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FACTORS INFLUENCING THE LOW REPORTING RATES OF MEASLES, YELLOW FEVER AND ACUTE FLACCID PARALYSIS IN NEW JUABEN NORTH MUNICIPAL.

BY

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DECLARATION

I, ANNETTE AKPENE ASRAKU, the author of this dissertation, do hereby declare that with the exception of references to the literature and works of other researchers which have been duly cited the work in this dissertation is the result of my original work.

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DEDICATION

I dedicate this dissertation to my lovely and supportive husband, Joseph Agbeko Yadoglah and children Elikem, Selasi and Enyonam and my family members whose collective support and prayers saw me through the studies.

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LIST OF ABBREVIATIONS /ACRONYMS

AFP	Acute Flaccid Paralysis
CDC	Centres for Disease Control and Prevention
CHAG	Christian Health Association of Ghana
CI	Confidence Interval
CHPS	Community-based Health Planning and Services
DHIMS	District Health Information Management System
GHS	Ghana Health Service
IDSR	Integrated Disease Surveillance and Response
KII	Key Informant Interviews
MOH	Ministry of Health
OR	Odds Ratio
SPSS	Statistical Package for Social Sciences
WHO	World Health Organization

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ABSTRACT

Introduction: Weaknesses in national public health surveillance and response systems in many African countries led to the adoption of the Integrated Disease Surveillance and Response (IDSR) strategy by countries in the WHO African Region (WHO-AFRO) for implementing comprehensive public health surveillance and response systems for priority diseases, conditions and events at all levels of health systems. IDSR aims at integrating surveillance functions at all levels. Over the period 2018 to 2020, the New Juaben Municipality has recorded less than expected numbers of suspected or confirmed acute flaccid paralysis, measles or yellow fever and the numbers keep declining. Such phenomena are characteristic of inadequate surveillance and may constitute a missed opportunity in disease surveillance for effective control strategies.

Objective: The main objective of the study was to assess the factors contributing to the low reporting of Measles, Yellow fever and AFP in New Juaben North Municipal.

Methods: A descriptive cross-sectional study was conducted on health workers in New Juaben North Municipality's IDSR performance using quantitative methods with interviews (key-informant interviews and quantitative questionnaires) in April, 2022. Data analysis was done using SPSS with level of reporting as the outcome. Factors associated with reporting were assessed using bivariate and multivariate logistic regression models. Significance was assessed at 5% level.

Results: A total of 233 health workers took part in the quantitative study whilst nine respondents participated in the key informant interviews. More than half of the respondents were nurses, 127 (54.5%); the respondents predominantly held certificate (43.8%) and diploma (41.6%) level qualifications. One-hundred and eighty-five (79.4%) of the health workers ever heard about IDSR but only 74 (31.8%) had training on it. Less than four out of

every ten - 38.2% (89/233) - of the health workers ever reported any of the priority IDSR diseases and more than half 131 (56.2%) never conducted any data analysis on the three notifiable diseases considered in this study. The overall rate of reporting of IDSR priority diseases was low/poor as only 29.2% of health facilities reported at least two suspected cases of the surveillance diseases. Age group (p=0.004), educational qualification (p=0.034), professional category of health workers (p=0.005), number of years in employment with the GHS (p=0.001) and number of years in current health facility (p<0.001) were the demographic characteristics of respondents which were strongly statistically associated with reporting of IDSR. Having standard case definitions of AFP, measles and yellow fever ($\chi 2$=56.059, p<0.001), having case-based forms for AFP, measles and yellow fever ($\chi 2$=65.005, p<0.001), evidence of data analysis of notifiable diseases ($\chi 2$=71.162, p<0.001), having a surveillance focal person ($\chi 2$=45.671, p<0.001) and supervision from district or higher levels (χ^2=49.378, p<0.001) were health system factors associated with reporting of IDSR. Having training on IDSR was the only independent predictor of reporting of the three priority IDSR diseases [OR=11.28; 95%CI=4.560-27.907; p<0.001). Lack of/irregular training, lack of funding or motivation and no feedback on reported diseases were some of the challenges of IDSR in the municipality.

Conclusion: There exists a disconnection between the awareness/knowledge of IDSR and level of reporting IDSR-priority diseases with high knowledge but low reporting rates in the New Juabeng Municipality. Health worker stability in terms of experience and length of stay in the district as well as availability of appropriate inputs to guide accountability were associated with reporting rates. Training of health workers on IDSR to be followed by regular supervision and provision of adequate resources to health facilities may hold the key to improving reporting of priority events in the municipality.

CHAPTER ONE

1.0 INTRODUCTION

Public Health Surveillance is the on-going systematic identification, collection, collation, analysis, and interpretation of disease occurrence and public health event data to take timely and robust action (CDC, 2014; MOH/GHS, 2020). It consists of timely dissemination of the resulting information to those who matter for necessary action. Surveillance is also vital for planning, implementation, and evaluation of public health practice (Awini et al., 2015).

Outbreaks and epidemics of infectious diseases frequently experienced by countries in the WHO African region are due to weak health systems and infrastructure, delay in identification, and inappropriate outbreak containment (Wolfe et al., 2021). Disease surveillance meanwhile remains the backbone of disease control and poor disease surveillance has been identified as one of the major factors responsible for increasing mortality and morbidity due to communicable diseases (Mwatondo et al., 2016).

International Health Regulations (IHR) require World Health Organization (WHO) member states to strengthen their existing capacity for disease surveillance and response (Chretien & Lewis, 2008). Shortfalls in the national disease surveillance and response systems in most African countries led to the adoption of the Integrated Disease Surveillance and Response (IDSR) strategy by countries in the WHO African Region (WHO-AFRO) for implementing comprehensive public health surveillance and response systems for priority diseases, conditions and events at all levels of health systems (Fall et al., 2019). To address the weaknesses in public health surveillance, many sub-Saharan Africa countries such as Burkina Faso, Ghana, Uganda, Ethiopia, Mali, Sudan, restructured their surveillance systems into central, regional, and district levels which are coordinated by epidemiological units that respond to various disease outbreaks, analyze data, report to immediate supervisors, and

afterwards implement epidemic responses (MOH/GHS, 2020; WHO/CDC/United Nations Foundation, 2003).

The IDSR strategy was developed in response to a series of emerging and re-emerging diseases which killed large numbers of people in the African region (Masiira et al., 2019). IDSR is targeted at integrating surveillance functions at all levels (World Health Organization AFRO, 2011). For IDSR to be successfully implemented, it will need a competent and dedicated personnel (WHO, 2021).

Acute flaccid paralysis (AFP), measles and yellow fever are proxy indicators of a good surveillance system. Poliomyelitis is targeted for eradication. AFP surveillance is critical for documenting the absence of poliovirus circulation and an important strategy for poliovirus eradication (Almoayed et al., 2019; World Health Organization, 2003a).

The global polio initiative has not yet achieved the definitive interruption of transmissible polioviruses everywhere hence the need for the highest quality of surveillance activities of people, the environment, and laboratories and manufacturing (Global Polio Eradication Initiative, 2017). The quality of AFP surveillance is evaluated by tracking two principal performance indicators: non-polio AFP rate of at least 2/100,000 and stool specimen adequacy of at least 80% indicating surveillance to effectively identify poliovirus among children with AFP (Maes et al., 2017; Wassilak et al., 2017; World Health Organization, 2003b, 2018). Every district is expected to meet these targets especially the non-polio AFP rate.

The primary purpose of measles surveillance is to suspect, in a timely manner, all areas in which measles virus is circulating. Timely notification of clinically diagnosed measles cases is required to detect outbreaks. Establishment and maintenance of a surveillance system is important to ensure timely notification of all measles cases (Government of India Ministry of

Health & Family Welfare, 2005). Countries with very low incidence of measles and with the aim of entirely interrupting measles transmission require intensive case-based surveillance to detect, investigate and confirm every suspected measles case in the community (World Health Organization, 2003a).

Yellow fever surveillance is therefore critical for monitoring the incidence of the disease and allowing the prediction and early detection of outbreaks and the monitoring of control measures. Case-reporting of yellow fever is universally required by the International Health Regulations (World Health Organization, 2003a) as measles and yellow fever for elimination.

In times of taking major decisions on public health and practice, disease surveillance has always remained the cornerstone over the years. To effectively control diseases, health systems need access to surveillance activities so they can use scarce resources in a more effective and efficient way.

Disease surveillance rely on definition of case and recognition of illness, compilation of individual data, analysis, and reporting (WHO/AFRO/CDC, 2001; WHO/AFRO, 2010, 2019). Disease notification is a process of giving account on the occurrence of disease or other health-related conditions to suitable and designated authorities.

Notifiable diseases are by authorized requirements, must be reported to the public health-care personnel in the pertinent jurisdiction when the diagnosis is made. Such diseases are taken to be of sufficient importance to public health care to require that their occurrence be reported to designated outfits. The epidemic-prone diseases are recorded weekly, in addition to the monthly report (Nnebue et al., 2013). The IDSR programme identified key challenges including inadequate numbers of trained staff, inadequate funding, irregular supervision and high turnover of trained staff in a study (Masiira et al., 2019).

A country such as Ghana has decided on 43 communicable diseases and conditions to be targeted as priority diseases for surveillance using the integrated approach (Awini et al., 2015). It is argued that despite the adoption of the IDSR strategy, disease surveillance remains a neglected area in Ghana hence the utilization of surveillance data for planning and decision-making at the periphery level remains very low (Adokiya et al., 2015).

On experiences of improving performance of IDSR at district and facility levels in Ghana and Tanzania, improvements were seen in reporting, analysis, and interpretation of surveillance data and that strengthening and maintaining IDSR performance is dependent ensuring on-going supervision and follow-up; ensuring IDSR visibility and leadership at all levels; understanding the links between IDSR and health system decentralization; and addressing structural barriers to IDSR that are a function of the overall health system (Franco et al., 2006).

Gradual improvement towards coordinated, integrated surveillance systems has been mixed, but in most of the region or district in the country and their partners had invested some human and material resources in strengthening capacities for public health systems in order to detect, report, confirm and respond to public health threats in time to prevent unnecessary illness, death, and disability (Awini et al., 2015). IDSR is fully operational throughout the country, yet the system still struggles in disease detection and reporting by most health facilities. Duplication of roles, inadequate coordination in various health facilities coupled with heavier workload de-motivate staff and often result in non-availability of information or little use of requisite information for appropriate response during routine public health activities.

1.1 Problem statement

Poliomyelitis, measles and yellow fever are epidemic prone and immediately reportable diseases in the IDSR system. The WHO identified 33 African countries and 11 countries in South America to be at risk for yellow fever epidemics (World Health Organization, 2003a).

It is reported that measles cases are going up globally with more than 429,000 confirmed cases out of about 679,000 suspected cases reported to disease surveillance systems worldwide in 2019 (World Health Organization, 2020). In the African Region, an average of about 60,000 to 70,000 measles cases are reported each year, of which 30,000 to 40,000 are confirmed (Global Polio Eradication Initiative, 2017). The WHO reports that more measles cases were recorded globally in the first half of 2019 than any year since 2006 with the African Region having the highest increase of 900% followed by the Western Pacific,230% and Europe, 150% (World Health Organization, 2019).

Although the New Juaben North Municipal seem to detect and record some suspected epidemic prone diseases such as Yellow Fever and Measles and diseases targeted for eradication such as Acute Flaccid Paralysis (AFP), for the three past years, very few were reported by facilities within the municipality. The municipal recorded three cases of AFP in 2018 and one case each in 2019 and 2020. From 2018 to 2020 the municipal again recorded four suspected measles cases in 2018, two in 2019 and four in 2020. The municipal also recorded one suspected yellow fever case in 2020 with none in 2018 and 2019 (DHIMS 2). This is far below the expected number of cases expected to be reported in the municipality for the periods under review. The low reporting of the priority diseases could be due to lack of resources for health facilities and personnel, inadequate or lack of training of health personnel of disease surveillance and staff attrition. This could make it impossible for health facilities and personnel to detect unusual increases and outbreaks of such diseases as and when they occur.

For the past three years from 2018 -2020, the reporting of suspected cases for communicable immunizable diseases within the municipal have become limited to just few facilities. Out of a total of twenty- four health facilities in the municipal, only one facility (representing 4%) had consistently reported any form of these suspected cases mentioned for the period between 2018- 2020. The only hospital in the municipal recorded one suspected measles case in 2018 with no AFP and yellow fever cases from 2018 -2020 (DHIMS 2).

Most facilities do not report any case of measles, yellow fever and AFP as required under the IDSR activities which constitutes missed opportunities for early detection of such priority diseases within the municipality. This study therefore sought to determine the factors contributing to low detecting and reporting of diseases such as Measles, Yellow Fever and AFP by health facilities within New Juaben North municipality

1.2 Conceptual framework

The framework tries to elaborate on the various factors that contributing to the reporting of integrated disease surveillance and response; the case of Measles, Yellow Fever and AFP. The ability of an individual to perform surveillance functions can be attributed to the inputs (resources) available to him/her. The inputs include the case definitions, IDSR technical guidelines, number of staff and funds. Also, the cadre of staff, number of years in service and the role they play in surveillance duties count in the reporting of IDSR diseases.

Knowledge level of health workers has a great influence on carrying out surveillance activities. The knowledge level on IDSR will contribute to what disease to do surveillance on. It also helps them to understand the timelines of reporting and its completeness. The reporting tools are well understood by persons who have great knowledge on IDSR.

It can be argued out that the perception and attitude of health workers can have a great effect on surveillance practices and performance of health facilities when surveillance activities

come to play. The attitude of health staff can result in non-reporting, under-reporting or over-reporting of surveillance data which have consequences on the IDSR system. The availability of the various reporting tools will influence compliance with reporting diseases under the IDSR system. If the tools/forms needed to report on a disease are not available, the staff may have an excuse or justifiable reason for not reporting the disease to the next higher level for action. Complete and timely submission of surveillance data are key indicators in the IDSR system.

The framework explores the perception of health workers on the IDSR as tool as to its usefulness and whether it is fit for purpose. The perceptions will feed into the attitude of staff in reporting IDSR diseases. The willingness and confidence to use and report on the IDSR by health workers are related to staff attitude. The framework seeks to establish the linkage between and among some these indicators so as to have an improved IDSR system.

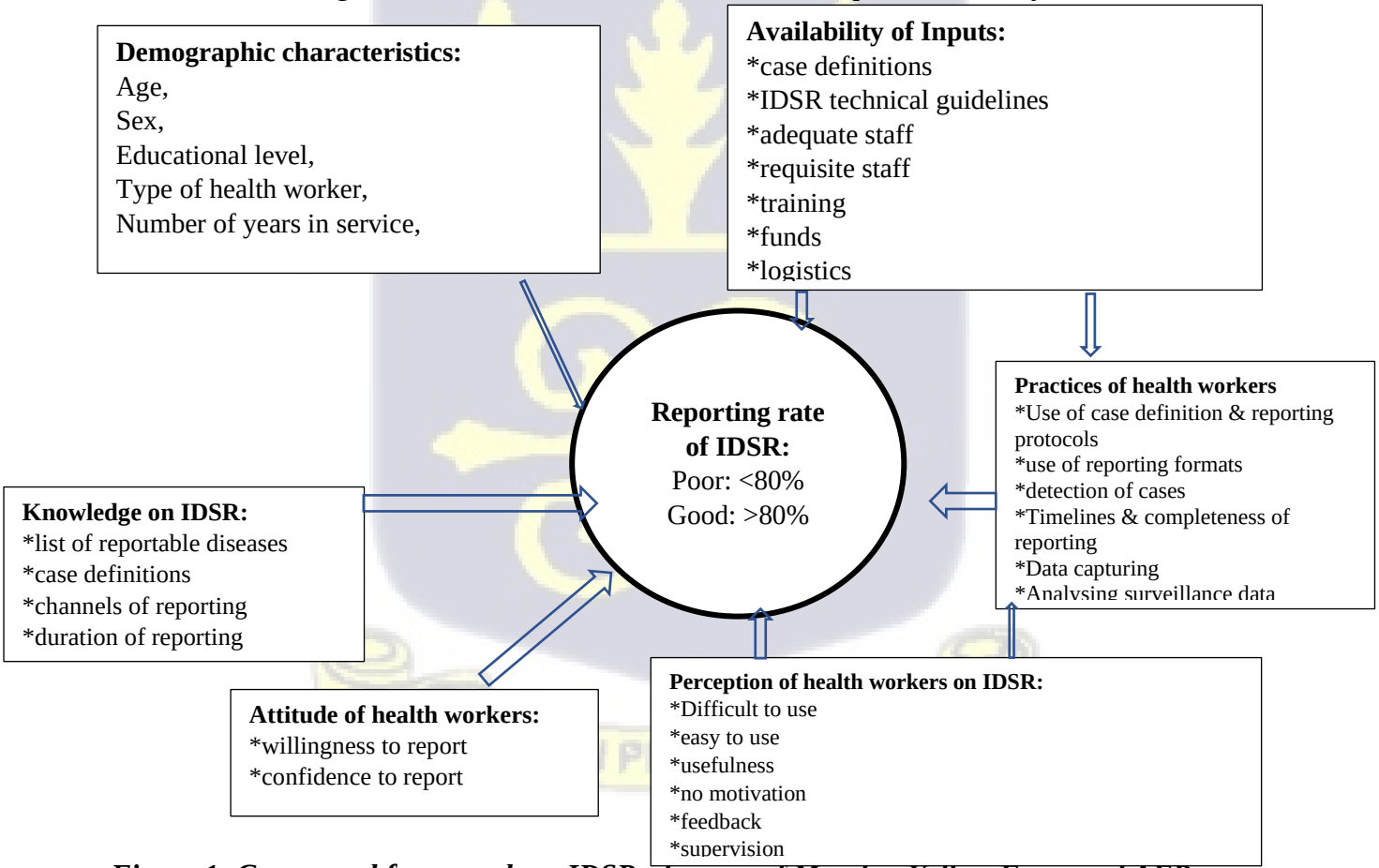


Figure 1: Conceptual framework on IDSR: the case of Measles, Yellow Fever and AFP

1.3 Rationale for the study

The study highlighted areas where the IDSR was doing well and where implementation remained below standard in health facilities and which has led to practical recommendations to improve IDSR among health facilities in the New Juaben North municipal. The study would enable the authorities in the various health facilities to gain scientific insight into the gaps that exist and help the municipal and its stakeholders to put in place adequate measures to strengthen the system.

1.4 Research questions

1. What is the level of knowledge of health care professionals on Integrated Disease Surveillance and Response?
2. What are the perception and attitudes of health care professionals towards Integrated Disease Surveillance and Response?
3. What are the practices on Integrated Disease Surveillance and Response at the health facilities and what factors determine adoption or non-adoption of these practices?

1.5 Objectives of the study

1.5.1 General Objective

The main objective of the study is to assess the factors contributing to the low reporting rates of Measles, Yellow fever and AFP in New Juaben North Municipal

1.5.2 Specific Objectives

1. To determine the level of knowledge, attitude and practices of health care professionals on IDSR with respect of Measles, Yellow fever and AFP
2. To assess the perceptions of health care professionals on the usefulness of IDSR as a tool for detecting cases of Measles, Yellow fever and AFP
3. To determine the factors associated with the low reporting of Measles, Yellow Fever and AFP

CHAPTER TWO

2.0 LITERATURE REVIEW

This chapter reviewed literature on the topic under review. It looks at studies and scholarly work of authors and authorities on IDSR from the global, continental and regional/country levels according to the objectives of the study.

2.1 Knowledge, attitude and practices of health care professionals on IDSR with respect of Measles, Yellow fever and AFP

2.1.1 Knowledge of health care professionals on IDSR of Measles, Yellow fever and AFP

Knowledge of health workers on disease surveillance has been mixed, with some having a higher degree of understanding while others have moderate to low understanding of disease surveillance especially immediately reportable epidemic prone diseases. It has been noted that health facilities with staff who are knowledgeable on disease surveillance indicators and reporting tools are more likely to comply with the reporting of disease conditions into the surveillance system (Makinde & Odimegwu, 2020).

It should be noted that training of staff on disease surveillance and availability of the required reporting tools should contribute to improvement in disease surveillance. In the Nairobi County of Kenya, (Japheth Omondi et al., 2020) report that 85% of health workers lacked training on disease surveillance with 75% of them reportedly lacking the reporting tools for disease surveillance in their health facilities.

Private health practitioners who are the best loved first point of care in a majority of low and middle-income countries and could contribute to improving the surveillance of diseases appear not to be doing so. It is suggested that insufficient knowledge resulting to unacceptable attitudes and misperceptions that influence their practices are some of the barriers to their participation in disease surveillance activities (Phalkey et al., 2017).

A study in the Pune district of India found that knowledge regarding surveillance, although limited, was better among allopathy practitioners than alternative medicine practitioners where allopathy practitioners were three times more likely to indicate their willingness of participation in disease surveillance systems with overall knowledge of at least one function of disease surveillance being 47% (Phalkey et al., 2015). This low knowledge is at variance with the 93% of the practitioners agreeing on the importance of disease surveillance for improving urban health (Phalkey et al., 2015). The study concluded that a general agreement among 94% of the practitioners was that the current surveillance efforts needed strengthening (Phalkey et al., 2015).

A cross-sectional study on AFP surveillance in the Bauchi State of Nigeria found that 71% (60/85) and 40% (17/35) of clinicians at AFP focal sites and non-focal sites respectively knew the correct case definition of AFP with 88% and 65% of them knowing stool sample collection (Ningi et al., 2018). Similarly, (Nnebue et al., 2012) in their study in Anambra State of Nigeria observed that as high as almost 90% of health workers were aware of the national disease surveillance and notification system but that only about 33%, 31, and 32% of them understands the specific uses of forms for prompt, weekly and monthly reporting respectively and concluded that knowledge on the use of the variety of forms at the facility and local government area (LGA) levels were generally low, though the IDSR forms were predominantly found in the primary health-care facilities. This high knowledge of epidemic prone diseases and the IDSR among health workers was also found in the Oyo State where between 70-90% of health workers had good knowledge of epidemic prone diseases and the IDSR system (Jinadu et al., 2018). Whereas there is high level of awareness of the national disease surveillance and notification system in Anambra State, about 91% of private laboratory scientists in the Lagos State of Nigeria never heard of the IDSR before and 87.4% of them were unaware of the national IDSR policy. General knowledge of the IDSR was

found to be poor in 51.1% of the personnel (Dairo et al., 2018). Similarly, (Aniwada & Obionu, 2016) reported that 67.5% of public and 57.5% of private Primary Health Care Workers in Enugu State of Nigeria reportedly heard of IDSR with 50% of the public and 27.5% private practitioners knowing the correct definition of IDSR and 57.5% of public and 25.0% of private health staff had correct knowledge of the diseases being reported.

Another study in Northeast Nigeria reported that the knowledge of Disease Surveillance and Notification Officers (DSNOs) and clinicians were restricted to timeliness and completeness only among over 10 core indicators for the IDSR (Ibrahim et al., 2020a). In the Yobe State of Nigeria, it is recorded that only 38.2% of 144 health workers were in the known of the national disease surveillance system and that lack of training on disease surveillance was one of the factors affecting disease reporting among about 86% of the health workers who were of the reporting requirements (Bawa et al., 2003). Lack of knowledge is a reason for not reporting notifiable diseases in some studies (Aniwada & Obionu, 2016; Dairo et al., 2010, 2018).

Knowledge level about case definitions of AFP, Measles & Neonatal Tetanus and the national procedure for investigations with posters of case definitions are available in all facilities in Eastern Africa was high (Okiror et al., 2021).

Training has known to positively impact the disease notification and reporting among health personnel as it is supposed to increase their knowledge. This is evident in Southwestern Nigeria where 76% of health workers who had appropriate training on disease surveillance and notification saw about 95% of them knowing the process of reporting (Dairo et al., 2010). District health personnel training coupled with regular supervision and feedback, reliable communication and availability of simplified reporting tools can contribute to improved performance of national diseases surveillance systems. Personnel could be trained on-the-job,

pre-service and fast track training on detection, reporting and data analysis (Sow et al., 2010).

2.1.2 Attitudes of health care professionals in detecting cases of Measles, Yellow fever and AFP

Knowledge, attitudes, perceptions and practices of the public and private sector health professionals affect disease case notification and surveillance hence the need for interventions such as training, timely feedback and supervision to improves surveillance (Phalkey et al., 2017). The participation of private sector health professionals in disease surveillance are inadequate knowledge leading to unsatisfactory attitudes and misperceptions that influence their practices had always been a barrier of concern. In a systematic review of studies, (Phalkey et al., 2017) reported that 73.1% of health practitioners in Malaysia had unsatisfactory attitude towards disease notification with 82%, 67% and 24% of them showing complacency, ignorance and indifference respectively. In the Pune district of India, it was found that 76% of practitioners expressed their willingness to participate in a routine sentinel surveillance system on a continuous basis (Phalkey et al., 2015).

In the Eastern and Western parts of Germany, it was reported that 66.2% and 75.5% respectively of physicians showed willingness to participate voluntary in the notifiable infectious disease surveillance system. They cited easy handling, getting feedback of results and financial compensation as the reasons for the participation (Krause et al., 2005).

Attitude of staff is very critical in reporting disease surveillance conditions to the appropriate authorities for the necessary action to be taken. However, in the Bauchi State of Nigeria, (Ningi et al., 2018) reported that only 11% and 28% of Disease Surveillance and Notification Officers had reports of outbreak investigations and supervisory visits respectively at the lower levels with 33% and 39% of them having minutes of meetings and surveillance work plans respectively. This led to a suggestion by the authors that knowledge and documentation

which are not mutually exclusive depend on motivation and attitude as documentation provides the evidence of efforts of AFP surveillance while the decision to promptly report for prompt action depends on the attitude and motivation of the staff assigned for the task.

2.1.3 Practices of health care professionals in the detection and reporting of Measles, Yellow fever and AFP

Lack of cooperation between government and the private sector and legal issues involved in reporting data have been identified as barriers to routine disease surveillance systems (Phalkey et al., 2015). In relation to practices with respect to surveillance in the Pune District of India, of the 76% of private practitioners who were willing to participate in routine surveillance, only 52% and 54% of them who diagnosed dengue and tuberculosis respectively actually reported them to the district administration (Phalkey et al., 2015). The practitioners cited some factors which facilitated or hindered their participation in routine surveillance. The barriers included lack of time (55%), lack of motivation (9%), and lack of infrastructure (6%), lack of cooperation between the government and private sector (11%) and legal issues (6%) while the facilitators to improve surveillance by the private sector included 40%) of the respondents provision of more knowledge about disease surveillance, practices, and processes (40%), monetary and basic structures (e.g. software, computer), incentives (17%), making reporting an obligatory activity (15%), and a better reporting system with clear and simple guidelines (13%).

Another study shows relatively good completeness (73.1%) but poor timeliness (40.2%) of total expected monthly reports nationwide and zero weekly reports on their current IDSR system in Malawi (Joseph Wu et al., 2018). The IDSR system had often experienced weak surveillance in most facilities and this is partially due to insufficient documentation of patients' data in the health facility registers, inadequate reporting tools, little participation of

health facilities in IDSR and limited capacities of personnel to identify, report IDSR priority diseases, analyze and interpret IDSR data for making decision (Ibrahim et al., 2020b).

In Kenya, it was found that deficiency in analyzing data and giving feedback on the data on operational surveillance features, by 80% of Counties and Sub-Counties was a weakness in their surveillance system (Okiror et al., 2021). As opined by (Edelstein et al., 2018), analysis of data will result in sharing surveillance data with others to improve public health. Another Kenyan study found that 55% of health workers lacked training on the use of IDSR data while 75% and 55% of them indicated lack of tools/forms for disease surveillance in health facilities, and lack of timely IDSR data as obstacles to IDSR data utilization (Japheth Omondi et al., 2020). Similarly, insufficient factual information on calculation of core surveillance indicators, analysis and information not used for decision making have been observed as a flaw in the Ethiopian surveillance system (Okiror et al., 2021).

A study on the "effectiveness of data collection and information transmission process for disease notification in Anambra state, Nigeria" found that about 44% of health workers reported regular supply of IDSR Forms whilst 25% and 16% reported that the forms were irregular and out-of-stock respectively (Nnebue et al., 2013). The study further revealed that about 19% and 17% of AFP forms were the least complete in the secondary and tertiary health facilities respectively when compared with the out-patient and in-patient registers. As a result of lack of timely and complete information needed for informed public health action, the authors concluded that health workers were not operating the Disease Surveillance and Notification system to optimal functionality in Anambra State. Another study in Northeastern Nigeria reported that only 23% of the 2598 health facilities in three states were committed in reporting IDSR meanwhile standard case definitions were available in all state and Local Government Area (LGA) offices and health facilities; only 63% and 47.7% of the LGAs in three states had rapid response teams and epidemic preparedness and response committees

respectively (Ibrahim et al., 2020a). In the Yobe State of Nigeria, Bawa & Co, 2003 reported that only about 29% of health workers never reported any of the notifiable diseases to the National Disease Surveillance system with only about 22% of them reportedly getting feedbacks on reports submitted to higher authorities. They also reported that about 92% of the health facilities did not have forms for reporting the immediately and weekly reportable diseases. In the Lagos State of Nigeria, only 13.7% of 190 private laboratory scientists ever reported a notifiable disease to higher authorities with the IDSR Form as the main means of reporting. The reasons for the non-reporting were inadequate knowledge to report (56.8%), inefficiency of the health department (44.7%) and no feedback on reported diseases (30%) (Dairo et al., 2018).

2.2 Perceptions of health care professionals on the usefulness of IDSR as a tool for detecting cases of Measles, Yellow fever and AFP

Following training of health workers on IDSR leading to a revitalized surveillance system in Uganda, health workers had a perception of improvement in the timeliness and completeness of reporting largely due to the introduction of modern reporting systems (Nakiire et al., 2019).

It has been reported that nearly 78%, 43% and 39% of physicians in some German states voluntarily participated in the notifiable infectious disease surveillance system because of easy handling, getting feedback of results and financial compensation respectively (Krause et al., 2005).

The availability of technical teams at all levels with the needed commitment of staff can greatly improve surveillance of diseases especially when their priority is recognized. A Surveillance Review System to Track Progress Towards Polio Eradication in the Horn of

Africa found that 75% of health workers perceived surveillance as a priority with community Health volunteers linked up with all Health facilities (Okiror et al., 2021).

Poor feedback on notifiable diseases is said to be a discouraging concern to health workers and does not promote effective monitoring and control of diseases with the negative implication of poor attitude of health workers to disease notification and reporting (Aniwada & Obionu, 2016). A survey in six Nigerian cities found that 31% and of 26% respectively of physicians cited inadequacy in infrastructure/logistics or reporting system and inadequate knowledge among doctors about how to report or to whom to report as the perceived common obstacles to reporting in the IDSR (Lafond et al., 2014)

2.3 Rate of reporting of measles Yellow Fever and AFP through IDSR

A core IDSR indicator for WHO/AFRO and the CDC is the proportion of health facilities submitting weekly or monthly surveillance data on time to the district level. For surveillance of diseases of explosive epidemic potential, a failure to document timeliness of reporting is a critical shortcoming. The IDSR guidelines call for individual "case-based reports" or line listings to be completed and submitted immediately to a higher level for each case of acute flaccid paralysis (AFP)/polio, measles, yellow fever and other epidemic prone diseases (Sakka et al., 2011).

In Liberia, polio eradication efforts saw a considerable improvement in AFP surveillance indicators where non-polio AFP rate (NPAFP) rate improved from 1.2 in 2015 to 3.7 in 2016 and 4.3 in 2017 with stool adequacy rate also improving from 79% in 2016 to 82% in 2017, meeting the global target of 80%. Similarly, measles surveillance coverage improved from 64% in 2015 to 87% in 2017 while yellow fever vaccine coverage was 84% in 2017 higher than in 2016 (Clarke et al., 2019).

Notification and reporting of notifiable diseases under the IDSR should not be limited to only public health facilities or workers but private health facilities as well. However, in the Enugu State of Nigeria, 85% of public and 40% of private Health Care Workers (HCWs) reported diseases in their facility while 55% public and 7.5% private has dedicated HCWs for the reporting (Aniwada & Obionu, 2016).

In Ghana, it was reported that the non-polio AFP rate attained acceptable values in 2009, 2011 and 2013 with the rate of AFP cases resulting from other causes rather than poliomyelitis was well above the WHO target of 2 per 100,000 children below 15 years of age and that none of the ten regions consistently reached the target for the period with the Ashanti region reaching the target in 2011 and 2013 while the Eastern and Western regions met the target in 2009 and the Greater Accra region continuously failing to achieve the target throughout the period (Odoom et al., 2014). Furthermore, adequacy of stool specimens was less than the 80% target in 2009 and 2010 but increased from 79.2% in 2010 to 82.5% in 2011 and to 86.7% in 2013 and that arrival of samples to the WHO accredited polio lab was higher than the target in terms of timeliness.

2.4 Factors associated with IDSR use for reporting cases of Measles, Yellow Fever and AFP

Getting feedback on results on the notifiable infectious disease surveillance system has been found to be associated with reporting infectious diseases in some states Germany (Krause et al., 2005).

A study in Uganda found no significant association between sex, place of residence, and specimen condition with positivity for measles for which they should be reported but age, vaccination status and vitamin A supplementation had association with measles positivity (Mensah & Gyasi, 2022).

The importance of training of health workers to improve surveillance has been reported by (Japheth Omondi et al., 2020) who in their study in Nairobi County in Kenya observed that training of community health workers increased the likelihood of using IDSR data by four times whilst the availability of IDSR tools and timely collection and dissemination of IDSR data would likely increase the IDSR data by three and five times respectively. A study on factors associated with adequate weekly reporting for disease surveillance data among health facilities in Nairobi County in Kenya found that health facilities with staff trained on IDSR were 11 times more likely to adequately report the weekly IDSR. Availability of weekly reporting forms, receiving quarterly supervision from district or higher level authorities, having a designated surveillance focal person, data analysis and having or displaying posters with case definitions and IDSR functions were factors identified to be colligated with increased odds of satisfactory reporting of weekly IDSR (Mwatondo et al., 2016).

CHAPTER THREE

3.0 METHODS

3.1 Study design

This was a descriptive cross-sectional study involving health professionals from health facilities in New Juaben North Municipality. It was conducted in April, 2022. It used quantitative methods with interviews. Qualitative (Key Informant (KI)) interviews were conducted to obtain the perceptions of health workers on the IDSR. This complemented the findings and interpretation of quantitative data on the IDSR that were collected on the three epidemic prone diseases under study.

3.2 Study site

The study was conducted in the New Juaben North, one of the municipalities of the Eastern Region with an estimated total population of 75,897 dispersed within 53 communities. The New Juaben North Municipal was created in February 2017 from then New Juaben Municipal by a government legislative instrument. It is shares boundaries with Abuakwa North, Suhum, Yilo Krobo, and New Juaben South Municipals. The New Juaben North Municipality has Effiduase as the capital.

3.2.1 Health facilities

There are twenty-four health facilities in the New Juaben Municipality comprising 18 CHPS Compounds, three health centres, one each of a mission hospital, quasi-government hospital (prisons hospital), and private clinic.

3.2.2 Climate

The municipality falls within the tropical equatorial climate. Rainfall is double maxima and therefore abundant throughout the year with the peak between June and August. Temperatures range from 20^0C - 29^0C throughout the year. The hottest months are February

and March while the coolest months are July and August. Humidity is high throughout the year.

3.2.3 Topography

The relief of the municipality is characterized by the continuation of the Kintampo-Mampong -Kwahu Scarp. The rest of the district is relatively flat with isolated hills dotted across plains. The municipality is traversed by a number of rivers and streams; notable among these is the river Densu. The vegetation is characteristically tropical rain forest with many big trees of economic importance.

3.3 Study Population

Twenty-four health facilities were involved in the study. The participants selected for the study were all health workers in the district. The health workers were Medical Officers, Physician Assistants, Midwives, General Nurses, Community Health Nurses, Public Health Nurses, Disease Control Officers and Laboratory personnel. These are health workers whose duties or work schedules relates to disease surveillance activities including IDSR. They were drawn from the hospitals, health centres and CHPS Zones.

3.3.1 Inclusion and exclusion Criteria

3.3.2.1 Inclusion criteria

All health workers who have been in employment for at least six months in the health facilities were eligible for the study.

3.3.2.2 Exclusion Criteria

Health workers at least six months in employment who refuse to participate or whose IDSR involvement is less than 6 months.

3.4 Variables of the Study

The dependent variable for the study was reporting of the three epidemic prone diseases in the IDSR by health facilities (i.e. reporting IDSR) defined by ever reporting two or more of them (where less than two is graded as poor and more than two as good). The independent variables of the study included socio-demographic characteristics of the respondents such as age, sex, educational level. The others were type of health facility, years of work experience, professional category.

3.5 Sample size and sampling

3.5.1 Sample size determination

The Cochran Formula, $n=z^2pq/d^2$ was used to calculate the sample size for the study where n=sample size, z= score of 1.96, p=proportion of IDSR reporting, and d=acceptable of margin of error, q=1-p. From the 2020 district annual report, only 17% of health facilities in the New Juaben North Municipality reported suspected cases of AFP, yellow fever and measles on the IDSR, giving p=17% (0.17). By substitution

$$n=\frac{Z2p(1-p)}{d2}=\frac{1.96*1.96*0.17(1-0.17)}{0.05*0.05}$$

$$n=\frac{3.8416*0.17*0.83)}{0.0025}=\frac{0.542050}{0.0025}$$ = 216.82 ~216.82. To allow for non-response rate, the sample size was adjusted by 10% to get the final sample size as 216.82*1.1=238.502 ~239. Therefore, 239 health workers were interviewed.

3.5.2 Sampling

The study was conducted in all the sub-districts of the district. All the three health centres, one prisons' hospital, CHPS Compounds and the catholic hospital were used. Simple random sampling was used to select health workers in the sampled health facilities for the study.

Multi-stage sampling was used to select the health workers and facilities. The sampling was done by the level of health facility. Using Proportionate to Size sampling, the number of

respondents per each category of workers were calculated by dividing the number of staff in each category by the total number of staff and multiplied by the sample size of 239. During the sampling, 286 health workers were found in the NJM whose work has to do with disease surveillance in one way or the other.

Proportionate stratified sampling was used to get the number of respondents per each category in the health facilities. The number of participants who took part in the study was in Table 1

Table 1: Samples of study participants

No	Category of staff	Number sampled
	Nurses (Community Health Nurse, Enrolled Nurses)	127
	Midwives	44
	Laboratory staff	8
	Medical Officers	7
	Physician Assistants	6
	Nutrition officers	8
	Disease Control officers	9
	Health information/Records Officers	17
	Health Promotion Officers	4
	Mental Health Officers	3
	Total	**233**

At the CHPS Zones where the staffs are not many, the in-charge and one other staff were interviewed. At the health centre and hospitals, staff in clinical care and public health units were involved in the surveillance activities were selected. Simple random sampling was then used to select the number of health workers from each cadre in each health facility. If there were five people in a facility, one person was interviewed. A ‘yes’ and ‘no’ were written on pieces of paper according to the sample size in each facility and staff asked to randomly pick. Those who picked the yes were interviewed.

3.6 Data Collection tools

A structured questionnaire and checklist was used for the quantitative data whilst sampling by saturation was used for the qualitative data (KII).

3.7 Data collection procedure

Quantitative data collection: A structured questionnaire was used to collect the data. At every health facility all facility, the in-charges were interviewed. All in- charges and one other staff of various units within the facilities were also interviewed. All 24 health facilities were included in the study.

The questionnaire was administered personally in each health facility to the health professionals identified to be interviewed. Facility level factors were assessed to enable appropriate detecting and reporting which consisted of the availability of reporting forms, case definitions, guidelines and hardware such as computers and internet connectivity. A retrospective review of hardcopies weekly and monthly IDSR reports filled for 52 completed weeks from June 2020 to May 2021 was done. Available reports or data for the period under review were appraised critically for completeness and timeliness of the report submission.

Qualitative data collection: qualitative key informant interviews (KII) was done to assess the perceptions of health workers on the usefulness of the IDSR. Surveillance officers and purposively selected in-charges who were not part of the quantitative study took part in the key informant interview. In all between nine (9) KII were conducted.

3.7 Data processing

The data was collected by kobocollect and exported into Microsoft Excel for cleaning and thoroughly cross-checking before finally exported into the Statistical Package for Social Sciences (SPSS) Version 22 for further statistical analysis.

3.8 Data analysis

Data was analysed using SPSS Version 22. Descriptive statistics were summarized as frequencies and proportions for categorical variables and mean (SD) for continuous variables. The Pearson's Chi Square test was used for bivariate analysis to determine the factors associated with reporting of IDSR. Logistic regression was used at multivariate analysis to determine factors that were independently associated with reporting of IDSR in New Juaben North Municipality. Odds ratios and 95% confidence intervals (CI) were calculated comparing adequately reporting facilities and poorly reporting facilities. P-value <0.20 was used to select variables for inclusion into the initial multiple logistic regression model. The following three points were used to assess the rate of reporting with a score of one (1) and zero (0) allocated for a health facility which responded to having reported any of the three diseases for the period under study *and no reporting respectively*. For the qualitative data, thematic approach was used to analyse the KII data where transcripts were reviewed by the evaluation team to generate a list of issues and themes arising from each question asked to the participants as was done by (Masiira et al., 2019).

Score	**Meaning**
0	None of the three diseases is reported
1	Only one of the diseases is reported
2	Two of the diseases is reported
3	All three diseases are reported

An overall level of reporting IDSR was scored when the aggregate of all the scores is graduated as 0-1 and 2-3 for poor and good respectively. Knowledge of health workers was assessed based on correct responses to the knowledge questions on IDSR. All correct responses were given a score of one while incorrect responses were given zero. A similar assessment was done in the Oyo State of Nigeria by (Jinadu et al., 2018).

3.9 Ethical consideration

Ethical clearance with number **GHS-ERC: 051/03/22** was obtained from Ghana Health Service Ethics Review Committee through the School of Public Health, University of Ghana. Permission was obtained from the District Health Directorate of the Ghana Health Service to conduct the study in the district. Data will not to be shared with unauthorized third parties. Research Assistants were trained and given ID cards for the data collection. Informed consent from the identified interviewees in each health facility and permission was sought from the various health facility heads before starting the interviews. The data will be stored for at least five years in line with GHS data storage policy after which it can be destroyed.

3.9.1 Informed consent

Informed consent was sought from all participants before the start of the interview at each level. This involved reading out a participant information sheet that detailed the purpose of the study to the potential participant. They were told the benefits of participation and were assured that there would be no harms in participation. Participants were assured that participation was entirely voluntary and that they could withdraw from the study at anytime without any effects on their position in the facility or service. They were allowed to ask any questions and assured that their data will be kept very confidential and no information could be linked to their individual identities. They were then invited to consent and indicated agreement to participate with a signature on the consent form.

3.9.2 Duration of data collection

Data collection lasted for one month, from 1st -30th April, 2022.

3.9.3 Potential Risks

The study did not pose any risks to participants. However, it was seen as inconveniencing because of the time it took to interview participants and as a disruption to their activity schedule for the day.

3.9.4 Benefits

There were no direct personal benefits to study for participants. The health system would benefit from the outcome of the study.

3.9.5 Costs to participants

No cost was incurred by the participants.

3.9.6 Compensation

No compensation was paid participants of the study. However, appreciation was given to all the participants of the study for allowing the researcher and his assistants to interact with them.

3.9.7 Confidentiality

All information gathered from the study was given utmost confidentiality. Data collected from the participants was not shared with any third party. Assurances were given that the data from the study was solely for academic purposes and that it will not be used for any other study elsewhere without seeking ethical approval from the Ghana Health Service Ethics Review Committee.

3.9.8 Sharing of participants Information/Data

Data from the study will be kept by the researcher through his email and will be destroyed after five years if it will not be needed. It will not be shared with unauthorized institution(s) or individuals. Copies of the findings from the study were shared with the Eastern Regional

and New Juaben North Health Directorates. The researcher presented the findings to stakeholders during the district annual performance review meetings.

3.9.9 Provision of Information and Consent for participants

Health facility leaders as well as participants themselves provide consent to the study. The permission letter from the District Director of Health Services for North Juaben North District was shown to respondents.

3.9.10 Declaration of conflict of interest

The principal investigator does not have any interest to declare in the study.

CHAPTER FOUR

4.0: RESULTS

Participants for the study were 233 out of the sample of 239 sampled, giving a response rate of 97%. Nine (9) key informant interviews were also conducted.

4.1 Socio-Demographic Characteristics of Respondents

From Table 2 the majority 208 (89.3%) of the health workers were in the age group of 20-39 (45.1% for 20-29 and 44.2% for 30-39) depicting a young workforce. Only eight (3.4%) of the health workers were in the age group of 50-59 years. On level of education, it was found that certificate and diploma holders were the majority accounting for 43.8% and 41.6% respectively with only 34 (14.6%) of them having a bachelor's or postgraduate degrees. Nurses, 127 (54.5%) comprised more than half of the health workers interviewed, followed by midwives, 44 (18.9%) for the study. Nutrition officers, health promotion officers and mental health officers constituted less than 10% of the health workers in the study. In respect of the number of years since being employed to be working with the GHS/CHAG, 123 (52.8%) being the majority have been working for between 1-4 years followed by 66 (28.3%) who have been working for 5-9 years, 19 (8.2%) working for 10-14 years, 12 (5.2%) working for 15-19 years and 13 (5.6%) have been working for more than 20 years. Also, on the number of years working in a current health facility at the time of the study, 164 (70.4%) of the health workers indicated that they have been there for 1-4 years, followed by 65 (27.9%) for 5-9 years and only 4 (1.7%) for 10-14 years.

Table 2: Demographic characteristics of study participants

Variable and category	Frequency	Percentage (%)
Age group (years)		
20-29	105	45.1
30-39	103	44.2
40-49	17	7.3
50-59	8	3.4
Educational level		
Certificate holder	102	43.8
Diploma holder	97	41.6
Bachelor's degree	29	12.4
Postgraduate degree	5	2.1
Cadre of staff		
Nurses[1]	127	54.5
Medical Officers	7	3.0
Physician Assistants	6	2.6
Disease Control Officers	9	3.9
Health Information/Records Officers	17	7.3
Midwives	44	18.9
Nutrition officers	8	3.4
Health Promotion Officers	4	1.7
Laboratory workers	8	3.4
Mental Health Officers	3	1.3
Number of years in GHS/CHAG		
1-4 years	123	52.8
5-9 years	66	28.3
10-14 years	19	8.2
15-19 years	12	5.2
20 and above years	13	5.6
Number of years of in current health facility		
1-4 years	164	70.4
5-9	65	27.9
10-14	4	1.7

4.2 Knowledge of health workers on Integrated Disease Surveillance and Response (IDSR)

This section presents results on the knowledge of health workers on Integrated Disease Surveillance and Response.

[1] Community Health Nurses, Enrolled Nurses

As can be seen in Table 3, 185 (79.4%) of the health workers reported that they have heard about IDSR in their working lives as against 48 (20.6%) who indicated the contrary. Majority, 159 (68.2%) of the health workers reported not being trained on IDSR compared to only 74 (31.8%) who had training on it. Of the 74 who reportedly had training on the IDSR, almost 60% (44/74) of them had the last training more than a year to the time of the study followed by 20 (27%) and 10 (13.5%) who had the training a year and three months ago respectively. The duration of these training sessions varied from a day to 5 days. The shortest duration of the reported training according to the 74 health workers was one day as reported by 30 (40.5%) followed by two days (52.7%) with five days being the longest duration as reported by one person. On when diseases under the IDSR should be reported, it was found that 148 (63.5%) of the health workers indicated immediately, with 168 (72.1%), 137 (58.8%) and 47 (20.2%) saying weekly, monthly and daily respectively.

Table 3: Knowledge of health workers on IDSR of AFP, measles and yellow fever

Variable and category	Frequency	Percentage (%)
Ever heard about IDSR?		
No	48	20.6
Yes	185	79.4
Ever trained on IDSR		
No	159	68.2
Yes	74	31.8
Last time being trained on IDSR (n=74)		
Three months ago	10	13.5
One year ago	20	27.0
More than one year ago	44	59.5
Duration of the IDSR training (n=74)		
One day	30	40.5
Two days	39	52.7
Three days	4	5.4
Five days or more	1	1.4
When IDSR diseases are to be reported*		
Immediately	148	63.5
Daily	47	20.2
Weekly	168	72.1
Monthly	137	58.8
Quarterly	15	6.4
Yearly	7	3.0

4.2.1 Practices of health care professionals in the detection and reporting of measles, Yellow fever and AFP

This section presents results on health system factors influencing the reporting of diseases through the Integrated Disease Surveillance and Response.

In Table 4, 138 (59.2%) of the health workers indicated that their facilities had standard case definition guides for the priority IDSR diseases (AFP, measles and yellow fever). On filing, 134 (57.5%) of health workers showed evidence of their facilities having separate files for each of the three priority IDSR diseases, 129 (55.4%) had evidence of availability of case-based forms for the diseases. More than half, 131 (56.2%) had no evidence of any attempt at analysis of data on the three notifiable diseases under study. About 59% (137/233) of the health workers reported of having a focal person for disease surveillance in their facilities and having at least two health workers trained on IDSR was reported by 124 (53.2%) of the health workers.

The results also show that less than a third 74 (31.8%) of the health workers had evidence of stool specimens collected within 14 days of onset of paralysis. Ninety (38.6%) of the health workers indicated that evidence of investigating suspected AFP cases within 48 hours of notification as against 143 (61.4%) of them without any evidence. Evidence of conducting 60-day follow-up was indicated by 166 (71.2%) of the health workers compared to 67 (28.8%) of them without such evidence. On evidence of supervision from the district or higher levels, it was found that 123 (52.8%) of the health workers responded in the affirmative compared to 110 (47.2%) who reported the contrary.

Table 4: Health worker/facility practices of IDSR on AFP, measles and yellow fever

Variable	Frequency	Percentage
Having case definitions of AFP, measles and yellow fever		
Yes	138	59.2
No	95)	40.8
Having separate file (s) for AFP, measles and yellow fever		
Yes	134	57.5
No	99	42.5
Availability of case-based forms for AFP, measles and yellow fever	129	55.4
Yes	104	44.6
No		
Evidence of data analysis of notifiable diseases (AFP, Measles, yellow fever)		
Yes	102	43.8
No	131	56.2
A focal officer for disease surveillance		
Yes	137	58.8
No	96	41.2
Having at least two health workers trained on IDSR		
Yes	124	53.2
No	109	46.8
Evidence of stool specimens collected within 14 days of paralysis onset		
Yes	74	31.8
No	159	68.2
Evidence of suspected AFP cases investigated within 48 hours of notification		
Yes	90	38.6
No	143	61.4
Evidence of 60-day follow-up conducted		
Yes	166	71.2
No	67	28.8
Evidence of supervision from district or higher level		
Yes	123	52.8
No	110	47.2

4.3 Perceptions of health care professionals on the usefulness of IDSR as a tool for detecting cases of measles, yellow fever and AFP

This section presents results on the views of health workers on the Integrated Disease Surveillance and Response. Quantitative and qualitative (KII) findings are presented here.

As in Table 6, it is seen that 94 (40.2%) of the health workers indicated that IDSR was used for the surveillance of priority diseases (AFP, measles and yellow fever) followed by 46 (19.7%) who reported they IDSR was used to collect data on priority diseases. Furthermore, 26 (11.2%) of them indicated that IDSR is used to strengthen the public health system with only 15 (6.4%) of them saying it is a tool for screening and management of diseases as well as for education and training.

Also, 111 (47.6%) of the health workers indicated that the IDSR was playing the expected role in early detection of priority diseases, 20.6% thought it helped in monitoring disease trends and prompt response to disease outbreaks. With respect to measles, yellow fever and AFP, 191 (82%) of the health workers said IDSR was playing its role with similar proportion, 83.3% saying it was fit for purpose.

Among the 212 health workers who provided reasons why IDSR may not be working, 72 (34%) of them cited inadequate/lack of in-service training as the main reason followed by lack of knowledge (19.8%), poor/no feedback (14.2%) and lack of motivation (11.3%).

On decision-making, 194 (83.3%) of the respondents reported the use of IDSR data for decision-making. Of the 39 respondents who gave reasons for not using IDSR data for decision-making, 19 (48.7%) of them cited lack of knowledge on data analysis followed by no feedback/follow-up from authorities (23.1%) and irregular training for health workers (10.3%) being the other reasons.

Table 5: Perceptions of health care professionals on IDSR for detecting measles, yellow fever and AFP

Variable	Frequency	Percentage (%)
Perception of IDSR as a tool?		
Used for priority diseases surveillance	94	40.3
Used for data collection on priority diseases	46	19.7
To strengthen the public health system	26	11.2
Screening and management of diseases	15	6.4
Prompt notifications of diseases of public health importance	12	5.2
For education and training	15	6.4
It's easy to use	5	2.1
Don't know	20	8.6
Expected role of IDSR		
Prompt response to disease outbreaks	41	17.6
Monitoring disease trends	48	20.6
Improves disease surveillance	13	5.6
Early detection of priority diseases	111	47.6
Don't know	20	8.6
IDSR playing the role with respect to measles, yellow fever and AFP?		
No	42	18.0
Yes	191	82.0
IDSR tool fit for purpose?		
No	39	16.7
Yes	194	83.3
Reasons IDSR is not working (n=212)		
Inadequate/lack of trained staff	10	4.7
Lack of in-service training	72	34.0
Because it is paper work	2	0.9
Unavailability of tools	7	3.3
Heavy work load	7	3.3
Lack of funding	4	1.9
Lack of knowledge about it	42	19.8
Lack of motivation	24	11.3
No commitment of staff at all levels	10	4.7
Poor/ no feedback	30	14.2
Difficult finding cases	4	1.9
IDSR data used for decision-making		
No	39	16.7
Yes	194	83.3
Reasons IDSR data not used for decision-making (n=39)		
Inaccurate collection of data	4	10.3
Lack of knowledge on data analysis	19	48.7
No feedback/follow-up from authorities	9	23.1
No reporting forms	3	7.7
No regular training for health workers	4	10.3

4.3.1 Results of key informant interviews

As part of the mixed method study, key informant interviews (KII) were conducted among nine health workers to solicit their views on the integrated disease surveillance system. The issues discussed during the KII were:

- ✓ What do you think of or know about the IDSR?
- ✓ What role is it supposed to play in health services delivery?
- ✓ How do you think it is playing the role with respect to measles, yellow fever and AFP?, and
- ✓ If not working as expected, what do you think are the reasons why IDSR may not be working as expected?

Table 6: Characteristics of key informant interviews

Variable and category	Number (9)
Age group (years)	
30-39	5
40-49	4
Sex	
Female	2
Male	7
Educational level	
Certificate holder	2
Diploma holder	3
Bachelor's degree	4
Cadre of staff	
Disease Control	4
Community Health Nurse	3
Physician Assistant	2
Number of years of in current health facility	
1-4	5
5-10	4

Most of the participants in the KII cited surveillance of priority diseases, data collection on priority diseases and prompt response to disease outbreaks as their views and knowledge on the IDSR. A male aged 30-39 years in the KII said

> "*for me the IDSR is a means to identify and report diseases for prompt action. That is for early detection of priority diseases. It means that people should be able to know when to report diseases in time to surveillance officers for investigation" (KII 3).*

Another participant (KII 1) said

> *"IDSR helps the health system to report suspected diseases very early so as to prevent outbreaks from those diseases like measles and yellow fever".*

On challenges facing the IDSR in the district, some of the participants cited irregular in-service training, lack of funding or motivation and no feedback on reported diseases as some of the challenges. A Disease Control Officer (KII 5) said

> *"surveillance is not easy, it needs resources and commitment to do it well, some of the staff especially the nurses and community health volunteers complain of motivation, and it is true, they want something [money) small to submit samples to the district but they do not get. We too at the district level also face challenges, getting money for fuel to send a sample to Accra is always a problem. Delayed feedback from the lab is also demotivating, sometimes it takes more than expected to receive feedback on samples from the labs through the region".*

A Physician Assistant (KII 8) emphasized on training of health workers on disease surveillance saying

> "*the issue of in-service or regular training should be looked at, especially for the non-disease control officers. See, I have not had any training since I came here or even since I started working but I am supposed to be reporting them. Even the staffs for surveillance are not in this facility, so I will urge the directorate to organize training for us to update our knowledge on it".*

4.4 Reporting rates of measles, yellow fever and AFP through IDSR

Table 7: Reporting IDSR priority diseases: AFP, measles and yellow fever

Variable and category	Frequency	Percentage (%)
Ever reported any suspected case of measles, AFP and Yellow to the next level?		
No	144	61.8
Yes	89	38.2
Reasons for not reporting IDSR diseases*		
Inadequate staff	27	19.4
Heavy workload	57	41.0
No training on IDSR	104	74.8
No reporting forms/tools	36	25.9
No motivation	36	25.9
No feedback from higher authorities	25	18.0
Ever received feedback on AFP, measles, YF (n=89)?		
No	24	27.0
Yes	65	73.0
Timely feedback (within 28 days after submitting samples), n=65		
No	2	3.1
Yes	63	96.9

As in seen in Figure 2, only 38.2% (89/233) of the health workers ever reported any of the priority IDSR diseases while 61.8% (144/233) of them indicated that they never reported any suspected cases of the priority IDSR diseases.

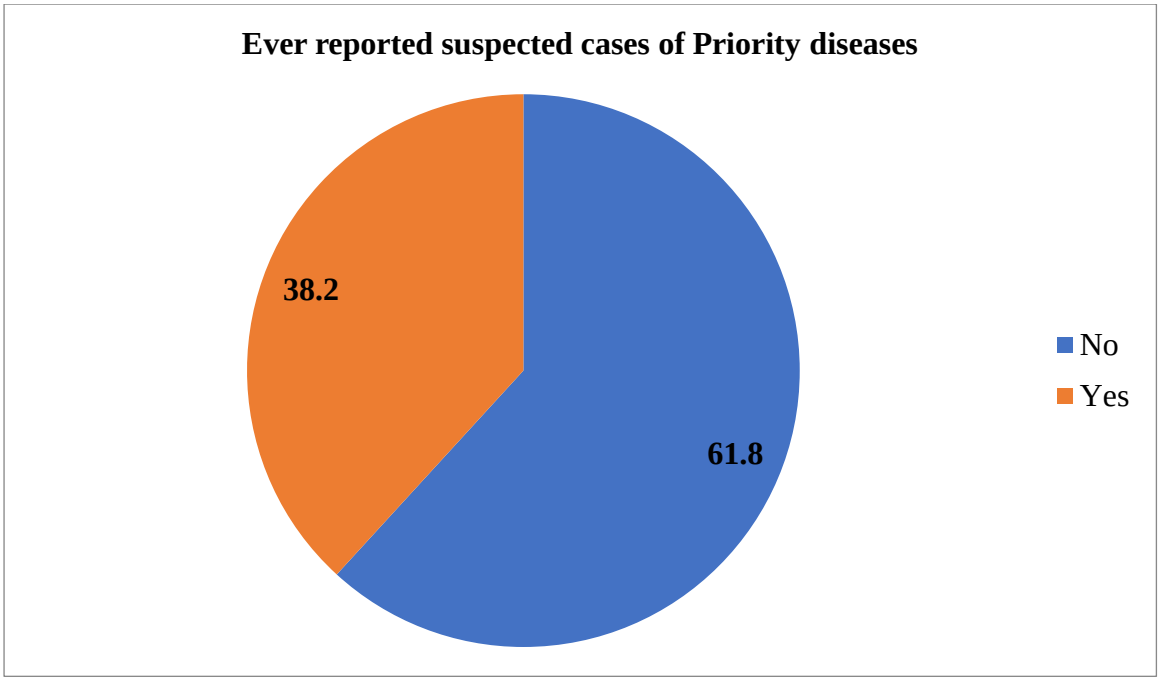
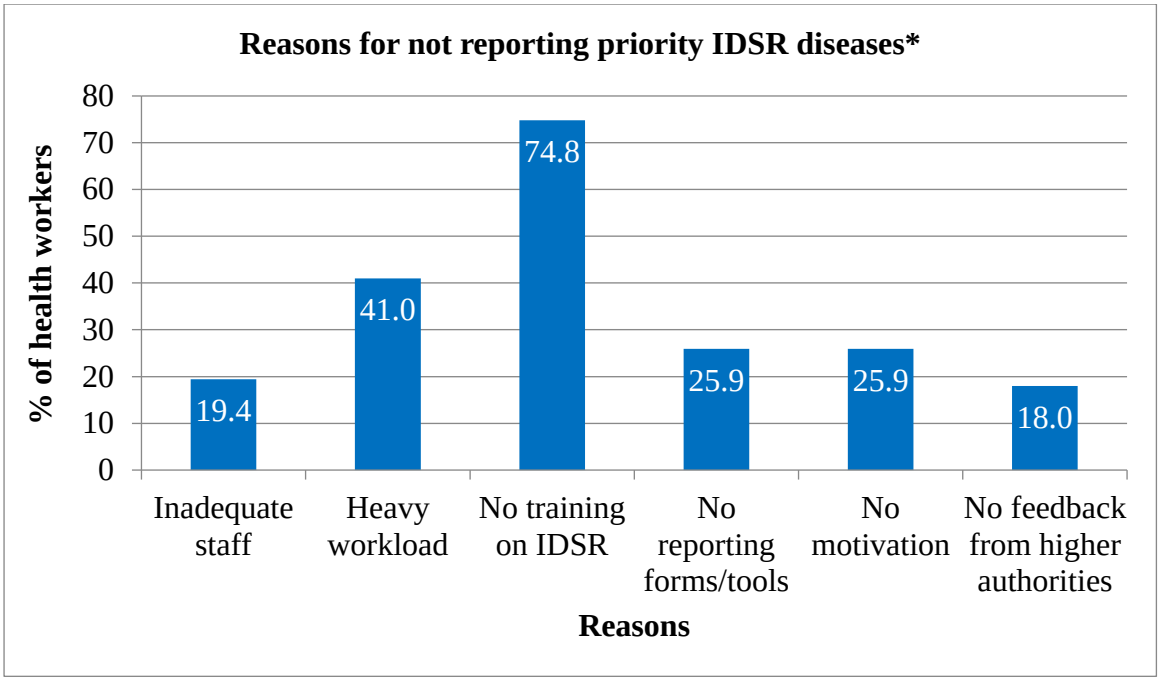


Figure 2: Ever reported of IDSR priority diseases

The reasons for not reporting priority IDSR diseases are shown in Table 5 and Figure 3. The main reason for not reporting priority IDSR diseases among the 89 health workers who indicated to have reported the three IDSR priority diseases is no training of staff on IDSR (74.8%), with heavy workload (41%), no reporting forms/tools (25.9%), no motivation (25.9%) and inadequate staff (19.4%) being the other reasons.



*Multiple responses

Figure 3: Reasons for not reporting priority IDSR diseases

Figure 4 gives results on the rating of suspected cases of AFP, measles and yellow fever being reported by health facilities over a three year period. Low/poor rating means less than two cases each of the priority diseases have been reported during the period under review whilst high/good rating indicates the reporting of at least two cases each of the priority diseases under consideration. From Figure 4, only 29.2% of health facilities had reported at least two suspected cases of the surveillance diseases whilst 70.8% of them reported less than two.

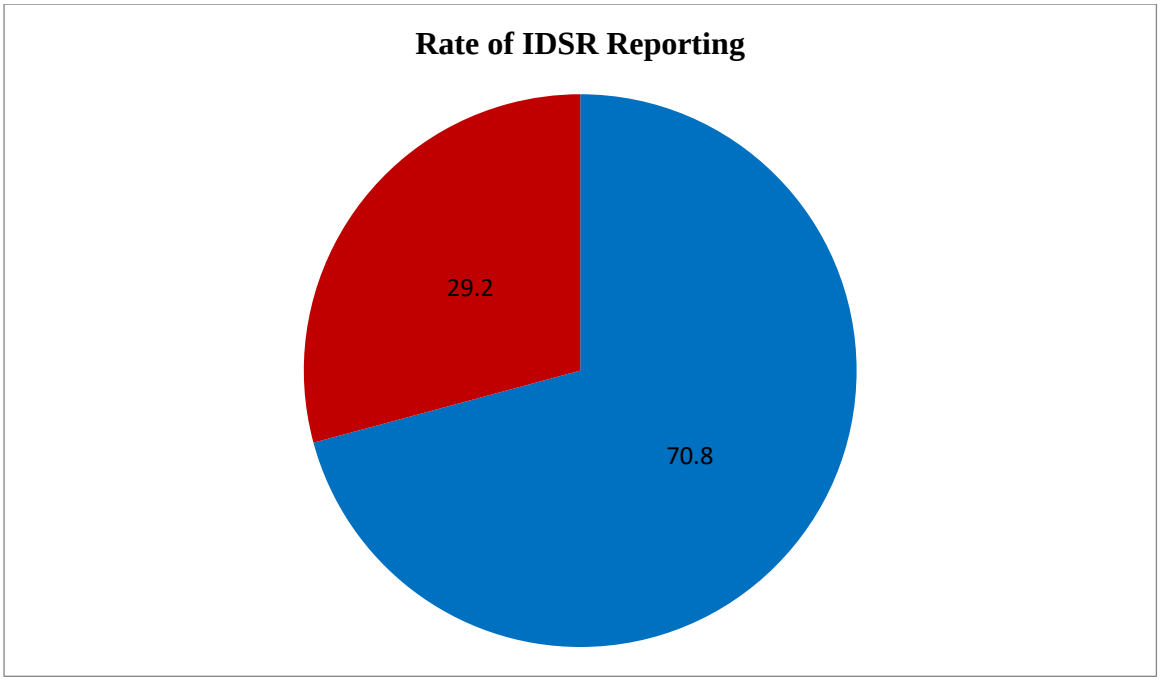


Figure 4: Overall reporting of AFP, measles and yellow fever under IDSR

4.5 Factors associated with IDSR use for reporting cases of Measles, Yellow Fever and AFP

Bivariate and logistic regression analyses have been done to determine the associations and predictors respectively of reporting IDSR diseases among health workers. In the bivariate analysis, age group (χ^2=13.523, p=0.004), educational qualification (χ^2=8.643, p=0.034), professional category of health workers (χ^2=23.814, p=0.005), number of years in employment with the GHS (χ^2=25.136, p<0.001) and number of years in current health facility (χ^2=20.835, p<0.001) are demographic characteristics of respondents which were strongly statistically associated with reporting of IDSR (See Table 8).

On the knowledge level, ever heard about IDSR (χ^2=19.764, p<0.001) and having training on IDSR (χ^2=89.884, p<0.001) were the only variables which had strong statistical association with reporting of IDSR.

With regard to health system factors on IDSR reporting, it is found that having standard case definitions of AFP, measles and yellow fever (χ^2=56.059, p<0.001), having files for AFP, measles and yellow fever (χ^2=49.583, p<0.001), having case-based forms for AFP, measles and yellow fever (χ^2=65.005, p<0.001), evidence of data analysis of notifiable diseases (χ^2=71.162, p<0.001), having a surveillance focal person (χ^2=45.671, p<0.001) in addition to having to having at least two persons trained on IDSR (χ^2=44.318, p<0.001) and supervision from district or higher levels (χ^2=49.378, p<0.001) had significant statistical association with reporting of IDSR diseases.

Table 8: Factors associated with IDSR use for reporting cases of Measles, Yellow Fever and AFP

	Ever reported any IDSR disease			
Variable and category	**No, n (%)**	**Yes, n (%)**	**Total, n(%)**	**χ^2 (p-value)**
Socio-demographic factors				
Age group (years)				13.523
20-29	76 (72.4)	29 (27.6)	105 (100.0)	(0.004)*
30-39	59 (57.3)	44 (42.7)	103 (100.0)	
40-49	7 (41.2)	10 (58.8)	17 (100.0)	
50-59	2 (25.0)	6 (75.0)	8 (100.0)	
Educational level				8.643
Certificate holder	56 (54.9)	46 (45.1)	102 (100.0)	(0.034)*
Diploma holder	62 (63.9)	35 (36.1)	97 (100.0)	
Bachelor's degree	24 (82.8)	5 (17.2)	29 (100.0)	
Postgraduate degree	2 (40.0)	3 (60.0)	5 (100.0)	
Cadre of staff				23.814
Nurses	75 (59.1)	52 (40.9)	127 (100.0)	(0.005)*
Medical Officers	1 (14.3)	6 (85.7)	7 (100.0)	
Physician Assistants	4 (66.7)	2 (33.3)	6 (100.0)	
Disease Control Officers	2 (22.2)	7 (77.8)	9 (100.0)	
Health Information/Records Officers	11 (64.7)	6 (35.3)	17 (100.0)	
Midwives	30 (68.2)	14 (31.8)	44 (100.0)	
Nutrition officers	8 (100.0)	0 (0.0)	8 (100.0)	
Health Promotion Officers	4 (100.0)	0 (0.0)	4 (100.0)	
Laboratory workers	6 (75.0)	2 (25.0)	8 (100.0)	
Mental Health Officers	3 (100.0)	0 (0.0)	3 (100.0)	
Number of years in GHS/CHAG				25.136
1-4	89 (72.4)	34 (29.6)	123 (100.0)	(<0.001)*
5-9	40 (60.6)	26 (39.4)	66 (100.0)	
10-14	10 (52.6)	9 (47.4)	19 (100.0)	
15-19	2 (16.7)	10 (83.3)	12 (100.0)	
20+	3 (23.1)	10 (76.9)	13 (100.0)	
Number of years of in current health facility	116(70.7)	48 (29.3)	164 (100.0)	20.835 (<0.001)*
1-4	25 (38.5)	40 (61.5)	65 (100.0)	
5-9	3 (75.0)	1 (25.0)	4 (100.0)	
10-14				
Knowledge of health workers on IDSR				
Ever heard about IDSR?				19.764
No	43 (89.6)	5 (10.4)	48 (100.0)	(<0.001)*
Yes	101(54.6)	84 (45.4)	185 (100.0)	

Table 8 cont'd

Ever trained on IDSR				89.884
No	131(82.4)	28 (17.6)	159 (100.0)	(<0.001)*
Yes	13 (17.6)	61 (82.4)	74 (100.0)	
Last time being trained on IDSR (n=74)				0.489 (0.783)
Three months ago	1 (10.0)	9 (90.0)	10 (100.0)	
One year ago	4 (20.0)	16 (80.0)	20 (100.0)	
More than one year ago	8 (18.2)	36 (81.8)	44 (100.0)	
Duration of the IDSR training (n=74)				1.883 (0.597)
One day	7 (23.3)	23 (76.7)	30 (100.0)	
Two days	6 (15.4)	33 (84.6)	39 (100.0)	
Three days	0 (0.0)	4 (100.0)	4 (100.0)	
Five days or more	0 (0.0)	1 (100.0)	1 (100.0)	
Health system practices on IDSR				
Case definitions of AFP, measles and yellow fever	86 (90.5)	9 (9.5)	95 (100.0)	56.059 (<0.001)*
No	58 (42.0)	80 (58.0)	138 (100.0)	
Yes				
Having separate file (s) for AFP, measles and yellow fever	87 (87.9)	12 (12.1)	99 (100.0)	49.583
No	57 (42.5)	77 (57.5)	134 (100.0)	(<0.001)*
Yes				
Availability of case-based forms for AFP, measles and yellow fever				65.005 (<0.001)*
No	94 (90.4)	10 (9.6)	104 (100.0)	
Yes	50 (38.8)	79 (61.2)	129 (100.0)	
Evidence of data analysis of notifiable diseases (AFP, Measles, yellow fever)				71.162
No	112(85.5)	19 (14.5)	131 (100.0)	(<0.001)*
Yes	32 (31.4)	70 (68.6)	102 (100.0)	
A focal officer for disease surveillance				45.671
No	84 (87.5)	12 (12.5)	96 (100.0)	(<0.001)*
Yes	60 (43.8)	77 (56.2)	137 (100.0)	
Having at least two health workers trained on IDSR				44.318 (<0.001)*
No	92 (84.4)	17 (15.6)	109 (100.0)	
Yes	52 (41.9)	72 (58.1)	124 (100.0)	
Evidence of supervision from district or higher level				49.378 (<0.001)*
No	94 (85.5)	16 (14.5)	110 (100.0)	
Yes	50 (40.7)	73 (59.3)	123 (100.0)	

Statistical significant at p≤0.05

4.5.1 Determinants of reporting IDSR diseases (AFP, Measles and yellow fever) in New Juaben North Municipality

In Table 9, the logistic regression analysis, only having training on IDSR is the only to be independent predictor of reporting of the three priority IDSR diseases [OR=11.28;

95%CI=4.560-27.907; p<0.001) This means that health workers who have training were 11 times more likely to report on IDSR disease than those not having any training.

Table 9: Determinants of reporting IDSR diseases (AFP, Measles and yellow fever)

Ever reported IDSR (AFP, Measles, YF)	Odds Ratio	95%CI	p-value
Age group	1.09	0.515-2.326	0.814
Educational qualification	0.70	0.374-1.313	0.267
Category (profession) of Health Workers	0.90	0.730-1.103	0.304
Number of years in GHS	1.23	0.521- 2.897	0.638
Number of years in current health facility	1.75	0.679-4.520	0.246
Ever heard about IDSR	1.65	0.848-5.643	0.422
Ever trained on IDSR	11.28	4.560-27.907	**<0.001***
Availability of case definitions of AFP, measles and YF	1.90	0.372-9.739	0.440
Availability of files for AFP, measles and YF	0.89	0.236-3.325	0.857
Availability of case-based for AFP, measles and YF	3.92	0.779-19.714	0.098
Data analysis on ISDR	2.21	0.804-6.048	0. 124
Having surveillance focal person	0.99	0.274-3.611	0.993
Having at least two health workers trained on IDSR	0.89	0.264-2.983	0.848

Statistical significant at p≤0.05

4.6 Limitations of the Study

As with all other studies, this study had some strengths and weaknesses. The strengths of the study were that the use of mixed methods and the involvement of all health facilities in the municipality could make the results generalizable to similar settings across the country and sub-region.

The weakness of the study could include recall bias from participants, short duration of the study. Also, the fact that it was done only in one municipality, making the results only generalizable to the municipality and/or others with similar settings should be done.

CHAPTER FIVE

5.0 DISCUSSION OF FINDINGS

5.1 Knowledge of health workers on IDSR reporting

The study found a high level of awareness about Integrated Disease Surveillance and Response among the health workers in the New Juaben North Municipality as nearly 80% of them had some knowledge of it. The high level of awareness on IDSR among the health workers is almost similar to findings in the Anambra State of Nigeria where nearly 90% of health workers were aware of the national disease surveillance and notification system (Nnebue et al., 2012). However, the proportion of health workers trained on the IDSR was disappointingly low. Less than one-third of the health workers had training on IDSR which is below the minimum threshold of 60% as required by the WHO African Region. As part from the fact that majority of the health workers were not trained, the regularity of training on the IDSR was an issue of concern; with nearly two-thirds of the health workers receiving training for more than a year ago, keeping up to date with current issues will certainly be lost. Therefore, regular training of staff on IDSR whether on-the-job or workshops would always enhance the knowledge of staff and ultimately improve surveillance. As found in this study, just having training on IDSR regardless of the frequency and duration is a significant predictor of reporting of AFP, measles and yellow fever.

The lack of knowledge on IDSR is found to be a reason for not reporting notifiable diseases and affect the reporting timeliness of epidemic prone diseases like measles, poliomyelitis and yellow fever which are to be reported on weekly basis in addition to monthly reporting as acknowledged (Aniwada & Obionu, 2016; Dairo et al., 2018; Nnebue et al., 2012, 2013).

The finding in this study that only 79% of health workers were found to be trained on IDSR is similar to the findings in Nairobi County of Kenya that 85% of health workers lacked

training on disease surveillance (Japheth Omondi et al., 2020). As part from the fact that majority of the health workers were not trained, the regularity of training on the IDSR was an issue of concern; with nearly two-thirds of the health workers receiving training for more than a year ago, keeping up to date with current issues will certainly be lost. Therefore, regular training of staff on IDSR whether on-the-job or workshops would always enhance the knowledge of staff and ultimately improve surveillance. As found in this study, having training on IDSR (regardless of the frequency and duration) is a significant predictor of reporting of AFP, measles and yellow fever. The importance of training agrees with the position of the WHO that successful implementation of IDSR depends on well trained, competent and dedicated workforce (WHO, 2021) and other studies which identified lack of trained staff as one of the key challenges of IDSR (Masiira et al., 2019)

The non-analysis of data by health workers could negatively affect the utilization of surveillance data for decision-making. This is in consonance with the position by Adokyira and Co (2015) that disease surveillance remains a neglected area in Ghana hence the utilization of surveillance data for planning and decision-making at the periphery level remains very low.

In the current study, nearly 60% of the health workers reported about the availability of standard case definitions/guidelines in their health facilities. This is in contrast with the finding in Northeast Nigeria that standard case definitions were available in all state and Local Government Area (LGA) offices and health facilities (Ibrahim et al., 2020a). Standard case definitions set the criteria for reporting a particular disease, therefore their availability in health facilities should enable health workers to know when and which disease to report.

Data analysis helps to make decision regarding the burden of disease in a particular geographical area within a period of time. It is expected that health workers should know how

to collect and analyze IDSR data to help in decision-making. The findings on data analysis in the present study make the author to agree with the opinions of (Ibrahim et al., 2020b; Okiror et al., 2021) that poor knowledge of calculation of core surveillance indicators, analysis and information not used for actions have been observed as weakness in the surveillance systems in Ethiopia and Malawi. In spite of the importance of data analysis in improving disease surveillance, the study found that more than half of the health workers had no evidence of data analysis on the priority IDSR diseases under study which though seems better than the 85% of no data analysis in a Kenyan study, still requires improvement in the municipality.

The rate of supervision from higher levels to lower levels in this study was less than 60% but higher than the 28% of Disease surveillance and Notification Officers in the Bauchi State of Nigeria who received supervisory visits from the appropriate authorities (Ningi et al., 2018). Supportive supervision as adopted by the GHS seeks to improve service delivery at all levels where higher authorities visit local level facilities to support them with updates on current events in the health service delivery chain. Therefore, the author agrees with the position that interventions such as training, timely feedback and supervision to improves surveillance on IDSR priority diseases (Dairo et al., 2010; Franco et al., 2006; Phalkey et al., 2017).

5.2 Perceptions of health care professionals on the usefulness of IDSR as a tool for detecting cases of measles, yellow fever and AFP

The observation in this study that 40% of the health workers see the usefulness of IDSR as a tool for the surveillance of priority diseases of measles, yellow fever and AFP and with about 10% of them seeing its usefulness as also a tool to strengthen public health systems adds weight to the importance of the IDSR requiring the necessary support to make it successful. For IDSR to be successfully implemented, it will require a well-trained, competent and dedicated workforce (WHO, 2021).

More than a third of health workers in the study perceived inadequate/lack of training as the main reason why IDSR may not be working as useful according to expectations. It is an undisputable fact that feedback and some motivation its various forms play a role in improving disease surveillance through IDSR. However, in this study, it has been found that nearly 20% and 15% of the health workers perceive lack of knowledge and lack of motivation as reasons against the optimum functioning of IDSR as a useful tool in detecting priority diseases. This suggests that attention must be given to these areas of concern to the health workers if we want to have an improved surveillance system through IDSR.

The author found in the current study that nearly 20% of the health workers hold the view that IDSR data was not used for decision-making thereby affecting its usefulness with lack of knowledge on data analysis, lack of feedback/follow-up and irregular training of health workers being the reasons for the non-use of IDSR data for decision-making. This is at variance with a study where nearly 78%, 43% and 39% of physicians in some German districts voluntarily participated in the notifiable infectious disease surveillance system because of easy handling, getting feedback of results and financial compensation respectively (Krause et al., 2005). Lack of knowledge among doctors about how to report or whom to report to (Dairo et al., 2018; Lafond et al., 2014), poor feedback on notifiable diseases as a discouraging concern to health workers (Aniwada & Obionu, 2016; Dairo et al., 2018; Okiror et al., 2021) were perceived as obstacles to reporting in the IDSR.

5.3 Factors associated with the low reporting of Measles, Yellow Fever and AFP

The current study found that nearly two-thirds (62%) of the health workers never reported any of the priority IDSR diseases under study. This is in contrast to the finding in the Enugu State of Nigeria where 85% of public and 40% of private Health Care Workers (HCWs) reported diseases in their facility (Aniwada & Obionu, 2016). The low/poor rate of reporting of the diseases could be due to several factors such as inadequate continuous training of

health workers, lack of reporting tools and no dedicated focal persons for surveillance activities as found in this study and elsewhere.

The main reason for not reporting the IDSR priority diseases was no training of staff on IDSR. This is consistent with findings many studies where lack of training of various categories of health workers as an obstacle to improved IDSR. Also heavy workload and the non-availability of reporting forms/tools cited as reasons for not reporting the IDSR diseases have been cited in some studies (Ibrahim et al., 2020; Nnebue et al., 2013; Okiror et al., 2021).

The low rate of reporting of the IDSR priority diseases in the study area has resulted in the overall reporting rate of AFP, measles and yellow fever to be poor/low meaning less than two suspected cases of each of the diseases were reported by the health workers in their health facilities. This is in contrast with the WHO requirements that at least two cases per 100, population of children under 15 years should be reported in a year (Maes et al., 2017; Wassilak et al., 2017; World Health Organization, 2003, 2018) and lower than the improvement witnessed in AFP surveillance in Liberia (Clarke et al., 2019) and some regions in Ghana (Odoom et al., 2014).

At the bivariate analysis level, training of health workers, availability of reporting tools, data analysis and supervision were some factors strongly associated with reporting of AFP, measles and yellow fever. This is consistent with studies elsewhere (Japheth Omondi et al., 2020; Mwatondo et al., 2016a). However, at the multivariate logistic regression level, only training of health workers remained the significant predictor for the reporting of IDSR diseases. This underscores the importance of training in whatever form and duration to improve integrated disease surveillance as has been espoused several authors in their studies

on disease surveillance (Bawa et al., 2003; Dairo et al., 2010; Japheth Omondi et al., 2020; Masiira et al., 2019; Mwatondo et al., 2016a; Sow, Alemu, Nanyunji, et al., 2010).

CHAPTER SIX

6.0 CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

There is high knowledge of IDSR among health workers but its influence on the reporting of IDSR diseases under consideration was very low. The high level of awareness of the IDSR system in the New Juaben North Municipality did not translate into reporting of IDSR priority diseases. This is incongruous to the expectation that a higher knowledge on a topic would/should normally translate into action, which means an increase in the rate of reporting these diseases. Training of health workers on IDSR was inadequate and infrequent as well as poor feedback and supervision. There was low/poor rate of reporting of AFP, measles and yellow fever which could conceal the occurrence of outbreaks until they are out of control (i.e. affect the early detection of these diseases to prevent outbreaks). Lack of training, feedback, motivation and supervision were seen as obstacles to the IDSR in the municipality.

6.2 Recommendations

1. The Municipality Health Directorate (MHD) of the GHS should, in the short to medium term (1-2 years), prioritize training of more health workers on Integrated Disease Surveillance and Response as an intervention to help improve surveillance in the municipality,
2. Though it is their role, the GHS should, in the short term (within a year) introduce motivation packages for staff who report suspected cases of IDSR priority diseases should be instituted by the MHD. This does not need to be monetary but the provision of internet/voice call data and fuel could be motivational packages for officers undertaking surveillance in the district.

3. The New Juaben MHD should immediately intensify and strengthen supervision to all levels of health facilities during which on-the-job training could be provided to health workers as one of the strategies to improve IDSR reporting in the Municipality. This supervision should be structured with fixed schedules and monitored from the MHD.
4. The MHD should ensure the analysis and use of surveillance data for decision-making at all levels of health facilities in the Municipality. This must be an immediate priority as the use of the data will help improve its quality.
5. The MHD should ensure timely and proper feedback on surveillance activities and performance is provided to all health workers and their facilities.

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APPENDICES

Appendix I: Questionnaire

INTRODUCTION

My name is Annette Asraku, a Master of Public Health (MPH) student at the University of Ghana, Legon. As a requirement for the award of the MPH degree, I am conducting a study on **Factors Contributing To The Reporting Of Integrated Disease Surveillance And Response In New Juaben North Municipal; The Case Of Measles, Yellow Fever And Acute Flaccid Paralysis.** The study is being carried out to assess the performance of the IDSR in the district. I would be happy to have you spend some time to answer the questions for me, it will about 10-15 minutes of your time. You are assured of confidentiality of your answers. You may withdraw from this interview at any point should you so wish but I will appreciate if gratefully if you would kindly complete to help me have a full set of completely answered questionnaire. Thank you.

Section A: Socio-Demographic Characteristics of Respondents

1. **What is current age in years……**
2. **Have your highest educational qualification?**
   a. Certificate holder [ ]
   b. Diploma holder [ ]
   c. Undergraduate degree [ ]
   d. Postgraduate degree [ ]
3. **What is your professional cadre?**
   a. Nurse [ ]
   b. Midwife [ ]
   c. Disease Control Officer [ ]
   d. Health Information/Records officer [ ]
   e. Medical Officer [ ]
   f. Laboratory worker [ ]
   g. Others (specify)……..
4. How many years have you been as a professional with the GHS/CHAG…..
5. How long have you been working in this health facility? ……

Section B: knowledge of integrated disease surveillance and response

6. Have you ever heard about IDSR?
   a. Yes [ ]
   b. No [ ]
7. Have you ever been trained on IDSR?
   a. Yes [ ]
   b. No [ ] If no, skip Q8-9
8. When was the last time you had training on IDSR?
   a. 3 months ago [ ]
   b. 6 months ago [ ]
   c. 9 months ago [ ]
   d. 1 year ago [ ]
   e. More than 1 year [ ]
9. How long was the training?
   a. One day [ ]
   b. Two days [ ]
   c. Three days [ ]
   d. Four days [ ]
   e. Five or more days [ ]
10. How often should notifiable disease be reported under IDSR? (Choose all that apply)
    a. Immediately [ ]
    b. Daily [ ]
    c. Weekly [ ]
    d. Monthly [ ]
    e. Quarterly [ ]
    f. Yearly [ ]

Section C: practices of health care professionals in the detection and reporting of measles, Yellow fever and AFP

11. Health facility practices of IDSR

	Activity	**Yes**	**No**
	Having case definitions of AFP, measles and yellow fever		
	Having file (s) for AFP, measles and yellow fever		
	Availability of case-based forms for AFP, measles and yellow fever		
	Evidence of data analysis of notifiable diseases (AFP, Measles, yellow fever)		
	A focal disease surveillance officers		
	Having at least two health workers trained on IDSR		
	Evidence of stool specimens collected within 14 days of paralysis onset		
	Evidence of suspected AFP cases investigated within 48 hours of notification		

	Evidence of 60-day follow-up conducted		
	Evidence of supervision from district or higher level		

12. Have you ever reported any suspected case of measles, AFP and Yellow to the next level?
    a. Yes [ ], If yes go to Q16
    b. No [ ] If no, go to Q15
13. How many suspected cases of AFP, measles and yellow fever have you reported for the past three years?

	2021	2020	2019
a. AFP	…….	…….	…….
b. Measles	…….	…….	……..
c. Yellow fever	…….	…….	……..

14. What are the reasons for not reporting diseases under the IDSR? (Tick all that apply)
    a. Inadequate staff [ ]
    b. Heavy workload/schedule [ ]
    c. Have not been trained on IDSR reporting [ ]
    d. No reporting forms/tools [ ]
    e. No motivation for reporting [ ]
    f. No feedback on reported diseases [ ]
15. Have you ever received feedback on suspected AFP, measles and yellow fever from the higher level?
    a. Yes [ ], If yes go to Q16
    b. No [ ]
16. Was the feedback timely, i.e. within 28 days after submitting samples?
    a. Yes [ ]
    b. No [ ]

Section D: perceptions of health care professionals on the usefulness of IDSR as a tool for detecting cases of measles, yellow fever and AFP

17. Do you think the IDSR tool is fit for purpose and working?
    Yes [ ]
    No [ ]
18. Why do you think the IDSR is not working?
19. Are IDSR data used for decision-making?
    a. Yes [ ], Go to Q20
    b. No [ ]
20. If so, how?.....

Section E: Reporting rates of measles, yellow fever and AFP through IDSR

	2018	2019	2020
AFP			
Number of AFP Cases			
Number of AFP cases notified within 7 days after onset of symptoms			
Number of AFP cases investigated within 48 hours of notification			
Number of AFP cases with two stool specimens collected 24-48 hours apart and in ≤14 days after onset			
Number of stool specimens with results sent from the reference laboratory within 28 days			
Number of AFP cases with 60 day follow-up			
Measles			
Number of suspected of cases notified ≤48 hours after rash onset			
Proportion of cases investigated with house visit ≤48 hours after notification			
Proportion of cases with adequate specimen (a blood specimen collected within 28 days of the onset of rash)			
Yellow fever			
Number of suspected of cases investigated within 48 hours of notification			
Number of all suspect cases for which specimens were collected			
Number of samples sent to the laboratory within three days of investigation			
Number of samples reaching laboratory in adequate condition			

Key Informant Interview (KII) questions

1. What do you think about IDSR as a tool?
2. What role is it supposed to play?
3. Do you think it is playing the role with respect to measles, yellow fever and AFP?
4. What do you think are the reasons why IDSR may not be working as expected?

Appendix II: Project Work plan and Timelines

Activity	March 2021	April 2021	May 2021	June 2021	July 2021	August 2021	September 2021	October 2021	November 2021	December 2021	January 2022	February 2022	March 2022	April 2022
Proposal presentation														
Ethical clearance														
Data collection														
Data analysis														
Report writing														
Submission of draft dissertation to departments														
Correction of dissertations														
Submission of final work on dissertations														

Appendix III: Budget for the study

Activity	Frequency	Resources needed			
		Item	Quantity	Unit cost (GH¢)	Amount (GH¢)
Administrative cost: Ethical clearance fee from GHS	Once	-	-	50.00	50.00
Literature search		Data			300.00
Purchase of journal articles*	when needed	-	-	-	500.00
Piloting (Health facility)	Once	Stationery for questionnaire	-		50.00
				Subtotal	***900.00***
Personnel requirements and benefits: Recruitment and training of Research Assistants (RAs):	One day	Snack Lunch T&T/per diem Data tools Pens/pencils	5 5 4 Various 10	10.00 20.00 50.00 100.00 1.00	50.00 100.00 200.00 100.00 10.00
				Subtotal	***460.00***
Travel, per-diem and accommodation Transport and accommodation for (RAs) to collect data	4 days	Per diem Lodging T&T My clear bag/file	7.0 RAs 8.0 RAs 9.0 RAs 5 RAs	50.00 100.00 50.00 2.00	800.00 1,600.00 800.00 10.00
				Subtotal	***3,210.00***
Materials and logistics requirements: Data collection software				-	600.00
Communication (voice and internet)	4 days for Ras	Credit for calls/data Credit for PI	10.0 R as various	10.00	160.00 500.00
Printing of draft copies of report	-	Funds	1 copy	50.00	50.00
Printing and binding of final report	-	Funds	4 copies	50.00	200.00
				Subtotal	***1,310.00***
Dissemination of report	-	-	-	**0.00**	**0.00**
				Total	**5,880.00**
Miscellaneous/contingency expenses		(10% of total)			**588.00**
				Grand total	**6,468.00**