in out clinic records	6	100.%
Monitoring the cases in other records	6	100.%
Presence of trained focal person	6	100.%
Personnel have computer skills	6	100.%
Personnel have data interring skills	6	100.%
Personnel have design tables skills	6	100.%
Personnel have good relationship	6	100.%
Presence the copies of reports	6	100.%
Presence of active surveillance visits	6	100.%
Presence of systematic surveillance visits	6	100.%
Presence of Sign in the visit form	6	100.%

Table 8; Assessment of AFP case definition, detection and registration**,** at health facilities level**, (**N= 50)

Presence case detection, definition Procedures	**Focal persons responds**	
	Yes	**Percent**
Agreed evidence for AFP case definition	50	100%
Case definition clear to all employees	50	100%
Specific person to record cases	50	100%
Registration done correctly	50	100%
Case recorded in the form prepared for it	50	100%
Registration form easy to use	50	100%
Registration forms sufficient	12	24%
Shortage of registration in the past months?	4	8%
Person responsible for writing the report	50	100%
Report written at the unit level	50	100%
Special reporting form	50	100%
Special form for samples of healthy children	50	100%
Send reports to the top authority regularly	50	100%
Saved copies from the reports sent	50	100%
Report copies well preserved	50	100%
Presence of problem in preparing reports	8	16%
Presence of analysis of the data collected in the unit	27	52%
Data include monitoring indicators	39	78%
Classify data by Age	34	68%
Classify data by Sex	33	66%
Classify data by house	33	66%
Specific person to analyze the data	32	64%

Table 9; Assessment of AFP case definition, detection and registration at localities level, (N= 6)

Presence case detection, definition Procedures	**Officers responds**	
	Yes	**%**
Agreed evidence for AFP case definition	6	100%
Case definition clear to all employees	6	100%
Specific person to record cases	6	100%
Registration done correctly	6	100%
Case recorded in the form prepared for it	6	100%
Registration form easy to use	6	100%
Registration forms sufficient	6	100%
Shortage of registration in the past months?	0	0.0
Person responsible for writing the report	6	100%
Report written at the unit level	6	100%
Special reporting form	6	100%
Special form for samples of healthy children	6	100%
Send reports to the top authority regularly	6	100%
Saved copies from the reports sent	6	100%
Report copies well preserved	6	100%
Presence of problem in preparing reports	0	0.0
Presence of analysis of the data collected in the unit	6	100%
Data include monitoring indicators	6	100%
Classify data by Age	6	100%
Classify data by Sex	6	100%
Classify data by house	6	100%
Specific person to analyze the data	6	100%

Table 10; Assessment the knowledge of focal persons about case investigation, (N= 50)

Case detection in health facilities (n= 50)	Good		Acceptable		Unacceptable	
	Count	Percent	Count	Percent	Count	Percent
Case definition	49	98.0%	0		1	2.0%
Fill the surveillance form	50	100.0%	0	0	0	0
Collection of stool samples	50	100.0%	0	0	0	0
Keeping the stool samples	49	98.0%	1	2.0%	0	
Processing of Follow-up	49	98.0%	1	2.0%	0	0

Table 11; Completeness of surveillance data on the health facilities levels, N= 50

Surveillance data and documents	**Availability of documents**	
	Count	Percent
File for the weekly reports	50	100%
File of documents of active visits	31	62%
A file for every AFP case	50	100%
Guide for AFP investigation	50	100%
File of feedback documents	31	62%
A container for collecting stool samples	50	100%
Stool sample collection tools	50	100%
Cold chain	31	62%
AFP investigation form	31	62%
The immediate report form	44	88%
A form for collecting stool samples	44	88%
A follow-up form (60 days) for AFP cases	31	62%
Weekly notification forms	42	84%
Schedule of active visits	30	60%
Posters to follow up on active visits investigation manual	50	100%
Posters to follow the weekly reports	31	62%
Poster for the list of notified cases	29	58%
Acute flaccid paralysis manual	44	88.0%
File to save notes from past visits	31	100%

Table 12; Completeness of surveillance data on the localities level, N= 6

Existence of surveillance data at all levels	Availability of documents	
	Count	Percent
File for the weekly reports	6	100%
File of documents of active visits	6	100%
A file for every AFP case	6	100%
Guide for AFP investigation	6	100%
File of feedback documents	6	100%
A container for collecting stool samples	6	100%
Stool sample collection tools	6	100%
Cold chain	6	100%
AFP investigation form	6	100%
The immediate report form	6	100%
A form for collecting stool samples	6	100%
Application form for laboratory examination	6	100%
A follow-up form (60 days) for AFP cases	6	100%
Weekly notification forms	6	100%
Forms for active visits	6	100%
Schedule of active visits	6	100%
Posters to follow up on active visits investigation manual	6	100%
Posters to follow the weekly reports	6	100%
Poster for the list of notified cases	6	100%
A map show the locations of reports and reported cases	6	100%
Acute flaccid paralysis manual	6	100%
File to save notes from past visits	6	100%

Table 13; Distribution the reported cases of non- polio AFP according to localities, year for each 100000 of population under 15 years of age

Localities/year	2017	2018	2019	2020
Shendi	3.3	3.6	2.4	4.6
Almatama	1.7	10	3.2	3.1
Aldamer	5	2.4	2.9	6.9
Atbara	3.5	2.3	5.6	4.3
Barbar	1.1	3.4	5.6	3.2
Abu hamd/albuhaira	12	7	4.4	2.2

Table 13; shows that there was sensitivity for AFP surveillance system at all localities level compared with WHO standard (AFP cases ≥2 for each 100000 of population under 15 years of age).

Table 14; Demography characteristics of non- polio AFP reported cases

Age	**Count**	**Percent**
less than 5	40	46.5
5 to 10	42	48.8
11 to 15	4	4.7
Total	**86**	**100%**
Gender	**Count**	**Percent**
Male	63	73.3
Female	23	26.7
Total	**86**	**100%**

Table 14; shows that the most AFP cases among children less than ten years and found in male more than female.

Table 15; AFP reported cases that investigated from 2017 to 2020, N= 86

Performance indicators	**Count**	**Percent**
Investigated cases	86	100%
AFP cases investigated <48 hours from paralysis	29	34%
AFP cases investigated <48 hours after reporting	84	97.7%
AFP cases followed up at 60 days	80	95%
AFP cases with two adequate stool specimens	86	100%
specimen results sent from national laboratory within 28 days of receipt of the specimen in the laboratory	86	100%

Table 10; shows that investigation procedures for AFP cases are complete, but there is a note regarding the time difference between the paralysis signs and reporting. The percentage of cases that reporting within 48 hours before the onset of paralysis was only 34%.

Table 16; Correlation between priority of reporting site and Supportive elements

Supportive elements		priority of reporting site				Chi-squire(x^2)/ p value (PV)
		high	medium	law	other	
Presence of calculator	Yes	3	5	5	5	X^2= 18.3
	No	2	0	3	27	PV= 0.00
Presence of telephone	Yes	4	3	5	0	X^2= 28.7
	No	1	2	3	32	PV= 0.00

There was luck in some supportive elements as telephone and calculator. but also related with priority, where significant between the priority of reporting sites and the availability of this supportive elements, was 0.00

Table 17; Correlation between priority of reporting sites and active surveillance visits

Active surveillance visits		**priority of reporting site**				**Total**
		high	medium	law	other	
Presence of active surveillance visits	Yes	5	5	8	24	**42**
	No	0	0	0	8	**8**
	Total	**5**	**5**	**8**	**32**	**50**

P value = 0.1 $\mathbf{X^2}$= 5.3 were X = chi-square

There is a significant between the priority of the notification center and the implementation of the active visits (P Value = 0.1), so all the priority centers are visited regularly compared to the additional centers.

Table 18; Correlation between Priority of reporting sites and complete of AFP documents

Complete of files		**priority of reporting site**				**Ch-squire/ p value**
		high	medium	law	other	
Active visits file	Exist	5	5	8	13	$\mathbf{X^2}$=17.2
	Not exist	0	0	0	19	**P V**= 0.001
Feedback documents file	Exist	5	5	8	13	$\mathbf{X^2}$=17.2
	Not exist	0	0	0	19	**P V**= 0.001
Cold chin	Exist	5	5	8	13	$\mathbf{X^2}$=17.2
	Not exist	0	0	0	19	**P V**= 0.001
AFP investigation form	Exist	5	5	8	13	$\mathbf{X^2}$=17.2
	Not exist	0	0	0	19	**P V**= 0.001
A follow-up form (60 days) for AFP cases	Exist	5	5	8	13	$\mathbf{X^2}$=17.2
	Not exist	0	0	0	19	**P V**= 0.001
Poster for the list of notified cases	Exist	5	3	8	13	$\mathbf{X^2}$=13.3
	Not exist	0	2	0	19	**P V**= 0.004
File to save notes from past visits	Exist	5	5	8	26	$\mathbf{X^2}$=3.8
	Not exist	0	0	0	6	**P V**= 0.82

There is a strong significant between the priority of the reporting sites and the completeness of documents for AFP surveillance in most of the required documents (P Value= 0.001 and 0.004), but there is one document, which is the file for saved notes from previous visits, and there was no significant of priority on it (P Value = 0.82).

Table 19; Correlation between problem in preparing reports and priority of reporting site

Preparing reports problem		**priority of reporting site**				
		high	medium	law	other	Total
Is there any problem in preparing reports	Yes	1	2	2	3	8
	No	4	3	6	29	42
	Total	5	5	8	32	50

P value= 0.29 $\mathbf{X^2}$= 3.7

There is no significant between the priority of the centers and the problems facing the employees in preparing reports (P Value = 0.29)

Table 20; Correlation between Case definition and specialty of the focal person

Case definition		**specialty of the focal persons**					
		doctor	nurse	Immunization technician	nutritionist	statistician	**Total**
Level of knowledge	good	11	7	24	1	6	49
	unacceptable	0	0	1	0	0	1
	Total	**11**	**7**	**25**	**1**	**6**	**50**

P value = 0.9 $\mathbf{X^2}$= 1

There are no statistically significant differences between the specialization of the focal person and his finding to define the case of acute flaccid paralysis (P Value = 0.9)

Table 21; Correlation between number of workshop and focal person' skills

Focal persons skills		Number of workshop		Chi-square(X^2) / P value (PV)
		one	two	
Focal personnel have computer skills	yes	20	1	X^2= 4.5
	no	20	8	PV= 0.033
Focal person has data interring skills	yes	20	0	X^2= 8.3
	no	20	10	PV= 0.004
Focal person with design tables skills	yes	19	0	X^2= 7.6
	no	21	10	PV= 0.006
Presence the copies of reports	yes	39	10	X^2= 0.255
	no	1	0	PV= 0.614
Presence of Sign in the Sign in visit form	yes	16	10	X^2= 3.3
	no	6	0	PV= 0.06

There is no statistically significant differences with regard to the number of Received more workshop and proficiency in the focal person to save a copy of the reports and the signing of the visit form (P = 0.614 Value and 0.0.06). While there is a relationship with respect to the focal person mastering computer skills, design tables and data entry skills (P value= 0.033, 0.006 and 0.004).

Table 22; Comparison between performance indicators and WHO performance targets

Performance indicators	**Target**	**Indicator**	**performance**
Rate of Annual reported cases	≥2	Sensitive	4.5
Proportion of Investigated cases	≥ 80%	Completeness of investigation time-line	100
Proportion of AFP cases investigated <48 hours reported	≥ 80%	Timeliness	97.7%
Proportion of AFP cases followed up at 60 days	≥ 80%	Completeness of follow-up	95%
Proportion of AFP cases with two adequate stool specimens	≥ 80%	Timeliness	100%
Proportion of specimen results sent from national laboratory within 28 days of receipt of the specimen in the laboratory	≥ 80%	Timeliness of laboratory investigation	100%
Proportion of surveillance site providing routine report (including ‘ zero reports’) on time	≥ 80%	Completeness of reporting	100%
Proportion of Active visits	≥ 80%	Complete	84%

From Table 22, we note that the surveillance system is sensitive, as it had an mean of 4.5 for the years from 2017 to 2020, and thus compatible with the WHO standard, greater than or equal to two cases for every 100,000 children less than 15 years old, as for completeness, there is completeness in all case investigation performance and reports, are all compatible with the WHO standards.

Table 23; Interview with AFP surveillance coordinator, N= 1

Questions	Answers
Are there sites other than health facilities in the state covered by the surveillance?	Yes, there are other sites like traditional healers.
How are these sites supervised?	Enlightenment is done every quarter and assessment of the reporting situation
What is the nature of other surveillance sites?	This type is named community surveillance. there is a responsible person and depute
Is that person receiving training?	Yes, they are trained twice a year or more
How the supervision to AFP surveillance sites in general?	Supervision is carried out in the field
Time period of supervision	Supervision is done every quarter equally for all sites
In the case of field supervision, what is the time interval between one visit and another according to the type of center (high, middle, lower, and addition sites)?	However, active visits are carried out and are carried out as follows: *high priority every week, *medium priority every two weeks, and *low priority every month.
Others sectors that participate in the surveillance program and their role in achieving the goals of the program and implementing its activities?	Information is exchanged with the Epidemiology Department with the aim of containing all suspected cases and immediate investigation about them.
Challenges facing the program in the state in terms of material, human and legal resources, as well as society, its customs and traditions?	Challenges: The surveillance vehicle is disrupted, which hinders the progress of work, the absence of depute for the focal person in some locations, and it is difficult to convince some families of the necessity of taking samples.

Chapter five

Discussion

Conclusion

Recommendations

5.1- discussion

The results of this study showed that the AFP surveillance system in the River Nile State has high efficiency in terms of the established infrastructure and performance of the system's activities, as mean of non-AFP reported cases rate from 2017 to 2020 was 4.02 cases per 100,000 children less than 15 years old, this rate is above the level of the WHO standard indicator (2 per 100,000 children under the age of 15 years, [43]. Compared with other studies in different countries and periods, the non- polio AFP cases in study area was reported from 2017 to 2020 higher than: (California/USA 2012-2015, South-East Delta region/Egypt2009-2017, Kirkuk Governorate- Iraq 2006, Mwenezi district, Masvingo, 2018), [44], [45-47]. This highly sensitive rate of the system makes it able to detect any polio case imported to the State,[48].

The sensitivity of the system is due to the fact that it has an established infrastructure, as it is committed to the general strategy of AFP surveillance, as cases are mandatory reported in all reporting sites that distributed by high level of representativeness, which include beside known health facilities (hospitals, health centers, and clinics). other places such as traditional healers and physiotherapy centers as one of community surveillance strategies.[49] However, hospitals are considered the most important sites for reporting by 56%, and this is consistent with what was mentioned in the national guidelines for surveillance and investigation of acute flaccid paralysis, as it indicated with regard to places of monitoring and reporting that hospitals are the most important places chosen for investigation and surveillance of acute flaccid paralysis and that Cases of acute flaccid paralysis often go to hospitals, and there are families for religious, social or economic reasons who prefer treating their children to traditional healers, [50]. And also agreed with GPEI which mentioned the public health staffs make regular visits to hospitals and rehabilitation centers to search for

AFP cases which may have been overlooked or misdiagnosed. In areas with few formal health workers, some countries use “community” surveillance, where pharmacists, traditional healers or clerics may serve as a source of information on paralyzed children, [43].

All reporting sites reports AFP cases through personnel trained in the reporting process with a difference in their specialties, but there are no statistically significant differences with regard to their knowledge of the definition and detection of acute flaccid paralysis case, "**P value= 0.9"**; As it was AFP investigation at a high level among all workers of various specialties. It was better than other areas as Bikita region in Zimbabwe, where the author referred to Health worker’s knowledge on AFP was low, and all interviewed workers needed training surveillance,[51].

Due to the staff receiving training and their possession of a field guide that includes all surveillance activities include investigate the disease. Despite the employee's possession of information related to the program’s activities, there is weakness in some aspects, such as computer skills and the process of data entry and representation With a statistical relationship, that the focal person increases his skill on these tools all that is found in a center of higher priority and received more than one workshop,"**P value = 0.033, 0.006 and 0.004"**for computer, process of data entry and representation Respectively. So receiving more than one training course had effect on increasing the skill of using the computer and entering data. This may be due to workers’ lack of computer equipment in about 90% of the reporting sites. This weakness and lack of skills may be explained by the decrease in the allocated budget and the absence of financial support for the program**,** which may have an impact on improving performance and encouraging employees to increase their skills in using technology and making use of it in the reporting process. A study in Nigeria indicated that the inclusion of a financial reward for all reported acute flaccid paralysis cases greatly encouraged staff, surveillance coordinators, clinicians, and community informers to detect

and report AFP. There was a marked increase in reports of AFP cases after the provision of the financial reward, [52]. Although the Internet has become necessary to speed up data reporting in many disease surveillance programs, we note there is a complete absence of Internet service at all levels of reporting sites. This has become an urgent necessity to facilitate work procedures and perform activities. As a Chinese study, stated that the existence of an online platform facilitates the process of reporting cases, [5]. Given that all employees have mobile phones that can be provided with some assistance and some training courses on the use of technology in the investigation program in the River Nile State, we can help those in charge of the program in developing the system, upgrading it and keeping pace with events. Especially since there is good infrastructure, trained, cooperative and highly qualified human resources in performing their activities and monitoring work, and this is evidenced by their possession of very excellent information on the definition of AFP case, filling in the investigation form, collecting stool samples and the follow-up procedure. They also keep their files and report regularly to the higher authorities.

Through this study, it was that most of the program requirements are complete, such as having a strategy for the system and a plan for its evaluation, laws and regulations, coordination between localities and reporting centers, job description and training. This is in full agreement with what has been stated by the WHO as the structure of the surveillance system is defined by legislation (laws, and regulations, including IHR 2005), the strategy for implementing activities, the implementers and stakeholders, and how they relate to each other and to the various networks and partnerships. The indicators that measure different aspects of the structure of a system constitute part of the evaluation indicators, [34].

The results of the activities' performance showed that there is broad agreement with the general standards of the surveillance program, as there was an easy-to-use AFP field guide for all workers in surveillance activities at all levels, containing guidelines for writing the

report and the decision-making process with the presence of focal persons in all reporting sites, "90 % Of them are formally appointed, 78% have deputies who perform their roles in the event of absence of the focal person", and although 96% have received training, only 42% have computer skills, 40% have data entry skills, 38% have the skill of designing tables and graphics. 98% of the employees keep copies of previous reports, 84% indicated the existence of active visits, 60% confirmed that the visits were regular, and 52% of the signed visit form was noticed.

In general, the resources available in the surveillance offices of localities were more than those available in health facilities, where not every health facility had a separate office for the surveillance program; only 68% had a separate room for program activities. There was access to public transport or electronic services that help to report cases, and although the localities have special vehicles for the program, the absence of support and continuous breakdowns affects the supervision activities, [49]. Calculators were available for data analysis in all localities offices and 36% of health facilities, all localities had computers, and only 10% of health facilities had a computer. 24% of health facilities have a phone for program activities. Nevertheless; the reporting process is ideal, using personal phones, which were available to all respondents. There are no printers in all health facilities and localities, just state level. There are also no internet lines at all levels; this confirms that the program still adopts the traditional methods in the reporting process, which is its use of the paper reporting system to collect data from reporting sites. In spite of that, the system was of high quality in terms of performance indicators, as the efficiency indicators were in conformity with the requirements of the WHO standards. Thus, the system is considered to have high quality in the performance of activities, especially with regard to indicators of completeness and sensitivity, where efficiency means the completion of the weekly and monthly reports by more than 80%. While sensitivity means reporting at least two cases per year for every

100,000 people of the population under 15 years old, [38]. That is exactly what was found in the River Nile State, This sensitivity may increase if technology is widely introduced into the program with the increase in reporting sites and the development of the community surveillance system by giving volunteers modern work aids to encourage them to work efficiently.

Finally, if the program finds support in addition to its available capabilities, it can be used to monitor a number of other diseases on a larger scale in addition to acute flaccid paralysis, especially those diseases targeted by vaccination, which may provide a database that easily guarantees knowledge and evaluation of the health situation in the community in the state Thus helping decision-makers in the intervention process in a timely manner, This is what was referred to by the reference, [5]. Where it was mentioned: Trained and experienced AFP surveillance medical officers can use the assets of the AFP surveillance system to help build integrated disease surveillance systems, providing opportunities to strengthen overall immunization programs. This is particularly important for childhood immunization programs in low-income countries. In a closer look at selected countries, it becomes apparent that polio assets are not just helping build capacity for nonpolio-related programs, but is providing the actual capacity for these efforts; in some cases, polio assets are the only resource supporting functions in the country. For these reasons, in resource-poor countries, international partners and country governments must collaborate to support key surveillance functions. Without such a transition, both polio eradication and control and elimination of other VPDs will suffer.

5.2- Conclusion

AFP surveillance program in River Nile state is based on an established infrastructure that includes legislation, regulations and strategy.

There was high efficiency in performing the activities of the AFP surveillance system in the state.

There was a clear weakness in the resources supporting the AFP surveillance program at all reporting sites.

The quality of the AFP surveillance indicators in the state were in compliance with WHO requirements for sensitivity and completeness

The program can be used to monitor a number of other diseases at all localities in the state.

5.3- Recommendations

3.5.1- The Ministry of health should be strengthening some elements of the surveillance system

3.5.2- Localities officers should be Conduct training of computer skills

3.5.3- The State authority should be provide aids to facilitate the process of reporting sites

3.5.4- The AFP surveillance officials should be increasing the frequently of during the job training for workers,

3.5.5- The health authority should encourage further studies on this topic

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Annexes

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Questionnaire about;

Evaluation of AFP Surveillance System in River Nile State

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١ -**المحلية:**1/شندي( ) 2/المتمة( ) 3/الدامر( ) 4/عطبرة( ) 5/بربر( )
6/أبو حمد( ) 7/البحيرة( )

٢ -**مركزالتبليغ** 1/مستشفى( ) 2/مركز صحي( ) 3/عيادة( ) 4/أخرى/حدد....

٣ -**الأولوية** 1/عليا ( ) 2/وسطى ( ) 2/دنيا ( )

٤ -**تخصص الشخص المسؤول** : 1/طبيب( ) 2/ضابط صحة( )
3/ممرض ( ) 4/ تقني مختبر( ) 5/أخرى/حدد.....

٥ - هل نظام ترصد الشلل الرخو الحاد اجباري بالوحدة 1/ نعم ( ) 2/ لا ( )

٦ - هل توجد غرفة خاصة بترصد الشلل الرخو الحاد 1/ نعم ( ) 2/ لا ( )

٧ - هل هنالك ميزانية منفصلة لنظام ترصد الشلل الرخو الحاد؟

1/ نعم ( ) 2/ لا ( )

٨ - اذا كانت الإجابة نعم في (4) هل يوجد دعم آخر من الميزانية العامة؟

1/ نعم ( ) 2/ لا ( )

٩ - هل الميزانية المرصودة كافية؟ 1/نعم( ) 2/لا( )

١٠ - هل يوجد العدد الكافي من العاملين في نظام الترصد؟ 1/نعم( ) 2/لا( )

١١ - هل توجد عربة خاصة بأنشطة ترصد الشلل الرخو الحاد؟

1/نعم( ) 2/لا( )

١٢ - كم عدد ضباط الترصد؟ 1/ضابط واحد( ) 2/ اثنان ( ) ثلاثة فأكثر( )

١٣ - هل يوجد مدير بيانات؟ 1/نعم( ) 2/لا( )

١٤ - هل هنالك مشرف على نظام الترصد؟ 1/نعم( ) 2/لا( )

١٥ - هل يوجد معمل بالوحدة؟ 1/نعم( ) 2/لا( )

١٦ - هل يوجد تقني معمل بمركز الترصد؟ 1/نعم( ) 2/لا( )

١٧ - هل يوجد دليل معياري لإدارة المعمل؟ 1/نعم( ) 2/لا( )

١٨ - هل توجد كهرباء بالمركز ؟ 1/نعم( ) 2/لا( )

١٩ - هل توجد وسيلة نقل خاصة بالترصد؟ 1/نعم( ) 2/لا( )

٢٠ - هل يوجد تلفون بمركز الترصد؟ 1/نعم( ) 2/لا( )

٢١ - هل توجد آلة حاسبة؟ 1/نعم( ) 2/لا( )

٢٢ - هل يوجد كمبيوتر؟ 1/نعم( ) 2/لا( )

٢٣ - هل توجد طابعة؟ 1/نعم( ) 2/لا( )

٢٤ - هل توجد شبكة انترنت؟ 1/نعم( ) 2/لا( )

٢٥ - هل يوجد دليل ترصد؟ 1/نعم( ) 2/لا( )

٢٦ - اذا كانت الاجابة نعم هل هو اخر اصدار؟ 1/نعم( ) 2/لا( )

٢٧ - هل الدليل سهل الاستخدام؟ 1/نعم( ) 2/لا( )

٢٨ - هل يتم استخدامه في انشطة الرصد والابلاغ؟ 1/نعم( ) 2/لا( )

٢٩ - هل يحتوي الدليل على موجهات عن كيفية كتابة التقرير ومعالجة البيانات؟

1/نعم( ) 2/لا( )

٣٠ - هل يحتوي الدليل على موجهات عن كيفية اتخاذ القرار على كل المستويات؟

1/نعم ( ) 2/لا( )

٣١ - هل يتم تزويد الوحدة بالدلائل والموجهات الحديثة؟

1/نعم ( ) 2/لا( )

٣٢ - هل يوجد شخص محوري 1/ نعم ( ) 2/ لا ( )

٣٣ - هل الشخص المحوري معين 1/ نعم ( ) 2/ لا ( )

٣٤ - هل يوجد نائب للشخص المحوري 1/ نعم ( ) 2 / لا ( )

٣٥ - هل يتحرى الشخص المحوري عن الحالات في سجلات العيادة الخارجية

1/ نعم ( ) 2/ لا ( )

٣٦ - الشخص المحوري يتحرى عن الحالات في سجلات عنبر الأطفال

1/ نعم ( ) 2/ لا ( )

٣٧ - الشخص المحوري يتحرى عن الحالات في سجلات أخرى؟

1/ نعم ( ) 2/ لا ( ) 3/اذا كان نعم حدد .....

٣٨ - هل الشخص المحوري مدرب؟ 1/ نعم ( ) 2/ لا ( )

٣٩ - هل يجيد مهارات استخدام الكمبيوتر؟ 1/ نعم ( ) 2/ لا ( )

٤٠ - معرفة كيفية ادخال البيانات؟ 1/ نعم ( ) 2/ لا ( )

٤١ - معرفة كيفية استخراج الجداول والرسوم البانية؟

1/ نعم ( ) 2/ لا ( )

٤٢ - هل الشخص المحوري له علاقة طيبة مع العاملين؟

1/ نعم ( ) 2/ لا ( )

٤٣ - هل الشخص المحوري يحتفظ بنسخة من تقاريره؟

1/ نعم ( ) 2/ لا ( )

٤٤ - تنفيذ زيارات التقصي النشط 1/ نعم ( ) 2/ لا ( )

٤٥ - اذا كانت الإجابة نعم في (41) من الذي يقوم بذلك؟ .....

٤٦ - هل الزيارة منتظمة؟ 1/ نعم ( ) 2/ لا ( )

٤٧ - اذا كانت الإجابة نعم في (43) ما هي الفترة التي تتم فيها الزيارة؟

1/نصف اسبوعي ( ) 2/ اسبوعيا ( ) 3/ شهريا ( )

٤٨ - هل يتم التوقيع في استمارة الزيارة؟ 1/ نعم ( ) 2/ لا ( )

- ما هو تقييم الشخص المحوري من حيث اجادة الآتي

٤٩ - تعريف حالة الشلل الرخو الحاد

1/جيد ( ) 2/ مقبول( ) 3/ غير مقبول ( )

٥٠ - ملء استمارة التقصي

1/جيد ( ) 2/ مقبول( ) 3/ غير مقبول ( )

٥١ - جمع عينات البراز

1/جيد ( ) 2/ مقبول( ) 3/ غير مقبول ( )

٥٢ - حفظ العينات في حالة عدم القدرة على ارسالها

1/جيد ( ) 2/ مقبول( ) 3/ غير مقبول ( )

٥٣ - اجراء المتابعة

1/جيد ( ) 2/ مقبول( ) 3/ غير مقبول ( )

المحور الثاني: الأنشطة الأساسية لنظام ترصد الشلل الرخو الحاد

٥٤ - هل توجد استراتيجية لنظام الترصد والابلاغ للشلل الرخو الحاد؟

1/نعم ( ) 2/ لا( )

٥٥ - ما هي الاستراتيجية المتبعة في نظام الترصد و الابلاغ للشلل الرخو الحاد؟

1/البحث النشط ( ) 2/البحث غير النشط ( ) 3/المناطق المختارة ( )

٥٦ - هل تتضمن الاستراتيجية خطة لتقييم النظام؟

1/ نعم( ) 2/ لا ( )

٥٧ - اذا كانت الاجابة نعم ما هي الفترة الزمنية التي يتم فيها تقييم النظام؟

1/ كل عامين ( ) 2/ كل ثلاثة أعوام ( ) 3/ كل خمسة سنة( ) 4/اكثرمن ذلك( )

٥٨ - هل توجد لوائح وقوانيت لتنظيم العمل بالوحدة؟ 1/ نعم( ) 2/ لا ( )

٥٩ - اذا كانت الاجابة نعم هل القانون مفعل؟ 1/ نعم( ) 2/ لا ( )

٦٠ - هل يوجد وصف وظيفي للعاملين بنظام الترصد بالوحدة؟

1/ نعم( ) 2/ لا ( )

٦١ - هل توجد لوائح تنظيم انسياب المعلومات؟ 1/ نعم( ) 2/ لا ( )

٦٢ - هل يوجد تنسيق بين الوحدات داخل المحلية لتبادل المعلومات؟

1/ نعم( ) 2/ لا ( )

٦٣ - هل يوجد تنسيق بين المحليات لتبادل المعلومات؟ 1/ نعم( ) 2/ لا ( )

٦٤ - هل يوجد شركاء لبرنامج الترصد على مستوى الوحدة؟

1/ نعم( ) 2/ لا ( )

٦٥ - هل هنالك تعاون ما بين الشركاء و نظام الترصد؟ 1/ نعم( ) 2/ لا ( )

٦٦ - هل يوجد تنسيق وتعاون بين القطاعات الأخرى ذات الصلة بالمحلية؟

1/ نعم( ) 2/ لا ( )

٦٧ - هل يوجد وصف وظيفي للعاملين في نظام الترصد والإبلاغ؟

1/ نعم( ) 2/ لا ( )

٦٨ - هل يتم تدريب العاملين بالوحدة؟ 1/ نعم( ) 2/ لا ( )

٦٩ - اذا كانت الإجابة نعم في (65) كم عدد الدورات التي تمت للعاملين بالوحدة؟

1/ دورة واحدة ( ) 2/ دورتين ( ) 3/ ثلاثة دورات ( )

٧٠ - **الدورات التي تم تنفيذها هي:**

1/تنشيطية ( ) 2/ أساسية ( ) 3/ الاثنين معا ( )

المحور الثالث: المواد ، المعينات والوثائق والأدوات التي يجب أن تكون متاحة

المواد ، المعينات ، الوثائق والأدوات	**1/توجد**	**2/لا توجد**
٧١ - ملف للتقارير الإسبوعية		
٧٢ - ملف وثائق الزيارات النشطة		
٧٣ - ملف لكل حالة شلل رخو حاد		
٧٤ - المبادئ التوجيهية لتقصي الشلل الرخو الحاد		
٧٥ - ملف وثائق التغذية الراجعة		
٧٦ - حاوية جمع عينات البراز		
٧٧ - ادوات جمع عينات البراز		
٧٨ - سلسلة التبريد الخاصة بوسائل جمع العينات		
٧٩ - الباقات المجمدة		
٨٠ - استمارة تقصي حالات الشلل الرخو الحاد		
٨١ - استمارة البلاغ الفوري		
٨٢ - استمارة جمع عينات البراز		
٨٣ - استمارة طلب الفحص المعملي		
٨٤ - استمارة متابعة (60يوم) لحالات الشلل الرخو الحاد		
٨٥ - استمارات التبليغ ا لإسبوعي		
٨٦ - استمارات الزيارات النشطة		
٨٧ - الجدول الزمني للزيارات النشطة		
٨٨ - بوستر لمتابعة الزيارات النشطة		
٨٩ - بوستر لمتابعة التقارير الإسبوعية		
٩٠ - بوستر لقائمة الحالات المبلغة		
٩١ - خريطة تبين مواقع التقارير والحالات المبلغ عنها		
٩٢ - كتيب ارشادات تقصي الشلل الرخو الحاد		
٩٣ - ملف لحفظ الملاحظات من الزيارات السابقة		

٩٤ - هل يوجد دليل متفق عليه لتعريف حالة الشلل الرخو الحاد

1/ نعم( ) 2/ لا ( )

٩٥ - **هل تعريف الحالة واضح لجميع العاملين 1/ نعم ( ) 2 / لا ( )**

٩٦ - هل يوجد شخص محدد لتسجيل الحالات؟ 1/ نعم ( ) 2/ لا ( )

٩٧ - هل يتم التسجيل بصورة صحيحة؟ 1/ نعم ( ) 2/ لا ( )

٩٨ - هل يتم تسجيل الحالة في الإستمارة أو الدفتر المعد لذلك؟

1/ نعم ( ) 2/ لا ( )

٩٩ - هل استمارة التسجيل سهلة الإستخدام؟ 1/ نعم ( ) 2/ لا ( )

١٠٠ - هل استمارات التسجيل كافية؟ 1/ نعم ( ) 2/ لا ( )

١٠١ - هل حدث نقص من قبل في استمارات التسجيل خلال الأشهر الماضية؟

1/ نعم ( ) 2/ لا ( )

١٠٢ - هل يوجد شخص مسؤول عن كتابة التقرير؟ 1/ نعم ( ) 2/ لا ( )

١٠٣ - هل تتم كتابة التقرير على مستوى الوحدة؟ 1/ نعم ( ) 2/ لا ( )

١٠٤ - هل توجد استمارة خاصة باعداد التقارير؟ 1/ نعم ( ) 2/ لا ( )

١٠٥ - هل توجد استمارة خاصة لعينات الأطفال الأصحاء؟

1/ نعم ( ) 2/ لا ( )

١٠٦ - هل تقوم الوحدة بإرسال التقارير للجهة العليا بصورة منتظمة؟

1/ نعم ( ) 2/ لا ( )

١٠٧ - هل يتم حفظ صورة من التقارير المرسلة؟ 1/ نعم ( ) 2/ لا ( )

١٠٨ - هل صور التقارير محفوظة بصورة جيدة؟ 1/ نعم ( ) 2/ لا ( )

١٠٩ - هل هنالك أي مشكلة في اعداد التقارير؟ 1/ نعم ( ) 2/ لا ( )

١١٠ - هل هنالك تحليل للبيانات المجمعة بالوحدة؟ 1/ نعم ( ) 2 / لا ( )

١١١ - هل البيانات تتضمن مؤشرات المراقبة؟ 1/ نعم ( ) 2/ لا ( )

تصنيف البيانات حسب:

١١٢ - العمر؟ 1/ نعم ( ) 2/ لا ( )

١١٣ - الجنس؟ 1/ نعم ( ) 2/ لا ( )

١١٤ - السكن؟ 1/ نعم ( ) 2/ لا ( )

١١٥ - هل يوجد شخص محدد لتحليل البيانات؟ 1/ نعم ( ) 2/ لا ( )

١١٦ - كيف يتم تمثيل البيانات التي تم تحليلها؟

1/ أشكال بيانية( ) 2/ جداول ( ) 3/ منحنيات( ) 4/ كل ما ذكر صحيح( )

المحور الرابع: جودة و كفاءة برنامج ترصد الشلل الرخو الحاد

١١٧ - هل هنالك حالات تم إستقصائها خلال هذا العام؟ 1/ نعم ( ) 2/ لا ( )

١١٨ - اذ كانت الإجابة نعم كم يبلغ عدد تلك الحالات؟ .....

١١٩ - كم يبلغ المعدل السنوي لحالات الشلل الرخو الغير ناتجة عن فيروس الشلل؟

1/أقل من 80%( ) 2/80%( ) 3/أكثر من 80% ( )

١٢٠ - نسبة الحالات التي تم التحقق منها خلال 48 ساعة؟

1/أقل من 80%( ) 2/80%( ) 3/أكثر من 80% ( )

١٢١ - نسبة الحالات التي يتم لها جمع عينتين من البراز خلال 14 يوم؟

1/أقل من 80%( ) 2/80%( ) 3/أكثر من 80% ( )

١٢٢ - معدل عينات البراز التي يتم نقلها خلال ثلاث أيام؟

1/أقل من 80%( ) 2/80%( ) 3/أكثر من 80% ( )

١٢٣ - معدل عينات البراز التي يتم نقلها للمعمل في ظروف مثالية؟

1/أقل من 90%( ) 2/90%( ) 3/أكثر من 90% ( )

١٢٤ - معدل العينات التي تم استقبال نتائج المعمل لها خلال 14 يوم

1/أقل من 80%( ) 2/80%( ) 3/أكثر من 80% ( )

١٢٥ - نسبة الحالات التي تم متابعة الفحص لها بعد 60 يوم من بدء الشلل الرخو

1/أقل من 80%( ) 2/80%( ) 3/أكثر من 80% ( )

١٢٦ - من الشخص الذي يتابع الحالة بعد 60 يوم من حدوث الشلل؟

أ/الشخص الذي أجرى الفحص الأولي ب/ شخص آخر ( )

١٢٧ - نسبة إكتمال التقارير الروتينية؟

أ/أقل من 80%( ) ب/80%( ) أكثر من 80% ( )

١٢٨ - نسبة الزياراة النشطة؟

1 /أقل من 80%( ) 2/80%( ) 3/أكثر من 80% ( )

١٢٩ - هل يتم جمع عينات عشوائية من الأطفال في المحلية التي لم تبلغ حالات خلال النصف الأول من العام؟ 1/ نعم ( ) 2/ لا ( )

١٣٠ - اذا كانت الإجابة نعم كيف يتم جمع هذه العينات؟ .....

.....

.....

استمارة تحليل السجلات

١. **العمر** **1**) أقل من 5 سنوات () 2) 5-10 سنوات () 3) 11-15 سنة ()

٢. **الجنس** 1) ذكر () 2) أنثى ()

٣. **السكن** 1) المدينة () 2) الريف ()

٤. **الحالة التمنيعية** 1) مطعم () 2) غير مطعم ()

٥. **تاريخ بداية الشلل** 1) قبل 48 ساعة من الوصول للمركز () 2) بعد 48 ساعة ()

٦. **تاريخ التبليغ** 1) قبل 48 ساعة () 2) بعد 48 ساعة ()

٧. **تاريخ التقصي** **1**) قبل 48 ساعة () 2) بعد 48 ساعة ()

٨. **موضع الشلل..... .....**

٩. **التشخيص الأولي..... .....**

١٠. **الأعراض..... .....**

١١. **هل المنطقة معرضة للخطر** 1) نعم () 2) لا ()

١٢. **تاريخ أول جمع للعينة** 1) قبل 48 ساعة () 2) بعد 48 ساعة ()

١٣. **تاريخ جمع العينة الثانية 1)** قبل 48 ساعة **() 2)** بعد 48 ساعة ()

١٤. **تاريخ استلام العينة** 1) قبل 48 ساعة () 2) بعد 48 ساعة ()

١٥. **التشخيص النهائي..... .....**

١٦. **مستوى الحالة..... .....**

١٧. **الشهر / الموسم..... .....**

١٨. **متابعة لمدة 60 يومًا** 1) موجودة () 2) لا ()

١٩. **التغذية الراجعة** 1) قبل 28 يومًا () 2) بعد 28 يومًا () 3) غير ()

المقابلة

1. هل هناك حالات رفض من قبل مسؤولي المرافق الصحية المختارة للترصد؟

2. كيف يتم التعامل مع الأمر إذا كان هناك رفض؟

3. هل هناك مواقع غير المرافق الصحية بالولاية مشمولة ببرنامج الترصد؟ إذا كان الجواب نعم فما هي طبيعة هذه المواقع؟

4. كيف يتم الإشراف على هذه المواقع؟ من هو الشخص الذي يبلغ عن البيانات على هذه المواقع؟

5. هل هذا الشخص يتلقى التدريب؟

6. كيف يتم الإشراف على مواقع مراقبة الشلل الرخو بشكل عام؟

7. في حالة الإشراف الميداني ، ما هي الفترة الزمنية بين زيارة وأخرى حسب نوع المركز (عليا، وسطى ، دنيا، إضافي)؟

8. القطاعات الأخرى التي تشارك في نظام الترصد ودورها في تحقيق أهداف البرنامج وتنفيذ أنشطته؟

9. التحديات التي تواجه النظام في الولاية من حيث الموارد المادية والبشرية والناحية القانونية وكذلك المجتمع وعاداته وتقاليده؟

Republic of Sudan

Ministry of Higher Education and scientific Research

Shendi University

Faculty of Graduate Studies and Scientific Research

Study the Acute Flaccid Paralysis (AFP) Surveillance System, River Nile State, Sudan.

Questionnaire for collection data about AFP surveillance system

1. **Structure of the AFP surveillance system (strategy and legislation),**

1- Locality

1)shendi ( ) 2) almatama ( ) 3) aldamer( ) 4)atbara ( )

5)barbar( ) 6)abuhmd( ) 7)albuhaira( )

2- Type of AFP reporting sites

1) Hospital ( ) 2) health center ( ) 3) clinic ( )

3- Priority of reporting site

1) High ( ) 2) medium ( ) 3) low ( ) 4) additional ( )

4- Specialty of the focal person

1) Doctor ( ) 2) nurse ( ) 3) immunization technician ( )

4) nutritionist ( ) 5) statistician ( )

Continue...	
5- There is mandatory surveillance for AFP cases	1)Yes ( ) 2) No ( )
6- There is an AFP strategy	1)Yes ( ) 2) No ( )
7- Type of strategy	1)active surveillance( ) 2)un active surveillance( ) 3)selected area ( )
8- Plan strategy for system assessment	1)Yes ( ) 2) No ( )
9- There is regulation	1)Yes ( ) 2) No ( )
10- Active low	1)Yes ( ) 2) No ( )
11- Worker Job description	1)Yes ( ) 2) No ( )
12- Data regulation	1)Yes ( ) 2) No ( )
13- Coordination with reporting sites	1)Yes ( ) 2) No ( )
14- Coordination with localities	1)Yes ( ) 2) No ( )
15- Presence of partners for AFP surveillance system	1)Yes ( ) 2) No ( )
16- Presence of support from other sectors	1)Yes ( ) 2) No ( )
17- Coordination with other sectors	1)Yes ( ) 2) No ( )
18- Presence of job description	1)Yes ( ) 2) No ( )
19- Presence of training	1)Yes ( ) 2) No ( )
20- Number of work shop	1)one ( ) 2)two( )
21- Presence of budget	1)Yes ( ) 2) No ( )
22- Presence of budget support	1)Yes ( ) 2) No ( )
23- Presence of enough budget	1)Yes ( ) 2) No ( )
24- Presence of enough personnel	1)Yes ( ) 2) No ( )

2. **supportive functions of AFP surveillance system at health facilities and localities**

Chick list		
25- there is separated AFP surveillance room	1)Yes ( )	2) No ( )
26- presence of AFP surveillance officers	1)Yes ( )	2) No ( )
27- presence of data responsible	1)Yes ( )	2) No ( )
28- AFP surveillance supervisor	1)Yes ( )	2) No ( )
29- presence of lab	1)Yes ( )	2) No ( )
30- presence of lab technician	1)Yes ( )	2) No ( )
31- presence of lab guide	1)Yes ( )	2) No ( )
32- presence of electricity	1)Yes ( )	2) No ( )
33- presence of transport car	1)Yes ( )	2) No ( )
34- presence of telephone	1)Yes ( )	2) No ( )
35- presence of calculator	1)Yes ( )	2) No ( )
36- presence of computer	1)Yes ( )	2) No ( )
37- presence of printer	1)Yes ( )	2) No ( )
38- internet line	1)Yes ( )	2) No ( )
39- presence of last version of AFP surveillance guide	1)Yes ( )	2) No ( )

c- Core activities for AFP Surveillance system

40- Presence of AFP manual	1)Yes ( ) 2) No ( )
41- Manual is the simple use	1)Yes ( ) 2) No ( )
42- uses the AFP surveillance guide in surveillance activities	1)Yes ( ) 2) No ( )
43- AFP manual contain the report guideline	1)Yes ( ) 2) No ( )
44- AFP manual contain decision making- guide	1)Yes ( ) 2) No ( )
45- modern manual guideline	1)Yes ( ) 2) No ( )
46- Exist the focal person	1)Yes ( ) 2) No ( )
47- Employed focal person	1)Yes ( ) 2) No ( )
48- Other focal person	1)Yes ( ) 2) No ( )
49- Monitoring the cases in out clinic records	1)Yes ( ) 2) No ( )
50- Monitoring the cases in other records	1)Yes ( ) 2) No ( )
51- Trained focal person	1)Yes ( ) 2) No ( )
52- personnel have computer skills	1)Yes ( ) 2) No ( )
53- personnel has data interring skills	1)Yes ( ) 2) No ( )
54- personnel have design tables skills	1)Yes ( ) 2) No ( )
55- personnel have good relationship	1)Yes ( ) 2) No ( )
56- Presence of saved cope of reports	1)Yes ( ) 2) No ( )
57- Presence of active surveillance visits	1)Yes ( ) 2) No ( )
58- systematic surveillance visits	1)Yes ( ) 2) No ( )
59- Presence of Sign in the visit form	1)Yes ( ) 2) No ( )

d- Knowledge about AFP case definition, detection and registration

60- agreed evidence for AFP case definition	1)Yes ( ) 2) No ( )
61- case definition clear to all employees	1)Yes ( ) 2) No ( )
62- specific person to record cases	1)Yes ( ) 2) No ( )
63- registration done correctly	1)Yes ( ) 2) No ( )
64- Case recorded in the form prepared for it	1)Yes ( ) 2) No ( )
65- registration form easy to use	1)Yes ( ) 2) No ( )
66- registration forms sufficient	1)Yes ( ) 2) No ( )
67- Shortage of registration in the past months?	1)Yes ( ) 2) No ( )
68- person responsible for writing the report	1)Yes ( ) 2) No ( )
69- report written at the unit level	1)Yes ( ) 2) No ( )
70- special reporting form	1)Yes ( ) 2) No ( )
71- Special form for samples of healthy children	1)Yes ( ) 2) No ( )
72- send reports to the higher authority regularly	1)Yes ( ) 2) No ( )
73- saved cope from the reports sent	1)Yes ( ) 2) No ( )
74- report copes well preserved	1)Yes ( ) 2) No ( )
75- problem in preparing reports	1)Yes ( ) 2) No ( )
76- analysis of the data collected in the unit	1)Yes ( ) 2) No ( )
77- data include monitoring indicators	1)Yes ( ) 2) No ( )
78- Classify data by Age	1)Yes ( ) 2) No ( )
79- Classify data by Sex	1)Yes ( ) 2) No ( )
80- Classify data by house	1)Yes ( ) 2) No ( )
81- specific person to analyze the data	1)Yes ( ) 2) No ( )

e- Focal person test

82- Case definition	1)) 2)acceptable( ) 3)unacceptable( )
83- Fill the surveillance form	1)good( ) 2)acceptable( ) 3)unacceptable( )
84- Collection of stool samples	1)good( ) 2)acceptable( ) 3)unacceptable( )
85- Keeping the stool samples	1)good( ) 2)acceptable( ) 3)unacceptable( )
86- Processing of Follow-up	1)good( ) 2)acceptable( ) 3)unacceptable( )

Chick list	
87- file for the weekly reports	1)exist ( ) not exist( )
88- file of documents of active visits	1)exist ( ) not exist( )
89- A file for every AFP case	1)exist ( ) not exist( )
90- Guide for AFP investigation	1)exist ( ) not exist( )
91- File of feedback documents	1)exist ( ) not exist( )
92- A container for collecting stool samples	1)exist ( ) not exist( )
93- Stool sample collection tools	1)exist ( ) not exist( )
94- Cold chain	1)exist ( ) not exist( )
95- Ice back	1)exist ( ) not exist( )
96- AFP investigation form	1)exist ( ) not exist( )
97- The immediate report form	1)exist ( ) not exist( )
98- A form for collecting stool samples	1)exist ( ) not exist( )
99- Application form for laboratory examination	1)exist ( ) not exist( )
100- A follow-up form (60 days) for AFP cases	1)exist ( ) not exist( )
101- Weekly notification forms	1)exist ( ) not exist( )
102- Forms for active visits	1)exist ( ) not exist( )
103- Schedule of active visits	1)exist ( ) not exist( )
104- Posters to follow up on active visits investigation manual	1)exist ( ) not exist( )
105- Posters to follow the weekly reports	1)exist ( ) not exist( )
106- Poster for the list of notified cases	1)exist ( ) not exist( )
107- A map show the locations of reports and reported cases	1)exist ( ) not exist( )
108- Acute flaccid paralysis manual	1)exist ( ) not exist( )
109- File to save notes from past visits	1)exist ( ) not exist( )

Reported cases investigation form

Age	1)less than 5years( ) 2)5- 10 years( ) 3)11- 15 years( )
Gender	1)male( ) 2)female( )
Housing	1)Urbanization( ) 2)rural( )
Immunization status	1)vaccinated( ) 2)not vaccinated( )
Date of paralysis	1)Before 48 hours( ) 2)after 48 hours( )
Date of reporting	1)Before 48 hours( ) 2)after 48 hours( )
Date of investigation	1)Before 48 hours( ) 2)after 48 hours( )
Paralysis location	.....
Primary diagnosis	.....
Symptoms	.....
Is area at risk	1)yes ( ) 2)No ( )
Date of first sample collection	1)Before 48 hours( ) 2)after 48 hours( )
Date of second sample collection	1)Before 48 hours( ) 2)after 48 hours( )
Date of sample received	1)Before 48 hours( ) 2)after 48 hours( )
Final diagnosis	.....
Ice back status	.....
Level of case	.....
The month/season	.....
60 days follow-up	1)yes( ) 2)No( )
Feedback	1)before 28 days( ) 2) after 28 days ( ) 3)non( )

Focusing interview

1. Are there any cases of refusal by officials of the institutions selected for investigation?
2. How is the matter handled if there is a rejection?
3. Are there sites other than health facilities in the state covered by the surveillance program? If the answer is yes, what is the nature of these sites?
4. How are these sites supervised? Who is the person reporting data on these sites?
5. Is that person receiving training?
6. How the supervision to AFP surveillance sites in general?
7. In the case of field supervision, what is the time interval between one visit and another according to the type of center (upper, middle, lower, and extra)?
8. Others sectors that participate in the surveillance program and their role in achieving the goals of the program and implementing its activities?
9. Challenges facing the program in the state in terms of material, human and legal resources, as well as society, its customs and traditions?


جمهورية مصر العربية
البحر الاحمر
ولاية نهر النيل
الولاية الشمالية
ولاية البحر الاحمر
ابوحبيه
دنقلا
بورتسودان
عطبرة
شندي
القضارف
ولاية شمال كردفان
ولاية الخرطوم
الخرطوم
ولايه كسلا
كسلا
ارتريا

الآيـــــــــــــــــــة

﴿ قَالَ الَّذِي عِنْدَهُ عِلْمٌ مِنَ الْكِتَابِ أَنَا آتِيكَ بِهِ قَبْلَ أَنْ يَرْتَدَّ إِلَيْكَ طَرْفُكَ فَلَمَّا رَآهُ مُسْتَقِرًّا عِنْدَهُ قَالَ هَذَا مِنْ فَضْلِ رَبِّي لِيَبْلُوَنِي أَأَشْكُرُ أَمْ أَكْفُرُ وَمَنْ شَكَرَ فَإِنَّمَا يَشْكُرُ لِنَفْسِهِ وَمَنْ كَفَرَ فَإِنَّ رَبِّي غَنِيٌّ كَرِيمٌ ﴾ [النمل: 40]

Dedication

To the spirit of my father

To my mother

To my wife

To my son

To my brothers

To my friends

To each science student

Acknowledgement

Praise is to **Allah**, peace and blessings are upon our Prophet **Mohammad**, peace is upon him.

I would like to express my thanks to everyone who helped and supported me in carrying out this research.

Thank all those working in the field of AFP surveillance, River Nile State, in particular: **Eiman E, Alhadi A, Ammar M, Ibrahim KH, Othman M, Sahar A and Hamdi** who helped me to conduct this study.

Special thanks: Prof. **Elsadig Mahgoub Eltayeb**, Who supervised the study.

Abstract

Background The acute flaccid paralysis surveillance is one of the four basic elements in the global initiative for polio eradication. This system is based on reporting and testing cases of acute flaccid paralysis in laboratories accredited by the World Health Organization, indicators have been developed to evaluate and monitor performance, [1]. Hence the need to study the components of the system, evaluate performance, its efficiency, and its conformity with the standards adopted by the World Health Organization, in order for it to be adopted as a good system, its results can be accredited to certify that the country is polio-free or not. The system is the only tool to certify Sudan free of polio.

Material and methods; A facility-based retrospective and descriptive study was conducted regarding Surveillance System's Structure and AFP surveillance data, in addition to AFP surveillance workers; who included head system at the level of River Nile State, all reporting sites/units, workers who were reporting the AFP cases and officers at localities level. A Total of 50 health facilities for surveillance were visited and interviews were conducted with a total of 59 health workers who participated in the AFP Surveillance System. The data were gathered from participants by using pre tested questionnaire, designed and developed according to WHO framework, and data was analyzed by using **SPSS** version 22.

Results; The AFP surveillance system in the River Nile State had high efficiency in terms of the established infrastructure and performance of the system's activities were; from 2017 to 2020 the reported non polio AFP cases was mean rate 4.02/100000 children under 15 years of age; the most AFP reported cases less than 10years; the males was 73.3% of reported cases, The completeness of reports and surveillance documents found was more than 80%, the active surveillance strategy was 92% at health facilities, the knowledge about AFP surveillance activities was 100% at all levels. Health workers knowledge regarding modern surveillance computer skills was low because the lack of some elements as the computer and its equipments.

Recommendations; The study recommended strengthening some elements of the system and increasing the frequently of training during the working for workers, especially on the computer applications skills.

المستخلص

خلفية: يعتبر ترصد الشلل الرخو الحاد أحد العناصر الأساسية الأربعة في المبادرة العالمية لاستئصال شلل الأطفال. يعتمد هذا النظام على الإبلاغ عن حالات الشلل الرخو الحاد واختبارها في المعامل المعتمدة من قبل منظمة الصحة العالمية، وقد تم تطوير مؤشرات لتقييم ومتابعة الأداء، [1]. ومن هنا ظهرت الضرورة لدراسة البرنامج بولاية نهر النيل وتقييم أدائه، كفاءته ومدى توافقه مع المؤشرات التي اعتمدتها منظمة الصحة العالمية من أجل إعتماده كنظام جيد يمكن إعتماد نتائجه للإشهاد بخلو البلاد من شلل الأطفال من عدمه.

منهجية الدراسة : تم إجراء دراسة استرجاعية – وصفية قائمة على المرافق المستهدفة بترصد الشلل الرخو الحاد، قواعد البيانات والعاملين في مجال ترصد الشلل الرخو الحاد. تم تضمين القائمين على أمر النظام على مستوى ولاية نهر النيل، جميع مواقع /وحدات التبليغ، العاملين في تلك الوحدات ومديري النظام على مستوى المحليات. تم اختيار إجمالي 50 منشأة صحية خاضعة للترصد وإجراء مقابلة مع العاملين بالنظام على جميع المستويات(59 عامل صحي). تم جمع البيانات من المشاركين باستخدام استبيان تم اختباره مسبقاً، ثم تم تصميمه وتطويره وفقًا لإطار منظمة الصحة العالمية ، وتم تحليل البيانات باستخدام برنامج التحليل الاحصائي للعلوم الاجتماعية"نسخة22".

النتائج: يتمتع نظام مراقبة الشلل الرخو الحاد في ولاية نهر النيل بكفاءة عالية من حيث البنية التحتية وأداء أنشطة النظام؛ من 2017 إلى 2020 كان متوسط حالات الشلل الرخو الحاد غير ناتج عن فيروس الشلل 4,02 لكل 100 ألف طفل دون سن 15 عامًا؛ 73,3% من الحالات المبلغة عبارة عن ذكور، كان اكتمال التقارير ووثائق المراقبة التي تم العثور عليها أكثر من 80 ٪؛ استراتيجية الترصد النشط يتم تنفيذها بنسبة 92% في المرافق الصحية، كانت المعرفة بأنشطة ترصد الشلل الرخو الحاد 100٪ على جميع المستويات، كانت معرفة العاملين الصحيين فيما يتعلق بمهارات استخدام الحاسوب منخفضة بسبب نقص بعض العناصر مثل الحاسب الآلي ومعداته.

التوصيات؛ أوصت الدراسة بتقوية بعض عناصر النظام وزيادة جرعة التدريب للعاملين أثناء العمل خاصة في مجال الحاسوب.

List of abbreviation

AFP	**A**cute **F**laccid **P**aralysis
WHO	**W**orld **H**ealth **O**rganization
OPV	**O**ral **P**olio **V**accine
NGOs	**N**on **G**overnmental **O**rganizations
GPEI	**G**lobal **P**olio **E**radication **I**nitiative
RNA	**R**ibose **N**ucleic **A**cid
PV1	**P**olio **V**irus type1
PV2	**P**olio **V**irus type2
PV3	**P**olio **V**irus type3
GBS	**G**uillain–**B**arré **S**yndrome
TM	**T**ransverse **M**yelitis
EV	**E**nvironmental **S**urveillance
VDPV	**V**accine **D**erived **P**olio **V**irus
CVDPVs	**C**irculating **V**accine **D**erived Polio Virus
IPV	**I**nactivated **P**olio **V**accine
CDC	Revise **C**entral of **D**iseases **C**ontrol and prevention
IHR	**I**nternational **H**ealth Regulation
PPV	**P**ositive Predictive **V**alue
PPVcd	**P**ositive **P**redictive **V**alue of cases detection
PPVod	**P**ositive **P**redictive **V**alue of outbreak detection
NPEV	**N**on **P**olio **E**ntero- **V**irus
VPDs	**V**accine **P**reventable **D**iseases

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1.1- Introduction

Acute Flaccid Paralysis (AFP) is a clinical syndrome characterized by a sudden onset of weakness of a limb, described as flaccid (reduced tone) in a child below 15 years of age,[1]. AFP mimics the clinical presentation of poliomyelitis; hence AFP surveillance was adopted globally as a key strategy for monitoring the progress of the polio eradication initiative,[2]. Any disease eradication initiative relies on highly sensitive surveillance to guide programmatic action. This is especially important for polio eradication, since only one out of 200 infections with poliovirus results in clinically apparent paralytic disease. To identify and eliminate the remaining pockets of wild poliovirus transmission, surveillance must detect and investigate as many cases of paralytic poliomyelitis as possible. To achieve eradication, high levels of polio vaccine coverage must be sustained worldwide, which is dependent on an adequate vaccine supply, [3]. A good AFP surveillance system serves as a sensitive instrument for detecting potential poliomyelitis cases and thus alerting health managers and clinicians to timely institute appropriate interventions to interrupt any poliovirus transmission. Effective AFP surveillance is also crucial for verifying, with confidence, the absence of wild poliovirus circulation in countries that are no longer reporting cases of poliomyelitis, [4]. (AFP) surveillance was adopted by World Health Organization (WHO) to monitor progress towards poliomyelitis eradication. AFP surveillance helps to detect reliably areas where poliovirus transmission is occurring. Thus, AFP surveillance data will guide targeted immunization activities in areas with continued wild poliovirus circulation. Additionally, surveillance data is accepted as the most reliable way to monitor how effectively routine and supplementary OPV immunization has succeeded in decreasing poliovirus transmission. Ultimately, surveillance data will be the basis for certification of polio eradication, [4].

1.2- Problem statement

In Sudan there are challenges to the surveillance system, as Insecurity, forced displacement, frequent nomadic population movement and inaccessibility in some areas make it challenging for health workers to consistently reach all children with vaccines to build immunity. To cater for specific surveillance challenges associated with reaching high risk groups, special strategies have been devised at state, locality and administrative unit levels. Examples include active searches for AFP cases and sample collection by community based surveillance officers in areas with access issues, the mapping of the movement of displaced populations, and establishing regular communication with nomadic community focal points who report AFP cases via mobile phone. In refugee camps, vaccination posts have provided an opportunity to screen for children with AFP, and collaboration and sensitization of non-government organizations (NGOs) staff has helped to improve reporting of AFP cases. Eighteen states were assessed throughout the review, with visits to 90 health facilities, families of 16 children with AFP, and high-risk special populations conducted. Using standardized tools, teams assessed the quality of case investigation, active surveillance and surveillance documentation as well as plans for outbreak preparedness and response. Overall conclusions were that solid structures for AFP surveillance are in place in Sudan at all levels. The system is meeting global AFP surveillance targets and it is unlikely for polio to circulate undetected, however, there are gaps that need to be addressed, [5].

1.3- Justification

The AFP surveillance system based on reporting and testing cases of acute flaccid paralysis in World Health Organization accredited laboratories; where indicators have been developed to assess and monitor performance.

In the study area, there is a complete system for AFP Surveillance, but no study has been conducted to evaluate it in the past, hence the need to study the components of the system and evaluate its performance, efficiency and conformity with the standards approved by the World Health Organization in order for it to be adopted as a good system, its results can be accredited to certify that the country is polio-free or not. This system is the only tool to prove that Sudan is free of polio.

Continuous surveillance of acute flaccid paralysis in the state; It is a task that requires skill and constant funding if we are to achieve our goal. Where there is a great achievement - all future generations are free from the threat of polio.

1.4- Objectives:

1.4.1- General objective

To Study the Acute Flaccid Paralysis Surveillance System in River Nile state, 2018- 2020

1.4.2- Specific objectives

1.4.2.1- To assess the structural components of AFP surveillance system.

1.4.2.2- To assess the performance of core activities for AFP Surveillance system.

1.4.2.3- To identify the support functions of AFP surveillance system.

2- Literature review

2.1- Background

Poliomyelitis is a highly contagious viral disease that attacks the nervous system. The most vulnerable are children under the age of five years, but early vaccination can prevent infection. Almost every child among 200-400 children is at risk of paralysis and even death. Poliomyelitis is one of the most serious diseases in the world, the largest public-private health partnership that has resulted in a 99 per cent reduction in poliomyelitis. Poliomyelitis exists only in the poorest and most marginalized communities in the world, where it remains among the most vulnerable children, [6].

In the normal context of the poliovirus infection, the polio virus remains in the stool for several weeks. Searching for poliovirus in wastewater or other wastewater was used to detect the poliovirus in the environment. It was pointed out that environmental surveillance could be used as one approach to assessing the elimination of the spread of polio virus in a given human group and to proving the ultimate success of polio eradication. The potential benefits of environmental surveillance are being assessed under the conditions of developing countries. However, the principles of sampling and detection methods used have been somewhat different, often non-quantitative, and have not been identified for use in WHO polio laboratory network, [7].

Acute flaccid paralysis (AFP) is defined as the sudden onset of paralysis / weakness in any part of the body of a child under 15 years old, or any person at any age is whom the clinician suspected polio. The term acute flaccid paralysis (AFP) is often used to describe a sudden onset, as is the case with polio. AFP is the most common sign of acute polio and is used for surveillance during an outbreak of polio. AFP is also associated with a number of other disease-causing agents including enteroviruses, echo viruses, West Nile virus, and

adenoviruses, among others, [8]. Acute flaccid paralysis (AFP) is a clinical syndrome characterized by rapid onset of weakness, including (less frequently) weakness of the muscles of respiration and swallowing, progressing to maximum severity within several days to weeks. The term "flaccid" indicates the absence of spasticity or other signs of disordered central nervous sys- tem motor tracts such as hyper reflexia, clonus, or extensor plantar responses. When applied to voluntary muscles, "paralysis" means loss of contraction due to interruption of motor pathways from the cortex to the muscle fiber. It is preferable to use the term "paresis" for slight loss of motor strength and "paralysis" or "plegia" for severe loss of motor strength. The differential diagnosis of AFP varies considerably with age. No single operational clinical case definition of AFP or paralytic poliomyelitis that combines both high sensitivity and high specificity has emerged, [9]. AFP surveillance helps to detect reliably areas where poliovirus transmission is occurring. Thus, AFP surveillance data will guide targeted immunization activities in areas with continued wild poliovirus circulation. Additionally, surveillance data is accepted as the most reliable way to monitor how effectively routine and supplementary OPV immunization has succeeded in decreasing poliovirus transmission. Ultimately, surveillance data will be the basis for certification of polio eradication. Any surveillance systems should meet their objectives as efficiently as possible. Meeting each of these objectives involves evaluating surveillance from different perspectives. The overall purpose of evaluating public health surveillance is to promote the most effective use of health resources. Evaluation is critical to strengthen surveillance and response systems, and should be an integral part of these systems. Its fosters accountability while ensuring that the surveillance and response systems meet the objectives for which they were developed, [10]. WHO framework for monitoring and evaluating surveillance and response systems for communicable diseases commonly used for purpose of guiding the

evaluation process of public health surveillance systems. This framework can identify the major element of evaluation process**.**

2.2- Causes of acute flaccid paralysis

2.2.1- Polio viruses; Polioviruses are classified into three distinct serotypes (type 1, type 2, and type 3) based on their reaction with reference panels of neutralizing anti sera**.** They belong to the genus enterovirus in the family picornaviridae. Polioviruses are stable at acid pH and can survive for weeks at room temperature and for many months at 0°C to 8°C. As with other enteroviruses, polioviruses are resistant to ether, 70% alcohol and other laboratory disinfectants. Treatment with 0.3% formaldehyde, 0.1 N HCl, or free residual chlorine at a level of 0.3 to 0.45 parts per million rapidly inactivates polioviruses, as does exposure to a temperature of 50°C or higher or to ultraviolet light**.** Early work identified two distinct types of antigens in harvests from virus infected cells, which were designated as D antigen and C antigen. D antigen is largely but not exclusively associated with infectious virus and C antigen with empty capsids**.** More recent investigations have revealed the complexity of the antigenic structure of polioviruses. The poliovirus virion is small, with a diameter of 27 to 30 nm, and contains a single stranded molecule of RNA. A thin 20-sided shell composed of four virion proteins (VP1, VP2, VP3, VP4) surrounds the RNA**.** Several sites involved in virus neutralization have been identified on the surface of the poliovirus. For example, a site composed of amino acids 89 to 100 of VP1 is a major immunogenic site for type 2 and type 3 polioviruses, as judged by monoclonal antibodies induced in mice, [11].

2.2.2- Guillain–Barré syndrome (**GBS**); Guillain-Barré syndrome (GBS) is an autoimmune disease and a post-infection disease. The syndrome includes several pathological subtypes, the most common of which is multifocal demyelization disorder of peripheral nerves. In this review, the main clinical aspects and essential features of GBS are discussed along with

diagnostic and treatment approaches. Furthermore, the pathophysiology of GBS is reviewed, with an emphasis on symptom production and disease, [12]. Some are affected by changes in the function of the autonomic nervous system, which can lead to dangerous abnormalities in heart rate and blood pressure. The cause is unknown. The underlying mechanism involves an autoimmune disorder in which the body's immune system mistakenly attacks the peripheral nerves and damages their myelin insulation. Sometimes this immune dysfunction is triggered by an infection or, less commonly by surgery and rarely by vaccination. The diagnosis is usually made based on the signs and symptoms, through the exclusion of alternative causes, and supported by tests such as nerve conduction studies and examination of the cerebrospinal fluid, [13]. There are a number of subtypes based on the areas of weakness, results of nerve conduction studies and the presence of certain antibodies. It is classified as an acute polyneuropathy.[14] In those with severe weakness, prompt treatment with intravenous immunoglobulins or plasmapheresis, together with supportive care, will lead to good recovery in the majority. Recovery may take weeks to years. About a third has some permanent weakness (Williams). Globally, death occurs in about 7.5% of those affected. Guillain – Barré syndrome is rare, at one or two cases per 100,000 people every year. Both sexes and all parts of the world have similar rates of disease, [12]. The syndrome is named after the French neurologists Georges Guillain and Jean Alexandre Barré, who described it with French physician André Strohl in 1916, [15].

2.2.3- Transverse myelitis (TM); It is a rare neurological condition in which there is inflammation of the spinal cord. Transverse means that the inflammation extends across the entire width of the spinal cord. Partial myelitis and partial myelitis are terms used to define myelitis that affects part of the width of the spinal cord, [16]. TM is characterized by weakness and numbness of the limbs, deficits in sensation and motor skills, dysfunctional urethral and anal sphincter activities, and dysfunction of the autonomic nervous system that

can lead to episodes of high blood pressure. Signs and symptoms are variable and reflect the level of the affected spinal cord. The underlying cause of transverse myelitis is unknown. The spinal cord inflammation seen in TM has been associated with various infections, immune system disorders, or damage to nerve fibers, by loss of myelin, [16].

2.2.4- Peripheral neuropathy; often shortened to neuropathy, is a general term describing disease affecting the peripheral nerves, meaning nerves beyond the brain and spinal cord. Damage to peripheral nerves may impair sensation, movement, gland or organ function depending on which nerves are affected; in other words, neuropathy affecting motor, sensory, or autonomic nerves result in different symptoms. More than one type of nerve may be affected simultaneously. Peripheral neuropathy may be acute (with sudden onset, rapid progress) or chronic (symptoms begin subtly and progress slowly), and may be reversible or permanent. Common causes include systemic diseases (such as diabetes or leprosy), hyperglycemia-induced glycation, vitamin deficiency, medication (eg, chemotherapy, or commonly prescribed antibiotics including metronidazole and the fluoroquinolone class of antibiotics (Ciprofloxacin, Levaquin, Avelox etc.), traumatic Injury, including ischemia, radiation therapy, excessive alcohol consumption, immune system disease, coeliac disease, non-celiac gluten sensitivity, or viral infection. It can also be genetic (present from birth) or idiopathic (no known cause), [17].

2.2.5- Enterovirus; is a genus of positive-sense single-stranded RNA viruses associated with several human and mammalian diseases. Enteroviruses are named by their transmission-route through the intestine (enteric meaning intestinal), [18]. Serologic studies have distinguished 71 human enterovirus serotypes on the basis of antibody neutralization tests. Additional antigenic variants have been defined within several of the serotypes on the basis of reduced or nonreciprocal cross-neutralization between variant strains. On the basis of their

pathogenesis in humans and animals, the enteroviruses were originally classified into four groups, polioviruses, Coxsackie A viruses (CA), Coxsackie B viruses (CB), and echoviruses, but it was quickly realized that there were significant overlaps in. the biological properties of viruses in the different groups. Enteroviruses isolated more recently are named with a system of consecutive numbers: EV68, EV69, EV70, EV71, etc, [19]**.** Poliovirus, as well as coxsackie and echovirus, is spread through the fecal-oral route. Infection can result in a wide variety of symptoms, including those of: mild respiratory illness (the common cold), hand, foot and mouth disease, acute hemorrhagic conjunctivitis, aseptic meningitis, myocarditis, severe neonatal sepsis-like disease, acute flaccid paralysis, and the related acute flaccid myelitis, [20].

2.2.6- Botulism; The Clostridium botulinum bacteria are the cause of botulism. Vegetative cells of C. botulinum may be ingested. Introduction of the bacteria may also occur via endospores in a wound. When the bacteria are in vivo, they induce flaccid paralysis. This happens because C. botulinum produces a toxin which blocks the release of acetylcholine. Botulism toxin blocks the exocytosis of presynaptic vesicles containing acetylcholine (ACh), [21]**.** When this occurs, the muscles are unable to contract, [22]**.** Other symptoms associated with infection from this neurotoxin include double vision, blurred vision, drooping eyelids, slurred speech, difficulty swallowing, dry mouth, and muscle weakness. Botulism prevents muscle contraction by blocking the release of acetylcholine, thereby halting postsynaptic activity of the neuromuscular junction. If its effects reach the respiratory muscles, then it can cause respiratory failure, leading to death**,** [23].

2.2.7- Curare; Curare is a plant poison derived from - among other species - Chondrodendron tomentosum and various species belonging to the genus Strychnos, which belongs to the rainforests of South America. Some of the indigenous peoples of the region -

particularly Macusi - crush and cook the roots and stems of these plants and some other plants and then mix the resulting decoction with other phytotoxins and animal poisons to form a syrupy liquid into which the arrowheads are dipped. And their blow arrows tips. Curare has also been used medicinally by South Americans to treat insanity, dropsy, edema, fever, kidney stones, and bruises. Curare acts as a neuromuscular blocking agent that induces flaccid paralysis. This toxin binds to acetylcholine (ACh) receptors found in the muscles, preventing them from binding to ACh. As a result, ACh builds up within the neuromuscular junction, but since ACh cannot bind to the receptors in the muscles, the muscles cannot be stimulated. This toxin must enter the bloodstream for it to work. If the ALCAR affects the muscles of the respiratory system, its effects may become life-threatening, putting the victim at risk of suffocation, [21]**.**

2.3- Poliovirus surveillance

The public health importance of a health-related event and the need to have that event under surveillance can be described in several ways. Health-related events that affect many persons or that require large expenditures of resources are of public health importance. However, health-related events that affect few persons might also be important, especially if the events cluster in time and place (e.g., a limited outbreak of a severe disease). In other instances, public concerns might focus attention on a particular health-related event, creating or heightening the importance of an evaluation. Diseases that are now rare because of successful control measures might be perceived as unimportant, but their level of importance should be assessed as a possible sentinel health-related event or for their potential to reemerge. Finally, the public health importance of a health-related event is influenced by its level of preventability, [24].

Surveillance is most important part of the whole polio eradication initiative. Without surveillance, it would be impossible to pinpoint where and how wild poliovirus is still

circulating, or to verify that the virus has been eradicated. Surveillance identifies new cases and detects importation of wild polio virus**,** [25]**.** Poliomyelitis surveillance provides the information for programmatic action. It serves as a method for assessing the effectiveness of immunization strategies and as a tool for guiding efforts toward eradication of the disease and the virus. Surveillance is based on the detection, reporting, clinical investigation, and virologic testing of stool specimens from all patients with acute flaccid paralysis (AFP). Successful surveillance depends on the cooperation of public health workers, clinicians, epidemiologists, and virologists. Poliovirus surveillance provides the evidence for certification of eradication. Surveillance systems of proven sensitivity are required to document the absence of wild virus isolations from AFP patients, healthy children, and the environment. Key to poliovirus eradication and its certification is a global network of high-quality poliovirus laboratories capable of detecting wild virus when and where it occurs. Building the network began in 1986 in the Americas, the first region to declare its intention to eradicate poliomyelitis, and has continued in the other regions of the World Health Organization (WHO), following the global resolution of 1988**,** [26]. Sensitive surveillance systems are essential to polio eradication. They enable the identification of any residual viruses and are a crucial basis for certification of eradication. This section outlines the steps that will be taken to further build and maintain a comprehensive polio surveillance system for eradication**,** [27].

2.4- Polio eradication and endgame strategic plan, 2013 – 2018

This programme is a comprehensive long – term strategy that addresses what is needed to deliver a polio free world by 2018. The plan has four objectives:

2.4.1- Detect and interrupt all poliovirus transmission; this objective is to stop all wild polio transmission by the end of 2014 by enhancing global poliovirus surveillance, effectively implementing national emergency plan to improve OPV campaign quality in the

remaining endemic countries, and ensuring rapid outbreak response. It also includes stopping any new polio outbreak due vaccine-derived polio virus (VDPV) within 6 months of the index case.

2.4.2- Strengthen immunization system and withdraw oral polio vaccine; This objective will help hasten the interruption of wild poliovirus transmission, reduce the risk of wild and VDPV importation and spread and help build a strong system for the delivery of other life saving vaccines. To eliminate all VDPV risks, in the long- term all OPV must be removed from routine immunization programmes.

2.4.3- Contain and Certify; Before certifying eradication, laboratories and vaccine production facilities worldwide must properly contain all virus samples to protect against future outbreaks. Both recently infected and polio-free countries must address gaps in surveillance in order to detect suspected polio cases and confirm that transmission has been stopped. All regions must surpass three years without a case to attain polio free status, with eradication certification possible the following year.

2.4.4- Plan Polio's Legacy; the polio program provides a blueprint for accessing the most marginalized and hard-to-reach communities in the world. Sharing this expertise can benefit other health and development initiatives. For example, according to a 2010 study published in Vaccine, the program is estimated to have already produced tens of billions of dollars in savings by delivering vitamin A during polio campaigns. The program's sophisticated global surveillance and response network is used to combat other vaccine-preventable diseases, as well as to provide assistance during humanitarian emergencies. The plan calls for the responsible transfer of the polio program's assets to ensure lasting public health benefits.[28]

2.5- Environmental surveillance of poliovirus circulation

Environmental surveillance has been used successfully in monitoring enteric virus circulation and assessing the extent or duration of epidemic PV circulation in specific

populations. The rationale for environmental surveillance is based on the characteristic PV excretion pattern**.** Infected individuals excrete PVs in faeces for periods up to several weeks, whether or not they are symptomatic and therefore, large numbers of PVs may remain infectious in the environment for varying lengths of time depending on the immediate conditions, [6].

Wild-type PVs and cVDPVs have been detected in the environment even in the absence of reported cases of AFP, which is of major concern, since these PVs might be transmitted and continue to circulate in a non-immune population after the cessation of polio vaccination, [29]. A study conducted by Divizia and colleagues (1999), confirmed the environmental circulation in Albania of recombinant PV strains (Sabin-like PV type 2/wild PV type 1), sustained by a massive immunisation effort and by the presence in the environment of a PV type 1, isolated from a river 2 months before the first case of symptomatic AFP. An unusual highly diverged derivative of the Sabin PV type 2 strain was isolated from environmental samples during routine screening for wild-type PV in Israel, The extensive genetic divergence of the isolate from its parental Sabin PV type 2 vaccine strain suggested that the virus had replicated in one or more individuals for approximately 6 years, [30]. According to other studies, VDPVs (with 1.4% nucleotide divergence from the vaccine strain) were isolated from sewage and river water in Japan within 3 months following OPV vaccination, and several of these VDPV type 1 and 3 isolates showed increased neurovirulence, [31].

More recently, two Sabin-like PVs were found by environmental surveillance 8 and 11 months after any OPV vaccine was used in New Zealand and showed 99.8% as well as99.9% homology with Sabin PV type 2 vaccine strain in the VP1 region. This suggested that these PVs could have been excreted by recently vaccinated children (one or two months) visiting from a country using OPV**.** Furthermore, a highly evolved VDPV type 3 strain harbouring a

13% sequence drift from Sabin PV type 3 vaccine strain has been isolated from sewage in Estonia, [32].

Research has shown that PV isolates in the environment are genetically and epidemiologically related to those circulating in the community,[30]. Thus, the properties of PV isolates from sewage and river water would reflect those of PVs excreted from humans after OPV immunization and for susceptible individuals, VDPVs have the potential to be the causative agents of poliomyelitis, [33]. However, it is difficult to address the risk of infection from the environment, since there is little chance that individuals come into direct contact with raw sewage**.** In contrast, access to river water or any other water source (used by the community for domestic purposes) is easy and therefore, susceptible individuals should be regarded as at greater risk of infection from such water sources**.** Nonetheless, although it is possible to eliminate wild-type PV from the human community and environment, it will be difficult to eradicate poliomyelitis completely as long as OPV is not replaced by IPV, [29].
It is evident that environmental surveillance is still epidemiologically important, because the results of virus surveillance retrospectively reflect the properties of virus circulating in the community and it assesses the potential risk of infection from the environment as well as. The examination of composite human faecal samples through environmental surveillance links PV isolates from unknown individuals to populations served by the wastewater system**.** In addition, environmental surveillance provides valuable information, particularly in urban populations where AFP surveillance is absent and where persistent PV circulation or re-introduction is suspected**,** [29].

2.6- AFP surveillance system

An AFP surveillance system is conducted to increase case yield of poliomyelitis. This includes collection of 2 stool samples within 14 days of onset of paralysis and identification of virus, and control of the outbreak and strengthening immunization in that area.

AFP cases rather than just “suspected poliomyelitis”, serves many purposes;

First, AFP surveillance substantially increases the sensitivity of the surveillance system and allows it to detect paralytic poliomyelitis due to wild poliovirus transmission in the population.

Secondly, AFP surveillance provides objective data with which to monitor the quality of surveillance in an individual country or large population group. AFP Surveillance also helps to monitor progress in polio eradication when polio exists in a country as well as helps to define when polio is gone from the country or area.

Finding and reporting children with acute flaccid paralysis (AFP); the first links in the surveillance chain are the staff in all health facilities from district health centres to large hospitals. They must promptly report every case of acute flaccid paralysis (AFP) in any child under 15 years of age. In addition, public health staffs make regular visits to hospitals and rehabilitation centres to search for AFP cases which may have been overlooked or misdiagnosed. In areas with few formal health workers, some countries use “community” surveillance, where pharmacists, traditional healers or clerics may serve as a source of information on paralysed children. The number of AFP cases reported each year is used as an indicator of a country’s ability to detect polio – even in countries where the disease no longer occurs. A country’s surveillance system needs to be sensitive enough to detect at least one case of AFP for every 100 000 children under 15 – even in the absence of polio.

Transporting stool samples for analysis; In the early stages, polio may be difficult to differentiate from other forms of acute flaccid paralysis, such as Guillin- Barré Syndrome, transverse myelitis, or traumatic neuritis. All children with acute flaccid paralysis (AFP) should be reported and tested for wild poliovirus within 48 hours of onset, even if doctors are confident on clinical grounds that the child does not have polio. To test for polio, faecal

specimens are analysed for the presence of poliovirus. Because shedding of the virus is variable, two specimens – taken 24-48 hours apart – are required. Speed is essential, since the highest concentrations of poliovirus in the stools of infected individuals are found during the first two weeks after onset of paralysis. Stool specimens have to be sealed in containers and stored immediately inside a refrigerator or packed between frozen ice packs at 4–8 degrees celsius in a cold box, ready for shipment to a laboratory. Undue delays or prolonged exposure to heat on the way to the laboratory may destroy the virus. Specimens should arrive at the laboratory within 72 hours of collection. Otherwise they must be frozen (at -200 degrees celsius), and then shipped frozen, ideally packed with dry ice or cold packs. The procedure is known as the “reverse cold chain”.

Isolating poliovirus; In a laboratory, virologists begin the task of isolating poliovirus from the stool samples. If poliovirus is isolated, the next step is to distinguish between wild (naturally occurring) and vaccine-related poliovirus. This is necessary because the oral vaccine consists of attenuated live polioviruses and resembles wild virus in the laboratory. If wild poliovirus is isolated, the virologists identify which of the two surviving types of wild virus is involved. Wild poliovirus type 2 has not been recorded since 1999.

Mapping the virus; Once wild poliovirus has been identified, further tests are carried out to determine where the strain may have originated. By determining the exact genetic makeup of the virus, wild viruses can be compared to others and classified into genetic families which cluster in defined geographical areas. The newly-found poliovirus sequence is checked against a reference bank of known polioviruses, allowing inferences about the geographical origin of the newly found virus. When polio has been pinpointed to a precise geographical area, it is possible to identify the source of importation of poliovirus – both long-range and

cross-border. Appropriate immunization strategies can then be determined to prevent further spread of the poliovirus,[27]**.**

2.7- Structure of the AFP surveillance system

The structure of the surveillance system is defined by legislation (laws, and regulations, including IHR 2005), the strategy for implementing activities, the implementers and stakeholders, and how they relate to each other and to the various networks and partnerships.

The indicators that measure different aspects of the structure of a system constitute part of the evaluation indicators, [34].

2.7.1- Legislation1 for surveillance

Public health legislation and regulations, including IHR 2005 (for example, regulations governing notifiable diseases and other communicable diseases of public health importance) provide the regulatory framework for the implementation of surveillance and response systems. Some of these laws and regulations have become outdated and may require some amendments. Periodic review and evaluation will establish the relevance, adequacy and need for update.

The IHR 2005 constitute an important component of public health legislation and aim to ensure adequate measures for the protection of public health and strengthening of the global public health response to the international spread of diseases. Their purpose is to ensure maximum security against the international spread of diseases with a minimum interference with the international traffic and trade. Member States to develop and enhance their capacities for surveillance, reporting, notification, verification, response, and collaboration, and their activities concerning designated airports, ports and ground crossings after an initial assessment, [35].

2.7.2- Surveillance strategy

The surveillance strategy depends on the diseases under surveillance, the objectives of the surveillance system, the methods for conducting surveillance and how the surveillance data are used to inform public health policy and practice. For example, an early warning surveillance system needs to be more comprehensive while a system that serves a programme monitoring function could be conducted through sentinel sites.

In a multi-disease surveillance system, a limited degree of integration and coordination may be required for efficiency. Some countries have also embarked on a structured approach to strengthening national surveillance systems through prioritization of diseases for surveillance, systematic assessments of existing systems, development of action plans to strengthen the systems, implementation of these plans, and monitoring and evaluation, [36].

2.7.3- Implementers and stakeholders

The important surveillance levels are central, intermediate (province /region, district) peripheral (sub-district, health facility) and community level. Each of these levels may comprise formal and private health-care providers that may or may not be included in the surveillance system.

Other stakeholders and implementers include the disease-specific programmes, public health laboratories, and public health training institutions. The roles and responsibilities of the implementers and stakeholders, and how they relate to each other should be clearly articulated. The flow of surveillance data through the system, and the dissemination and utilization of information needs to be clear and known to implementers and stakeholders, and the mechanism for response should be well coordinated across the different levels of surveillance, [37].

2.7.4- Networking and partnership

Surveillance of communicable diseases requires concerted efforts and collaboration between stakeholders and partners in and between countries. At country level, intersectoral collaboration and coordination between key partners is crucial for the implementation of effective and comprehensive surveillance systems.

Various surveillance networks and partnerships exist at country level and between countries.

The laboratory network is a good example of a country-level network, while collaboration on surveillance and response activities between countries bordering one another represents intercountry networking. Intersectoral collaboration is a necessity in order to implement early warning and response functions.

2.8- Surveillance quality

The quality of the surveillance system is defined by attributes such as completeness, timeliness, usefulness, sensitivity, positive predictive value (PPV), specificity, representativeness, simplicity, flexibility, acceptability, and reliability.

While monitoring will help identify changes in the attributes over time, periodic evaluations should assess the extent of the improvements in the quality of surveillance systems, the data they generate, and the type and quality of the public health responses to the information.

Surveillance attributes can be evaluated using quantitative and qualitative methods.

Centers for Disease Control and Prevention and the framework for evaluating public health surveillance systems for early detection of outbreaks illustrate some of the approaches;

2.8.1- Completeness

Completeness in surveillance can have varying dimensions and may include the following:

- Completeness of reporting sites/surveillance forms
- Completeness of case reporting
- Completeness of surveillance data

2.8.1.1- Completeness of reporting sites/surveillance forms

Completeness of reporting sites refers to the proportion of reporting sites that submitted the surveillance report irrespective of the time when the report was submitted. This is measurable in situations where the surveillance system is such that the number of reporting sites or expected surveillance reports is known, as in the case of "zero reporting". Examples include zero reporting of notifiable conditions, weekly or monthly reporting of surveillance data.

2.8.1.2 Completeness of case reporting

Completeness of case reporting refers to the match between the number of cases reported and the actual number of cases. This can be obtained by comparing the number of the reportable conditions reported to the next higher level over a period of time with the number of cases recorded in the patient register over the same period of time. The capture and recapture method can also be used to estimate the completeness of case reporting.

In a system where the level of reporting of detected cases is very high, the completeness of case reporting will be directly related to the sensitivity of the surveillance system.

2.8.1.3- Completeness of surveillance data

Completeness of surveillance data is the match between the expected minimum data requirement and what is reported. The following questions are useful in determining completeness of surveillance data and its implications on public health actions;

- Are all the data on each of the required variables in a surveillance form collected, registered and compiled?
- If not, which are the variables that are not routinely collected and what is the problem in their collection?
- What is the implication of the missing data on the quality of the surveillance data?
- How can this problem be resolved?

2.8.2 Timeliness of reporting

The single most important measure of timeliness is whether data are submitted in time to begin investigations and implement control measures. Timeliness of reporting should be measured against standards developed by each country.

Important aspects of timelines of reporting in a communicable disease surveillance system include:

- Timeliness of immediate notification, i.e. within 24 hours
- Timeliness of weekly reporting
- Timeliness of monthly reporting

2.8.3- Usefulness of the surveillance data and the surveillance system

Surveillance data have many potential uses. The usefulness of the surveillance data and the system should be evaluated in the context of the two key surveillance functions i.e. early warning and routine programme monitoring. An early warning system serves to:

- Detect outbreaks of diseases in a timely manner
- Inform appropriate and effective public health responses
- Determine the distribution and spread of disease
- Illustrate the epidemiology of new diseases
- Provide information to categorize the outbreak as of national or international importance
- Provide data to evaluate control measures.

The surveillance systems for monitoring effectiveness of control programmes serve to:

- Estimate disease burden
- Identify risk groups
- Determine incidence trends over time
- Measure outcomes and impacts of preventive and public health interventions

- Evaluate the overall control interventions.

Evaluations should determine the extent to which surveillance objectives are being met.

The section below contains examples of how to assess the usefulness of public health data and surveillance systems.

2.8.3.1- Usefulness of surveillance data in an early warning system

As indicated above, surveillance systems with an early warning function mainly serve to provide data that can be used to detect and respond to outbreaks or public health threats in a timely and appropriate manner.

To evaluate the actual usefulness of the data for this purpose, the surveillance data in an early warning system over the previous year should be reviewed to identify cases and suspected outbreaks for which an epidemiological response was required. For the suspected outbreaks, it should be determined whether:

- The suspected outbreaks were detected early by the system
- Epidemiological investigations were undertaken
- The response was initiated in a timely manner
- The surveillance data were used to guide the public health response.

In addition, the factors that led to inappropriate or lack of use of surveillance data should be determined.

2.8.3.2- Usefulness of surveillance data with a programme monitoring function

Evaluators should ask both the surveillance staff and the end users of the data to list the different ways they have been able to use the data, e.g. for case detection, planning, policy, etc. They should also ask them to specify factors relating to lack of use of the data and identify the data elements that are not useful.

2.8.4- Simplicity of the system

Simplicity refers to the structure of the system and the ease of implementation. As part of the structure, the simplicity of information flow from its point of generation to the end users should be considered. The structure for response to ensure that all the different structures are complementary to one another should also be reviewed.

In terms of implementing the system, the amount and type of information collected, ease of collection, compilation, analysis, reporting, and ease of using the reporting format should all be considered.

Analyzing the simplicity of a surveillance system does not easily lend itself to quantitative evaluation, and remains a largely subjective process. The evaluation team can determine the perceived simplicity of the system from the persons responsible for operating and managing the existing system. Some of the suggested questions to be posed include:

- In your experience/judgment do you believe any part of the surveillance system is unnecessarily complicated?
- What changes to the system do you believe would make it easier to implement while still achieving its purpose?

Depending on the responses to these initial questions, the evaluators can follow up with more specific questions to determine the features of the system which are identified as problematic, what changes could be made and why the changes might improve the system.

2.8.5- Acceptability of the system

Acceptability of a system is a reflection of the willingness of the surveillance staff to implement the system, and of the end users to accept and use the data generated through the system.

Evaluation of the acceptability should establish if the staff implementing the surveillance system, or who otherwise support the system, views it as appropriate to their needs. In cases

where the system is found to be inappropriate, suggestions for improvements to make it more acceptable by the implementers and end users of the data should be made.

2.8.6- Flexibility of the surveillance system

Flexibility refers to the ability of the system to be adapted to changing needs such as the removal or inclusion of additional diseases, modification of the reporting frequency, data requirement needs, etc. An early warning system may need to be adapted from time to time to meet additional case detection needs, for example by:

- Adapting the system to the required data collection needs for signals and alerts
- Collecting exposure information and data requirements for outbreak management
- Increasing coverage by increasing data sources or data providers
- Modifying the case definitions in use
- Redefining the alert and action threshold values.

The system should also be flexible enough to shift from providing the needs for outbreak detection to outbreak response and control.

The following questions could help in ascertaining the flexibility of a surveillance system:

- Could you please describe how your system was adapted to changes and new challenges?
- Are there existing elements that make your system difficult to adapt?
- Briefly describe circumstances when it was not possible to adapt the surveillance system and why it was not possible to adapt it.

2.8.7 Sensitivity in surveillance

Sensitivity in surveillance refers to the proportion of actual cases in a population that are detected and notified through the system. Sensitivity is particularly important in an early warning system designed to detect outbreaks. It is usually not practical to obtain highly accurate estimates of sensitivity as this requires the true number of cases in the population be

known, something that is almost impossible, and that the diagnosis of reported cases be confirmed to eliminate “false positives.”

Sensitivity in surveillance can be described at three different levels:

2.8.7.1- Sensitivity of the surveillance case definition

This refers to the ability of the case definition to identify all possible cases in the community. A surveillance case definition is very sensitive but it may create problems by increasing the number of false positives. A laboratory-confirmed case definition may not be very sensitive in countries where laboratory testing is not widely available.

2.8.7.2- Sensitivity of the detection of events for public health response

This refers to the proportion of cases detected and reported through the system. It includes the use of "thresholds" which should trigger intervention.

2.8.7.3 Sensitivity of the notification system

This refers to the proportion of cases meeting the case definition (regardless of the sensitivity of the case definition itself) that are detected and notified as they should be.

2.8.8 - Specificity in surveillance

Specificity refers to the proportion of persons without the disease that are considered by the surveillance system as not having the disease.

Very low specificity would result in the surveillance system indicating many "false" outbreaks, and the staff spending a lot of resources to verify and investigate.

2.8.9- Positive predictive value

The positive predictive value (PPV) is the proportion of people the surveillance system indicates as having the disease who actually have it. All positives PPV = true positives

The PPV for surveillance can be viewed in three different ways:

2.8.9.1 The PPV of the case definition

The positive predictive value of the case definition (PPVcd) is the proportion of actual cases that meet the case definition (PPVcd). This is calculated as: total number of actual cases PPVcd = cases meeting case definition

The higher the PPVcd, the better is the case definition. The PPVcd is affected by the sensitivity and the specificity of the case definition, and the prevalence of the condition in the population.

Improving the specificity of the case definition would involve making the case definition more restrictive (which may decrease its sensitivity).

A low PPVcd means that either the case definition is not adequate or is not applied appropriately. In this case, it may be necessary to review the case definition in use and update or recommend the training of clinical staff in its proper use.

2.8.9.2- The PPV of case detection

The positive predictive value of detecting cases (PPVdc) is the proportion of diseased persons that are detected (clinically or through laboratory confirmation) by the surveillance system.

2.8.9.3- The PPV of outbreak detection

The PPVdo of detecting outbreaks refers to the proportion of the alerts detected by the system that were indeed confirmed after initial verification. Total alerts received / detected PPVdo = total alerts confirmed as outbreaks

The higher the PPVo, the better is the surveillance system. If the value of the PPVdo is low then the thresholds used for triggering an alert should be made more specific (higher values) without impairing the sensitivity too much.

2.8.10- Representativeness of the surveillance system

Representativeness refers to the degree to which the reported cases reflect the occurrence and distribution of all the cases in the population under surveillance. Geographical representativeness is particularly important in an early warning system to ensure detection of outbreaks of infectious diseases. In a situation where the reported cases of a particular health condition in a population are not representative of all the cases that are occurring in that population, the disease prevention and health promotion priorities may be inappropriate and inadequate compared to the actual needs.

Because the true frequency and distribution of the health condition in a population is usually unknown, it is impossible to measure representativeness accurately. If population-based studies have been conducted and reliable estimates made, then evaluators can compare the frequency and distribution reported by the surveillance system to that established by those studies. The degree to which the reported data corresponds to the data from population-based studies is a measure of the representativeness of the reported data. However, if such population-based data are not available, evaluators must decide whether the importance of knowing the representativeness of the reported data is sufficient to recommend and/or implement one or more of the following:

- A population-based study of the incidence or prevalence of a particular disease or syndrome. This would provide the most useful data, but is time-consuming and very costly.
- A study of the demographic characteristics of clinic/health facility attendees and a comparison of this information with that of census data for the same jurisdiction. This is the easiest to do if reliable census data exist. It will not measure representativeness, but it will measure the degree of opportunity for the reported data to be representative.

- A study to determine the proportion or characteristics of the population that seek medical care from non-governmental facilities. This, combined with follow-up evaluation, will provide information that can be used directly to adjust projections of the occurrence of the health condition in the population.
- A study of reporting of notifiable conditions by different care providers e.g. nongovernmental, military, private, etc.
- A study of the diagnostic and reporting practices of the health service.
- A study on health-seeking behavior among the public, [8].

2.9- WHO-recommended surveillance standard of poliomyelitis

2.9.1- Rationale for surveillance

Poliomyelitis is targeted for **eradication**. Highly sensitive surveillance for acute flaccid paralysis (AFP), including immediate case investigation, and specimen collection are critical for the detection of wild poliovirus circulation with the ultimate objective of polio eradication. AFP surveillance is also critical for documenting the absence of poliovirus circulation for polio-free certification

2.9.2- Recommended case definition

- **Clinical case definition**

Any child under 15 years of age with AFP* or any person of any age with paralytic illness if polio is suspected

- **Case classification**

- **Suspected case:** A case that meets the clinical case definition

- **Confirmed case:** was defined as any person with symptoms of AFP and a spinal cord lesion largely restricted to grey matter on magnetic resonance imaging scanning Including Guillain-Barré syndrome.

2.9.3- Recommended types of surveillance

- Aggregated data on AFP cases should be included in routine monthly surveillance reports
- Designated reporting sites at all levels should report at a specified frequency (e.g. weekly or monthly) even if there are zero cases (often referred to as "zero reporting")
- All outbreaks should be investigated immediately
- All AFP cases under 15 years of age or with paralytic illness at an age where polio is suspected should be reported immediately and investigated within 48 hours, and two stool specimens should be collected 24-48 hours apart and within 14 days of the onset of paralysis
- Active surveillance: Regular weekly visits should be made to selected reporting sites that are most likely to admit acute flaccid paralysis patients (e.g. major hospitals, physiotherapy centers) to look for unreported AFP cases

2.9.4- Recommended minimum data elements

Aggregated data

- Number of third doses of oral polio vaccine (OPV3) administered to infants
- Number of AFP cases

Case-based data

(To be linked to specimen-based data for analysis)

- Unique identifier
- Geographical area (e.g. district and province names)
- Date of birth
- Sex: (male, female, unknown)
- Date of paralysis
- Date of notification
- Date of case investigation
- Total polio vaccine doses received: (yes, no, unknown)
- Fever at onset of paralysis: (yes, no, unknown)
- Progression of paralysis within four days: (yes, no, unknown)
- Asymmetric paralysis: (yes, no, unknown)
- Date of 60-day follow-up examination
- Findings at 60-day follow-up: (residual weakness, no residual weakness, lost to follow-up, death before follow-up, unknown)
- Final classification: (confirmed, compatible, discarded)

Specimen-based data; (To be linked to case-based data for analysis)

- Unique identifier
- Specimen number: (first specimen, second specimen, other, unknown)
- Date of onset of paralysis
- Date of last OPV dose
- Date of collection of stool specimen

- Date stool specimen sent to laboratory
- Date stool specimen received in laboratory
- Condition of stool: (good, poor, unknown)
- Date final culture results sent from laboratory to EPI
- Date intratypic differentiation results sent from laboratory to EPI
- Results
- Polio type1 isolated? Yes wild, yes Sabin, yes, pending intratypic differentiation, yes mixture of wild and Sabin, no polio type 1 isolated, specimen not processed, unknown
- Polio type 2 isolated? (Yes wild, yes Sabin, yes, pending intratypic differentiation, yes mixture of wild and Sabin, no polio type 1 isolated, specimen not processed, unknown)
- Polio type 3 isolated? (Yes wild, yes Sabin, yes, pending intratypic differentiation, yes mixture of wild and Sabin, no polio type 1 isolated, specimen not processed, unknown)
- Non-polio enterovirus (NPEV) isolated? (Yes, no NPEV isolated, specimen not processed, unknown)

2.9.5- Recommended data analyses, presentations, reports

Aggregated data

- Cases and incidence rate by month, year and geographical area
- OPV3 coverage by year and geographical area
- Completeness/timeliness of monthly reporting

Case-based data

Same as aggregated data plus the following:

- Confirmed cases by age group, sex, immunization status, geographical area, month and year
- Confirmed cases from which wild poliovirus was isolated, by geographical area, sex, month and year
- Compatible cases by geographical area and month
- All suspect cases by final classification
- Non-polio enterovirus isolation rate

2.9.6- Principal uses of data for decision-making

- Track wild poliovirus circulation
- Use data for classifying cases as confirmed, polio-compatible or discarded (see special aspects section)
- Monitor routine coverage, as well as performance of surveillance (by means of the standard indicators listed above) in all geographical areas and focus efforts in low-performing geographical areas
- Monitor seasonality to determine low season of poliovirus transmission in the interest of planning national immunization days (NIDs)
- Identify high-risk areas with a view to planning mop-up immunization campaigns
- Provide evidence to certification commissions of the interruption of wild poliovirus circulation

2.9.7- Special aspects

The scheme in the following illustration should be used to classify AFP cases. Countries should use the clinical classification until their surveillance performance meets the following three criteria:

- A non-polio AFP rate of at least 1/100 000 children under 15 years of age
- Two adequate specimens collected from at least 60% of detected AFP cases
- All specimens processed in a WHO-accredited laboratory

2.9.8- other criteria

- Percentage of all expected monthly reports that were received: target >=90%
- Percentage of AFP cases investigated within 48 hours: target >=80%
- Percentage of AFP cases with two adequate stool specimens collected 24-48 hours apart and <=14 days="" after="" onset:="" target="">=80%
- Percentage of specimens arriving at the laboratory in good condition: target >=80%
- Percentage of specimens arriving at a WHO-accredited laboratory within three days of being sent: target >=80%
- Percentage of specimens for which laboratory results sent within 28 days of receipt of specimens: target >=80%.

2.10- AFP surveillance system in Sudan

Sudan initiated polio eradication efforts in 1994. The last endogenous wild poliovirus case was reported in 2001. An importation in 2004 led to an outbreak that spread to other countries in the Horn of Africa. The last case in the 2004–2005 outbreak was reported in June 2005. Sudan subsequently had importations of wild poliovirus in 2007 and 2008, with

one and two cases, respectively. The last wild poliovirus outbreak was in 2009, when an importation led to five cases in two states. The genomic sequencing indicated a link with wild poliovirus circulating in South Sudan. The last reported wild poliovirus case was reported in March 2009. Sudan has been polio-free since then.

Routine immunization

The Expanded Programme on Immunization started in 1976. The strength of the routine immunization programme and high level of population immunity have been the key factors to limiting circulation of wild poliovirus despite repeated importations over the last decade.

National immunization days

Since 1994, Sudan has conducted national immunization days. Following the last outbreak which ended in 2009, Sudan has conducted national immunization days at least twice annually and subnational immunization days in high-risk states (e.g. Darfur states bordering Chad) to boost population immunity. Post-campaign finger-marking by independent monitoring routinely demonstrates coverage rates above 90%.

Acute flaccid paralysis surveillance

Although acute flaccid paralysis surveillance was started in 1996, Sudan intensified surveillance activities in 1999. The acute flaccid paralysis surveillance system consistently meets global certification standards at national and subnational levels for both the non-polio acute flaccid paralysis case rate (≥2 per 100 000) and stool specimen adequacy (80%) , [38].

2.11- Supplementary methods to increase surveillance sensitivity

With time, innovative surveillance methods and strategies were developed to adapt to settings where the application of traditional approaches could not yield satisfactory

sensitivity. In countries affected by conflict or complex emergencies such as Afghanistan, Somalia and South Sudan, active surveillance cannot be conducted in many areas because of limited availability and usage of health facilities. Instead, AFP surveillance has successfully been extended into communities through setting up networks of community-level AFP focal points and AFP 'informants' (i.e., village leaders, teachers, pharmacy keepers, traditional healers, mullahs) who report the occurrence of AFP cases to district and province-level surveillance teams. Community surveillance for AFP is also successfully being used in hard-to-access areas of countries not affected by conflict. Other supplementary methods to increase the sensitivity of surveillance include the collection of stool specimens from healthy direct contacts of AFP cases and / or from nearby communities, particularly when specimen collection from the index case is delayed beyond two weeks after the onset of paralysis. If poliovirus is isolated from a direct contact of a virus-negative AFP case, a scenario which does occur several times each year in the remaining infected areas, the index case is confirmed as polio. Also, in areas with low surveillance quality, or whenever surveillance needs to be enhanced such as following the detection of a new outbreak, national programs may conduct special 'AFP case search activities' during supplementary immunization campaigns, or by visiting health facilities and conducting retrospective record searches. Such searches help to improve surveillance, particularly if they show that AFP cases were missed in the past, [39].

2.12- Previous studies

Multi of studies in this field were reviewed, analyzed and compared with this study such as:

Study (a) about: ***Acute flaccid paralysis in North East Delta, Egypt was a retrospective analysis of prospectively collected surveillance data, 2009- 2017***.

The study objectives were to examine the annual incidence of reported AFP cases, the seasonal and geographical variations of AFP, the level of AFP surveillance performance indicators and the differential diagnosis of reported AFP cases during the study period.

Study was a record-based descriptive study.

Shows that the reported non-polio AFP rate was at least 2.8/100,000 every year, MOHP hospitals were the main source of AFP case reporting (57.1%) of cases.

Published at "Journal of Infection and Public Health" available at http://www.elsevier.com/locate/jiph .

Study (b) about*:* ***Strengthening the Acute Flaccid Paralysis (AFP) Surveillance Component of the Polio Eradication Initiative through Short Message Service (SMS) Reminders; Experience from Sokoto State, Nigeria 2014***.

To ascertain the awareness of AFP case definition and detection by health care workers and evaluate the impact of SMS-based reporting on the AFP surveillance system.

The experimental study has a one-group pretest-posttest design. It was conducted in three stages. The first stage was the baseline assessment of the knowledge, attitude, and practice (KAP) of the health care workers. The second stage entailed two interventions, the first part being the training of both focal points and clinicians and the second part being the use of SMS reminders for AFP reporting for a period of 36 weeks in addition to the routine method. The third stage of the study was the follow-up assessment of health care worker awareness and knowledge of AFP and the surveillance process.

The study showed improved knowledge gap of health care workers on AFP surveillance between pre and post intervention. It shows that this approach of improved surveillance will

be effective in countries in hard to reach, access compromised or countries/place without sufficient surveillance staff.

It was published at "Europe PMC Author Manuscripts ". Available at **http://europepmc.org/Funders/**

Study (c) about*: Evaluation of Ondo State acute flaccid paralysis surveillance system (2009-2013).*

To describe the key attributes and the process of operation, determine the efficiency and effectiveness of the surveillance system and to make appropriate recommendations for improving the surveillance system.

The evaluation was conducted using the Center for Disease Control and prevention (CDC) Updated Guidelines for Evaluating Public Health Surveillance System, 2001". The evaluation included interview of stakeholders, review of relevant document and resource materials and the analysis of 2009 – 2013 data from the Ondo state AFP surveillance system.

The AFP surveillance system in Ondo State is simple, flexible and sensitive (annualized NPAFP rate of 3.8/100,000 children less than 15 years in 2009, 4.0/100,000 in 2010, 4.3/100,000 in 2011, 4.1/100,000 in 2012 and 6.4/100,000 in 2013). The system is representative, stable and generates high quality data (97%, 98%, 97%, 98% and 99% from 2009-2013. Partner agencies provided 90 – 95% of the system's operating resources. The system is acceptable to stakeholders but has a low positive predictive value (1.2% cumulatively from 2009 to 2013). The state has however not recorded any case of WPV since2010.

Published at 17th International Congress on Infectious Diseases / International Journal of Infectious Diseases 45S (2016) 1–477. Available at file:///C|/Users/nokia/Documents/alhaj%20saad.Data/PDF/0928132020/dx.doi.org/10.1016/j.ijid.2016.02.640

Study (d) about: ***Surveillance of acute flaccid paralysis in Akwa Ibom State, Nigeria 2004-2009.***

Carried out to describe the characteristics of reported acute flaccid paralysis cases between 2004 and 2009, evaluate the performance of the acute flaccid paralysis surveillance system using indicators recommended by the World Health Organization.

A retrospective study was conducted among children, 0-15 years, by the World Health Organization (WHO) and Epidemiology unit of State Ministry of Health (SMOH), Uyo.

This study showed high levels of surveillance performance with some challenges in reverse the cold chain system

Published at "Pan African Medical Journal – ISSN: 1937- 8688" available at www.panafrican-med-journal.com.

Study (e) about: ***Sensitivity of Acute Flaccid Paralysis Surveillance in Nigeria (2006-2015).***

Was conducted a retrospective review of AFP surveillance performance in Nigeria between 2006 and 2015 from the AFP database at the WHO Country Office. Also reviewed rapid surveillance assessment reports conducted in various states of the country within the reporting period to identify surveillance strengths and gaps as well as recommendations put forward to improve polio surveillance performance.

The AFP surveillance performance in Nigeria during the reporting period demonstrated high level of sensitivity that can be relied upon to timely detect polio outbreak.

Available at http://infectious-diseases-and-treatment.imedpub.com/archive.php

Study (f); about: ***Strategies for Improving Polio Surveillance Performance in the Security-Challenged Nigerian States of Adamawa, Borno, and Yobe During 2009–2014.***

To identify areas of polio transmission and promptly detect possible cases of importation in these states, to identify strategies that were implemented to improve polio surveillance.

Was conducted a retrospective review of acute flaccid paralysis surveillance in the security-compromised states between 2009 and 2014, using the acute flaccid paralysis database at theWorld Health Organization Nigeria Country Office.We also reviewed the reports of surveillance activities conducted in these security-challenged states,

The strategies implemented in the security-challenged states improved the quality of polio surveillance during the review period.

Published at "The Journal of Infectious Diseases" available at http://creativecommons.org/licenses/by/3.0/igo/legalcode

Study (g); about: ***Evaluation of the acute flaccid paralysis (AFP) surveillance system in Mwenezi district, Masvingo, 2018: a descriptive study***

Was evaluated the AFP surveillance system in Mwenezi district.

Conducted a surveillance system evaluation using the updated Centers for Disease Control guidelines for evaluating public health surveillance systems. Was interviewed health workers in Mwenezi district and looked at AFP records from January to December 2017

The main reasons for failure to report a case in 2017 were the vastness of the district with bad road networks as well as lack of a dedicated vehicle to carry out EPI outreach activities. About a quarter, 24%, of the health workers did not know the specimen that is used in AFP diagnosis. The AFP surveillance system in Mwenezi district was performing poorly due to lack of active search of cases in the community caused by disruption of EPI outreach activities.

Available at https://doi.org/10.1186/s13104-018-3981-6

Study; (h) about: ***Evaluation of Acute Flaccid Paralysis Surveillance System's Structure at Al-Russafa Health Directorate in Baghdad City***

Aimed to evaluation of Acute Flaccid Paralysis Surveillance (AFP) System's Structure at Al-Russafa Health directorate in Baghdad City

Descriptive study using evaluation approach conducted to measure the efficiency of AFP Surveillance System structure for period from November 27th 2014 to June 30th 2015. The study adopted the non-probability multi-stage sampling approach. As nineteen health facilities under surveillance are chosen and interview is conducted with a total of 50 health worker how are involved in the AFP Surveillance System. The data are gathered from sample by using questionnaire specifically developed for each of sample stage.

The study results indicates that the certain of system's structure component are efficient and available such as the system owns a legal authorization and availability of field's guide that is used in AFP surveillance. On the other hand, the study proved that some of system's structure elements need to strengthen and enhance such as unavailability of special budget line, lack of necessary materials to work and lack of training for workers in the system.

Published at "Iraqi national journal of nursing specialties, 2016

Study; (i) about: ***Evaluation of acute flaccid paralysis surveillance system in Kerkuk governorate***

Aimed of the present study is to evaluate the acute flaccid paralysis surveillance system in Kerkuk Governorate

Was used Program evaluation of the Directorate of health, primary health care districts (sectors), hospitals, and primary health care centers in Kerkuk Governorate. All the responsible personnel for the acute flaccid paralysis surveillance system were interviewed and included in addition to the relevant records. Ordinary percentages were used in the description of acute flaccid paralysis cases. While rates were used in the evaluation of the performance indicators.

The study revealed a sensitive acute flaccid paralysis surveillance system (Non polio acute flaccid paralysis rate 3.98 and 3.1 in 2005 and 2006 respectively) with clear field guidelines.

All the performance indicators were high indicating a high quality surveillance system in Kerkuk Governorate.

Authored by; Dr. Zaid M. Yassen - Department of Community Medicine, Mosul College of Medicine, University of Mosul

Study; (j) about: ***Evaluation of the Acute Flacid Paralysis (AFP) Surveillance System in Bikita District Masvingo Province 2010***

A descriptive cross-sectional study was carried out in Bikita district. A pre tested interviewer-administered questionnaire was used to elicit information from health workers to determine their knowledge on the operations and usefulness of the surveillance system.

Health worker's knowledge on AFP was low and all interviewed workers needed training surveillance. The system was found to be flexible but unacceptable. Reasons for failure to detect AFP cases could be, no cases reporting to the centers, lack of knowledge on health workers hence failure to recognize symptoms, high staff turnover.

Found at: http://www.biomedcentral.com

3- Material and methods:

3.1- Study Design:

A retrospective- descriptive facility based study is conducted on Surveillance System's Structure and AFP surveillance data base, River Nile state in the period of time 2018- 2020

3.2- Study area

River Nile State is located north of Khartoum State. It is located between latitudes 16-22 north and longitude 30-32 east, and has an area of 124 thousand square kilometers. It has a population of about 1,212,000 people.

River Nile State relies on traditional and modern agriculture for its economy. Among the most important agricultural products are soybeans, vegetables and fruits. In the River Nile State, there is the cement industry, which is a flourishing industry. Mica is one of the most important untapped minerals. The country is very rich in this important mineral, as there are some other minerals, such as gold, which people extract in traditional ways, [40].

There are about 1962 schools in the state, and there are three universities and a number of research centers. There are about 34 hospitals and about 156 health centers, [41], [42].

3.3- Study population

The study population comprised all reporting sites/units, "N= 50 sites" from all the levels and worker who are reporting the AFP cases, "N= 50 focal persons", localities officers, "N= 6 officers" and state level," N= 3"

3.4- Sample size

Total coverage of surveillance officers and workers in the AFP surveillance system, were covered as; All health facilities under AFP surveillance in the state, focal persons

working in health facilities, department officers in localities and system coordinators at the state level.

3.5- Data collection tools and analysis procedures:

Multiple tools were used for this study including the group discussion with system coordinators, chick list of observations, analysis form for records and questionnaire for officers and focal persons

3.5.1- Questionnaire design; Questionnaire designed and developed according to WHO framework for communicable diseases surveillance, it is contain on variables relate with AFP surveillance as;

- Structure variables; including: (organization, legislation, strategy, available offices, existing plans of actions, coordination, network, lab facilities)
- Surveillance resources; including: (doctors, public health officers, lab technicians, medical assistance, nurse and statisticians)
- Operational resources; including: (financial, materials, supplies) were Supplies include; (register book, forms, case definition, guidelines, posters, transport and communication means)
- Cases detection and registration variables
- Diagnosis confirmation variables
- Reporting, information, dissemination, response and feedback variables
- Supervision variables
- Indicators of AFP surveillance system

Then it was amended to suit the study method and the respondents**.** After designated the questionnaire in its first form, it was presented to specialists to assess the structure and face

validity**.** Then it was distributed to some personnel as small sample (n=10) to measure the reliability and stability by use Alpha Cronbach's test.

3.5.2- Interview design; this tool designed to interview with AFP surveillance coordinators at state level and contains the follows;

- The health facilities selected for surveillance?
- Other sites than the health facilities covered by the surveillance system?
- The time period between one visit and another according to the type of center (upper, middle, lower, and additional)
- Other sectors that participate in the surveillance system and their role in achieving the goals of the system and implementing its activities
- Challenges facing the system in the state in terms of material, human and legal resources, as well as society and its customs and traditions

3.5.3- Chick list design; this tool used to observation some elements that exist at all levels of study population contains the follows;

- AFP surveillance documents
- Supportive functions of AFP surveillance system

3.5.4- Data analysis

Data analyzed by use **SPSS** version 22, include multi of statistics needed in this study as:

Frequencies tables; to show data include percentages and frequencies

Cross tabulations; to know the relationship between two or more variables

Chi- square/ P value test; used in some variables to know Significance between variables

Alpha Cronbach's test; It was performed as a pre-test of the study tool to find out the stability rate.

3.6- AFP surveillance indicators

- a non-polio AFP rate of at least 1/100 000 children under 15 years of age
- two adequate specimens collected from at least 60% of detected AFP cases
- all specimens processed in a WHO-accredited laboratory
- Percentage of all expected monthly reports that were received: target ≥ 90%
- Percentage of AFP cases investigated within 48 hours: target ≥ 80%
- Percentage of AFP cases with two adequate stool specimens collected 24-48 hours apart and ≤ 14 days after onset: target ≥ 80%
- Percentage of specimens arriving at the laboratory in good condition: target ≥ 80%
- Percentage of specimens arriving at a WHO-accredited laboratory within three days of being sent: target ≥ 80%
- Percentage of specimens for which laboratory results sent within 28 days of receipt of specimens: target ≥ 80%.

3.7- Ethical considerations are;

- The study was approved by Shendi university
- Consent was obtained Ministry of health
- From the heads of health facilities to be studied
- Information collected from references was documented by **EndNote x7**

4- Results

Table 1; Distribution of AFP reporting sites in River Nile State by localities, type, priority and job of focal person,2020, (N = 50)

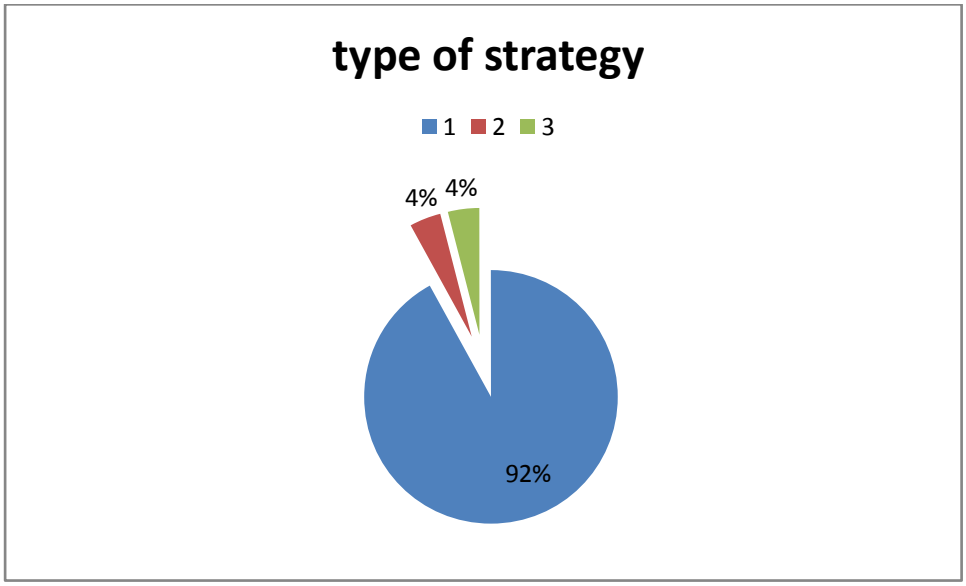
Subject	Count	Percent
Localities		
Shendi	8	16.0%
Almatama	7	14.0%
Aldamer	10	20.0%
Atbra	12	24.0%
Barbar	6	12.0%
Abuhamd	6	12.0%
Albuhira	1	2.0%
Total	**50**	**100%**
Reporting center	**Count**	**Percent**
Hospitals	28	56.0%
Health centers	19	38.0%
Clinics	3	6.0%
Total	**50**	**100%**
Reporting sites priority	**Count**	**Percent**
High priority	5	10.0%
Medium priority	5	10.0%
Low priority	8	16.0%
Additional surveillance sites	32	64.0%
Total	**50**	**100%**
focal persons	**Count**	**Percent**
Doctors	11	22.0%
Nurses	7	14.0%
Immunization technicians	25	50.0%
Nutritionist	1	2.0%
Statisticians	6	12.0%
Total	**50**	**100%**

Table 2; Structure of the AFP surveillance system (strategy and legislation) at health facilities level, (N= 50)

AFP surveillance structure	Respondents' answers	
	Yes	Percent
The mandatory of AFP surveillance	50	100%
Presence of AFP strategy	50	100%
Presence of plan strategy for system assessment	50	100%
Presence of regulation	50	100%
Presence of active law	50	100%
Presence of data regulation	47	94%
Presence of coordination with reporting sites	50	100%
Presence of coordination with localities	50	100%
Presence of partners for AFP surveillance system	42	84%
Presence of support from other sectors	42	84%
Presence of coordination with other sectors	46	92%
Presence of job description	50	100%
Presence of training	50	100%
Presence of budget	16	32%
Presence of budget support	0	0
Presence of enough budget	9	18%
Presence of enough personnel	19	38%

Table 3; Structure of the AFP surveillance system (strategy and legislation) at localities level, (N= 6)

Structure of the AFP surveillance system	Respondents' answers	Percent
Presence of mandatory AFP surveillance	6	100%
Presence of AFP strategy	6	100%
Presence of plan strategy for system assessment	6	100%
Presence of regulation	6	100%
Presence of active law	6	100%
Presence of data regulation	6	100%
Presence of coordination with reporting sites	6	100%
Presence of coordination with localities	6	100%
Presence of partners for AFP surveillance system	6	100%
Presence of support from other sectors	6	100%
Presence of coordination with other sectors	6	100%
Presence of job description	6	100%
Presence of training	6	100%
Presence of budget	6	100%
Presence of budget support	0	0.0
Presence of enough budget	0	0.0
Presence of enough personnel	2	33.0%



N= 56 **1 active surveillance** **2 inactive surveillance** **3 selected areas**

Figure 1; shows AFP surveillance strategy. The active surveillance strategy is the most used strategy in the surveillance program as it was 92% at localities and health facilities levels.

Table 4; Supportive functions of AFP surveillance system at health facilities level, (N= 50)

Supportive functions	**Observed supportive elements**	
	Count	Percent
Presence of separated AFP surveillance room	34	68.0%
Presence of AFP surveillance officers	43	86.0%
Presence of data entry officer	13	26.0%
Presence of AFP surveillance supervisor	47	94.0%
Presence of lab	40	80.0%
Presence of lab technician	40	80.0%
Presence of lab guide	40	82.0%
Presence of electricity	50	100.0%
Presence of transport car	3	6.0%
Presence of telephone	12	24.0%
Presence of calculator	18	36.0%
Presence of computer	5	10.0%
Presence of printer	0	0
Presence of internet line	0	0
Presence of last version of AFP surveillance guide	48	96.0%

Table 5; Supportive functions of AFP surveillance system at localities level, (N= 6)

Supportive functions	**Observed supportive elements**	
	Count	Percent
Presence of separated AFP surveillance room	6	100.0%
Presence of AFP surveillance officers	6	100.0%
Presence of data entry officer	6	100.0%
Presence of AFP surveillance supervisor	6	100.0%
Presence of electricity	6	100.0%
Presence of transport car	6	100.0%
Presence of telephone	6	100.0%
Presence of calculator	6	100.0%
Presence of computer	6	100.0%
Presence of printer	1	16.6%
Presence of internet line	0	0.0
Presence of last version of AFP surveillance guide	6	100%

Table 6; Core activities for AFP Surveillance system at health facilities level, (N= 50)

Core activities	**Existed elements**	
	Count	Percent
Presence of AFP surveillance guide-line	50	100%
An easy-to-use AFP surveillance guide-line	50	100%
Uses the AFP surveillance guide in surveillance activities	50	100%
AFP surveillance guide-line contain the report guideline	50	100%
AFP surveillance guide-line contain decision making-guide	50	100%
Modern AFP surveillance guide-line guideline	50	100%
presence of focal person	50	100%
Employed focal person	45	90%
Presence of deputy for focal person	39	78%
Monitoring the cases in out clinic records	48	96%
Monitoring the cases in other records	37	74%
Presence of trained focal person	48	96%
Personnel have computer skills	21	42%
Personnel has data interring skills	20	40%
Personnel have design tables skills	19	38%
Personnel have good relationship	48	96%
Presence the copies of reports	49	98%
Presence of active surveillance visits	42	84%
Presence of systematic surveillance visits	30	60%
Presence of sign in the visit form	26	52%

Table 7; Core activities for AFP Surveillance system at localities level, (N= 6)

Core activities	**Existed elements**	
	Count	Percent
Presence of AFP surveillance guide-line	6	100.%
An easy-to-use AFP surveillance guide-line	6	100.%
Uses the AFP surveillance guide in surveillance activities	6	100.%
AFP surveillance guide-line contain the report guideline	6	100.%
AFP surveillance guide-line contain decision making-guide	6	100.%
Presence of modern AFP surveillance guide-line guideline	6	100.%
Monitoring the cases in out clinic records	6	100.%
Monitoring the cases in other records	6	100.%
Presence of trained focal person	6	100.%
Personnel have computer skills	6	100.%
Personnel have data interring skills	6	100.%
Personnel have design tables skills	6	100.%
Personnel have good relationship	6	100.%
Presence the copies of reports	6	100.%
Presence of active surveillance visits	6	100.%
Presence of systematic surveillance visits	6	100.%
Presence of Sign in the visit form	6	100.%

Table 8; Assessment of AFP case definition, detection and registration**,** at health facilities level**, (**N= 50)

Presence case detection, definition Procedures	**Focal persons responds**	
	Yes	**Percent**
Agreed evidence for AFP case definition	50	100%
Case definition clear to all employees	50	100%
Specific person to record cases	50	100%
Registration done correctly	50	100%
Case recorded in the form prepared for it	50	100%
Registration form easy to use	50	100%
Registration forms sufficient	12	24%
Shortage of registration in the past months?	4	8%
Person responsible for writing the report	50	100%
Report written at the unit level	50	100%
Special reporting form	50	100%
Special form for samples of healthy children	50	100%
Send reports to the top authority regularly	50	100%
Saved copies from the reports sent	50	100%
Report copies well preserved	50	100%
Presence of problem in preparing reports	8	16%
Presence of analysis of the data collected in the unit	27	52%
Data include monitoring indicators	39	78%
Classify data by Age	34	68%
Classify data by Sex	33	66%
Classify data by house	33	66%
Specific person to analyze the data	32	64%

Table 9; Assessment of AFP case definition, detection and registration at localities level, (N= 6)

Presence case detection, definition Procedures	**Officers responds**	
	Yes	**%**
Agreed evidence for AFP case definition	6	100%
Case definition clear to all employees	6	100%
Specific person to record cases	6	100%
Registration done correctly	6	100%
Case recorded in the form prepared for it	6	100%
Registration form easy to use	6	100%
Registration forms sufficient	6	100%
Shortage of registration in the past months?	0	0.0
Person responsible for writing the report	6	100%
Report written at the unit level	6	100%
Special reporting form	6	100%
Special form for samples of healthy children	6	100%
Send reports to the top authority regularly	6	100%
Saved copies from the reports sent	6	100%
Report copies well preserved	6	100%
Presence of problem in preparing reports	0	0.0
Presence of analysis of the data collected in the unit	6	100%
Data include monitoring indicators	6	100%
Classify data by Age	6	100%
Classify data by Sex	6	100%
Classify data by house	6	100%
Specific person to analyze the data	6	100%

Table 10; Assessment the knowledge of focal persons about case investigation, (N= 50)

Case detection in health facilities (n= 50)	Good		Acceptable		Unacceptable	
	Count	Percent	Count	Percent	Count	Percent
Case definition	49	98.0%	0		1	2.0%
Fill the surveillance form	50	100.0%	0	0	0	0
Collection of stool samples	50	100.0%	0	0	0	0
Keeping the stool samples	49	98.0%	1	2.0%	0	
Processing of Follow-up	49	98.0%	1	2.0%	0	0

Table 11; Completeness of surveillance data on the health facilities levels, N= 50

Surveillance data and documents	**Availability of documents**	
	Count	Percent
File for the weekly reports	50	100%
File of documents of active visits	31	62%
A file for every AFP case	50	100%
Guide for AFP investigation	50	100%
File of feedback documents	31	62%
A container for collecting stool samples	50	100%
Stool sample collection tools	50	100%
Cold chain	31	62%
AFP investigation form	31	62%
The immediate report form	44	88%
A form for collecting stool samples	44	88%
A follow-up form (60 days) for AFP cases	31	62%
Weekly notification forms	42	84%
Schedule of active visits	30	60%
Posters to follow up on active visits investigation manual	50	100%
Posters to follow the weekly reports	31	62%
Poster for the list of notified cases	29	58%
Acute flaccid paralysis manual	44	88.0%
File to save notes from past visits	31	100%

Table 12; Completeness of surveillance data on the localities level, N= 6

Existence of surveillance data at all levels	Availability of documents	
	Count	Percent
File for the weekly reports	6	100%
File of documents of active visits	6	100%
A file for every AFP case	6	100%
Guide for AFP investigation	6	100%
File of feedback documents	6	100%
A container for collecting stool samples	6	100%
Stool sample collection tools	6	100%
Cold chain	6	100%
AFP investigation form	6	100%
The immediate report form	6	100%
A form for collecting stool samples	6	100%
Application form for laboratory examination	6	100%
A follow-up form (60 days) for AFP cases	6	100%
Weekly notification forms	6	100%
Forms for active visits	6	100%
Schedule of active visits	6	100%
Posters to follow up on active visits investigation manual	6	100%
Posters to follow the weekly reports	6	100%
Poster for the list of notified cases	6	100%
A map show the locations of reports and reported cases	6	100%
Acute flaccid paralysis manual	6	100%
File to save notes from past visits	6	100%

Table 13; Distribution the reported cases of non- polio AFP according to localities, year for each 100000 of population under 15 years of age

Localities/year	2017	2018	2019	2020
Shendi	3.3	3.6	2.4	4.6
Almatama	1.7	10	3.2	3.1
Aldamer	5	2.4	2.9	6.9
Atbara	3.5	2.3	5.6	4.3
Barbar	1.1	3.4	5.6	3.2
Abu hamd/albuhaira	12	7	4.4	2.2

Table 13; shows that there was sensitivity for AFP surveillance system at all localities level compared with WHO standard (AFP cases ≥2 for each 100000 of population under 15 years of age).

Table 14; Demography characteristics of non- polio AFP reported cases

Age	**Count**	**Percent**
less than 5	40	46.5
5 to 10	42	48.8
11 to 15	4	4.7
Total	**86**	**100%**
Gender	**Count**	**Percent**
Male	63	73.3
Female	23	26.7
Total	**86**	**100%**

Table 14; shows that the most AFP cases among children less than ten years and found in male more than female.

Table 15; AFP reported cases that investigated from 2017 to 2020, N= 86

Performance indicators	**Count**	**Percent**
Investigated cases	86	100%
AFP cases investigated <48 hours from paralysis	29	34%
AFP cases investigated <48 hours after reporting	84	97.7%
AFP cases followed up at 60 days	80	95%
AFP cases with two adequate stool specimens	86	100%
specimen results sent from national laboratory within 28 days of receipt of the specimen in the laboratory	86	100%

Table 10; shows that investigation procedures for AFP cases are complete, but there is a note regarding the time difference between the paralysis signs and reporting. The percentage of cases that reporting within 48 hours before the onset of paralysis was only 34%.

Table 16; Correlation between priority of reporting site and Supportive elements

Supportive elements		priority of reporting site				Chi-squire(x^2)/ p value (PV)
		high	medium	law	other	
Presence of calculator	Yes	3	5	5	5	X^2= 18.3
	No	2	0	3	27	PV= 0.00
Presence of telephone	Yes	4	3	5	0	X^2= 28.7
	No	1	2	3	32	PV= 0.00

There was luck in some supportive elements as telephone and calculator. but also related with priority, where significant between the priority of reporting sites and the availability of this supportive elements, was 0.00

Table 17; Correlation between priority of reporting sites and active surveillance visits

Active surveillance visits		**priority of reporting site**				**Total**
		high	medium	law	other	
Presence of active surveillance visits	Yes	5	5	8	24	**42**
	No	0	0	0	8	**8**
	Total	**5**	**5**	**8**	**32**	**50**

P value = 0.1 $\mathbf{X^2}$= 5.3 were X = chi-square

There is a significant between the priority of the notification center and the implementation of the active visits (P Value = 0.1), so all the priority centers are visited regularly compared to the additional centers.

Table 18; Correlation between Priority of reporting sites and complete of AFP documents

Complete of files		**priority of reporting site**				**Ch-squire/ p value**
		high	medium	law	other	
Active visits file	Exist	5	5	8	13	$\mathbf{X^2}$=17.2
	Not exist	0	0	0	19	**P V**= 0.001
Feedback documents file	Exist	5	5	8	13	$\mathbf{X^2}$=17.2
	Not exist	0	0	0	19	**P V**= 0.001
Cold chin	Exist	5	5	8	13	$\mathbf{X^2}$=17.2
	Not exist	0	0	0	19	**P V**= 0.001
AFP investigation form	Exist	5	5	8	13	$\mathbf{X^2}$=17.2
	Not exist	0	0	0	19	**P V**= 0.001
A follow-up form (60 days) for AFP cases	Exist	5	5	8	13	$\mathbf{X^2}$=17.2
	Not exist	0	0	0	19	**P V**= 0.001
Poster for the list of notified cases	Exist	5	3	8	13	$\mathbf{X^2}$=13.3
	Not exist	0	2	0	19	**P V**= 0.004
File to save notes from past visits	Exist	5	5	8	26	$\mathbf{X^2}$=3.8
	Not exist	0	0	0	6	**P V**= 0.82

There is a strong significant between the priority of the reporting sites and the completeness of documents for AFP surveillance in most of the required documents (P Value= 0.001 and 0.004), but there is one document, which is the file for saved notes from previous visits, and there was no significant of priority on it (P Value = 0.82).

Table 19; Correlation between problem in preparing reports and priority of reporting site

Preparing reports problem		**priority of reporting site**				
		high	medium	law	other	Total
Is there any problem in preparing reports	Yes	1	2	2	3	8
	No	4	3	6	29	42
	Total	5	5	8	32	50

P value= 0.29 $\mathbf{X^2}$= 3.7

There is no significant between the priority of the centers and the problems facing the employees in preparing reports (P Value = 0.29)

Table 20; Correlation between Case definition and specialty of the focal person

Case definition		**specialty of the focal persons**					
		doctor	nurse	Immunization technician	nutritionist	statistician	**Total**
Level of knowledge	good	11	7	24	1	6	49
	unacceptable	0	0	1	0	0	1
	Total	**11**	**7**	**25**	**1**	**6**	**50**

P value = 0.9 $\mathbf{X^2}$= 1

There are no statistically significant differences between the specialization of the focal person and his finding to define the case of acute flaccid paralysis (P Value = 0.9)

Table 21; Correlation between number of workshop and focal person' skills

Focal persons skills		Number of workshop		Chi-square(X^2) / P value (PV)
		one	two	
Focal personnel have computer skills	yes	20	1	X^2= 4.5
	no	20	8	PV= 0.033
Focal person has data interring skills	yes	20	0	X^2= 8.3
	no	20	10	PV= 0.004
Focal person with design tables skills	yes	19	0	X^2= 7.6
	no	21	10	PV= 0.006
Presence the copies of reports	yes	39	10	X^2= 0.255
	no	1	0	PV= 0.614
Presence of Sign in the Sign in visit form	yes	16	10	X^2= 3.3
	no	6	0	PV= 0.06

There is no statistically significant differences with regard to the number of Received more workshop and proficiency in the focal person to save a copy of the reports and the signing of the visit form (P = 0.614 Value and 0.0.06). While there is a relationship with respect to the focal person mastering computer skills, design tables and data entry skills (P value= 0.033, 0.006 and 0.004).

Table 22; Comparison between performance indicators and WHO performance targets

Performance indicators	**Target**	**Indicator**	**performance**
Rate of Annual reported cases	≥2	Sensitive	4.5
Proportion of Investigated cases	≥ 80%	Completeness of investigation time-line	100
Proportion of AFP cases investigated <48 hours reported	≥ 80%	Timeliness	97.7%
Proportion of AFP cases followed up at 60 days	≥ 80%	Completeness of follow-up	95%
Proportion of AFP cases with two adequate stool specimens	≥ 80%	Timeliness	100%
Proportion of specimen results sent from national laboratory within 28 days of receipt of the specimen in the laboratory	≥ 80%	Timeliness of laboratory investigation	100%
Proportion of surveillance site providing routine report (including ‘ zero reports’) on time	≥ 80%	Completeness of reporting	100%
Proportion of Active visits	≥ 80%	Complete	84%

From Table 22, we note that the surveillance system is sensitive, as it had an mean of 4.5 for the years from 2017 to 2020, and thus compatible with the WHO standard, greater than or equal to two cases for every 100,000 children less than 15 years old, as for completeness, there is completeness in all case investigation performance and reports, are all compatible with the WHO standards.

Table 23; Interview with AFP surveillance coordinator, N= 1

Questions	Answers
Are there sites other than health facilities in the state covered by the surveillance?	Yes, there are other sites like traditional healers.
How are these sites supervised?	Enlightenment is done every quarter and assessment of the reporting situation
What is the nature of other surveillance sites?	This type is named community surveillance. there is a responsible person and depute
Is that person receiving training?	Yes, they are trained twice a year or more
How the supervision to AFP surveillance sites in general?	Supervision is carried out in the field
Time period of supervision	Supervision is done every quarter equally for all sites
In the case of field supervision, what is the time interval between one visit and another according to the type of center (high, middle, lower, and addition sites)?	However, active visits are carried out and are carried out as follows: *high priority every week, *medium priority every two weeks, and *low priority every month.
Others sectors that participate in the surveillance program and their role in achieving the goals of the program and implementing its activities?	Information is exchanged with the Epidemiology Department with the aim of containing all suspected cases and immediate investigation about them.
Challenges facing the program in the state in terms of material, human and legal resources, as well as society, its customs and traditions?	Challenges: The surveillance vehicle is disrupted, which hinders the progress of work, the absence of depute for the focal person in some locations, and it is difficult to convince some families of the necessity of taking samples.

5.1- discussion

The results of this study showed that the AFP surveillance system in the River Nile State has high efficiency in terms of the established infrastructure and performance of the system's activities, as mean of non-AFP reported cases rate from 2017 to 2020 was 4.02 cases per 100,000 children less than 15 years old, this rate is above the level of the WHO standard indicator (2 per 100,000 children under the age of 15 years, [43]. Compared with other studies in different countries and periods, the non- polio AFP cases in study area was reported from 2017 to 2020 higher than: (California/USA 2012-2015, South-East Delta region/Egypt2009-2017, Kirkuk Governorate- Iraq 2006, Mwenezi district, Masvingo, 2018), [44], [45-47]. This highly sensitive rate of the system makes it able to detect any polio case imported to the State,[48].

The sensitivity of the system is due to the fact that it has an established infrastructure, as it is committed to the general strategy of AFP surveillance, as cases are mandatory reported in all reporting sites that distributed by high level of representativeness, which include beside known health facilities (hospitals, health centers, and clinics). other places such as traditional healers and physiotherapy centers as one of community surveillance strategies.[49] However, hospitals are considered the most important sites for reporting by 56%, and this is consistent with what was mentioned in the national guidelines for surveillance and investigation of acute flaccid paralysis, as it indicated with regard to places of monitoring and reporting that hospitals are the most important places chosen for investigation and surveillance of acute flaccid paralysis and that Cases of acute flaccid paralysis often go to hospitals, and there are families for religious, social or economic reasons who prefer treating their children to traditional healers, [50]. And also agreed with GPEI which mentioned the public health staffs make regular visits to hospitals and rehabilitation centers to search for

AFP cases which may have been overlooked or misdiagnosed. In areas with few formal health workers, some countries use “community” surveillance, where pharmacists, traditional healers or clerics may serve as a source of information on paralyzed children, [43].

All reporting sites reports AFP cases through personnel trained in the reporting process with a difference in their specialties, but there are no statistically significant differences with regard to their knowledge of the definition and detection of acute flaccid paralysis case, "**P value= 0.9"**; As it was AFP investigation at a high level among all workers of various specialties. It was better than other areas as Bikita region in Zimbabwe, where the author referred to Health worker’s knowledge on AFP was low, and all interviewed workers needed training surveillance,[51].

Due to the staff receiving training and their possession of a field guide that includes all surveillance activities include investigate the disease. Despite the employee's possession of information related to the program’s activities, there is weakness in some aspects, such as computer skills and the process of data entry and representation With a statistical relationship, that the focal person increases his skill on these tools all that is found in a center of higher priority and received more than one workshop,"**P value = 0.033, 0.006 and 0.004"**for computer, process of data entry and representation Respectively. So receiving more than one training course had effect on increasing the skill of using the computer and entering data. This may be due to workers’ lack of computer equipment in about 90% of the reporting sites. This weakness and lack of skills may be explained by the decrease in the allocated budget and the absence of financial support for the program**,** which may have an impact on improving performance and encouraging employees to increase their skills in using technology and making use of it in the reporting process. A study in Nigeria indicated that the inclusion of a financial reward for all reported acute flaccid paralysis cases greatly encouraged staff, surveillance coordinators, clinicians, and community informers to detect

and report AFP. There was a marked increase in reports of AFP cases after the provision of the financial reward, [52]. Although the Internet has become necessary to speed up data reporting in many disease surveillance programs, we note there is a complete absence of Internet service at all levels of reporting sites. This has become an urgent necessity to facilitate work procedures and perform activities. As a Chinese study, stated that the existence of an online platform facilitates the process of reporting cases, [5]. Given that all employees have mobile phones that can be provided with some assistance and some training courses on the use of technology in the investigation program in the River Nile State, we can help those in charge of the program in developing the system, upgrading it and keeping pace with events. Especially since there is good infrastructure, trained, cooperative and highly qualified human resources in performing their activities and monitoring work, and this is evidenced by their possession of very excellent information on the definition of AFP case, filling in the investigation form, collecting stool samples and the follow-up procedure. They also keep their files and report regularly to the higher authorities.

Through this study, it was that most of the program requirements are complete, such as having a strategy for the system and a plan for its evaluation, laws and regulations, coordination between localities and reporting centers, job description and training. This is in full agreement with what has been stated by the WHO as the structure of the surveillance system is defined by legislation (laws, and regulations, including IHR 2005), the strategy for implementing activities, the implementers and stakeholders, and how they relate to each other and to the various networks and partnerships. The indicators that measure different aspects of the structure of a system constitute part of the evaluation indicators, [34].

The results of the activities' performance showed that there is broad agreement with the general standards of the surveillance program, as there was an easy-to-use AFP field guide for all workers in surveillance activities at all levels, containing guidelines for writing the

report and the decision-making process with the presence of focal persons in all reporting sites, "90 % Of them are formally appointed, 78% have deputies who perform their roles in the event of absence of the focal person", and although 96% have received training, only 42% have computer skills, 40% have data entry skills, 38% have the skill of designing tables and graphics. 98% of the employees keep copies of previous reports, 84% indicated the existence of active visits, 60% confirmed that the visits were regular, and 52% of the signed visit form was noticed.

In general, the resources available in the surveillance offices of localities were more than those available in health facilities, where not every health facility had a separate office for the surveillance program; only 68% had a separate room for program activities. There was access to public transport or electronic services that help to report cases, and although the localities have special vehicles for the program, the absence of support and continuous breakdowns affects the supervision activities, [49]. Calculators were available for data analysis in all localities offices and 36% of health facilities, all localities had computers, and only 10% of health facilities had a computer. 24% of health facilities have a phone for program activities. Nevertheless; the reporting process is ideal, using personal phones, which were available to all respondents. There are no printers in all health facilities and localities, just state level. There are also no internet lines at all levels; this confirms that the program still adopts the traditional methods in the reporting process, which is its use of the paper reporting system to collect data from reporting sites. In spite of that, the system was of high quality in terms of performance indicators, as the efficiency indicators were in conformity with the requirements of the WHO standards. Thus, the system is considered to have high quality in the performance of activities, especially with regard to indicators of completeness and sensitivity, where efficiency means the completion of the weekly and monthly reports by more than 80%. While sensitivity means reporting at least two cases per year for every

100,000 people of the population under 15 years old, [38]. That is exactly what was found in the River Nile State, This sensitivity may increase if technology is widely introduced into the program with the increase in reporting sites and the development of the community surveillance system by giving volunteers modern work aids to encourage them to work efficiently.

Finally, if the program finds support in addition to its available capabilities, it can be used to monitor a number of other diseases on a larger scale in addition to acute flaccid paralysis, especially those diseases targeted by vaccination, which may provide a database that easily guarantees knowledge and evaluation of the health situation in the community in the state Thus helping decision-makers in the intervention process in a timely manner, This is what was referred to by the reference, [5]. Where it was mentioned: Trained and experienced AFP surveillance medical officers can use the assets of the AFP surveillance system to help build integrated disease surveillance systems, providing opportunities to strengthen overall immunization programs. This is particularly important for childhood immunization programs in low-income countries. In a closer look at selected countries, it becomes apparent that polio assets are not just helping build capacity for nonpolio-related programs, but is providing the actual capacity for these efforts; in some cases, polio assets are the only resource supporting functions in the country. For these reasons, in resource-poor countries, international partners and country governments must collaborate to support key surveillance functions. Without such a transition, both polio eradication and control and elimination of other VPDs will suffer.

5.2- Conclusion

AFP surveillance program in River Nile state is based on an established infrastructure that includes legislation, regulations and strategy.

There was high efficiency in performing the activities of the AFP surveillance system in the state.

There was a clear weakness in the resources supporting the AFP surveillance program at all reporting sites.

The quality of the AFP surveillance indicators in the state were in compliance with WHO requirements for sensitivity and completeness

The program can be used to monitor a number of other diseases at all localities in the state.

5.3- Recommendations

3.5.1- The Ministry of health should be strengthening some elements of the surveillance system

3.5.2- Localities officers should be Conduct training of computer skills

3.5.3- The State authority should be provide aids to facilitate the process of reporting sites

3.5.4- The AFP surveillance officials should be increasing the frequently of during the job training for workers,

3.5.5- The health authority should encourage further studies on this topic

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جامعة شندي

كلية الدراسات العليا والبحث العلمي

قسم الصحة العامة

استبيان

اسم الإستبيان: إستبيان لدراسة نظام ترصد الشلل الرخو الحاد بولاية نهر النيل

التأريخ .....

المحلية .....

اسم ونوع مركز التبليغ .....

تخصص الشخص المسؤول .....

المحور الأول: التعرف على مكونات نظام ترصد الشلل الرخو الحاد

١ - هل نظام ترصد الشلل الرخو الحاد اجباري بالوحدة أ/ نعم ( ) ب/ لا ( )

٢ - متى تم إنشائه؟ .....

٣ - هل توجد غرفة خاصة بترصد الشلل الرخو الحاد أ/نعم( ) ب/لا( )

٤ - هل هنالك ميزانية منفصلة لنظام ترصد الشلل الرخو الحاد؟

أ/نعم( ) ب/لا( )

٥ - اذا كانت الإجابة نعم في (4) هل يوجد دعم آخر من الميزانية العامة؟

أ/نعم( ) ب/لا( )

٦ - هل الميزانية المرصودة كافية؟ أ/نعم( ) ب/لا( )

٧ - هل يوجد العدد الكافي من العاملين في نظام الترصد؟ أ/نعم( ) ب/لا( )

٨ - هل توجد عربة خاصة بأنشطة ترصد الشلل الرخو الحاد؟

أ/نعم( ) ب/لا( )

٩ - كم عدد ضباط الترصد .....

١٠ - هل يوجد مدير بيانات؟ أ/نعم( ) ب/لا( )

١١ - هل هنالك مشرف على نظام الترصد؟ أ/نعم( ) ب/لا( )

١٢ - هل يوجد معمل بالوحدة؟ أ/نعم( ) ب/لا( )

١٣ - هل يوجد تقني معمل بمركز الترصد؟ أ/نعم( ) ب/لا( )

١٤ - هل يوجد دليل معياري لإدارة المعمل؟ أ/نعم( ) ب/لا( )

١٥ - هل توجد كهرباء بالمركز ؟ أ/نعم( ) ب/لا( )

١٦ - هل توجد وسيلة نقل خاصة بالترصد؟ أ/نعم( ) ب/لا( )

١٧ - هل يوجد تلفون بمركز الترصد؟ أ/نعم( ) ب/لا( )

١٨ - هل توجد آلة حاسبة؟ أ/نعم( ) ب/لا( )

١٩ - هل يوجد كمبيوتر؟ أ/نعم( ) ب/لا( )

٢٠ - هل توجد طابعة؟ أ/نعم( ) ب/لا( )

٢١ - هل توجد شبكة انترنت؟ أ/نعم( ) ب/لا( )

٢٢ - هل يوجد دليل ترصد؟ أ/نعم( ) ب/لا( )

٢٣ - اذا كانت الاجابة نعم هل هو اخر اصدار؟ أ/نعم( ) ب/لا( )

٢٤ - هل الدليل سهل الاستخدام؟ أ/نعم( ) ب/لا( )

٢٥ - هل يتم استخدامه في انشطة الرصد والابلاغ؟ أ/نعم( ) ب/لا( )

٢٦ - هل يحتوي الدليل على موجهات عن كيفية كتابة التقرير ومعالجة البيانات؟

أ/نعم( ) ب/لا( )

٢٧ - هل يحتوي الدليل على موجهات عن كيفية اتخاذ القرار على كل المستويات؟

أ/نعم ( ) ب/لا( )

٢٨ - هل يتم تزويد الوحدة بالدلائل والموجهات الحديثة؟

أ/نعم ( ) ب/لا( )

٢٩ - هل يوجد شخص محوري أ/ نعم ( ) ب/ لا ( )

٣٠ - هل الشخص المحوري معين أ/ نعم ( ) ب/ لا ( )

٣١ - هل يوجد نائب للشخص المحوري أ/ نعم ( ) ب/ لا ( )

٣٢ - هل يتحرى الشخص المحوري عن الحالات في سجلات العيادة الخارجية

أ/ نعم ( ) ب/ لا ( )

٣٣ - الشخص المحوري يتحرى عن الحالات في سجلات عنبر الأطفال

أ/ نعم ( ) ب/ لا ( )

٣٤ - الشخص المحوري يتحرى عن الحالات في سجلات أخرى؟

أ/ نعم ( ) ب/ لا ( ) اذا كان نعم حدد .....

٣٥ - هل الشخص المحوري مدرب؟ أ/ نعم ( ) ب/ لا ( )

٣٦ - هل يجيد مهارات استخدام الكمبيوتر؟ أ/ نعم ( ) ب/ لا ( )

٣٧ - معرفة كيفية ادخال البيانات؟ أ/ نعم ( ) ب/ لا ( )

٣٨ - معرفة كيفية استخراج الجداول والرسوم البانية؟

أ/ نعم ( ) ب/ لا ( )

٣٩ - هل الشخص المحوري له علاقة طيبة مع العاملين؟

أ/ نعم ( ) ب/ لا ( )

٤٠ - هل الشخص المحوري يحتفظ بنسخة من تقاريره؟

أ/ نعم ( ) ب/ لا ( )

٤١ - تنفيذ زيارات التقصي النشط أ/ نعم ( ) ب/ لا ( )

٤٢ - اذا كانت الإجابة نعم في (41) من الذي يقوم بذلك؟ .....

٤٣ - هل الزيارة منتظمة؟ أ/ نعم ( ) ب/ لا ( )

٤٤ - اذا كانت الإجابة نعم في (43) ما هي الفترة التي تتم فيها الزيارة؟

أ/نصف اسبوعي ( ) ب/ اسبوعيا ( ) ج/ شهريا ( )

٤٥ - هل يتم التوقيع في استمارة الزيارة؟ أ/ نعم ( ) ب/ لا ( )

- ما هو تقييم الشخص المحوري من حيث اجادة الآتي

٤٦ - تعريف حالة الشلل الرخو الحاد

أ/جيد ( ) ب/ مقبول( ) ج/ غير مقبول ( )

٤٧ - ملء استمارة التقصي

أ/جيد ( ) ب/ مقبول( ) ج/ غير مقبول ( )

٤٨ - جمع عينات البراز

أ/جيد ( ) ب/ مقبول( ) ج/ غير مقبول ( )

٤٩ - حفظ العينات في حالة عدم القدرة على ارسالها

أ/جيد ( ) ب/ مقبول( ) ج/ غير مقبول ( )

٥٠ - اجراء المتابعة

أ/جيد ( ) ب/ مقبول( ) ج/ غير مقبول ( )

المحور الثاني: الأنشطة الأساسية لنظام ترصد الشلل الرخو الحاد

٥١ - هل توجد استراتيجية لنظام الترصد والابلاغ للشلل الرخو الحاد؟

أ/نعم ( ) ب/ لا( )

٥٢ - ما هي الاستراتيجية المتبعة في نظام الترصد و الابلاغ للشلل الرخو الحاد؟

أ/البحث النشط ( ) ب/البحث غير النشط ( ) ج/المناطق المختارة ( )

٥٣ - هل تتضمن الاستراتيجية خطة لتقييم النظام؟

أ/ نعم( ) ب/ لا ( )

٥٤ - اذا كانت الاجابة نعم ما هي الفترة الزمنية التي يتم فيها تقييم النظام؟

أ/ كل عامين ( ) ب/ كل ثلاثة أعوام ( ) ج/ كل خمسة سنة( ) د/اكثرمن ذلك( )

٥٥ - هل توجد لوائح وقوانيت لتنظيم العمل بالوحدة؟ أ/ نعم( ) ب/ لا ( )

٥٦ - اذا كانت الاجابة نعم هل القانون مفعل؟ أ/ نعم( ) ب/ لا ( )

٥٧ - هل يوجد وصف وظيفي للعاملين بنظام الترصد بالوحدة؟

أ/ نعم( ) ب/ لا ( )

٥٨ - هل توجد لوائح تنظيم انسياب المعلومات؟ أ/ نعم( ) ب/ لا ( )

٥٩ - هل يوجد تنسيق بين الوحدات داخل المحلية لتبادل المعلومات؟

أ/ نعم( ) ب/ لا ( )

٦٠ - هل يوجد تنسيق بين المحليات لتبادل المعلومات؟ أ/ نعم( ) ب/ لا ( )

٦١ - هل يوجد شركاء لبرنامج الترصد على مستوى الوحدة؟

أ/ نعم( ) ب/ لا ( )

٦٢ - هل هنالك تعاون ما بين الشركاء و نظام الترصد؟ أ/ نعم( ) ب/ لا ( )

٦٣ - هل يوجد تنسيق وتعاون بين القطاعات الأخرى ذات الصلة بالمحلية؟

أ/ نعم( ) ب/ لا ( )

٦٤ - هل يوجد وصف وظيفي للعاملين في نظام الترصد والإبلاغ؟

أ/ نعم( ) ب/ لا ( )

٦٥ - هل يتم تدريب العاملين بالوحدة؟ أ/ نعم( ) ب/ لا ( )

٦٦ - اذا كانت الإجابة نعم في (65) كم عدد الدورات التي تمت للعاملين بالوحدة؟

أ/ دورة واحدة ( ) ب/ دورتين ( ) ج/ ثلاثة دورات ( )

٦٧ - **الدورات التي تم تنفيذها هي:**

أ/تنشيطية ( ) ب/ أساسية ( ) ج/ الاثنين معا ( )

المحور الثالث: المواد والمعينات الخاصة ببرنامج الترصد

٦٨ - **الوثائق والأدوات التي يجب أن تكون متاحة**

الوثائق والأدوات التي يجب أن تكون متاحة	توجد	لا يوجد
١ -ملف للتقارير الإسبوعية		
٢ -ملف وثائق الزيارات النشطة		
٣ -ملف لكل حالة شلل رخو حاد		
٤ -المبادئ التوجيهية لتقصي الشلل الرخو الحاد		
٥ -ملف وثائق التغذية الراجعة		
٦ -حاوية جمع عينات البراز		
٧ -ادوات جمع عينات البراز		
٨ -سلسلة التبريد الخاصة بوسائل جمع العينات		
٩ -الباقات المجمدة		
١٠ - استمارة تقصي حالات الشلل الرخو الحاد		
١١ - استمارة البلاغ الفوري		
١٢ - استمارة جمع عينات البراز		
١٣ - استمارة طلب الفحص المعملي		
١٤ - استمارة متابعة (60يوم) لحالات الشلل الرخو الحاد		
١٥ - استمارات التبليغ ا لإسبوعي		
١٦ - استمارات الزيارات النشطة		
١٧ - الجدول الزمني للزيارات النشطة		
١٨ - بوستر لمتابعة الزيارات النشطة		
١٩ - بوستر لمتابعة التقارير الإسبوعية		
٢٠ - بوستر لقائمة الحالات المبلغة		
٢١ - خريطة تبين مواقع التقارير والحالات المبلغ عنها		
٢٢ - كتيب ارشادات تقصي الشلل الرخو الحاد		
٢٣ - ملف لحفظ الملاحظات من الزيارات السابقة		

٦٩ - هل يوجد دليل متفق عليه لتعريف حالة الشلل الرخو الحاد

أ/ نعم( ) ب/ لا ( )

٧٠ - هل تعريف الحالة واضح لجميع العاملين أ/ نعم ( ) ب/ لا ( )

٧١ - هل يوجد شخص محدد لتسجيل الحالات؟ أ/ نعم ( ) ب/ لا ( )

٧٢ - هل يتم التسجيل بصورة صحيحة؟ أ/ نعم ( ) ب/ لا ( )

٧٣ - هل يتم تسجيل الحالة في الإستمارة أو الدفتر المعد لذلك؟

أ/ نعم ( ) ب/ لا ( )

٧٤ - هل استمارة التسجيل سهلة الإستخدام؟ أ/ نعم ( ) ب/ لا ( )

٧٥ - هل استمارات التسجيل كافية؟ أ/ نعم ( ) ب/ لا ( )

٧٦ - هل حدث نقص من قبل في استمارات التسجيل خلال الأشهر الماضية؟

أ/ نعم ( ) ب/ لا ( )

٧٧ - هل يوجد شخص مسؤول عن كتابة التقرير؟ أ/ نعم ( ) ب/ لا ( )

٧٨ - هل تتم كتابة التقرير على مستوى الوحدة؟ أ/ نعم ( ) ب/ لا ( )

٧٩ - هل توجد استمارة خاصة باعداد التقارير؟ أ/ نعم ( ) ب/ لا ( )

٨٠ - هل توجد استمارة خاصة لعينات الأطفال الأصحاء؟

أ/ نعم ( ) ب/ لا ( )

٨١ - هل تقوم الوحدة بإرسال التقارير للجهة العليا بصورة منتظمة؟

أ/ نعم ( ) ب/ لا ( )

٨٢ - هل يتم حفظ صورة من التقارير المرسلة؟ أ/ نعم ( ) ب/ لا ( )

٨٣ - هل صور التقارير محفوظة بصورة جيدة؟ أ/ نعم ( ) ب/ لا ( )

٨٤ - هل هنالك أي مشكلة في اعداد التقارير؟ أ/ نعم ( ) ب/ لا ( )

٨٥ - هل هنالك تحليل للبيانات المجمعة بالوحدة؟ أ/ نعم ( ) ب/ لا ( )

٨٦ - هل البيانات تتضمن مؤشرات المراقبة؟ أ/ نعم ( ) ب/ لا ( )

٨٧ - هل يتم تصنيف البيانات حسب:

- العمر؟ أ/ نعم ( ) ب/ لا ( )
- الجنس؟ أ/ نعم ( ) ب/ لا ( )
- السكن؟ أ/ نعم ( ) ب/ لا ( )

٨٨ - هل يوجد شخص محدد لتحليل البيانات؟ أ/ نعم ( ) ب/ لا ( )

٨٩ - كيف يتم تمثيل البيانات التي تم تحليلها؟

أ/ أشكال بيانية( ) ب/ جداول ( ) ج/ منحنيات( ) د/ كل ما ذكر صحيح( )

المحور الرابع: جودة و كفاءة برنامج ترصد الشلل الرخو الحاد

٩٠ - هل هنالك حالات تم إستقصائها خلال هذا العام؟ أ/ نعم ( ) ب/ لا ( )

٩١ - اذ كانت الإجابة نعم كم يبلغ عدد تلك الحالات؟ .....

٩٢ - كم يبلغ المعدل السنوي لحالات الشلل الرخو الغير ناتجة عن فيروس الشلل؟

أ/أقل من 80%( ) ب/80%( ) أكثر من 80% ( )

٩٣ - نسبة الحالات التي تم التحقق منها خلال 48 ساعة؟

أ/أقل من 80%( ) ب/80%( ) أكثر من 80% ( )

٩٤ - نسبة الحالات التي يتم لها جمع عينتين من البراز خلال 14 يوم؟

أ/أقل من 80%( ) ب/80%( ) أكثر من 80% ( )

٩٥ - معدل عينات البراز التي يتم نقلها خلال ثلاث أيام؟

أ/أقل من 80%( ) ب/80%( ) أكثر من 80% ( )

٩٦ - معدل عينات البراز التي يتم نقلها للمعمل في ظروف مثالية؟

أ/أقل من 90%( ) ب/90%( ) أكثر من 90% ( )

٩٧ - معدل العينات التي تم استقبال نتائج المعمل لها خلال 14 يوم

أ/أقل من 80%( ) ب/80%( ) أكثر من 80% ( )

٩٨ - نسبة الحالات التي تم متابعة الفحص لها بعد 60 يوم من بدء الشلل الرخو

أ/أقل من 80%( ) ب/80%( ) أكثر من 80% ( )

٩٩ - من الشخص الذي يتابع الحالة بعد 60 يوم من حدوث الشلل؟

أ/الشخص الذي أجرى الفحص الأولي ب/ شخص آخر ( )

١٠٠ - نسبة إكتمال التقارير الروتينية؟

أ/أقل من 80%( ) ب/80%( ) أكثر من 80% ( )

١٠١ - نسبة الزياراة النشطة؟

أ /أقل من 80%( ) ب/80%( ) أكثر من 80% ( )

١٠٢ - هل يتم جمع عينات عشوائية من الأطفال في المحلية التي لم تبلغ حالات خلال النصف الأول من العام؟ أ/ نعم ( ) ب/ لا ( )

١٠٣ - اذا كانت الإجابة نعم كيف يتم جمع هذه العينات؟ .....

.....

.....

Shendi University

Faculty of Higher Studies and Scientific Research

Questionnaire about;

Evaluation of AFP Surveillance System in River Nile State

By; **A.S.** Mohamed Ahmed, alhajsm198@gmail.com, 0919896294, 0923224164

١ -**المحلية:**1/شندي( ) 2/المتمة( ) 3/الدامر( ) 4/عطبرة( ) 5/بربر( )
6/أبو حمد( ) 7/البحيرة( )

٢ -**مركزالتبليغ** 1/مستشفى( ) 2/مركز صحي( ) 3/عيادة( ) 4/أخرى/حدد....

٣ -**الأولوية** 1/عليا ( ) 2/وسطى ( ) 2/دنيا ( )

٤ -**تخصص الشخص المسؤول** : 1/طبيب( ) 2/ضابط صحة( )
3/ممرض ( ) 4/ تقني مختبر( ) 5/أخرى/حدد.....

٥ - هل نظام ترصد الشلل الرخو الحاد اجباري بالوحدة 1/ نعم ( ) 2/ لا ( )

٦ - هل توجد غرفة خاصة بترصد الشلل الرخو الحاد 1/ نعم ( ) 2/ لا ( )

٧ - هل هنالك ميزانية منفصلة لنظام ترصد الشلل الرخو الحاد؟

1/ نعم ( ) 2/ لا ( )

٨ - اذا كانت الإجابة نعم في (4) هل يوجد دعم آخر من الميزانية العامة؟

1/ نعم ( ) 2/ لا ( )

٩ - هل الميزانية المرصودة كافية؟ 1/نعم( ) 2/لا( )

١٠ - هل يوجد العدد الكافي من العاملين في نظام الترصد؟ 1/نعم( ) 2/لا( )

١١ - هل توجد عربة خاصة بأنشطة ترصد الشلل الرخو الحاد؟

1/نعم( ) 2/لا( )

١٢ - كم عدد ضباط الترصد؟ 1/ضابط واحد( ) 2/ اثنان ( ) ثلاثة فأكثر( )

١٣ - هل يوجد مدير بيانات؟ 1/نعم( ) 2/لا( )

١٤ - هل هنالك مشرف على نظام الترصد؟ 1/نعم( ) 2/لا( )

١٥ - هل يوجد معمل بالوحدة؟ 1/نعم( ) 2/لا( )

١٦ - هل يوجد تقني معمل بمركز الترصد؟ 1/نعم( ) 2/لا( )

١٧ - هل يوجد دليل معياري لإدارة المعمل؟ 1/نعم( ) 2/لا( )

١٨ - هل توجد كهرباء بالمركز ؟ 1/نعم( ) 2/لا( )

١٩ - هل توجد وسيلة نقل خاصة بالترصد؟ 1/نعم( ) 2/لا( )

٢٠ - هل يوجد تلفون بمركز الترصد؟ 1/نعم( ) 2/لا( )

٢١ - هل توجد آلة حاسبة؟ 1/نعم( ) 2/لا( )

٢٢ - هل يوجد كمبيوتر؟ 1/نعم( ) 2/لا( )

٢٣ - هل توجد طابعة؟ 1/نعم( ) 2/لا( )

٢٤ - هل توجد شبكة انترنت؟ 1/نعم( ) 2/لا( )

٢٥ - هل يوجد دليل ترصد؟ 1/نعم( ) 2/لا( )

٢٦ - اذا كانت الاجابة نعم هل هو اخر اصدار؟ 1/نعم( ) 2/لا( )

٢٧ - هل الدليل سهل الاستخدام؟ 1/نعم( ) 2/لا( )

٢٨ - هل يتم استخدامه في انشطة الرصد والابلاغ؟ 1/نعم( ) 2/لا( )

٢٩ - هل يحتوي الدليل على موجهات عن كيفية كتابة التقرير ومعالجة البيانات؟

1/نعم( ) 2/لا( )

٣٠ - هل يحتوي الدليل على موجهات عن كيفية اتخاذ القرار على كل المستويات؟

1/نعم ( ) 2/لا( )

٣١ - هل يتم تزويد الوحدة بالدلائل والموجهات الحديثة؟

1/نعم ( ) 2/لا( )

٣٢ - هل يوجد شخص محوري 1/ نعم ( ) 2/ لا ( )

٣٣ - هل الشخص المحوري معين 1/ نعم ( ) 2/ لا ( )

٣٤ - هل يوجد نائب للشخص المحوري 1/ نعم ( ) 2 / لا ( )

٣٥ - هل يتحرى الشخص المحوري عن الحالات في سجلات العيادة الخارجية

1/ نعم ( ) 2/ لا ( )

٣٦ - الشخص المحوري يتحرى عن الحالات في سجلات عنبر الأطفال

1/ نعم ( ) 2/ لا ( )

٣٧ - الشخص المحوري يتحرى عن الحالات في سجلات أخرى؟

1/ نعم ( ) 2/ لا ( ) 3/اذا كان نعم حدد .....

٣٨ - هل الشخص المحوري مدرب؟ 1/ نعم ( ) 2/ لا ( )

٣٩ - هل يجيد مهارات استخدام الكمبيوتر؟ 1/ نعم ( ) 2/ لا ( )

٤٠ - معرفة كيفية ادخال البيانات؟ 1/ نعم ( ) 2/ لا ( )

٤١ - معرفة كيفية استخراج الجداول والرسوم البانية؟

1/ نعم ( ) 2/ لا ( )

٤٢ - هل الشخص المحوري له علاقة طيبة مع العاملين؟

1/ نعم ( ) 2/ لا ( )

٤٣ - هل الشخص المحوري يحتفظ بنسخة من تقاريره؟

1/ نعم ( ) 2/ لا ( )

٤٤ - تنفيذ زيارات التقصي النشط 1/ نعم ( ) 2/ لا ( )

٤٥ - اذا كانت الإجابة نعم في (41) من الذي يقوم بذلك؟ .....

٤٦ - هل الزيارة منتظمة؟ 1/ نعم ( ) 2/ لا ( )

٤٧ - اذا كانت الإجابة نعم في (43) ما هي الفترة التي تتم فيها الزيارة؟

1/نصف اسبوعي ( ) 2/ اسبوعيا ( ) 3/ شهريا ( )

٤٨ - هل يتم التوقيع في استمارة الزيارة؟ 1/ نعم ( ) 2/ لا ( )

- ما هو تقييم الشخص المحوري من حيث اجادة الآتي

٤٩ - تعريف حالة الشلل الرخو الحاد

1/جيد ( ) 2/ مقبول( ) 3/ غير مقبول ( )

٥٠ - ملء استمارة التقصي

1/جيد ( ) 2/ مقبول( ) 3/ غير مقبول ( )

٥١ - جمع عينات البراز

1/جيد ( ) 2/ مقبول( ) 3/ غير مقبول ( )

٥٢ - حفظ العينات في حالة عدم القدرة على ارسالها

1/جيد ( ) 2/ مقبول( ) 3/ غير مقبول ( )

٥٣ - اجراء المتابعة

1/جيد ( ) 2/ مقبول( ) 3/ غير مقبول ( )

المحور الثاني: الأنشطة الأساسية لنظام ترصد الشلل الرخو الحاد

٥٤ - هل توجد استراتيجية لنظام الترصد والابلاغ للشلل الرخو الحاد؟

1/نعم ( ) 2/ لا( )

٥٥ - ما هي الاستراتيجية المتبعة في نظام الترصد و الابلاغ للشلل الرخو الحاد؟

1/البحث النشط ( ) 2/البحث غير النشط ( ) 3/المناطق المختارة ( )

٥٦ - هل تتضمن الاستراتيجية خطة لتقييم النظام؟

1/ نعم( ) 2/ لا ( )

٥٧ - اذا كانت الاجابة نعم ما هي الفترة الزمنية التي يتم فيها تقييم النظام؟

1/ كل عامين ( ) 2/ كل ثلاثة أعوام ( ) 3/ كل خمسة سنة( ) 4/اكثرمن ذلك( )

٥٨ - هل توجد لوائح وقوانيت لتنظيم العمل بالوحدة؟ 1/ نعم( ) 2/ لا ( )

٥٩ - اذا كانت الاجابة نعم هل القانون مفعل؟ 1/ نعم( ) 2/ لا ( )

٦٠ - هل يوجد وصف وظيفي للعاملين بنظام الترصد بالوحدة؟

1/ نعم( ) 2/ لا ( )

٦١ - هل توجد لوائح تنظيم انسياب المعلومات؟ 1/ نعم( ) 2/ لا ( )

٦٢ - هل يوجد تنسيق بين الوحدات داخل المحلية لتبادل المعلومات؟

1/ نعم( ) 2/ لا ( )

٦٣ - هل يوجد تنسيق بين المحليات لتبادل المعلومات؟ 1/ نعم( ) 2/ لا ( )

٦٤ - هل يوجد شركاء لبرنامج الترصد على مستوى الوحدة؟

1/ نعم( ) 2/ لا ( )

٦٥ - هل هنالك تعاون ما بين الشركاء و نظام الترصد؟ 1/ نعم( ) 2/ لا ( )

٦٦ - هل يوجد تنسيق وتعاون بين القطاعات الأخرى ذات الصلة بالمحلية؟

1/ نعم( ) 2/ لا ( )

٦٧ - هل يوجد وصف وظيفي للعاملين في نظام الترصد والإبلاغ؟

1/ نعم( ) 2/ لا ( )

٦٨ - هل يتم تدريب العاملين بالوحدة؟ 1/ نعم( ) 2/ لا ( )

٦٩ - اذا كانت الإجابة نعم في (65) كم عدد الدورات التي تمت للعاملين بالوحدة؟

1/ دورة واحدة ( ) 2/ دورتين ( ) 3/ ثلاثة دورات ( )

٧٠ - **الدورات التي تم تنفيذها هي:**

1/تنشيطية ( ) 2/ أساسية ( ) 3/ الاثنين معا ( )

المحور الثالث: المواد ، المعينات والوثائق والأدوات التي يجب أن تكون متاحة

المواد ، المعينات ، الوثائق والأدوات	**1/توجد**	**2/لا توجد**
٧١ - ملف للتقارير الإسبوعية		
٧٢ - ملف وثائق الزيارات النشطة		
٧٣ - ملف لكل حالة شلل رخو حاد		
٧٤ - المبادئ التوجيهية لتقصي الشلل الرخو الحاد		
٧٥ - ملف وثائق التغذية الراجعة		
٧٦ - حاوية جمع عينات البراز		
٧٧ - ادوات جمع عينات البراز		
٧٨ - سلسلة التبريد الخاصة بوسائل جمع العينات		
٧٩ - الباقات المجمدة		
٨٠ - استمارة تقصي حالات الشلل الرخو الحاد		
٨١ - استمارة البلاغ الفوري		
٨٢ - استمارة جمع عينات البراز		
٨٣ - استمارة طلب الفحص المعملي		
٨٤ - استمارة متابعة (60يوم) لحالات الشلل الرخو الحاد		
٨٥ - استمارات التبليغ ا لإسبوعي		
٨٦ - استمارات الزيارات النشطة		
٨٧ - الجدول الزمني للزيارات النشطة		
٨٨ - بوستر لمتابعة الزيارات النشطة		
٨٩ - بوستر لمتابعة التقارير الإسبوعية		
٩٠ - بوستر لقائمة الحالات المبلغة		
٩١ - خريطة تبين مواقع التقارير والحالات المبلغ عنها		
٩٢ - كتيب ارشادات تقصي الشلل الرخو الحاد		
٩٣ - ملف لحفظ الملاحظات من الزيارات السابقة		

٩٤ - هل يوجد دليل متفق عليه لتعريف حالة الشلل الرخو الحاد

1/ نعم( ) 2/ لا ( )

٩٥ - **هل تعريف الحالة واضح لجميع العاملين 1/ نعم ( ) 2 / لا ( )**

٩٦ - هل يوجد شخص محدد لتسجيل الحالات؟ 1/ نعم ( ) 2/ لا ( )

٩٧ - هل يتم التسجيل بصورة صحيحة؟ 1/ نعم ( ) 2/ لا ( )

٩٨ - هل يتم تسجيل الحالة في الإستمارة أو الدفتر المعد لذلك؟

1/ نعم ( ) 2/ لا ( )

٩٩ - هل استمارة التسجيل سهلة الإستخدام؟ 1/ نعم ( ) 2/ لا ( )

١٠٠ - هل استمارات التسجيل كافية؟ 1/ نعم ( ) 2/ لا ( )

١٠١ - هل حدث نقص من قبل في استمارات التسجيل خلال الأشهر الماضية؟

1/ نعم ( ) 2/ لا ( )

١٠٢ - هل يوجد شخص مسؤول عن كتابة التقرير؟ 1/ نعم ( ) 2/ لا ( )

١٠٣ - هل تتم كتابة التقرير على مستوى الوحدة؟ 1/ نعم ( ) 2/ لا ( )

١٠٤ - هل توجد استمارة خاصة باعداد التقارير؟ 1/ نعم ( ) 2/ لا ( )

١٠٥ - هل توجد استمارة خاصة لعينات الأطفال الأصحاء؟

1/ نعم ( ) 2/ لا ( )

١٠٦ - هل تقوم الوحدة بإرسال التقارير للجهة العليا بصورة منتظمة؟

1/ نعم ( ) 2/ لا ( )

١٠٧ - هل يتم حفظ صورة من التقارير المرسلة؟ 1/ نعم ( ) 2/ لا ( )

١٠٨ - هل صور التقارير محفوظة بصورة جيدة؟ 1/ نعم ( ) 2/ لا ( )

١٠٩ - هل هنالك أي مشكلة في اعداد التقارير؟ 1/ نعم ( ) 2/ لا ( )

١١٠ - هل هنالك تحليل للبيانات المجمعة بالوحدة؟ 1/ نعم ( ) 2 / لا ( )

١١١ - هل البيانات تتضمن مؤشرات المراقبة؟ 1/ نعم ( ) 2/ لا ( )

تصنيف البيانات حسب:

١١٢ - العمر؟ 1/ نعم ( ) 2/ لا ( )

١١٣ - الجنس؟ 1/ نعم ( ) 2/ لا ( )

١١٤ - السكن؟ 1/ نعم ( ) 2/ لا ( )

١١٥ - هل يوجد شخص محدد لتحليل البيانات؟ 1/ نعم ( ) 2/ لا ( )

١١٦ - كيف يتم تمثيل البيانات التي تم تحليلها؟

1/ أشكال بيانية( ) 2/ جداول ( ) 3/ منحنيات( ) 4/ كل ما ذكر صحيح( )

المحور الرابع: جودة و كفاءة برنامج ترصد الشلل الرخو الحاد

١١٧ - هل هنالك حالات تم إستقصائها خلال هذا العام؟ 1/ نعم ( ) 2/ لا ( )

١١٨ - اذ كانت الإجابة نعم كم يبلغ عدد تلك الحالات؟ .....

١١٩ - كم يبلغ المعدل السنوي لحالات الشلل الرخو الغير ناتجة عن فيروس الشلل؟

1/أقل من 80%( ) 2/80%( ) 3/أكثر من 80% ( )

١٢٠ - نسبة الحالات التي تم التحقق منها خلال 48 ساعة؟

1/أقل من 80%( ) 2/80%( ) 3/أكثر من 80% ( )

١٢١ - نسبة الحالات التي يتم لها جمع عينتين من البراز خلال 14 يوم؟

1/أقل من 80%( ) 2/80%( ) 3/أكثر من 80% ( )

١٢٢ - معدل عينات البراز التي يتم نقلها خلال ثلاث أيام؟

1/أقل من 80%( ) 2/80%( ) 3/أكثر من 80% ( )

١٢٣ - معدل عينات البراز التي يتم نقلها للمعمل في ظروف مثالية؟

1/أقل من 90%( ) 2/90%( ) 3/أكثر من 90% ( )

١٢٤ - معدل العينات التي تم استقبال نتائج المعمل لها خلال 14 يوم

1/أقل من 80%( ) 2/80%( ) 3/أكثر من 80% ( )

١٢٥ - نسبة الحالات التي تم متابعة الفحص لها بعد 60 يوم من بدء الشلل الرخو

1/أقل من 80%( ) 2/80%( ) 3/أكثر من 80% ( )

١٢٦ - من الشخص الذي يتابع الحالة بعد 60 يوم من حدوث الشلل؟

أ/الشخص الذي أجرى الفحص الأولي ب/ شخص آخر ( )

١٢٧ - نسبة إكتمال التقارير الروتينية؟

أ/أقل من 80%( ) ب/80%( ) أكثر من 80% ( )

١٢٨ - نسبة الزياراة النشطة؟

1 /أقل من 80%( ) 2/80%( ) 3/أكثر من 80% ( )

١٢٩ - هل يتم جمع عينات عشوائية من الأطفال في المحلية التي لم تبلغ حالات خلال النصف الأول من العام؟ 1/ نعم ( ) 2/ لا ( )

١٣٠ - اذا كانت الإجابة نعم كيف يتم جمع هذه العينات؟ .....

.....

.....


جمهورية مصر العربية
البحر الاحمر
ولاية نهر النيل
الولاية الشمالية
ولاية البحر الاحمر
ابوحبيه
دنقلا
بورتسودان
عطبرة
شندي
القضارف
ولاية شمال كردفان
ولاية الخرطوم
الخرطوم
ولايه كسلا
كسلا
ارتريا