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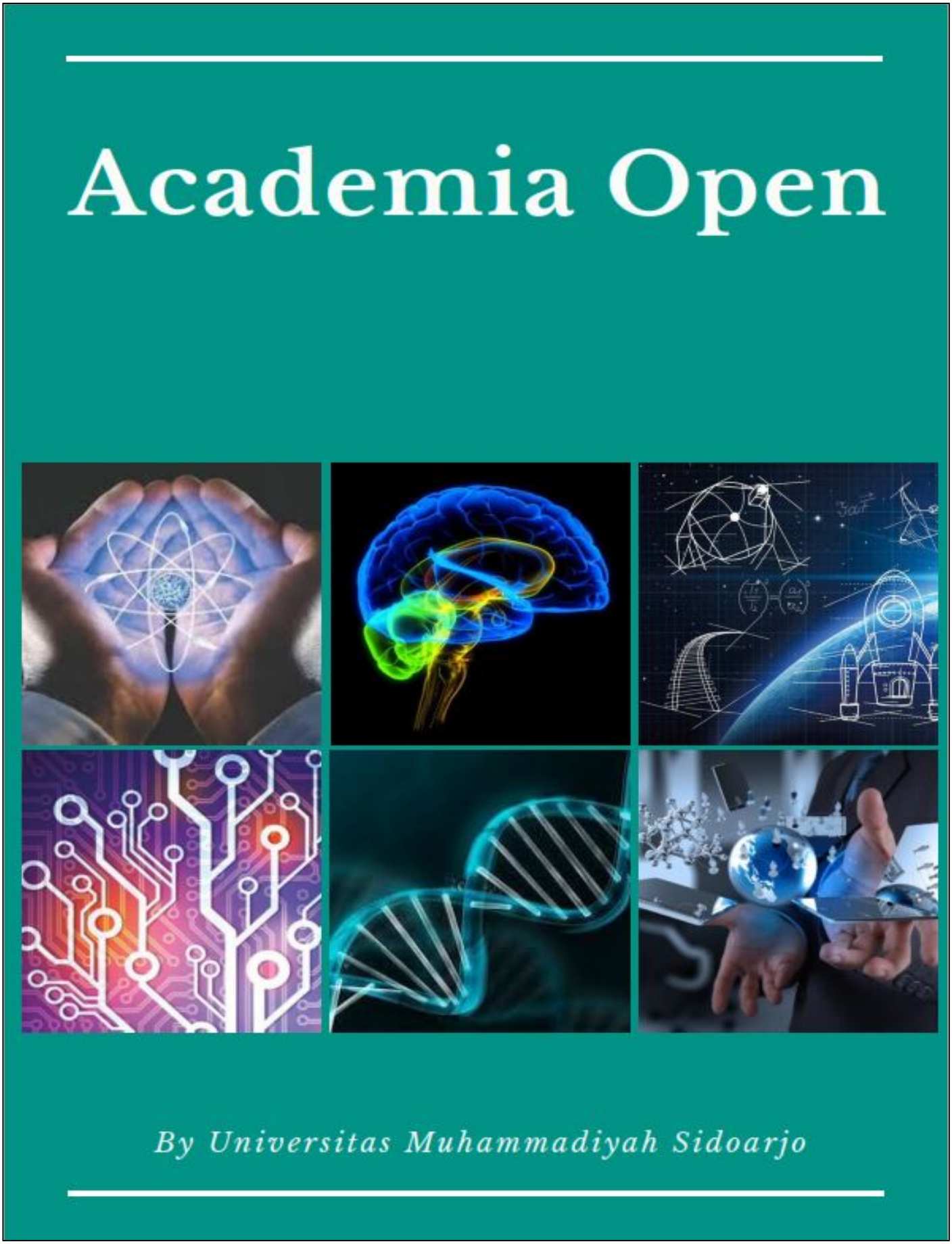

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Enhancing Global Poliomyelitis Surveillance Performance is Crucial for Eradication Efforts

Meningkatkan Kinerja Surveilans Polio Global Sangat Penting untuk Upaya Pemberantasan

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Abstract

Background: Poliomyelitis remains a significant public health challenge, with global efforts focused on its eradication. One critical strategy in this endeavor is the implementation of an acute flaccid paralysis (AFP) surveillance system, which is essential for early detection and response to poliovirus transmission. **Specific Background:** Despite the system's importance, there is limited evaluation of its performance, particularly in regions like Diyala province, Iraq. **Knowledge Gap:** Previous studies have not adequately assessed the AFP surveillance performance indicators specific to this region, necessitating a comprehensive analysis. **Aims:** This study aimed to evaluate the performance indicators of the AFP surveillance system in Diyala province during 2021, utilizing established World Health Organization (WHO) standards. **Results:** The cross-sectional study analyzed data from seven primary health care centers. Key findings revealed a Non-Polio Acute Flaccid Paralysis rate of 5.11 per 100,000 children under 15 years. Performance indicators included 100% reporting completeness, 95% timeliness of notification and investigation, and 97% stool quality for laboratory analysis. Furthermore, 97.3% of specimens reached the national laboratory within three days, demonstrating high operational efficiency. **Novelty:** This study is one of the first to provide a detailed evaluation of the AFP surveillance system in Diyala province, highlighting areas of strength and compliance with WHO targets. **Implications:** The findings underscore the effectiveness of the AFP surveillance system in this region, suggesting that its continued implementation can significantly contribute to the global eradication efforts of poliomyelitis while also serving as a model for similar evaluations in other regions.

Highlights:

1. High reporting completeness and timeliness in AFP surveillance.
2. Non-Polio AFP rate exceeds WHO targets, indicating effective monitoring.
3. Study supports global efforts toward poliomyelitis eradication.

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Keywords: Poliomyelitis, Acute Flaccid Paralysis, Surveillance System, Performance Indicators, Iraq

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Introduction

Polio eradication has been a goal of the World Health Organization (WHO) the primary target for eradication by 2000 was wasted, as well as the 2005 and 2018 targets, the number of acute flaccid paralysis (AFP) occurrences due to wild polioviruses is extremely low (Howard, 2021). It decreased by 99.99 %, from 350 000 in the 1988s to 140 cases of the wild poliovirus (WPV) in 2020 (Tuma, 2021). One of the four strategies for polio eradication is; the AFP surveillance that was adopted by the WHO to track progress towards poliomyelitis eradication. It goals to identify all cases of polio by defining any case of AFP as a potential case of polio (Makoni, 2017).The primary method of detecting poliovirus circulation is to test stool specimens for WPV and vaccine-derived polioviruses (VDPVs) in children aged less than 15 years in WHO-accredited laboratories (Lickness, 2020).

Since the Global Polio Eradication Initiative (GPEI) was launched in 1988, two of the three wild poliovirus (WPV) serotypes (types 2 and 3) have been eradicated and transmission of WPV type 1 (WPV1) remains uninterrupted only in Afghanistan and Pakistan (Bandyopadhyay & Macklin, 2021). Globally, the number of AFP cases reported between January and September decreased by 33%, from 81,439 in 2019 to 54,631 in 2020. The decline in AFP cases reported from 2019 to 2020 varied by WHO region (Zomahoun, 2021). In the Eastern Mediterranean Region, the population's immunity against the poliovirus is relatively high enough to prevent the occurrence of transmission and with all this, the wild poliovirus spread in the Middle East in Egypt, Palestine, Syria and Iraq during 2013 - 2014 demonstrated the weakness of countries in the face of the virus invasion (Farag et al., 2020). Yemen has also had three outbreaks of circulating vaccine-derived polio viruses, with 9 cases in April 2011, 4 cases in 2012, 1 case in 2016, and one case reported in September 2020 (Al-Dubaiee et al., 2021).

The poliovirus began to spread in Syria in 2013 and later spread to the Iraq in 2014 after importing the poliovirus circulating in Pakistan (Arie, 2014). No cases of polio have appeared in the two countries for years, and there were 38 cases of polio, 36 cases in Syria, as well as two cases in Iraq (Mbaeyi et al., 2017). This study illustrates the importance to know the strength and efficiency of the AFP surveillance system, starting with immediate notification, sample collection, access to the laboratory, and delivery of completed results within the specified deadline. This study aimed to evaluate the performance indicators of the acute flaccid paralysis (AFP) surveillance system in Iraq, Diyala province, 2021

Methods

Study Design

A cross-sectional study was conducted in all sectors in Diyala Province.

Study Period

Data collection started from 1st January to 31st January, 2022.

Setting of Study

This study was conducted in Diyala province. Diyala province is about 57 kilometers north of Baghdad city the capital of Iraq and has an area of 17,685 square kilometers, and accounts for 4.1% of the total area of Iraq. According to the Central Statistical Organization (CSO), Ministry of Planning, Republic of Iraq, the total population of Diyala province in 2021 was 1,768,920 and population below fifteen years was 742946 considered as 42% from total population. It included 7 sectors for primary health care centers in First Baquba sector, Second Baquba sector, Al-Mansouriya sector, Al-Khalis sector, and Baladruz sector, Muqdadiyah sector, Khanaqin sector, these sectors were located within the geographical location of Diyala province

Selection Criteria

Inclusion Criteria

Sectors included main primary health care centers that apply the AFP surveillance and all cases less than fifteen years in Diyala province.

Exclusion Criteria

Sub health centers and cases more than fifteen years were excluded from study.

Study Sample

Sectors that apply AFP surveillance system in this study were 7, included the main primary health centers.

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Sampling Technique

The main PHCCs were chosen in study was 62 out 105 total number involved sub and main PHCCs distributed in sectors. All sectors that reported cases were selected by convenience sampling technique.

Questionnaire Form

The questionnaire was built on the 7 standard indicators of the WHO AFP surveillance performance indicators in addition to 3 lab performance indicators from AFP field manual, Ministry of health to evaluate the quantitative indicators of the system. Percent indicators were computed according to timeliness and completeness by dividing the reported cases from all, while rate (Non polio AFP cases under the age of 15 years / population under 15 years of age × 100,000 population) (Table 1).

FIRST. Non-polio AFP rate in children <15 years of age. (Target ≥ 2/100,000)
SECOND. Completeness of weekly reporting. (Target > 90%)
THIRD. Timeliness of weekly reporting. (Target > 80%) number of reports received before a specified deadline (notified within 7 days after onset of symptoms)
Fourth. Percentage of reported AFP cases investigated ≤ 48 hours of report (Target ≥ 80%)
Fifth. Reported AFP cases with 2 specimens collected 24-48 hours apart and ≤ 14 days since onset. (Target ≥ 80%)
Sixth. Reported AFP cases with a follow-up exam at least 60 days after paralysis onset to verify the presence of residual paralysis or weakness. (Target ≥ 80%)
Lab Performance Indicators SEVENTH. Specimens arriving at national laboratory ≤ 3 days of being sent (Target ≥ 90%)
EIGHTH. Specimens arriving at laboratory in «good condition ». (Target > 80%).
NINTH. Percentage of specimens for which laboratory results sent within 28 days of receipt of specimens. (Target ≥ 80%).
TENTH. Percentage (≥10%) of stool specimens from which Non-Polio enterovirus was isolated

Table 1. *Estimate the quantitative attributes of surveillance system*

Ethical consideration

Administrative Arrangement

Before collecting data, necessary official permissions agreements were obtained from Department of Public Health.

Statistical Analysis

Analysis of data was carried out using the excel software (version 19). For the AFP surveillance questionnaire, the performance indicators were calculated using WHO questionnaire and from AFP field manual, Ministry of Health, Republic of Iraq. Data were presented in simple measures of frequency, percentage, rate, and average in a descriptive, cross-sectional study

Result and Discussion

Result

Distribution Non-Polio AFP Rate by the Geographical Region of the Sectors during, 2021

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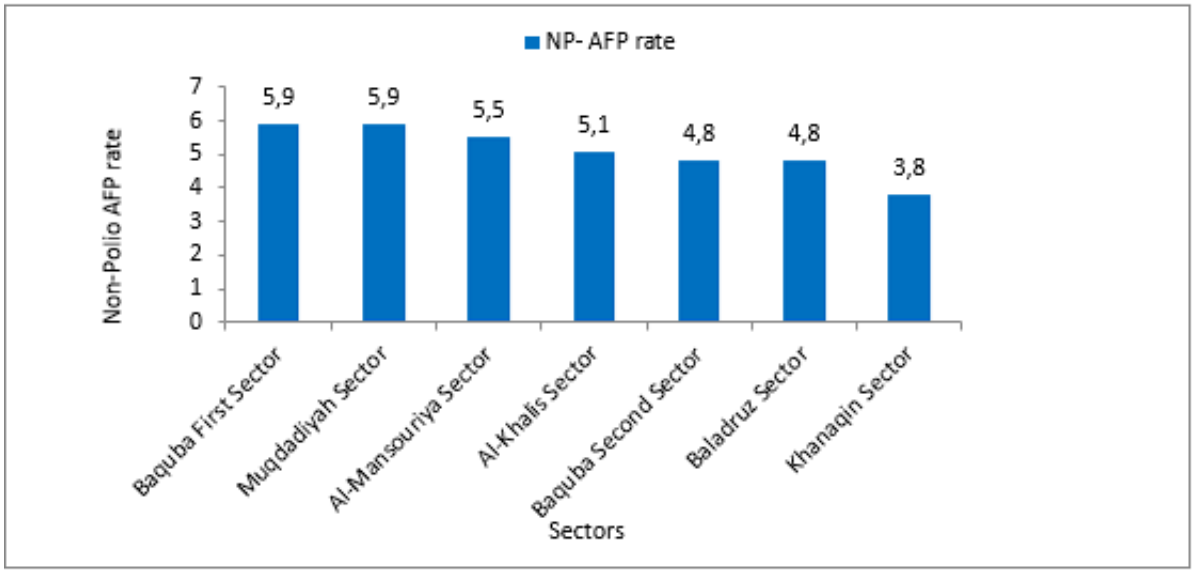

Figure 1. *showed the Non-polio AFP rate according to sectors which is highest (5.9) in Baquba first and, while lowest rate (3.8) in Khanaqin Sector.*

Distribution of detected cases by hospitals during, 2021

Province Hospitals		No. cases	%
1	Al-Batoul Teaching Hospital	16	42.1
2	Khalis General Hospital	4	10.5
3	Baladrooz General Hospital	2	5.2
4	Zahraa Hospital for Women & Children	2	5.2
	Total	24/38	63
*Hospitals Outside The Province		No. cases	%
1	Child Welfare Teaching Hospital	10	26.3
2	Central Child Hospital	2	5.2
3	Shar Hospital	1	2.6
4	Kirkuk Hospital for Children	1	2.6
	Total	14/38	37
*Hospitals Outside the Province (Notification According geographical Area for cases)			

Table 2. *According to the cases detected by province hospitals was (24/38), While (14/38) cases detected by*hospitals outside the province.*

Performance indicators for surveillance system in Diyala province, Iraq, 2021

Indicator	Target	Attribute	Rate
First: Non-polio AFP rate in children <15 years of age.	≥2 /100,000	Sensitivity	5.11
Second: Completeness of weekly reporting.	≥90%	Completeness of reporting	100
Third: Timeliness of weekly reporting. number of reports received before a specified deadline (notified within 7 days after onset of symptoms)	>80%	Timeliness of notification	95

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Fourth: Percentage of reported AFP cases investigated ≤48 hours of report	≥80%	Timeliness of investigation	95
Fifth: Reported AFP cases with 2 specimens collected 24-48 hours apart and ≤14 days since onset.	≥80%	Timeliness and quality stool collection	97
Sixth: Reported AFP cases with a follow-up exam at least 60 days after paralysis onset to verify presence of residual paralysis or weakness	≥80%	Completeness of follow-up	100
Lab Performance Indicators: Seventh: Specimens arriving at national laboratory ≤3 days of being sent	≥90%	Timeliness	97.3
Eighth: Specimens arriving lab in good condition	>80%	Stool condition	90
Ninth: Percentage of specimens for which laboratory results sent 28 days (14 days in Iraq) of receipt of specimens	≥80%	Timeliness of reporting	95
Tenth: Percentage of stool specimens from which non-polio enterovirus was isolated	≥10%	Quality of laboratory performance	10.5

Table 3. *showed the indicator Non-polio AFP rate in children <15 years of age in province was (5.11%), and adequacy of stool (97). While completeness and timeliness of reporting notification performance was above targeted.*

Performance the seven indicators of the AFP surveillance system in Diyala province Iraq, from 2017 to 2021

Indicators	Target	Actual performance					Average
		2017	2018	2019	2020	2021	
First: Non-polio AFP rate in children <15 years of age.	≥2/ 100,000	7.25	8.15	11.06	4.16	5.11	7.14
Second: percentage of AFP cases reported within 7 days (notified within 7 days after onset of paralysis	≥80%	88.9	82.1	90.7	97.5	95	90.84
Third: percentage of reported AFP cases investigated ≤48 hours of report	≥80%	93.3	85.7	92.0	85.8	95	90.36
Fourth: reported AFP cases with two adequate	≥80%	93.3	94.6	98.6	93.2	97	95.34

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stool specimens							
Fifth: percentage of Specimens arriving at national laboratory ≤3 days of being sent	≥80%	98.9	100	95.9	98.1	97.3	98.4
Sixth: percentage of specimens for which laboratory results sent within 28 days (14 days in Iraq) of receipt of specimens	≥80%	100	100	97.0	96.0	95	97.6
Seventh: percentage of stool specimens from which non-polio enterovirus was isolated	≥10%	22.2	8.9	16.4	11.1	10.5	13.82

Table 4. *showed performance the seven indicators of the AFP surveillance system in Diyala province from 2017 to 2021. The AFP surveillance system's performance indicators all met WHO standard indicator levels except the seventh indicator percentage of stool specimens from which non-polio enterovirus was isolated in 2018, which are lower than the minimum WHO standard indicator of (≥10%).*

Discussion

The Non-Polio AFP rate is used as the standard for assessing the sensitivity of AFP surveillance. Number of AFP cases that have been reported (38) and Non-Polio AFP rate in Diyala province was (5.11/100,000 <15 years), this result is higher than the finding of a previous study done in Iraq, karbala province (Aradhi, et al., 2020) which found that Non-Polio AFP rate was (4.2 /100,000 <15 years), through week 33 of the year 2015. The result of this study was lower compared with the finding of a previous study (6.11/100,000 <15 years) done in Diyala province, Iraq (Al-kinani, 2015).

Cases detected by the hospital are immediately reported to the districts primary health care according to the geographical area for follow-up investigation. Hospital was main source for detection of cases rather than PHCCs. The number of cases reported by Al-Batoul Teaching Hospital was the main source of AFP cases reporting. While the lowest reported cases in Zahraa Hospital for Women & Children, also the Baladruz General Hospital. This result agreed with the finding of a previous study done in Dakahlia, North East of delta, Egypt (Abdel-fattah, et al., 2019) which found the hospitals were the primary source of AFP case reporting. (57.1%) of cases, and PHC facilities and medical offices come next (11.0%).

Regarding completeness of weekly reporting the study found all health institutions (100%) were weekly reporting, while timeliness of reports received within 7 days of the symptom's onset was (95%). This result agreed with previous study in Bangladesh (Habib, 2017), which found for all reported AFP cases, completeness and timeliness of passive reporting from institutions has been satisfactory. While the result of current study were high than other study done in Pakistan (Rehman, & Saleem, 2018)

The fifth indicator for adequacy stool was (97%). This result agreed with previous study done in Bangladesh (Habib, 2017), which found adequately two stool samples were collected from all reported AFP cases within 14 days of case reporting. Regarding tenth indicator percentage of stool specimens from which Non-Polio enterovirus (NPEV) isolated was (10.5%). This result is higher than WHO indicators and lower than another study done in Iraq (Jasem, et al., 2014). The difference between the two studies does not matter because the goal is achieved. As well as this result is higher than other study done in Ethiopia (Tegegne et al., 2017) also this result is higher than other study done in the Democratic Republic of Congo (Membo et al., 2016) which found the NPEV isolation percent was consistent under the minimum requirement.

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The study's findings revealed that the Non-Polio AFP detection rate average (7.15) above minimum WHO standard indicator level (≥2 AFP cases/100,000) the Non-Polio AFP rates by sectors performed well. This result indicates that the AFP surveillance system sensitive and able to detect any polio case re-imported into the province. When compared to other studies from different countries and time periods, the average Non-Polio AFP rate in Diyala province, Iraq was higher than a study done in Yemen (Almoayed et al., 2019 and study done in Iraq (Jasem et al., 2014).

The average percent of cases of AFP with two adequate stool samples specimens are core function an indicator for the AFP surveillance system. In this study in Diyala province, Iraq this indicator was (95.34%). This result was higher from minimum WHO standard indicator level (≥80%) when compared to that in many other countries around the world. This result agree with the study done in Sokoto State, Nigeria (Raji, et al, 2021) and study done in Yemen (Almoayed et al., 2019) .

The performances of the National Polio Lab (NPL) in Bagdad succeed to return results within 28 days and to meet the WHO standard indicator level (≥80%) in regards to returning results within 28 days (Target 14 days in Iraq) of stool specimen receipt was (97.6). These performance standard indicator levels was reached higher than study done in Yemen (Almoayed et al., 2019) and agree with study done in Ghana (Odoom et al., 2014) concerning laboratory results sent within 28 days of receiving of specimens.

Conclusion

The AFP surveillance system performance indicators were above minimum WHO indicators and the performance rate of the indicators for the five years from 2017 to 2021 was within the target to be achieved.

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