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Assessment of Measles Elimination Criteria In Alhsaheissa locality, Algazira State, Sudan 2017.

A thesis submitted in full fulfillment required for master degree in public health.

BY

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2018

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قال تعالى:

بسم الله الرحمن الرحيم

((وَقُلْ رَبِّ زِدْنِي عِلْمًا))

سورة طه الايه 114

صدق الله العظيم

Dedication

For my lovely

Family

And all my friends

For all their

Encouragement

And support throughout my study

Acknowledgments

My thanks and appreciation to Dr. Abdullah Ahmed Adam Belal .for persevering with me as my supervisor and advisor throughout the time it took me to complete this research and write the dissertation.

I must acknowledge as well the many friends, colleagues in **Alhsaheissa** Locality

For their support and providing information that helped me

Conduct this research

My acknowledgment to my sister Sally to return my life

Finally I would like to thank my close colleagues **Adam**, **Ahmed**, **Ahmed Abd Elmonem** and **Malaz** for their support to complete my dissertation

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Abbreviation

AMR	Regions Of America
BCG	Bacilli Calmett And Gurine
CDC	Centre For Disease Control And Prevention
CRS	Congenital Rubella Syndrome
DPT	Diphtheria Pertuses And Tetanus
EMR	Eastern Mediterranean Region
EPI	Expanded Program Of Immunisation
EUR	Europe Region
M &R	Measles and Rubella
MCV1	Measles Coverage Vaccine First Dose
MCV2	Measles Coverage Vaccine Second Dose
MDGS	Millennium Development Gaols
MLIs	Measles Like Illness
MMR	Measles, Mumps And Rubella
MMWR	Morbidity And Mortality Weekly Report
MV	Measles Vaccine
NNDSS	National Notifiable Diseases Surveillance System
PCV	proportion of Cases Occurring in Vaccinated Individuals
PPV	proportion of the Population that is Vaccinated
SIAs	Supplemenry Immunisation Activities
SSPE	Sub Acute Sclerosing Panencephalitis
UNICEF	United Nations Children Fund
VE	Vaccine Efficacy
WHO	World Health Organization
WRP	Western Pacific Region.

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Abstract

Measles disease is considered as one of the most serious childhood diseases worldwide, Sudan started measles elimination activities since 2004 .Therefore, remarkable progress noted in morbidity and mortality reduction of the disease.

A descriptive cross sectional facility and community based study was carried out in Alhsaheissa locality in Gazira state in Sudan during the period from 2015 to 2017.

This study aimed to assess the on-going activities concerning measles elimination including measles converge in routine program , supplementary immunization activities ,surveillance system ,.WHO standard of 30 clusters immunization survey was applied for locality to assess immunization coverage through examine the immunization status of 210 children. In addition, all surveillance sites of reporting system were selected in this study during the period of the study were interviewed.

The study revealed that, measles's first dose coverage (MCV1) was (99.1) in Alhsaheissa locality respectively, measles's second dose coverage (MCV2) was (84.2%) in Alhsaheissa locality respectively, educated mothers were not likely to have their children immunized than mothers who had no education. This Study showed high sensitivity in surveillance reporting system noted in Alhsaheissa locality, very poor community link in surveillance activities in Alhsaheissa locality. Moreover, an Outbreak reports was not available in locality level as well as absence of any evidence of analysing or displaying data.

In conclusion ,the study recommended that, National immunization program should conduct a periodic immunization surveys especially in high risk groups To obtain high level of first and second doses of measles coverage as well as focus on improving the quality of supportive supervision with proper teams selection and data quality management. Furthermore, Regular and systematic To raise awareness about the eradication of the disease.

المستخلص

يعتبر مرض الحصبة من أخطر أمراض الطفولة في العالم ,بداء السودان انشطه القضاء علي مرض الحصبة منذ العام 2004 مما ادي الي تطور ملحوظ في تقليل نسبه المراضة والاماته من مرض الحصبه.

أجريت هذه الدراسه الوصفيه المقطعيه من المجتمع والوحدات الصحيه في محلية الحصاحيصا بولاية الجزيرة بالسودان ,في الفتره من 2015م حتي 2017م .

هذه الدراسه تهدف الي تقييم انشطه القضاء علي مرض الحصبة التي تتكون من تغطية الحصبة للجرعة الاولي والثانية في برنامج الروتين ,نظام الترصد ,التصدي الفاشيات ووعي المعالجين .طبقت عينه ال30 عنقود المعيارية لمنظمة الصحة العالمية بالمحلية وذلك لتقييم التغطية التمنيعية وقد تم مسح 210 طفل وزياره كل مراكز الترصد للحصبة ومقابله المعالجين بالمستشفيات اثناء فتره جمع المعلومات .

خلصت الدراسة الي ان تغطية الحصبة للجرعة الاولي كانت (99.1) والتغطية للجرعة الثانية (82.7%)

بمحلية الحصاحيصا اتضح ان لا علاقة بين الامهات المتعلمات و الامهات الغير متعلمات في تطعيم اطفالهن..

هذه الدراسة اظهرت ايضا حساسيه عالية في نظام تقارير الترصد في المحلية . وبالنقيض كان هنالك ضعف في الارتباط مع المجتمع تجاه انشطة الرصد والتقصي بالمحلية اضافه الي عدم وجود تقارير تفشيات الحصبه او اي تحليل او عرض للبيانات .

في الختام اوصت الدراسة الي ان علي برنامج التحصين الموسع الاتحادي تطبيق مسوجات دوريه لتقييم التغطية خاصه في المناطق الخاصة وذلك لضمان تغطية عالية للجرعة الاولي والثانية ,بجانب ذلك يجب التركيز علي تحسين جودة الاشراف الداعم ,اختيار الاتيام وجودة استخدام البيانات .ايضا يجب عمل دورات مستمرة ومنتظمة لرفع الوعي تجاه القضاء علي المرض .

Chapter One

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Chapter One
Introduction

1.1 Introduction

Measles is one of the leading causes of death among young children even though a safe and cost-effective vaccine is available. In 2016, there were 89 780 measles deaths globally – marking the first year measles deaths have fallen below 100 000 per year. Measles vaccination resulted in a 84% drop in measles deaths between 2000 and 2016 worldwide

. In 2016, about 85% of the world's children received one dose of measles vaccine by their first birthday through routine health services – up from 72% in 2000. During 2000-2016, measles vaccination prevented an estimated 20.4 million deaths making measles vaccine one of the best buys in public health. Measles is a highly contagious, serious disease caused by a virus. Before the introduction of measles vaccine in 1963 and widespread vaccination, major epidemics occurred approximately every 2–3 years and measles caused an estimated 2.6 million deaths each year. The disease remains one of the leading causes of death among young children globally, despite the availability of a safe and effective vaccine. Approximately 89 780 people died from measles in 2016 – mostly children under the age of 5 years. Measles is caused by a virus in the paramyxovirus family and it is normally passed through direct contact and through the air. The virus infects the respiratory tract , then spreads throughout the body. Measles is a human disease and is not known to occur in animals. Accelerated immunization activities have had a major impact on reducing measles deaths. During 2000–2016, measles vaccination prevented an estimated 20.4 million deaths. Global measles deaths have decreased by 84% from an estimated 550 100 in 2000* to 89 780 in 2016.. (1)

Measles is one of the most infectious and severe diseases of childhood and remains an important cause of morbidity and mortality in children in developing countries. In recent years, with the support of WHO and UNICEF, countries have accelerated their efforts to reduce measles morbidity and mortality both through increasing routine measles coverage and conducting periodic supplementary immunization activities (campaigns). In the period 2000–2007, these accelerated measles activities led to a 74% reduction in estimated global measles mortality (90% in the Eastern Mediterranean and 89% in the African regions). In addition, high coverage of two doses of measles vaccine (delivered through routine programs with or without supplementary campaign strategies) has virtually eliminated measles from the western hemisphere since November 2002.

The current goals in the six regions for measles are elimination in the regions of the Americas (AMR), Eastern Mediterranean (EMR), Europe (EUR) and Western Pacific (WPR) and, mortality reduction in AFR. Due to the success of the measles mortality reduction and elimination efforts thus far through the Measles Initiative and related WHO-UNICEF efforts, WHO has raised the question of feasibility of possible new goals such as the eradication of measles or further significant reductions in measles mortality (2)

Drinking from an infected person's glass, or sharing eating utensils with an infected person, increases your risk of infection (3).

The fourth Millennium Development Goal (MDG 4) aims to reduce the under-five mortality rate by two-thirds between 1990 and 2015. Recognizing the potential of measles vaccination to reduce child mortality, and given that measles vaccination coverage can be considered a marker of access to child health services, routine measles vaccination coverage has been selected as an indicator of progress towards achieving MDG 4 (4).

Intensified efforts to vaccinate children against measles have resulted in a 74% drop in global measles-related deaths between 2000 and 2010, from an estimated 535,000 down to 139,000 (5). Despite the significant drop in measles deaths since 2000, there is more work to be done to ensure that children are protected. In 2007, more than 23 million one-year old children did not receive a dose of measles vaccine through routine immunization services (6). Moreover, in 2006, South Korea became the first country in (WPR) to declare measles elimination (7). United States considered the largest country to have ended endemic measles transmission. This experience provides evidence that sustained interruption of transmission can be achieved in large geographic areas, suggesting the feasibility of global eradication of measles (8).

In Sudan, several measles outbreak were reported before introducing the vaccine in 1985, and measles was considered as one of the morbidity and mortality cause among under five years, after starting measles elimination strategies in 2004, dramatically decreasing of morbidity and mortality of measles cases were reported because of conducting SIAs and increasing in routine immunization activities. During 2004, 2005 the number of cases were 10131, 1374, while only 228 cases were reported in 2006 (95% reduction from 2004) .Sudan also experienced several outbreaks in different regions because of accumulation of susceptible population (9).

1.2 Problem statement

Measles elimination is the situation in a large geographical area in which endemic transmission of measles has stopped and sustained transmission does not occur following the occurrence of an imported cases, the other definition is the status of measles elimination is best summarized by evaluation of the effective reproduction number R; maintaining $R < 1$ is necessary and sufficient to achieve elimination (10). WHO also defined measles elimination as (Measles elimination is defined as the absence of endemic measles cases for a period of >12 months, in the presence of adequate surveillance. One indicator of measles elimination is a sustained measles incidence of <1 case per million population) (11).

While measles is now rare in many industrialized countries, it remains a common illness in many developing countries. Globally, more than 30 million people are affected each year by measles. In 2004, an estimated 454,000 measles deaths occurred globally; this translates to more than 1,200 deaths every day or 50 people dying every hour from measles. The overwhelming majority (more than 95%) of measles deaths occur in countries with per capita gross national income of less than US $1,000. In countries where measles has been largely eliminated, cases imported from other countries remain an important source of infection.

The WHO/UNICEF Measles Mortality Reduction and Regional Elimination Strategic Plan, 2001-2005 outlines the following strategies for reducing measles mortality:-

providing the first dose of measles vaccine to successive cohorts of infants95%

Ensuring that all children have a second opportunity for measles vaccination95%

Enhancing measles surveillance with integration of epidemiological and laboratory information;

Improving the management of every measles case (12).

Achieving measles elimination in countries depends on having high quality SIAs, improvements in routine immunization, and good surveillance in place. In addition, an assumption was made that case importation would decrease. Thus, the incremental costs of achieving elimination were associated with the costs of improving the quality of SIAs, routine immunization and surveillance. The costs of increasing routine immunization coverage and finding harder-to-reach cases were assumed to be increasing and the rate of increase is greater at higher levels of coverage. In addition, costs per dose of SIAs are assumed to increase by approximately $0.01 per additional percentage of coverage. These increasing costs are not so high as to make eradication economically unattractive

(13).

Reaching the measles elimination goal by the target date of 2010 will require high-level political commitment to increase and sustain at high levels 2-dose MCV coverage among children and, where necessary, implement SIAs to reduce measles susceptibility among older cohorts (14)

The resources provided by the Measles Initiative partners have been pivotal in priority countries that had the highest burden of measles in 2000. The Initiative secures the financial resources required to implement activities through joint resource mobilization efforts. In 2009, the Initiative provided more than US$ 20 million for measles campaigns and surveillance in 32 countries. Since its inception, over US$ 693 million has been devoted to measles control through the Initiative (15).

In Sudan, Measles considered the third cause of infant mortality and the first cause of mortality among vaccine preventable diseases. Prior the introduce of vaccine in 1985,the country experienced nationwide outbreaks on a regular basis of 50 to 75000 cases and 1500 to 30000 death annually .there has been considerable decrease in disease incidence as vaccination coverage has increased .approximately 40% of patient with acute disease are in the age group between 5 to 15 years of age (16).

1.3 Rationale

The rationale of this study is, measles elimination considered as one of the WHO priorities for elimination by 2015 and the present study aim to assess elimination activities and no previous study has done in alhsaheissa locality.

1.4 Objectives

1.4.1General objective

To assess Measles Elimination Criteria in alhsaheissa district, algazira State Sudan 2015-2017

1.4.2 Specific objectives are:

1/ To assess Measles coverage vaccine first dose (MCV1) and second dose (MCV2).

2/ To determine socio-economic factors limiting immunization of measles vaccine.

3/ To measure measles surveillance performance criteria according to WHO standards

Chapter Tow

Literature review

Chapter Tow

2.Literature review

2.1 Introduction

Measles is an acute viral disease caused by a paramyxovirus of the genus Morbillivirus. Symptoms include fever, cough, runny nose, red eyes and a generalized maculopapular erythematous rash. It is spread by respiratory system contact with fluids from an infected person's nose and mouth by either droplet (coughing or sneezing) or aerosol transmission. Although a vaccine has been available since 1959, measles remains an important cause of morbidity and mortality in children, particularly in developing countries where more than 95% of measles-associated deaths occur. Measles vaccination efforts have achieved major public health gains, resulting in a 74% decline in measles deaths worldwide between 2000 and 2007 from an estimated 750, 000 to 197, 000, with a decline of about 90% in the eastern Mediterranean and sub-Saharan African regions (17).

Measles is an important public health concern during disasters involving massive population displacements who end up living in camps. The World Health Organization (WHO) recognizes refugees as one of the high-risk groups for measles outbreaks. Several outbreaks have been reported among refugees and other emergency settings due to their characteristic massive population displacements, overcrowding, high population densities and low vaccination coverage. Overcrowding is associated with the transmission of higher infectious doses of measles virus, resulting in more severe cases of clinical disease, which makes measles more often the leading cause of mortality among children in refugee populations (18).

If moderate immunization coverage results in low numbers of cases, the extra resources to reach elimination may seem hard to justify. However, with only moderate coverage, there will eventually be a large measles epidemic through the build up of susceptible. Such epidemics are likely to have a disproportionate impact because health services are no longer used to deal with measles, and there will be many cases and a greater proportion of cases will be in older children and young adults. It is clear that elimination is the only

Appropriate option (unless one accepts pre-vaccine measles morbidity and mortality).

Global measles mortality has decreased by 78% from an estimated 733,000 deaths in 2000 to an estimated 164,000 deaths in 2008. Even the current reduced rate of 450 deaths a day, 300 of which occur in India, is still hundreds too many, however, for a disease that can easily be prevented (19).

2.2 Measles epidemiology

2.2.1 Infectious agent

The measles virus is a paramyxovirus, genus Morbillivirus. It is 120–250 nm in diameter, with a core of single-stranded RNA, and is closely related to the rinderpest and canine distemper viruses. Two membrane envelope proteins are important in pathogenesis. They are the F (fusion) protein, which is responsible for fusion of virus and host cell membranes, viral penetration, and hemolysis, and the H (hemagglutinin) protein, which is responsible for adsorption of virus to cells.

There is only one antigenic type of measles virus. Although studies have documented changes in the H glycoprotein, these changes do not appear to be epidemiologically important (i.e., no change in vaccine efficacy has been observed). (20)

2.2.2 occurrence

Measles is one of the leading causes of death among young children even though a safe and cost-effective vaccine is available.

In 2015, there were 134 200 measles deaths globally – about 367 deaths every day or 15 deaths every hour.

Measles vaccination resulted in a 79% drop in measles deaths between 2000 and 2015 worldwide.

In 2015, about 85% of the world's children received one dose of measles vaccine by their first birthday through routine health services – up from 73% in 2000.
During 2000-2015, measles vaccination prevented an estimated 20.3 million deaths making measles vaccine one of the best buys in public health.
Measles is a highly contagious, serious disease caused by a virus. In 1980, before widespread vaccination, measles caused an estimated 2.6 million deaths each year.
The disease remains one of the leading causes of death among young children globally, despite the availability of a safe and effective vaccine. Approximately 134 200 people died from measles in 2015 – mostly children under the age of 5.
Measles is caused by a virus in the paramyxovirus family and it is normally passed through direct contact and through the air. The virus infects the respiratory tract , then spreads throughout the body. Measles is a human disease and is not known to occur in animals.
Accelerated immunization activities have had a major impact on reducing measles deaths. During 2000-2015, measles vaccination prevented an estimated 20.3 million deaths. Global measles deaths have decreased by 79% from an estimated 651 600 in 2000* to 134 200 in 2015 (21)

In developing countries with low vaccination coverage, epidemics often occur every two to
three years and usually last between two and three months, although their duration varies
according to population size, crowding, and the population's immune status. Outbreaks last
longer where family size, and hence the number of household contacts, is large. In the absence
of measles vaccination, virtually all children will have been infected with measles by the time
they are 10 years old . (22)

2.2.3Transmission

Measles is a highly contagious virus that lives in the nose and throat mucus of an infected person. It can spread to others through coughing and sneezing. Also, measles virus can live for up to two hours in an airspace where the infected person coughed or sneezed. If other people breathe the contaminated air or touch the infected surface, then touch their eyes, noses, or mouths, they can become infected. Measles is so contagious that if one person has it, 90% of the people close to that person who are not immune will also become infected .Infected people can spread measles to others from four days before through four days after the rash appears .Measles is a disease of humans; measles virus is not spread by any other animal species. (23)

2.2.4 Signs and Symptoms

The symptoms of measles generally appear about seven to 14 days after a person is infected.

Measles typically begins with

- high fever,
- cough,
- runny nose (coryza), and
- red, watery eyes (conjunctivitis).

Two or three days after symptoms begin, tiny white spots (Koplik spots) may appear inside the mouth. (24)

Women infected while pregnant are also at risk of severe complications and the pregnancy may end in miscarriage or preterm delivery. People who recover from measles are immune for the rest of their lives

2.2.5. Reservoir

Humans are the only natural hosts of measles virus. Although monkeys may become infected, transmission among them in the wild does not appear to be a mechanism by which the virus persists in nature.

2.2.6. Incubation period

The incubation period is approximately 10–12 days from exposure to the onset of fever and other unspecific symptoms, and 14 days (with a range of 7–18 days, and, rarely, as long as 19–21 days) from exposure to the onset of rash.

2.2.7 Temporal Pattern

In temperate areas, measles disease occurs primarily in late winter and spring (25)

some study shows that the disease could spread through all the years' seasons but more so in winter and spring months (26).

2.2.8 Communicability

Measles is a highly contagious, serious disease caused by a virus. In 1980, before widespread vaccination, measles caused an estimated 2.6 million deaths each year.

It remains one of the leading causes of death among young children globally, despite the availability of a safe and effective vaccine. Approximately 122 000 people died from measles in 2012 – mostly children under the age of five. (27)

2.2.9 Risk of travellers

Travellers who are not fully immunised against measles are at risk when visiting countries or areas where vaccine coverage in complete .special attention must be paid to children and adolescent /young adult travellers who have not received two doses of measles vaccine (28) .

2.2.10 Treatment

No specific antiviral treatment exists for measles virus. Severe complications from measles can be avoided through supportive care that ensures good nutrition, adequate fluid intake and treatment of dehydration with WHO-recommended oral rehydration solution. This solution replaces fluids and other essential elements that are lost through diarrhoea or vomiting. Antibiotics should be prescribed to treat eye and ear infections, and pneumonia .All children diagnosed with measles should receive two doses of vitamin A supplements, given 24 hours apart. This treatment restores low vitamin A levels during measles that occur even in well-nourished children and can help prevent eye damage and blindness. Vitamin A supplements have been shown to reduce the number of deaths from measles by 50% (29)

2.2.11Prevention

Routine measles vaccination for children combined with mass immunization campaigns in countries with high case and death rates are key public health strategies to reduce global measles deaths. The measles vaccine has been in use for over 50 years. It is safe, effective and inexpensive. It costs approximately one US dollar to immunize a child against measles. The measles vaccine is often incorporated with rubella and/or mumps vaccines. It is equally effective in the single or combined form. Adding rubella to measles vaccine increases the cost only slightly, and allows for shared delivery and administration costs.

In 2016, about 85% of the world's children received 1 dose of measles vaccine by their first birthday through routine health services – up from 72% in 2000. Two doses of the vaccine are recommended to ensure immunity and prevent outbreaks, as about 15% of vaccinated children fail to develop immunity from the first dose. (29)

2.3 Changing epidemiology

Since the introduction of effective measles vaccines, the epidemiology of measles has changed in both developed and developing countries. As vaccine coverage has increased, there has been a marked reduction in measles incidence; and, with decreased measles virus circulation, the average age at which infection occurs has increased (30).

Even in areas where vaccine coverage rates are high, outbreaks may still occur. Periods of low incidence (the “honeymoon” effect) may be followed by a pattern of periodic measles outbreaks, with an increase in the number of years between epidemics. Outbreaks are generally due to the accumulation of persons susceptible to measles virus, including both unvaccinated persons and those who were vaccinated but failed to seroconvert. Approximately 15% of children vaccinated at 9 months of age and 5%–10% of those vaccinated at 12 months of age fail to seroconvert, and are thus not protected after vaccination.

After the introduction of measles vaccine during the 1960s, countries that had achieved high vaccine coverage experienced a 98% or greater reduction in the number of reported cases. However, periodic measles epidemics continued to occur, especially in large urban areas. These outbreaks occurred primarily among unvaccinated preschool- aged children, but cases and outbreaks were also reported among fully vaccinated school-aged children.

For instance, unvaccinated infants and preschool-aged children were at greatest risk for measles infection during the 2001–2002 outbreaks that occurred in Venezuela. Cases among older children and adults also occurred and likely involved those individuals who had not been vaccinated and had previously escaped natural measles infection because of decreasing measles incidence. Since measles vaccine is less than 100% effective, vaccinated individuals might also have contracted measles.

In large urban areas, even where measles vaccine coverage is high, the number of susceptible infants and children may still be sufficient to sustain transmission. Conditions such as high birth rates, overcrowding, and the influx of large numbers of susceptible children from rural areas can facilitate measles transmission.

In areas where measles remains endemic, a large proportion of cases occur in children aged less than 1 year, an age group that also has the highest age-specific measles case-fatality rates. In those areas, only a brief period (or “window of opportunity”) exists between the waning of maternal antibody and children’s exposure to circulating measles virus (31).

Outbreak investigations are important for measles control because studying outbreak epidemiology, in addition to studying individual measles cases, helps to understand patterns of measles virus transmission including who is susceptible and in which settings the disease spreads. This information is essential for refining strategies for measles prevention. Results of outbreak epidemiology strengthen the evidence for the absence of endemic transmission of measles along 4 lines of reasoning. First, actively searching for cases in response to the report of a single case contributes to the credibility of the data on measles incidence. When small outbreaks are identified, confidence increases in the system's ability to detect large outbreaks if they occurred (32).

2.4 Measles in Adults:

Although measles usually is considered a childhood disease, people of any age can get it. In the, most cases are in unvaccinated infants, children, and teens. Adults at increased risk include college students, international travellers, and health care personnel (33).

Secondary failure of measles vaccine is a reason of measles outbreaks in young and adult population that is caused by decreasing anti measles antibody in the course of time. Secondary failure predisposes adults to measles infection if they have not been sub-clinically infected or have not had contact with measles virus before (34).

Measles infection or susceptibility in adults has serious consequences for children. First, infected adults are unable to work and could not adequately care for their children for a median of 15 days. Second, infected adults transmitted measles virus to susceptible children. Third, susceptible mothers could not confer protective anti-measles virus antibodies to new born children, leaving them vulnerable to measles infection from their parents, siblings or other close contacts (35).

A vacation period and an immunization campaign limited the spread of measles within the schools but could not prevent further spread among unvaccinated family members.

It was necessary to raise clinicians' awareness of measles since it had become a rare, less known disease and went undiagnosed (36) .

A routine second dose of MMR vaccine, administered a minimum of 28 days after the first dose, is recommended for adults who: are students in postsecondary educational institutions; work in a health care facility; or Plan to travel internationally.

Persons who received inactivated (killed) measles vaccine or measles vaccine of unknown type during 1963–1967 should be revaccinated with 2 doses of MMR vaccine (37).

2.5 Risk factors for measles virus infection

Unvaccinated young children are at highest risk of measles and its complications, including death. Unvaccinated pregnant women are also at risk. Any non-immune person (who has not been vaccinated or was vaccinated but did not develop immunity) can become infected. (38)

People at high risk for severe illness and complications from measles include:

Infants and children aged <5 years

Adults aged >20 years

Pregnant women

People with compromised immune systems, such as from leukemia and HIV infection. (39)

Children at greatest risk of developing severe complicated measles include:

The young, particularly those who are under one year of age.

the malnourished (children with Marasmus or kwashiorkor)

Those living in overcrowded situations (e.g. the urban poor, refugee camps) where they may be exposed to a high load of virus.

Those whose immunity (the body's defence mechanism against infections) is affected, such as children with HIV infection, malnutrition or malignancyThose who are vitamin A-deficient (40).

2.6 Differential diagnosis

Regarding case-finding activity, many conditions produce rash syndromes that could be measles—for example, rubella, scarlet fever, dengue fever, and drug reactions. Although the incidences of these illnesses vary over time and by location, some level of diagnostic activity or investigation of measles like illness (MLIs) should be occurring regardless of the incidence of measles itself, and this activity can serve as a measure of case-finding effort (41)

And the early stages of chickenpox in the differential diagnosis. Moreover, there are other conditions that may present in a similar form, including erythema infectious (fifth disease), enterovirus or adenovirus infections, Kawasaki's disease, toxic shock syndrome, rickettsial diseases, and drug hypersensitivity reactions.

Modified forms of measles, with generally mild symptoms, may occur in infants who still have partial protection from maternal antibody, and occasionally in persons who only received partial protection from the vaccine. Atypical forms may occur in persons who were vaccinated with a formalin-inactivated (killed) vaccine, but such a vaccine has not been used since the mid-1960s. Case-based reporting and laboratory confirmation of every suspected case is fundamental for monitoring measles virus during the elimination phase. Regarding case-finding activity, many conditions produce rash syndromes that could be measles—for example, rubella, scarlet fever, rosella, dengue fever, and drug reactions.

Although the incidences of these illnesses vary over time and by location (41).

Children aged less than 5 years and adults over 20 years of age are at greater risk of serious complications; malnutrition and immunodeficiency disorders also increase that risk. It was estimated that among the cases reported in the United States between 1987 and 2000, diarrhea occurred in 8% of cases, otitis media in 7%, and pneumonia in 6%. Overall, 29% of the cases had some type of complication (42).

Respiratory infections.. Pneumonia is the most common severe complication from measles and is associated with the greatest number of measles-related deaths. It may be due to the measles virus alone or to secondary infection with adenoviruses or bacterial organisms (42).

Diarrhea and malnutrition. Diarrhea may develop both during and following acute measles illness, and is an important component of the burden caused by measles for children in developing countries. Measles infection is more severe among children who are already malnourished,. Under nutrition may lead to or worsen vitamin A deficiency and keratitis, resulting in a high incidence of childhood blindness following measles outbreaks (42).

Neurological complications. These occur in 1 to 4 of every 1,000 infected children. The most common manifestation is febrile seizures, which are not usually associated with persistent residual sequelae. Post infectious encephalomyelitis occurs a few days after rash onset in 1 to 3 of every 1,000 infected persons, especially in adolescents and adults. It may develop several years after a measles infection (42).

Case-fatality. In industrialized countries, the case-fatality rate for measles is approximately 1 per 1,000 reported cases. In developing countries, the case-fatality rate has been estimated at between 3% and 6%; the highest case-fatality rate occurs in infants 6 to 11 months of age, with malnourished infants at greatest risk. These rates may underestimate the true lethality of measles because of incomplete reporting of outcomes of measles illness, such as deaths related to chronic diarrhea that occur after the acute illness has passed. In addition, some deaths may be missed when death certificates are miscoded or hospital records are incomplete. In certain high-risk populations, case-fatality rates as high as 20% or 30% have been reported in infants aged less than 1 year. Young age, crowding, underlying immunodeficiency, vitamin A deficiency, and lack of access to medical care are all factors leading to the high case-fatality rates observed in developing countries (42).

Measles has been hypothesized to cause or contribute to multiple sclerosis, but available evidence is weak and inconclusive. Measles or measles vaccines have been suggested to contribute to or induce autism (43) .

In addition to standard precautions, hospitalized patients should be cared for using airborne precautions until 4 days have passed since the onset of the rash (or for the duration of illness if the patient is immunocompromised) (44).

2.7 Measles vaccines

Measles can be prevented with MMR vaccine. The vaccine protects against three diseases: measles, mumps, and rubella. CDC recommends children get two doses of MMR vaccine, starting with the first dose at 12 through 15 months of age, and the second dose at 4 through 6 years of age. Teens and adults should also be up to date on their MMR vaccination.

The MMR vaccine is very safe and effective. Two doses of MMR vaccine are about 97% effective at preventing measles; one dose is about 93% effective.

Children may also get MMRV vaccine, which protects against measles, mumps, rubella, and varicella (chickenpox). This vaccine is only licensed for use in children who are 12 months through 12 years of age.

Before the measles vaccination program started in 1963, an estimated 3 to 4 million people got measles each year in the United States. Of these, approximately 500,000 cases were reported each year to CDC; of these, 400 to 500 died, 48,000 were hospitalized, and 1,000 developed encephalitis (brain swelling) from measles. Since then, widespread use of measles vaccine has led to a greater than 99% reduction in measles cases compared with the pre-vaccine era. However, measles is still common in other countries. Unvaccinated people continue to get measles while abroad and bring the disease into the United States and spread it to others. (45)

2.8 Measles Elimination in Africa

In 2003, the World Health Assembly endorsed a global goal to reduce measles mortality by 50% by 2005, compared with the mortality in 1999. Through measles control strategies that included increasing routine immunization coverage and mass vaccination campaigns, the goal was achieved, and a new goal was established to achieve 90% reduction by 2010, compared with the mortality in 2000.

The WHO recommended strategy for measles control in Africa, established in 2001, includes the following components:

Increasing routine vaccination coverage with the first dose of measles-containing vaccine (MCV1) for all children,

Providing a second dose of MCV to be given through supplemental immunization activities (SIAs),

Improving measles case management, and Establishing case-based surveillance with laboratory confirmation for all suspected measles cases (43).

The SIA improved both coverage and equity, achieving significantly higher coverage in all provinces with routine measles vaccination coverage less than 80%, reached a large percentage of zero-dose children in these provinces, and reached more children belonging to the poorest households (46).

During 2001–2008, routine measles vaccination coverage in Africa increased from 54% to 73%, and approximately 400 million children were vaccinated during SIAs, resulting in a decrease in estimated measles mortality from 395,000 deaths in 2000 to

28,000 in 2008, a 92% reduction. In 1999, as part of the measles mortality reduction strategy, case-based surveillance with laboratory testing for all suspected measles cases was introduced. By 2009, all African countries except Algeria, Comoros, Guinea Bissau, Mauritius, Sao Tome & Principe, and Seychelles had established measles case-based surveillance in accordance with the WHO African Regional Office measles surveillance guidelines. In 2009, WHO African member states endorsed a goal of .98% reduction in measles mortality by 2012, compared with mortality in 2000 and an additional goal of regional measles elimination by 2020 was adopted (47).

2.9 Measles in Sudan

Sudan is the largest country in Africa, located in the northeast. Measles is an endemic disease in Sudan. It is the third common cause of childhood deaths, preceded by gastroenteritis and non-specific fever. The incidence of the disease is greatly underestimated due to the general instability of the population; influx of immigrants from other countries, and the spread of wrong beliefs of not taking measles patients to hospitals. In 2001 the number of reported measles cases in Sudan was 4362. These reported incidence rates are all hospital-based and do not reflect the real incidence in the community.

A number of epidemiological studies involving the morbidity rates and age of infection have been carried out in different parts of Sudan. These showed that most measles cases occur during the first five years of life. A community-based study was performed in a suburban area in Khartoum, and showed a seasonal pattern in Measles virus infection with incidence rates peaking during winter. The risk factors predisposing to severe disease were found to include malnutrition, poverty, overcrowding and poor sanitation (48) .

The most common long-term measles complications in Sudan are eye lesions, pneumonia and otitis media. Measles cases in Sudan are only clinically diagnosed as no serological or virological assays are performed at the community health care units or hospitals. In many cases patients with measles have no access to medical treatment (48).

The live attenuated Schwarz vaccine was introduced in Sudan in the late 1970s. In 1985 the Ministry of Health introduced countrywide measles vaccination at 9 months of age, through the expanded Programme of immunization (EPI) services. This resulted in a remarkable reduction in the incidence of measles. Despite these extensive efforts, low vaccination coverage and high incidences of vaccine failure were reported. Vitamin A supplementation in the early course of infection was found to reduce the frequency of complications and mortality and proved to enhance recovery from complications. Vitamin A is thus therapeutically administered to measles cases reporting to hospitals and health canters. (48).

2.10 Measles elimination program in Sudan

Measles is third cause of infant mortality in Sudan and the first cause of mortality among vaccine preventable diseases. Prior the introduce of vaccine in 1985,the country experienced nationwide outbreaks on a regular basis of 50 to 75000 cases and 1500 to 30000 death annually .there has been considerable decrease in disease incidence as vaccination coverage has increased .approximately 40% of patient with acute disease are in the age group between 5 to 15 years of age (16).

In order to achieve the global and regional measles elimination target ,EPI program in collaboration with WHO,CDC and UNICEF has develop the national measles mortality reduction plan in 2003,the plan has been implemented in four phases ,the storages of this plan included :-

Keep up routine infant immunization program above 95%.

Provision of second opportunity of measles immunization 95%.

One time catch-up campaign targeting children from 9 month to 15 years.

A flow-up campaign 4-5 years later targeting the cohort of fewer than five borne after the first catch-up campaign (16)

2.11 Measles surveillance

2.11.1Surveillance objectives

Surveillance is ongoing systematic collection, analysis, and interpretation of outcome-specific data for use in planning, implementation, and evaluation of public health practice. Disease surveillance is a critical component of measles control and elimination efforts and is used in the assessment of progress and in making adjustments to programmers as required. (12)

2.11.2 Surveillance data are essential for:

describing the characteristics of measles cases in order to understand the reasons for the occurrence of the disease and develop appropriate control measures; · predicting potential outbreaks and implementing vaccination strategies in order to prevent outbreaks; · monitoring progress towards achieving disease control and elimination goals; · providing evidence that, in countries with low measles incidence, the absence of reported cases is attributable to the absence of disease rather than to inadequate detection and reporting.

Surveillance and its objectives should evolve according to the stage of measles control.

The principal uses of data for decision-making are as follows. (12)

At the mortality reduction stage:

monitoring incidence and coverage in order to assess progress (i.e. decreasing incidence and increasing coverage); · identifying areas at high risk or with poor programme performance; · describing the changing epidemiology of measles in terms of age, immunization status and the intervals between epidemics. (12)

At the low incidence or elimination stage:

identifying high-risk populations

determining when the next outbreak may occur because of a build-up of susceptible persons, and accelerating activities beforehand;

determining where measles virus is circulating or may circulate (i.e. high-risk areas);

· assessing the performance of the surveillance system (e.g. reaction time for notification, specimen collection) in the detection of virus circulation or potential importation;

using performance indicators to identify areas where it is necessary to strengthen surveillance. (12)

At both stages:

· detecting and investigating outbreaks so as to ensure proper case management, and determining why outbreaks have occurred (e.g. failure to vaccinate, vaccine failure, accumulation of susceptible persons).

In general, surveillance lags behind vaccination efforts in most programmes for the control of vaccine-preventable diseases. Effective vaccination strategies can quickly reduce disease incidence, whereas establishing a surveillance system takes time and changing surveillance practices is difficult. Countries should therefore develop and follow long-term measles control strategies providing a surveillance system that can respond to changes in the incidence of the disease.

In the interest of improving vaccination systems that aim to control and eliminate measles it is also vital to monitor the cold chain and immunization safety, including injection safety and adverse events following immunization. However, the present document deals exclusively with disease surveillance. (12)

2.11.3 Monitoring the accumulation of susceptible persons

The aim of a vaccination programme is to reduce the number of susceptibles and to ensure that low levels of susceptibility are maintained thereafter. The susceptibility profile describes the distribution of susceptibility to measles within a population. It will vary by age and by population sub-group (e.g., ethnic or social group). Before a new vaccination programme is launched the age specific susceptibility profile should be established. In particular, vaccination campaigns can only be targeted effectively if the distribution of susceptible individuals in the population is known.

There are 3 methods to assess the susceptibility profile of a population, availability of surveillance data is important for the last two methods:

Serological surveys.

The most direct way to estimate the susceptibility profile is through an age stratified serological survey, interpreting samples negative for measles IgG antibody as susceptible to measles

Alternative methods

using vaccine coverage and incidence data. For a healthcare system with limited resources other methods of estimating the susceptibility profile can be used. These rely upon routine vaccine coverage and case notification data. In populations with little exposure to natural infection, the proportion susceptible can be estimated from age-specific data on vaccination status (proportions who have received no dose, one dose only, and two doses) and vaccination effectiveness.

Mathematical models.

Mathematical models simulate measles transmission in a population and those simulations can be used to determine the susceptibility profile. (12)

2.11. 4 Performance indicators Target

% of weekly reports received	≥ 80%
% of cases notified ≤ 48 hours after rash onset	≥ 80%
% of cases investigated with house visit ≤ 48 hours after notification	≥ 80%
% of cases with adequate specimen and laboratory results within 7 days	≥ 80%
% of confirmed cases with source of infection identified	≥ 80%

2.11.5 Principal uses of data for decision-making

Monitor incidence and coverage to assess progress (i.e. decreasing incidence and increasing coverage) and identify areas at high risk or with poor Programme performance. Describe the changing epidemiology of measles in terms of age, immunization status and interepidemic period. Assist in determination of optimal age groups to be targeted by second opportunity for measles vaccination (including mass vaccination campaigns).

Low-incidence or elimination phase: Identify chains of transmission. Monitor the epidemiology (age groups at risk, inter epidemic period, immunization status) of measles and accelerate immunization activities accordingly to avert potential outbreaks.

2.11.6 Special aspects

While IgM ELISA tests are more sensitive between days 4 and 28 after the onset of rash, a single serum sample obtained at the first contact with the health care system within 28 days after onset is considered adequate for measles surveillance.

If the case has been vaccinated within six weeks before serum collection, if an active search in the community does not find evidence of measles transmission and there is no history of travelling to areas where measles virus is known to be circulating, the case should be discarded (49).

2.12 WHO Response

In 2010, the World Health Assembly established 3 milestones towards the future eradication of measles to be achieved by 2015:

increase routine coverage with the first dose of measles-containing vaccine (MCV1) by more than 90% nationally and more than 80% in every district or equivalent administrative unit for children aged 1 year;

reduce and maintain annual measles incidence to less than 5 cases per million; and

reduce estimated measles mortality by more than 95% from the 2000 estimate.

By 2015, the global push to improve vaccine coverage resulted in a 79% reduction in deaths. During 2000-2015, with support from the Measles & Rubella Initiative and Gavi, the Vaccine Alliance, measles vaccination prevented an estimated 20.3 million. During 2015, about 183 million children were vaccinated against measles during mass vaccination campaigns in 41 countries. All WHO Regions have now established goals to eliminate this preventable killer disease by 2020 (50)

2.13 Global Measles and Rubella Strategic Plan 2012-2020

In 2012, the M&R Initiative launched a new Global Measles and Rubella Strategic Plan which covers the period 2012-2020. The Plan provides clear strategies for country immunization managers, working with domestic and international partners, to achieve the 2015 and 2020 measles and rubella control and elimination goals.

By the end of 2015 the plan aims:

to reduce global measles deaths by at least 95% compared with 2000 levels;

to achieve regional measles and rubella/congenital rubella syndrome (CRS) elimination goals.

By the end of 2020 the plan aims:

to achieve measles and rubella elimination in at least 5 WHO regions.

Global Measles and Rubella Strategic Plan 2012-2020, 1.39Mb

Based on current trends of measles vaccination coverage and incidence and the report from the mid-term strategy review, the WHO Strategic Advisory Group of Experts on Immunization (SAGE) concluded that the 2015 global milestones and measles elimination goals were not achieved because immunization coverage gaps persist. SAGE recommends an increased focus on improving immunization systems in general to ensure that the gains made thus far in measles control can be sustained.

WHO will continue to strengthen the global laboratory network to ensure timely diagnosis of measles and track international spread of the measles viruses to allow more coordinated approach in targeting vaccination activities and reduce measles deaths from this vaccine-preventable disease.

* Mortality estimates for 2000 might be different from previous reports. When WHO and UNICEF rerun the model used to generate estimated measles deaths each year with new WHO/UNICEF Estimates of National Immunization Coverage (WUENIC) data, as well as updated surveillance data, adjusted results for each year, including the baseline year, are also produced and updated. (50)

2.14 Previous Study

1.A study on Impact of Measles Elimination Activities on Immunization Services and Health Systems in Six Countries (: Bangladesh, Brazil, Cameroon, Ethiopia, Tajikistan, and Vietnam.)

during 2011 was done by P. Hanvoravongchai, S. Mounier-Jack, V. Oliveira Cruz, D. Balabanova, R. Biellik, Y. Kita

w, T. Koehlmoos,

S. Loureiro, M. Molla, H. Nguyen, P. Ongolo-Zogo, U. Sadykova, H. Sarma, M. Teixeira, J. Uddin, A. Dabbagh,and U. K. Griffiths.

Background. One of the key concerns in determining the appropriateness of establishing a measles eradication goal is its potential impact on routine immunization services and the overall health system. The objective of this study was to evaluate the impact of accelerated measles elimination activities (AMEAs) on immunization services and health systems in 6 countries: Bangladesh, Brazil, Cameroon, Ethiopia, Tajikistan, and Vietnam.

Methods. Primary data were collected from key informant interviews and staff profiling surveys. Secondary data were collected from policy documents, studies, and reports. Data analysis used qualitative approaches.

Results. This study found that the impact of AMEAs varied, with positive and negative implications in specific immunization and health system functions. On balance, the impacts on immunization services were largely positive in Bangladesh, Brazil, Tajikistan, and Vietnam, while negative impacts were more significant in Cameroon and Ethiopia.

Conclusions. they conclude that while weaker health systems may not be able to benefit sufficiently from AMEAs, in more developed health systems, disruptions to health service delivery are unlikely to occur. Opportunities to strengthen the routine immunization service and health system should be actively sought to address system bottlenecks in order to incur benefits to eradication program itself as well as other health priorities.

2/ A study on assessment of measles elimination surveillance system was done by (Dawria, Adam, Khadiga, Haroon, Ahmed, M.Hussein, Suleman Alkamil)was carried out during 2012- 2013 in Ombada Locality to assess measles surveillance system in Ombada Locality, to evaluate the monitoring and supervisory visits conducted by the staff of the health centers. To evaluate the knowledge of focal persons, doctors, surveillance officers and lap technicians, assess the quality indicators in reporting sites, and to assess reporting system structure. All the (92) health centers were included in the study also the surveillance sites (4) and the locality officer.

The study found that the weekly reports were 100% timely and complete, also guidelines, sampling equipment's and surveillance forms are available in surveillance sites. The documentation of active visit was (100%) for three years and this in centers of high and medium priorities. Measles cases were not plotted in the locality map. Most of focal persons and surveillance officer received basic training. The surveillance officer also received on the job training. Feedback received by surveillance officer was 100%. The main recommendations were to conduct continuous refresher training courses for surveillance officer, focal persons, doctors and lap technicians. Provide fee back at reporting sites, Provide posters, guidelines and files for reporting documents. Provide suitable means of communication and transports for Locality surveillance officer.

3/ .A study on Assessment of the 2010 global measles mortality reduction goal: results from a model of surveillance data by Emily Simons, Matthew Ferrari, John Fricks, Kathleen Wannemuehler, Abhijeet Anand, Anthony Burton, Peter Strebel Background In 2008 all WHO member states endorsed a target of 90% reduction in measles mortality by 2010 over 2000 levels. We developed a model to estimate progress made towards this goal.

Methods We constructed a state-space model with population and immunization coverage estimates and reported surveillance data to estimate annual national measles cases, distributed across age classes. We estimated deaths by applying age-specific and country-specific case-fatality ratios to estimated cases in each age-country class.

Findings Estimated global measles mortality decreased 74% from 535 300 deaths (95% CI 347 200–976 400) in 2000 to 139 300 (71 200–447 800) in 2010. Measles mortality was reduced by more than three-quarters in all WHO regions except the WHO southeast Asia region. India accounted for 47% of estimated measles mortality in 2010, and the WHO African region accounted for 36%.Interpretation Despite rapid progress in measles control from 2000 to 2007, delayed implementation of accelerated disease control in India and continued outbreaks in Africa stalled momentum towards the 2010 global measles mortality reduction goal. Intensified control measures and renewed political and financial commitment are needed to achieve mortality reduction targets and lay the foundation for future global eradication of measles.

4. A study on epidemiological surveillance of measles and Germán measles (rubella) within the context of the elimination plan was conducted in Colombia, during 1995-2009, by Lina S. Morón-Duarte , y José O. Castillo- Pabón

The objective were to describing the behavior of epidemiologic surveillance regarding measles and German measles (rubella) to provide evidence about the interruption of the endemic circulation of tríese viruses in Colombia. Methods: This was a rospective descriptive study of epidemiological surveillance for measles and German measles in Colombia from 1995 to 2009 by reviewing available notification information from the measles elimination surveillance system (MESS), the Colombian Public Health surveillance System (SIVIGILA) and the Colombian Statistics Department (DANE) for population projections. Surveillance quality was evaluated by using the indicators proposed for integrated measles and German measles surveillance. Results: 28,732 suspicious cases were notified during the study period (66.15 % concerned measles and 33.8 % German measles). The greatest number of notified cases occurred in 2002 (22.4 %); this was detected in the 6-11 month and 2-4 year-old groups. Confirmed measles cases amounted to 495 (1995-2002) and German measles to 946 (for the whole period). The cumulative average for indicators was as follows: timely research had a pattern below 80.5 %, weekly notification was above 80 %, suitable sampling was 93.7 % on average and sample reception was 65.2 % for 1995-2006 and 83.3 % for 2007-2009. Conclusions :According to the information compiled regarding epidemiological surveillance, Colombia complied with 4 of the 7 proposed indicators for quality evaluation; these showed active surveillance having suitable indicator performance regarding laboratory and notification rate. They demonstrated interrupted endemic circulation of measles and German measles in Colombia.

5. A study on assessment of Measles Surveillance in Iran during 2004-2007 was done by Solange Artimos de Oliveira, Luiz Antonio Bastos Camacho,
Antonio Carlos de Medeiros Pereira, Sérgio Setúbal ,Rita Maria Ribeiro Nogueira,and Marilda Mendonça Siqueira.

The aim of this study was to evaluate measles surveillance in center of Iran. The epidemiological data was collected from immediate telephone reports and follow up results in CDC of deputy of health in Isfahan medical sciences university. 59 suspected cases were reported and only measles in one 2 years Afghanian girl had been confirmed. The incidence rate of suspected cases was 18 per one million under risk population. The average age of cases was 8-8.3 years that varied from 1 to 34 years. Male was more than female and 13.6% of cases were immigrant. One third of patients did not have any previous vaccination. The mean age was different significantly in three years of assessment. Our finding demonstrated that the measles surveillance is effective in Iran and endemic measles have been eliminated in Iran. The measles cases are immigrant from neighbor countries.

Chapter Three

Methodology

Chapter Three

3. Methodology

3.1 Type and duration of the study

The type of this study was a cross- sectional community and facility – based study in alhsaheissa &localities, in the period (Nov 2016 April 2018) to assess measles elimination criteria

3 .2 Study Area

Al-Hassaheisa is a city located in the central island state of Sudan on the west bank of the Blue Nile at a height of 401 meters (1316 feet) above sea level. It is about 121 kilometers (75 miles) north-west, Miles (28 miles), and converged on the eastern bank of the river Rifaa. Al-Hassaheisa is located in a large urban, agricultural and industrial area where the famous Al-gazira project is on the road between East Sudan and Khartoum. Al-Hassaheisa is located on the west bank of the Blue Nile River, along the riverbed on a flat plain with a level surface.

It is characterized by a semi-tropical climate, warm in the summer, which starts in May and lasts until late September. The winter is cold and the temperature drops to 12° C

Al-Hassaheisa is one of the largest industrial cities in the Sudan with a large number of factories in it and distributed to two large industrial areas, the southern industrial zone and the northern industrial zone, and the number of more than 50 factories for various industries, including 6 cotton wipes and a textile factory is the friendship factory for spinning and weaving and flour mills The most important of which are the Goz Kebro flour mill, the yeast factory, as well as other manufacturing industries for the production of oils, feed, soap, sweets and others.

The city is located in the Al-gazira agricultural project. Some of the residents have farms in the project. Others also practice traditional agriculture using flood irrigation in the islands on the Nile and irrigation with pumps. It is an agriculture in Sudan administrative division: the seven administrative units are:

administrative units (Al-Hassaheisa, and wadhbubh, Almuslmya, Abogota, elrabah, Tabat and Almehariba).

the number of villages and neighborhoods and Alknaby: 630

The EPI services are provided by:

1-Fixed site: 24

2- Out reach :174

3- Mobile team: 3

3.3 - Study Population

Demographic and Population Data

Item	Number
Total population	910158
Under 1	31940
1-4 years of age	144533
10 – 14 years	289066
15 and more	379809

Source: Annual immunization plan 2017*

Health Services Basic Information

District	High	Medium	Low	Zero Report
ALHASSAHISA	Hassaheisa Pediatric Hospital	Abu oshar Hospital	Tabat Hospital	Abogota Hospital
	Dr M-Alhassan Clinic		Almasalamia Hospitsl	Alrebi Hospital
	Dr Entesar Alataa Clinic		Wad haboba hospital	Alhadahed Hospital
				Alfreegab Hospital
				Almehariba Hospital
				Fetees Hospital
				Arbagi hospital

1- Children between 9 month to 15 years aged

Two children were selected from each household to evaluate the immunization status by examining the immunization cards or taking histories from caregiver recall, the state of two

groups are:

Child aged from 12 – 23 month during the time of immunization survey were checked to assess MV1 & MV2.(Routine Immunization).

2- Focal persons of Disease surveillance in sentential sites

All surveillance sites of reporting system were selected in this study (universal coverage) it was consisting of

High priority sites

Medium priority sites

Low priority sites

.Community site surveillance

3- EPI & surveillance officers

EPI & surveillance officers at locality level .

EPI & surveillance officer at administrative units ‘level .

Sampling

WHO recommended 30-cluster EPI Coverage survey methodology was followed to assess immunization coverage in this study universal coverage has been taken to cover the surveillance sites .,focal persons and surveillance officers

3.4 Sample size

- Total numbers of 30 clusters were randomly selected from the locality to complete 30 clusters.
- From each cluster we selected 7 children aged (12 – 23 month) for first and second measles doses.

Total converge of sentinel surveillance sites (14 sites) were visited including priority (high, medium &low) and WHO adapted structural questionnaire were used .

- EPI head office and operation officers including the surveillance officer

3.4.1 Sample size

Sample unit	Sample subjects	Note
Household	Children 9Month-24Month	Total of 210
Health Center	High-Medium-Low-	14
	Focal person	14
Health Manager	Surveillance Officer	1

3.4.2 Sample technique

WHO recommended 30-cluster sampling method was followed for the current Study to evaluate the immunization status of the study groups.

A. Selection of the clusters

The catchment areas (Blocks or villages) list was obtained as sampling frame in order to select the 30 clusters for each locality. Then random simple was /will applied to select the 30 cluster from each locality and reserve list was/will devolved to provide option in case of any missing in the cluster like inaccessibility or community rejections.

B. Selection of the households (sample units)

The first house visited in each cluster was/will selected at random using existing listings of household names, official maps, in case of the listing not available the map of the catchment area was used to determine the first house.

Systematic random sample was/will applied for listed the households to select the 7 children for MV1 and 7 children for MV2. The sample interval was obtained by divided the total numbers of households over the number of child intend to select etc:

$$\text{Sample interval} = \frac{\text{total numbers of households in the cluster}}{7(\text{number of sample unit})}$$

In areas where no listing for the households, the sketch map of the area was obtained and divided the catchment area into 4 sectors. Then, Random selection of one sector was applied, the data collectors stand at the center of the sector and spin a bottle/pen and chosen the first house in the direction pointed as the starting point of the survey.

The next or second household was/will select by directing to right side and after count the number of sample interval.

Second households = first household + sample interval

C. Selection of eligible children (sample subjects)

Inclusion criteria:-

Any child aged between 9-23 month (for routine immunization) - living in the study area and took his/her vaccine shot inside the study area.

Exclusion criteria:-

Any child coming from outside the study area and took his /her vaccine shot from outside or partially vaccinated in study area.

Any child has measles vaccine sensitivity disease or has reasons for not completing the course.

Any eligible child hasn't got person to give information about vaccine status during the time of data collecting should be discarded. (Caregiver should the mother, father or any other family members up to 18 years)

3.5 Data collection

Data was collect by WHO adapted Structure questionnaires. Pretesting and Questionnaires validation was apply before the survey. The following four questionnaires and forms were used:

Characteristics of households, mothers and all children aged 9 months through 15 years in each household included in the sample.

Focal persons in sentinel site.

Administrative units EPI operation officer.

Locality EPI operation officer. .

3.6 Data analysis

All data collected from the questionnaires were/ will be coded, checked and cleaned before entering, and analysed by entering to computer using the statistical package for social science programme (SPSS).

3.7 Ethical clearance for the study

The survey conducted in accordance with the national policies on ethics for surveys involving human subjects. The proposal was passed by the faculty of public health and faculty of post graduate in Shendi University. The data collection started after taken consent from Al-Hassaheisa locality health authority, author and children caregiver .information of this study will be disseminated to the health authority in national, state and local level and in addition to published in local and international journals.

3.8 Study Limitation

The study met numbers of limitations .Firstly, unavailability of data about outbreak reports made our investigation about measles epidemiological changes very hard to monitor and we were not able to come out with the result as we plan in study objectives. Secondly, we were considering mother’s recall to determine the history child immunization’s status that it might be as selection bias

Chapter Four

Results

Chapter Four

Results

Table 1 Distribution by Resident site of the study population in alhsaheissa locality 2017

فVariables	Alhsaheissa	%
Rural	154	73.4
Urban	37	17.6
Slum	19	9.0
Total	210	100.0

N = 210

Table 2 Sex of the study population in alhsaheissa locality 2017

Variables	Alhsaheissa	%
Male	97	46.2
Female	113	53.8
Total	210	100.0

N = 210

Table 3: distribution of the Educational level of the mothers in alhsaheissa locality 2017.

Variables	Alhsaheissa	%
Illiteracy	37	17.6
Primary	49	23.3
Secondary	73	34.8
high education	51	24.3
Total	210	100.0

N= 210

Table 4 Income level of the study population in alhsaheissa locality 2017.

Variables	Alhsaheissa	%
High	23	11.0
Medium	153	72.9
Low	34	16.2
Total	210	100.0

N= 210

Table 5 Number of children per household in alhsaheissa locality 2017.

Variables	Alhsaheissa	%
One Child	45	21.4
2-3 Children	93	44.3
4-5 Children	43	20.5
>5 Children	29	13.8
Total	210	100.0

N=210

Table 6 Availability of Immunisation cards among selected children in alhsaheissa locality 2017

Variables	Alhsaheissa	%
Available	173	82.4
Not Available	37	17.6
Total	210	100.0

N=210

Table 7 The reasons of unavailability of immunisation cards among selected children in alhsaheissa locality 2017

Variables	Alhsaheissa	%
Lost	11	30.6
Damage	9	25
Not Received	16	44.4
Total	36	100

N=36

Table 8 The coverage survey of first dose of Measles vaccine among children Aged 12 – 23 months in alhsaheissa locality 2017.

Variables	Alhsaheissa	%
Immunised	200	95.2
Not Immunised	10	4.8
Total	210	100.0

N=210

Figure 1 MCV1record reported coverage 2015-2017 for alhsaheissa locality.

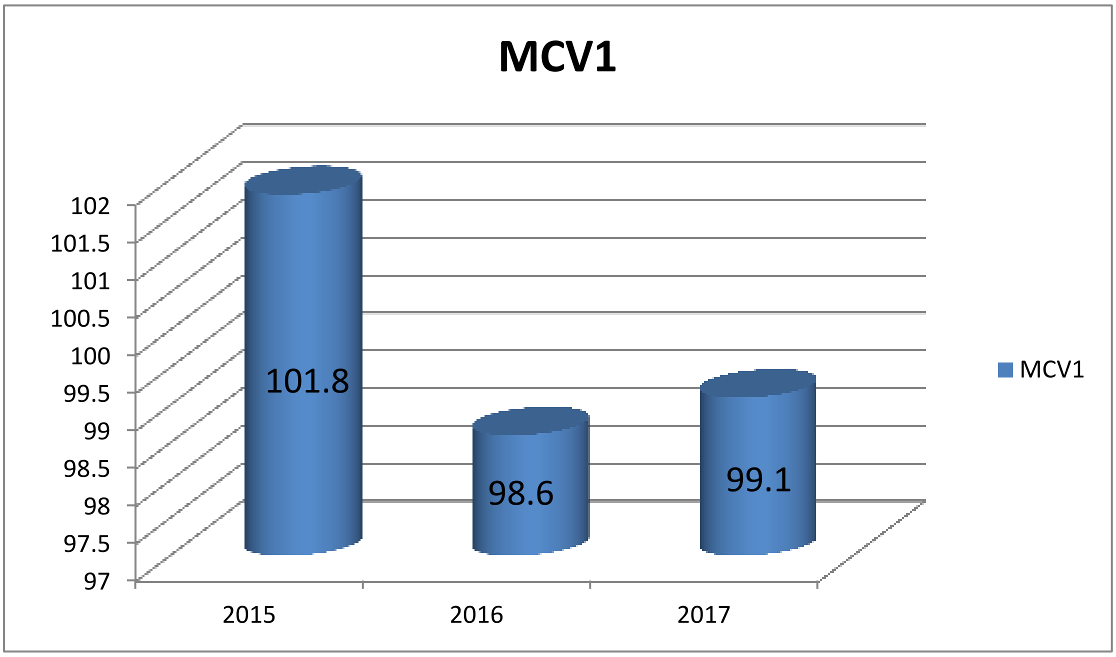

Figure (3) Shows that, MCV1 coverage in alhsaheissa locality is (101.8%) for year 2015, (98.6%) for year 2016 and (99.1%) for year 2017.

Table 9 The reasons of Measles vaccination failure for (MCV1) among the selected children in alhsaheissa locality 2017.

Variables	Frequency	%
Unaware of need for immunization	5	50
Fear of side reactions	1	10
Place of immunization too far	3	30
Vaccinator absent or vaccine not available	1	10
Total	10	100

N=10

Table 10 the Measles second dose immunisation survey coverage among children Aged 18-24 months in alhsaheissa locality 2017.

Variable	Alhsaheissa	%
Immunised	199	94.8
Not Immunised	11	5.8
Total	210	100

N=210

Figure 2 : MCV2 record reported coverage 2015-2017 for alhsaheissa locality.

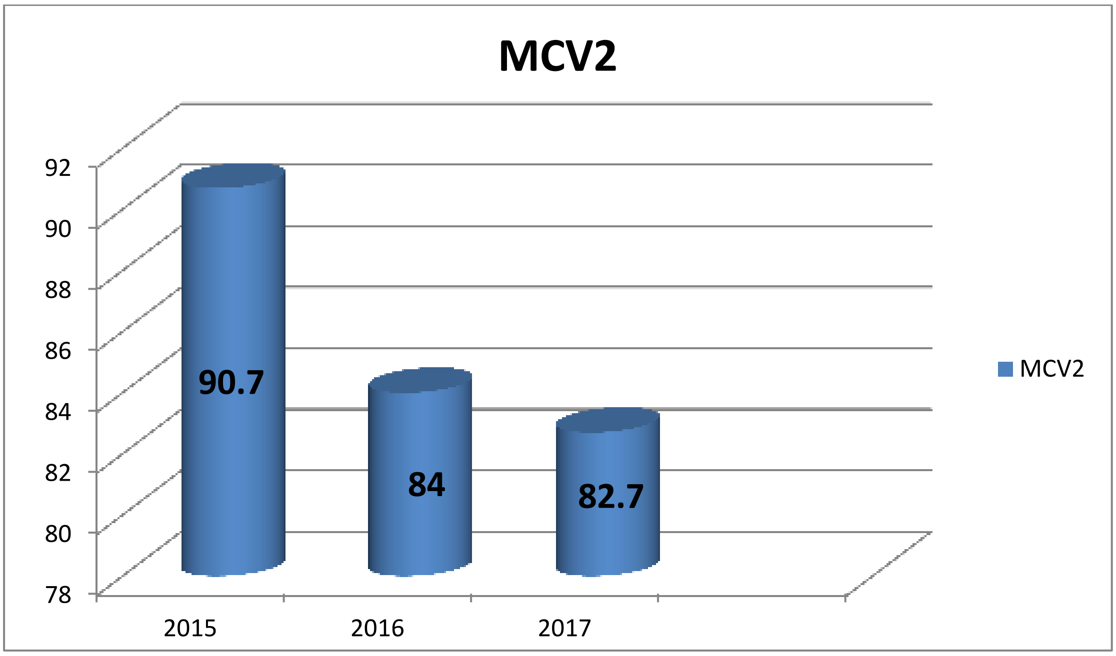

Figure (6) Shows that, MCV2 for alhsaheissa locality (90.7%) for year 2015, (84%) for year 2016 and (82.7%) for year 2017.

Table 11 The reasons of Measles vaccination failure for (MCV2) among the selected children in alhsaheissa locality 2017.

Variables	Frequency	%
Unaware of need for immunization	1	9
Unaware of need to return for 2 nd Dose..	8	73
Fear of side reactions	1	9
Place of immunization too far	1	9
Total	11	100

N=11

Figure 3 The sources of immunisation services distributed according to the EPI strategies in alhsaheissa locality 2017.

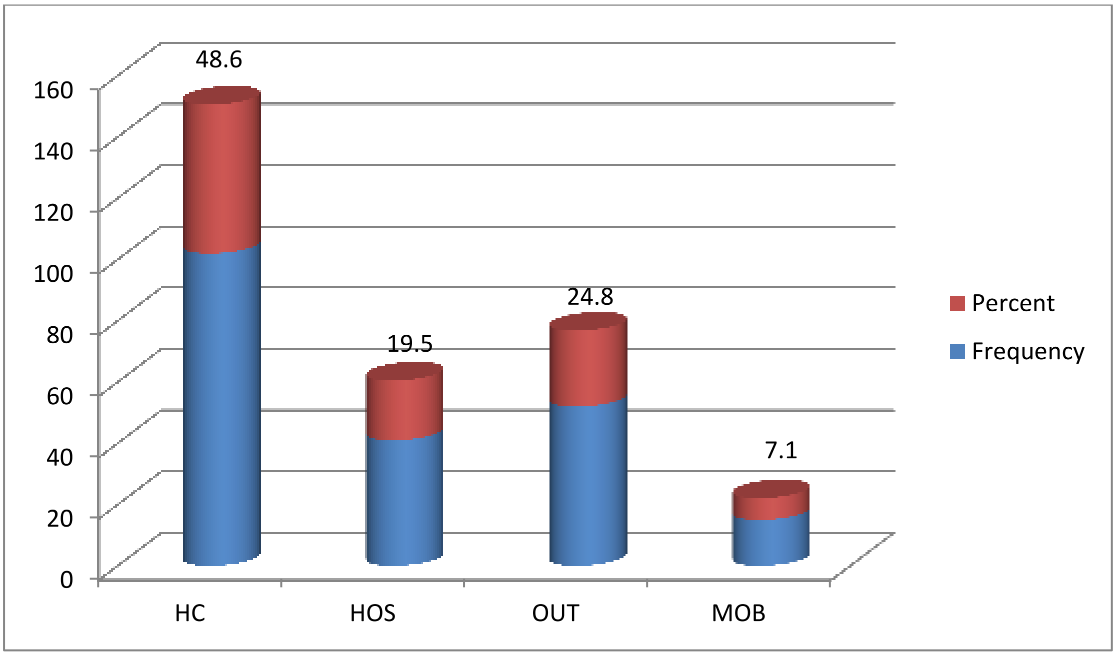

Figure (7)Shows that most of population are seeking immunization services from health care (48.6%) number of population are immunize in health center and 19.5%() in hospital and (24.8%) outreach - (4.8%) , and mobile team is (7.1%)-. in alhsaheissa locality.

Surveillance indicators

Table 12 Routine and surveillance coverage information of alhsaheissa locality.

Item	2015	2016	2017
No. of Health Facilities	3	3	3
No. of surveillance site	7	7	7
MCV1 coverage	30570	31485	32734
MCV2 routine immunisation coverage	27217	27281	27007
Measles drop- out rate	3353	4204	5727
Measles focal persons	7	7	7

Source (51)

Table 13 Measles surveillance indicators in alhsaheissa locality.

Indicator(80% WHO standards)	2015	2016	2017
% of sites reporting weekly	100	100	100
% of cases notified within <48 hours of onset of rash	100	100	100
% of cases investigated within <48 hours of notification	100	100	100
% of cases with adequate specimen (blood, urine,…)	100	100	100
% of cases with laboratory results within 7 days	0	0	0
% of confirmed cases with sources of infection identified	100	100	100

Source(51)

Table 14 The relationship between Age in month and Vaccination status first dose in alhsaheissa locality.

Variables	Yes	No	total
9-12 month	78	9	87
13-18 month	63	1	64
19-23 month	59	0	59
Total	200	10	210

P. value < 0.05 significant N=210

P. value (0.006) significant

Table 15 The relationship between Sex and Vaccination status first dose in alhsaheissa locality.

Variables	Yes	No	total
Male	95	2	97
Female	104	9	113
Total	199	11	210

P. value < 0.05 significant N=210

P. value (0.019) significant

Table 16 The relationship between Resident and Vaccination status first dose in alhsaheissa locality.

Variables	Yes	No	total
Rural	37	0	37
Urban	145	9	153
Slum	1 7	2	19
Total	199	11	210

P. value > 0.05 not significant N=210

P. value (.192) *not significant*

Table 17 The relationship between Mother education levels and vaccination status first dose in alhsaheissa locality.

Variables	Yes	No	total
Illiteracy	35	2	37
Primary	46	3	49
Secondary	67	6	73
high education	51	0	0
Total	199	11	210

P. value > 0.05 not significant N=210

P. value (0.318) *not significant*

Table 18 The relationship between the level of annual income and Vaccination status first dose in alhsaheissa locality.

Variables	Yes	No	total
High	23	0	23
Medium	145	8	153
Low	32	2	34
Total	199	11	210

P. value > 0.05 not significant N=210

P. value (0. 512) *not significant*

Table 19 The relationship between Number of child (9 month to 15 years) and Vaccination status first dose in alhsaheissa locality.

Variables	Yes	No	total
One Child	44	1	45
2-3 Children	87	6	93
4-5 Children	41	2	43
>5 Children	28	1	29
Total	200	10	210

P. value > 0.05 *not significant N=210*

P. value (0.727) *not significant*

Table 20 The relationship between Age in month and Vaccination status second dose in alhsaheissa locality.

Variables	Yes	No	total
9-12 month	88	0	88
13-18 month	62	2	64
19-23 month	49	9	58
Total	119	11	210

P. value < 0.05 significant N=210

P. value (.000) *highly significant*

Table 21 The relationship between Sex and Vaccination status second dose in alhsaheissa locality.

Variables	Yes	No	total
Male	89	8	97
Female	110	3	113
Total	199	11	210

P. value < 0.05 significant N=210

P. value (0.032) *significant*

Table 22 The relationship between Resident and Vaccination status second dose in alhsaheissa locality.

Variables	Yes	No	total
Rural	145	9	154
Urban	35	2	37
Slum	19	0	19
Total	199	11	210

P. value > 0.05 *not significant N=210*

P. value (0. 295) *not significant*

Table 23 The relationship between Mother education level and vaccination status second dose in alhsaheissa locality.

Variables	Yes	No	total
Illiteracy	34	3	37
Primary	47	2	49
Secondary	69	4	73
high education	49	2	51
Total	199	11	210

P. value > 0.05 not significant N=210

P. value (0.818) not significant

Table 24 The relationship between the level of annual income and Vaccination status second dose in alhsaheissa locality.

Variables	Yes	No	total
High	21	2	23
Medium	148	9	159
Low	30	0	30
Total	199	11	210

P. value > 0.05 not significant N=210

P. value (.097) not significant

Table 25 The relationship between Number of child (9 month to 15 years) and Vaccination status second dose in alhsaheissa locality.

Variables	Yes	No	total
One Child	43	2	45
2-3 Children	88	5	93
4-5 Children	41	2	43
>5 Children	27	2	29
Total	199	11	210

P. value > 0.05 not significant N=210

P. value (0. 969) not significant

Table 26 The relationship card availability and Vaccination status second dose in alhsaheissa locality.

Variables	Yes	No	total
Available	165	8	173
Not Available	34	3	37
Total	199	11	210

P. value > 0.05 not significant N=210

P. value (0. 388) not significant

Table 27 The relationship between unavailability of immunisation cards and Vaccination status second dose in alhsaheissa locality.

Variables	Yes	No	total
Lost	8	3	11
Damage	9	0	9
Not Received	16	0	16
Total	33	3	36

P. value < 0.05t significant N=36

P. value (0.024) significant

Table 28 The relationship between reasons of Measles vaccination failure for (MCV1) among the selected children and Vaccination status second dose in alhsaheissa locality.

Variables	Yes	No	total
Unaware of need for immunization	1	0	1
Fear of side reactions	8	0	8
Place of immunization too far	1	0	1
Vaccinator absent or vaccine not available	1	0	1
Total	11	0	11

P. value < 0.05 not significant N=11

P. value (01) *not* significant

Table 29 The relationship between sources of immunisation services distributed according to the EPI strategies and Vaccination status second dose in alhsaheissa locality.

Variables	Yes	No	total
Health Centre	95	7	102
Hospital	41	0	41
Outreach	49	3	52
Mobile Team	14	1	15
Total	199	11	210

P. value < 0.05 not significant N=210

P. value (0407) not significant

Qualitative results from interview with EPI operation officers in alhsaheissa locality

Surveillance data availability and use:

Administrative unit level still under initiating in EPI system, therefore the sub detailed data in certain level were not available.

The registration logbook for vaccination and default tracing available and completed in locality level.

Surveillance network plan was available and displayed and there were additional heath facilities planned for review and check for existence of cases.

Regular surveillance reports were available and No evidence to use this data in decision making actions (Graphics display, supplementary immunization activities response, routine immunization and training).

Standard operation procedures (surveillance materials):

All measles surveillance materials were available including surveillance guide line, SOPs, case definitions, line listing and case investigation.

Surveillance Training and supervision:

There is a continuing training plan for the staff that involved in measles surveillance in locality .

There receive feedback from the state level on data you have reported,

Information on duplicated records Samples from suspected case were routinely collected in reporting site by focal persons.

Very good supplying system of sterile equipment supplies for blood collection and clinical specimen.

There is no evidence of sending lab result periodically to the health facilities which reported suspected cases.

Infrastructure and Data Security

There is no car available for supervision.

There is no have a computer for measles surveillance .

Qualitative result from the surveillance health facilities in alhsaheissa locality:

All Focal persons available at the time of interviewing with backup person.

All focal persons in surveillance facilities knows the standard measles definition and reporting of suspected measles cases to the locality fallowing the standard operative procedures except focal person in zero report level does not knows reporting of suspected measles cases.

Focal persons have a very good knowledge with regard to the purpose of measles active search in surveillance facilities except focal person in zero report level.

There is link conducted with the local community to enhance surveillance among community and document available for future planning.

Measles suspected cases Laboratory results were usually received after more than 3 weeks in all health facilities in alhsaheissa locality.

No supportive supervision conducted in the last month of interview for the health facilities and there is no supervision book for observation and action point available in zero report level .

the national measles updates ,notifications, recommendations received only b\once in year.

Complete files documentation observed in alhsaheissa locality at surveillance facilities, files were checked including measles line listing, reported case folders, notification reports and community education materials and there is no community education material.

Chapter Five

Discussion

Chapter Five

Discussion

5.1 Immunization coverage:

In the present study and according to the 30 cluster survey conducted in the study area, the measles's first dose coverage was (95.2%) [CI 95%] in alhsaheissa locality respondents. This coverage represents the routine coverage for children below one year. The measles's second dose coverage for children aged 18-24 months was (94.8%) [CI 95%] in alhsaheissa locality .Additionally the reported coverage was (99.1%) from EPI 2017 report (51). However, these averages meet the WHO standard criteria to eliminate measles disease; there is still a gap to achieve (95%) coverage. The left-out rate of MCV2 was considered as the key reason for measles prevalence in the younger age-group of (18 to 23 months). These results indicate the need to accelerate the improvement of the age-appropriate immunization rates for MCV2. (Providing the first dose of measles vaccine to successive cohorts of infants 95% and Ensuring that all children have a second opportunity for measles vaccination95%) (12).

Although the reported coverage is high, the study also showed poor immunisation cards record keeping available for performance among respondents (82.4%) in alhsaheissa locality. The reasons behind unavailability were : lose through carelessness by the holders (lost) (30.6%) and (44.4%) had never been received an immunization cards for their child , consequently this decreases the opportunity of tracking immunization status among the target children in case of outbreak, immunization survey for elimination purpose or even travelling .(You will need your children's immunization records to register them for school, child care, athletic teams, and summer camps or for international travel, they will be much easier to get if you have accurate, up-to-date personal record) (52)

Concerning the reasons behind vaccine intake ,the present study showed that respondents reported the primary reasons for children not being ever vaccinated against measles to “unaware of return for next dose”, “unaware of the need to immunization”, ``immunization post too far``, “Fear of side reactions ”, “Vaccinator absent or vaccine not available ” and (Table 9,11) This is agreement with previous study conducted in Eretria 2012 (53). These results indicate the poor utilization of immunization health services increasing the possibility to elevate the numbers of susceptible children.

Educated mothers were not likely to have their children immunized than mothers who had no education. (Table18, 24) this is not agree with pervious study in Sudan (Educated mothers were more likely to have their children immunized than mothers who had no education. Mothers with secondary and higher education had a great chance for full immunization than more than half of the illiterate respondents who had unvaccinated children) (54)

Substantial differences in vaccination status rates were found for children in urban and rural areas. Rural areas had the highest coverage rates compared with urban and slum areas. This is probably partly due to the general distribution of immunization services strategy because they depend on mobile team in rural area and that may boost access opportunity and diminish dropout rate, this result disagrees with previous study done in Sudan and found that (46.7% of children in rural areas were fully immunized compared to 30.5 % of children in rural areas.) (54)

5.2 Surveillance indicators

Our results confirmed that, the surveillance indicators (100% of sites reporting weekly), and (100% of suspected cases adequately investigated within 48 hours),(100% of cases had adequate blood samples collected) and (100% of sites reporting weekly) as quality of indicator has been met and achieved in locality and this indicates strong level of staff commitment in the last three years(Table13,Table14) . Elevating cut-off levels of indicators is highly recommended to achieve high performance; this is in line with study done in Australia and came out with similar result (55) .

The indicator (80% of cases with laboratory results within 7days) still zero present and it is not achieved, To ensure quality of results and timeliness of reporting at least 80% of results sent in time to assist in diagnosis and identification of outbreaks trend as well as improving the quality prevention and control .Immediate feedback from laboratory to EPI office it is highly recommended in confirmed cases. We agree with (quality surveillance criteria should be guided by elimination criteria, not the other way around) (56)

Very high reporting system sensitivity noted and they were adding numbers of private clinics in surveillance network, conversely, very poor community link in surveillance activities in locality and it is considered a great miss opportunity to enhance surveillance system by increasing the community awareness to participate in case notification and detection, this is doesn't agree with study conducted. in India that found out that (active search for suspected measles cases in health facilities and in the community during outbreaks were critical elements in the success of the surveillance system) (57).

This study revealed that numbers of outbreak reported in alhsaheissa locality during last three years, however ,its expected negative consequences because of the huge gaps in immunization coverage specifically MCV2 (failure to vaccinate, vaccine failure, accumulation of susceptible persons) (12),

Outbreak reports show that data was available in locality level as well as absence of any evidence of analysing or displaying data, This results highlight the easy of utilizing surveillance data to control the outbreaks.(Outbreak prevention requires not only one-dose coverage to be increased, but also coverage with a second dose provided by a routine vaccination system or by supplemental activities) (58).

Our study revealed that all focal persons (7 focal persons) who serve in surveillance site have a high knowledge about (standard measles definition and reporting of suspected measles cases) and this might indicates their long experience in surveillance system, with job stability. We also noted that they all have a well knowledge about the purpose of surveillance and active search, .this agrees with study conducted in Ombada locality and revealed high staff knowledge regarding surveillance system (59).

Measles reported site were not receiving the lab results in regular base (usually not before 3 weeks) this reflected poor surveillance performance indicator and can lead to elevate the numbers of cases among susceptible population. except focal person in zero report level (7 focal persons) does not knows reporting of suspected measles cases

The documentation reviewing revealed low standard level in surveillance site ,see also case reporting file, case line listing, case definition , monthly reporting site, and community education material were not completed .(documentations of measles elimination activities playing an importance in roles of verifying elimination of Measles endogenous virus). (60)

No supportive supervision conducted in the last month of interview for the health facilities and there is no supervision book for observation and action point available in zero report level.

Chapter Six

Conclusion
Recommendations

Chapter Six

6.1 Conclusion

The measles first dose coverage (MCV1) was (99.1%) and it doesn't match the WHO measles standard criteria for measles elimination.

The measles second dose coverage (MCV2) was (82.7%) and it doesn't match WHO measles standard criteria for measles elimination.

Immunization card availability was (82.4%) in alhsaheissa locality and (17.6.0%) were lost.

The top reasons behind improper vaccine uptake were "unaware of return for next dose", "unaware of the need to immunization", ``immunization post too far``, "Fear of side reactions ", "Vaccinator absent or vaccine not available " .

Educated mothers were not likely to have their children immunized than mothers who had no education.

Very high performance matching WHO measles elimination criteria was reported in terms of ``number of measles suspected cases ``, ``case investigation within 48 hours `` ``adequate blood sample collection`` and `` rate of weekly reporting site ``

The indicators of receiving laboratory results within 7 days are still irrelevant or zero and not achieved.

Outbreak reports data were not available in localities level as well as absent of any evidence of analysing or displaying data.

There was no community linkage with measles surveillance system to increase the sensitivity of community case notification and detection.

All focal persons in surveillance sites were aware about measles case definitions and reporting systems except focal person in zero report level

6.2 Recommendation

National immunization program,

should conduct a periodic immunization surveys especially in high risk groups To obtain high level for first dose of measles coverage vaccine for children between (9month -18 month) on the way to elevate the immunity level and decrease the numbers of susceptibility among targeting groups, National immunization program.

should focus on improving the quality of supportive supervision, teams selection and performance and data quality management's insure high supplementary immunization activities coverage with high performance quality in support of accelerating the community immunization level and preventing outbreaks, National immunization program and state program

State Immunization Program,

operation officers in alhsaheissa locality need to strengths the community link approach through educate community to support surveillance and immunization activates to insure high level of community engagement in measles elimination activities in both localities,

Alhsaheissa local authorities,

Should review and strength the surveillance network plan regularly to create sensitive measles surveillance system enough to identify measles circulating virus in the community, should be scale up the training of surveillance personnel and provide adequate surveillance supplies in order to enhance the outbreaks investigation and response in localities and districts levels

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Annexes

Annexes

Annex (1)

assessment of measles elimination criteria in alhsaheissa (locality, algazira tate2015-2017

District & locality Level questionnaire

Date: / / 20 State................................
locality...................... District.............................

A. Demographic and Population Data:

Item	Number	Source/ year
Total population		
Under 1		
1-4 years of age		
5 – 9 years		
10 – 14 years		
and more		

B. Routine and surveillance coverage information :

Item	2015	2016	2017
No of HFs			
No of surveillance site			
MCV1 coverage			
MCV2 RI coverage			
Measles drop- out rate			
SIAs coverage			
Measles focal persons			

1-Is the registration logbook for vaccination and default tracing available and completed?

Yes ☐ No ☐

2- Is there displayed of monitoring chart for vaccination coverage?

Yes ☐ No ☐

3- Is the surveillance net-work plane is available and displayed?:

Available Yes ☐ No ☐

Displayed Yes ☐ No ☐

C. Surveillance Data, Availability and Use

1. Does the District receive reports regularly according to the agreed schedule (i.e. monthly or quarterly) from the reporting sites?

data]Yes ☐ No ☐

[If yes, ask to review

2. Have data from the surveillance been used by the District for decision making/ action?

Yes ☐ No ☐

3. If yes, how?

Graphic outbreaks display ☐ SIAs response ☐ strengthening RI ☐ training ☐

4. , review the active visit registration book

Regular visit ☐ Irregular visit ☐

5. Is there enough number of measles focal persons in the district /locality level?

Yes ☐ No ☐

D. Standard Operating Procedures: Obtain copies and review after interview

1. Are there measles surveillance guidelines, SOPs, manuals or guidelines at this site?1.

Yes ☐ No ☐

	Azvailability?		Consistent with WHO criteria	
a. Case definitions	Yes ☐	No ☐	Yes ☐	No ☐
b. Line listing	Yes ☐	No ☐	Yes ☐	No ☐
c. Case investigation form	Yes ☐	No ☐	Yes ☐	No ☐
d. Measles surveillance guidelines	Yes ☐	No ☐	Yes ☐	No ☐
e. Specimen collection and transport	Yes ☐	No ☐	Yes ☐	No ☐

E. Training, Supervision, and Use of Data

1. Is there a plan for continuing education/training for staff involved in measles surveillance?

Unknown ☐ Yes ☐ No ☐

2. Do you receive feedback from the state level on data you have reported, e.g. about data quality, information on duplicated records, etc.?

Unknown ☐ Yes ☐ No ☐

2. Are visual aids displayed for the staff to follow a protocol?

No ☐ Yes ☐

F. Specimen Collection and Transport

1. Are specimens routinely collected from all suspected measles cases by reporting site staff or district?

Yes ☐ No ☐

2. Are supplies of essential materials (i.e. sterile equipment supplies for blood collection, other clinical specimen etc?) (*Observe stock on hand and comment)*

Available Yes ☐ No ☐

Enough yes ☐ No ☐

3. Are the lab results sent to the reporting site/ clinician in a timely manner?

Yes ☐ No ☐

G. Feed forward/ Feedback back

1. Are laboratory results reported to the district within 7 days of specimen receipt?

Yes ☐ No ☐

2. Does the district conduct review meetings for measles surveillance?

Yes ☐ No ☐

H. Infrastructure and Data Security

1. Does the district have a car available for supervision? Yes ☐ No ☐

2. Does the district have a computer for measles surveillance? Yes ☐ No ☐

I. **District Surveillance Performance Indicators**.

1. Does the district analyze it surveillance data

Yes ☐ No ☐

3. If yes check if surveillance monitoring charts of measles cases by months, age, vaccination status and indicators.

Yes ☐ No ☐

Using surveillance reports or laboratory data, complete the table for district surveillance performance indicators for the past 3 years (2015 - 2017):

	Indicator(80% WHO standards)	2015	2016	2017
A	% of sites reporting weekly			
B	% of cases* notified within <48 hours of onset of rash			
C	% of cases investigated within <48 hours of notification			
D	% of cases with adequate specimen			
E	% of cases with laboratory results within 7 days			
F	% of confirmed cases with sources of infection identified			

Annex (2)

assessment of measles elimination criteria in alhsaheissa locality**, algazira state2015-2017**

-Measles Immunization Survey

Date: / /20 cluster No ☐ child No ☐

1. age in month ☐
2. Sex :- male ☐ female ☐

3. Resident : -

a) Rural ☐ b) Urban ☐ d) slum ☐

4. Mother education level:-

a)Illiteracy ☐ b) primary ☐ c) secondary ☐ d) high education ☐

5. Number of child (9 month to 15 years) :-

a) < 2 children ☐ b) 2 – 3 children ☐ c) 4-5 children ☐ d) > 5 children ☐

6. Card availability:-

Yes ☐ No ☐

7. If No, reasons :-

a) Lost ☐ b) damage ☐ c) don't received ☐

8. Vaccination status: First dose (9 month)

Yes ☐ No ☐

9. Reasons if No (put the number below).

10. Vaccination status: Second dose ( )

Yes ☐ No ☐

11. Reasons if No (put the number below)

12. Source of immunization

a) HC ☐ b) HOS ☐ c) OUT ☐ d) MOB ☐

Reasons for immunization failure

1. Unaware of need for immunization
2. Unaware of need to return for 2 nd Dose.
3. Place and/or time of immunization unknown
4. Fear of side reactions
5. Wrong ideas about contraindications
6. Place of immunization too far
7. Time of immunization inconvenient
8. Vaccinator absent or vaccine not available
9. Long waiting time

بسم الله الرحمن الرحيم

بحث تقييم موشرات القضاء علي مرض الحصبه بمحلية الحصاحيصا– ولايه الجزيرة

الفتره من 2015- 2017

التاريخ: / / 201	***رقم العنقود ( )***	***رقم الاستماره ( )***

1- العمر بالشهور ( )

2- النوع : أ- ذكر ( ) ب- أنثي ( )

3- نوع السكن :

أ- ج- غير منظم ( )

4- **المستوي التعليميي للام** :

أ- امي ( ) ب- ابتدائي ( ) ج – ثانوي ( ) د- جامعي فما فوق ( )

5- **مستوي الدخل السنوي**

أ- عالي ( ) ب- متوسط ( ) ج- متدني( )

6- **حجم الاسره (عدد الاطفال**

أ- طفل واحد ( ) ب- 2- طفل 3 ( ) ج- 4 – 5 اطفال ( ) د – اتر من 5 اطفال ( )

7- **وجود كارت التطعيم**

أ- يوجد ( ) ب- لا يوجد ( )

8- **اذا كانت الاجابه لا ماهو السبب**

أ- ضياع ( ) ب – تلف ( ) ج- لم يتم الاستلام من الوحده ( )

9- **الحاله التطعيميه : الجرعه الاولي (الاطفال 12- 23 شهر)**

ب- عمر الطفل بالشهور ( )

ت- مطعم ( ) غير مطعم ( )

10- **الاسباب في حاله عدم التطعيم ( )** كتابه رقم السبب من خلف الاستماره

11- **الحاله التطعيميه: للجرعه التانيه (18- 23 شهر)**

أ- عمر الطفل بالشهور ( )

ب - مطعم ( ) غير مطعم ( )

12- الاسباب في حاله عدم التطعيم ( ) كتابه رقم السبب من خلف الاستماره

13- مصدر تلقي الخدمه :

أ- مركز صحي ( ) ب- مستشفي ( ) ج – مركز فرعي( ) د – اتيام جواله ( )

**Reasons for immunization failure

1. Unaware of need for immunization(عدم معرفه اهميه التطعيم)
2. Unaware of need to return for 2nd or 3rd dose(عدم معرفه اهميه العوده للجرعه التاليه)
3. Place and/or time of immunization unknown(زما ومكان التطعيم غير معروف)
4. Fear of side reactions(الخوف من الاثار الجانبيه)
5. Wrong ideas about contraindications(افكار خاطئه عن موانع التطعيم)
6. Place of immunization too far(مكان التطعيم بعيد جدا)
7. Time of immunization inconvenient(زمن التطعيم غير مناسب)
8. Vaccinator absent or vaccine not available (المطعم غايب عن المركز)
9. Long waiting time(زمن الانتظار طويل في المركز)

Annex (3)

assessment of measles elimination criteria in alhsaheissa locality, algazira state2015-2017

Questionnaire of Health facilities level

Date / / 20 localities .... District....................................

Health facility name..................... Name of data collector..............................

1. Surveillance priority level

a) High ☐ B) Medium ☐ C) Low ☐

2. Availability of assigned focal persons

a) Not available ☐ b) Available but no backup person ☐ c) Available with backup persons ☐

3. Dose the Measles focal person knows the standard measles case definition

Yes ☐ No ☐

4. Dose the Measles focal person know how to report the suspected cases

Yes ☐ No ☐

5. Do the Measles focal person know the purpose of measles active search?

Yes ☐ No ☐

6. Do the Measles focal person conduct any link with the community regard community active search?

Yes ☐ No ☐

7. If yes, is it documented?

Yes ☐ No ☐

8. How many days need to receive the lap result? (Within)

a) one week ☐ b) 2 weeks ☐ 3weeks ☐ 3 weeks ☐

9. Did you receive supportive supervision last month?

Yes ☐ No ☐

10. If yes, dose the action point noted and achieved?

Yes ☐ No ☐

11. How often do you receive the national measles updates/notifications/recommendations/year?

a) Once ☐ b) twice ☐ d) more than 3 time c) never ☐

12. Availability of documents:

No	Item	Yes/No	(Completed) Yes/No	Observation
1	Surveillance reporting forms			
2	Reported cases folder			
3	Line listing			
4	Field book for measles			
5	Supervision logbook			
6	Notification report			
7	Sampling kid			
8	Poster of case definitions			
9	Community education material			

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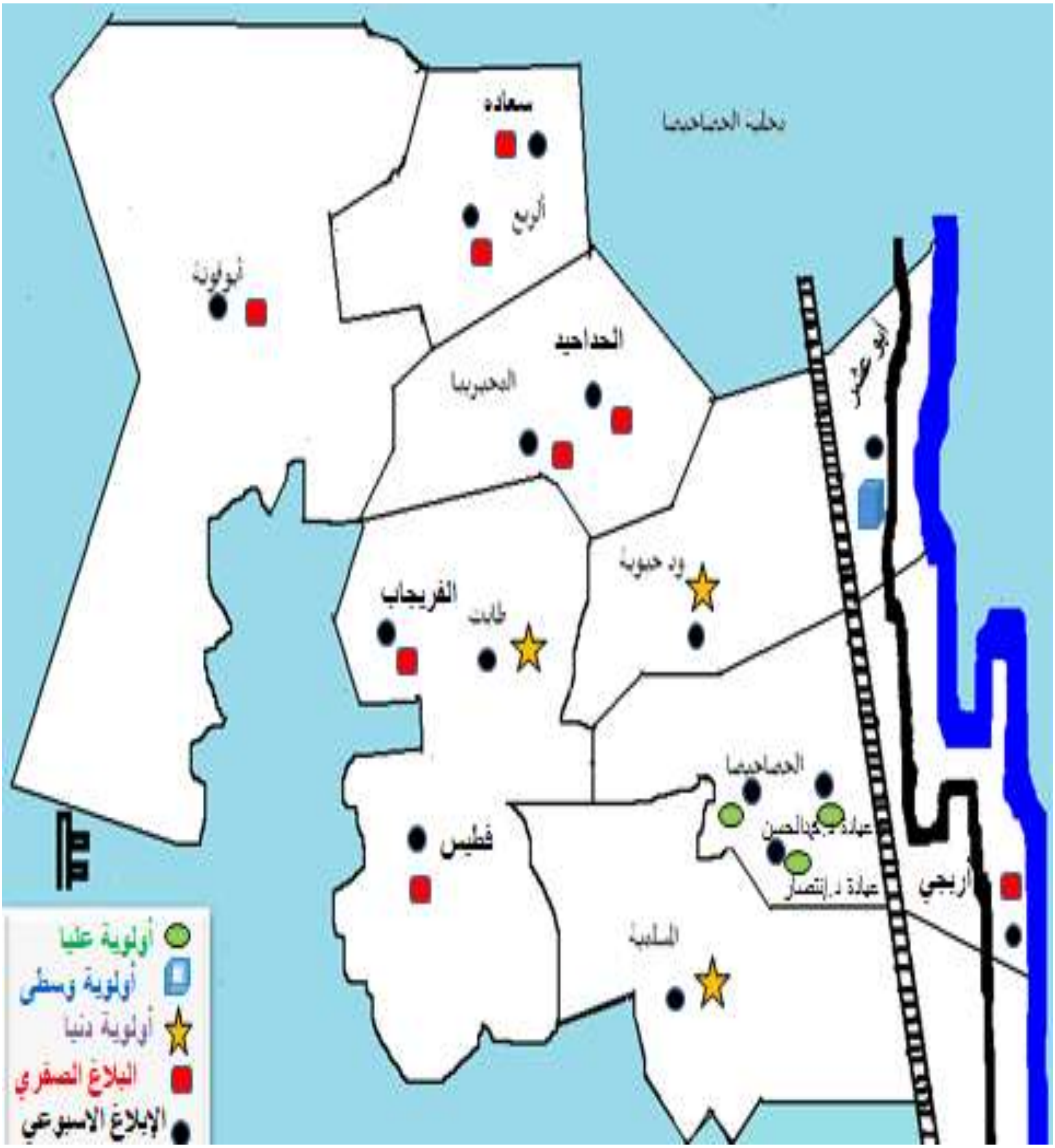
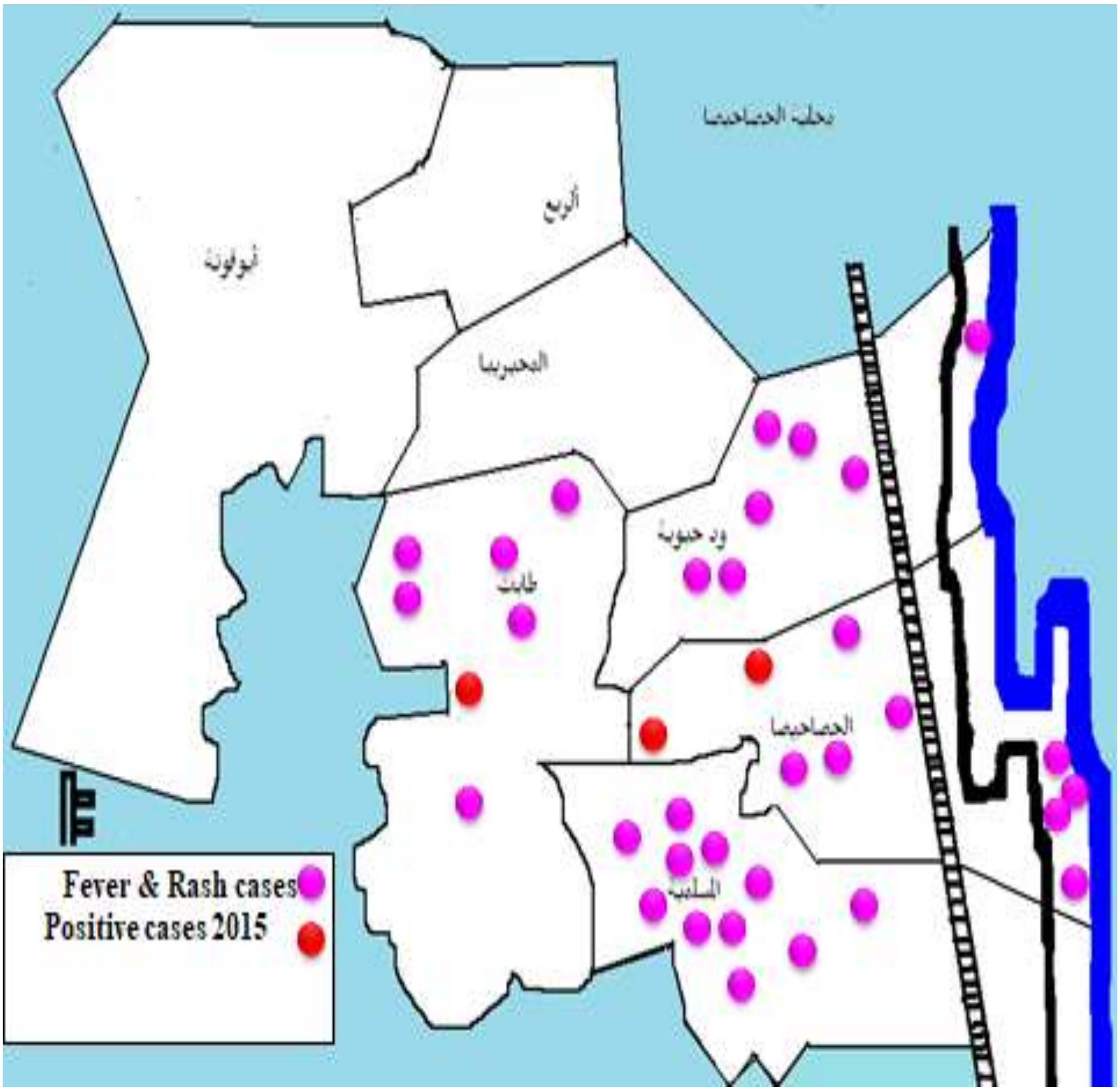
Annex (4)

Surveillance sites



Annex (5)

Fever and Rash (Positive cases 2015)



Annex (6)

Fever and Rash (Positive cases 2016)