

Measles Outbreak in Benghazi, Libya: Epidemiology of Pediatric Measles Hospitalization, 2013-2014

Safa Suleman Elfaituri,¹ MD, Idris Matoug,² MD, Eltajoury Fatma,² MD, Hanan Elsalheen,² MD, Salah Elammroni,² MD, Khairia Bujallawi,² MD, Abdallah Elter,² MD,

Address: Benghazi University, Medical Faculty ¹Dermatology Department, ²Pediatric Department, Benghazi, Libya

E-mail: selfaitoury@yahoo.co.uk

* Corresponding Author: Dr Safa Suleman Elfaituri, Benghazi University, Medical Faculty, Dermatology Department, 2026 Benghazi, Libya

Published:

J Turk Acad Dermatol 2015; **9** (2): 1592a3.

This article is available from: <http://www.jtad.org/2015/2/jtad1592a3.pdf>

Keywords: Children, Measles hospitalizations, Benghazi, Libya

Abstract

Introduction: Measles is an acute, highly communicable viral disease. Measles outbreaks usually occur in settings where there are unvaccinated populations. Measles vaccination at 12 and 18 months is routine in Libya; however, coverage seldom reached >95% predisposing to measles outbreaks. We describe the epidemiology of hospitalized measles cases at pediatric hospital in Benghazi over 1 year.

Materials and methods: All measles pediatric patients admitted to infectious department at Benghazi pediatric hospital during the period from June 2013 to May 2014 were studied. Epidemiological data including age, sex, immunization state, exposures place and time as well as complications was recorded. Laboratory tests including serological diagnostic methods were done.

Results: A total of 367 measles-associated hospitalizations were studied, of these 83% was children aged less than 1 year, 17% was older than 1 year but were unvaccinated, 33% was nosocomial cases and 65% was during winter months. Diarrhea was the most common complication (65%), followed by stomatitis (53%), pneumonia (35%), otitis media (20%) and encephalitis (0.8%). Deaths were reported in 3 cases (0.8%).

Conclusion: Unvaccinated children whether they were less than 1 year and not eligible for measles vaccine or they were not receive their routine vaccines were the victims of measles associated hospitalizations during the measles outbreak in Benghazi, 2013-2014.

Efforts to maintain high routine measles vaccination coverage at 9 and 18 months should be emphasized.

Introduction

Measles is an acute highly infectious viral disease which often associated with diverse complications [1, 2]. Although measles can affect people of all ages, it is considered primarily a childhood illness. Despite the availability of highly effective and safe measles vaccine, measles is still responsible for significant morbidity and mortality especially in

children younger than 5 years of age in undeveloped countries [3, 4]. Measles may cause extensive epidemics and outbreaks being reported particularly in populations with low vaccination rates [5].

We aimed to study measles outbreak that occurred in 2013-2014 in Benghazi, Libya; we describe the epidemic, assess risk factors as well as complications associated with measles in hospitalized pediatric cases.

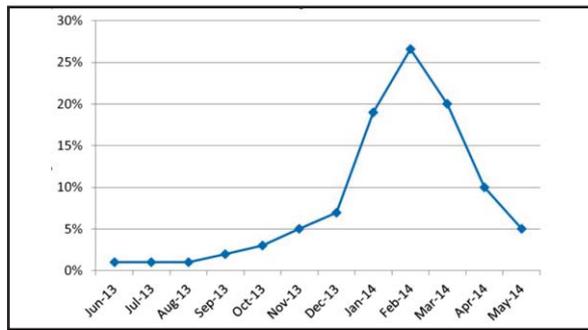


Figure 1. Distribution of measles cases over 1 year

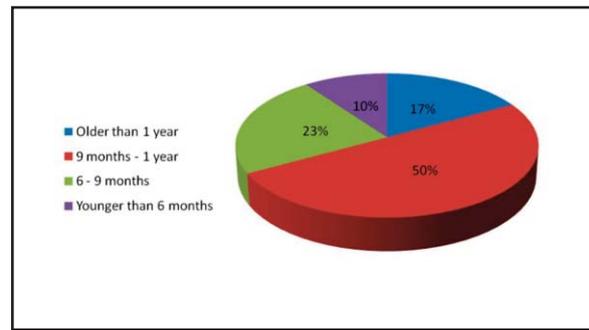


Figure 2. Age distribution

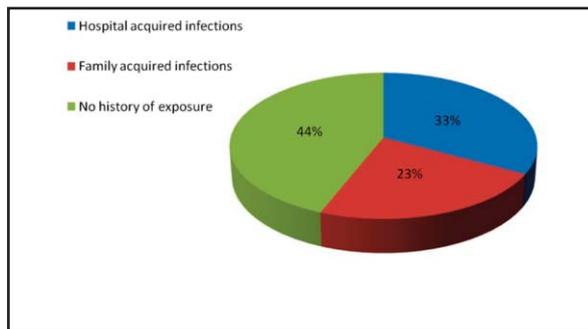


Figure 3. Exposure history

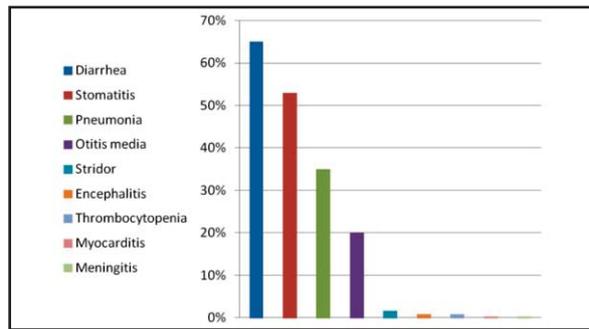


Figure 4. Complication of measles

Materials and Methods

Over a period of 1 year from June 2013, all pediatric patients meeting the suspected-measles case definition (rash and fever with at least one of cough, coryza or conjunctivitis) whom admitted to the infectious disease department in pediatric hospital in Benghazi, Libya were studied. Serum specimens were collected from the patients and tested for measles-specific IgM and all cases with negative results were excluded from the study. Sex, age, city, time (date), nationality, vaccination status, and exposure history were recorded. Cases were considered nosocomial if they had contact with other measles cases in the hospital 7 to 21 days before onset dates. Complications including diarrhea, middle ear infection, stomatitis, pneumonia, meningitis, stridor and encephalitis as well as expired cases were recorded.

Results

A total number of 367 hospitalized patients with clinical diagnosis of measles and whom were serologically positive were studied. Although the first case was reported in June 2013, 65% were seen during winter months 2014 with the peak in February (Figure 1).

Almost all cases were resident in Benghazi and the majority was Libyan, only 4 Egyptian and 1 Syrian patients were reported. Sex distribution showed 57% males and 43% females. Age distribution re-

vealed that vaccine ineligible children aged less than 1 year were the most affected age group (83%); 50% was between 9 months and 1 year, 23% was between 6-9 months and 10% was less than 6 months. Children older than 1 year constituted 17% (Figure 2). The youngest patient was 40 days old whereas the oldest one was 15 years old. Nearly one third of cases were hospital acquired infections, 23% has family or social contact whereas 44% gave no history of exposure (Figure 3).

All children younger than 1 year were not vaccinated as the first dose of measles vaccine from routine immunization in Libya is at 12 months. All the older children did not provide vaccination document and considered unvaccinated. 90 percent had complicated measles, the most frequent complication reported in this study was diarrhea (65%), followed by stomatitis (53%), pneumonia (35%) and otitis media (20%). Stridor was reported in 1.6%, encephalitis and thrombocytopenia in 0.8% whereas myocarditis and meningitis occurred in single cases (0.3%) (Figure 4). Death had occurred in 3 cases (0.8 %).

Discussion

Measles is a highly contagious acute viral disease caused by a Morbillivirus from the paramyxovirus family. It is spread by respiratory droplets and characterized by a prodromal illness of fever, cough, runny nose



Figure 5. Typical measles rash

and conjunctivitis after 10 to 12 days of getting the infection, followed by the appearance of a generalized rash [2]. The classic measles rash, which is thought to be due to a hypersensitivity reaction, is an erythematous maculopapular eruption that begins on the head and face then spreads to involve the entire body (Figure 5). The rash lasts for 5-7 days before fading [4].

A confirmed measles outbreak is defined as the occurrence of three or more confirmed measles cases (at least two of which should be laboratory-confirmed; IgM positive) in one month per 100 000 population living in a geographical area [1].

This study was conducted over 1 year from June 2013, and included 367 confirmed measles hospitalized patients whom admitted because of vomiting, diarrhea, dehydration, chest infection or associated medical problems as wheezy chest. As cases required hospitalization constitute only small portion of the total number of measles cases, the incidence of measles is expected to be high.

The mostly used and recommended serologic test for measles diagnosis is measles-specific immunoglobulin M (IgM) antibody assay, it is almost 100% sensitive when done 2 to 3 days after the rash onset. It peaks at 4 weeks after the infection and disappears by 6 to 8 weeks [5, 6]. Only the positive cases for measles-specific IgM were included in this study.

Measles is a highly contagious, with at least 90% of susceptible household contacts develop the disease [4, 5, 7, 8]. The virus can remain infective in respiratory droplets up to two hours after a person with measles symptoms has left and for every case of the disease, as many as 18 individuals can get in-

fectured [1, 5]. Outbreaks may occur when ill children are brought to a doctor's room for evaluation for fever, irritability, or rash [8]. Exposure history in our study revealed that hospital become sites of measles transmission; 33% was nasocomial infection with history of visiting outpatient pediatric clinic or admission to ward 7 to 21 days before onset dates, 23% has family or social contact whereas 44% gave no history of exposure to measles, most probably they got the infection from measles patients in the prodromal phase as infectivity is greatest in the late prodromal (2 to 4 days before the onset of rash) [5, 8].

Transplacental maternal anti-measles antibodies which persist in the child for as long as nine months, protect the child against measles, so measles usually occurs after 9 months. If we give measles vaccine before 9 months, it will be neutralized by the maternal antibodies and may not be effective, and even when administered at the age of 9 months, vaccine failures expected in approximately 15% of children [3, 7].

Our study showed that most of cases (83%) were aged less than 12 months, below the target age group for vaccination. There is a substantial immunity gap in the group aged between 9 months and 1 year (50%), due to waning maternal antibodies [3]. Regarding those less than 9 months (33%), either they had no protective maternal antibodies because their mothers were unvaccinated and they also get the infection recently, or their mothers were vaccinated but may not have good titers of anti-measles antibodies. Unfortunately in this study maternal anti-measles antibodies were not measured.

When less than 90 to 95% of children are immunized, the number of susceptible individuals may accumulate over time with the potential for outbreaks to occur. Occurrence of measles among unvaccinated children older than 1 year (17%), and among non-vaccinated adults including mothers and other relatives as well as medical staffs reflect the suboptimum vaccination coverage in our country [1, 3, 7]. If we achieve higher coverage of measles vaccination, incidence of measles will become less.

Measles outbreaks can occur among vaccinated children who did not respond to the vaccine or if vaccine efficacy is reduced because of poor vaccine storage or handling [7]. Because our data lacks accurate information on the vaccination state, we could not assess any direct association between the vaccine failures and this outbreak of measles.

Libya experiences relatively high rates of immigration from other countries as Syria from which children because of war condition missing their routine vaccination and although few non Libyan cases were reported in this study, measles may be indirectly linked to importation of the virus from other countries and the incomplete vaccination rates have facilitated the spread of the virus once introduced into the country [5]. Complications from measles have been reported in every organ system, they include pneumonia, otitis media, diarrhea, stomatitis, croup, thrombocytopenia, appendicitis, ileocolitis, pericarditis, myocarditis, encephalitis and hypocalcemia [4, 5, 8].

The risk of measles complications and death was inversely related to age at infection [9].

The death rate associated with measles in developed countries is 0.1 to 0.3%, the rate of complications and death are both higher in third world countries [5]. Reported incidences of measles complications vary between different countries, years and situations, in our study, 90% had complicated measles.

Pneumonia is the most common severe complication of measles and accounts for most measles-associated deaths. It may be caused by measles virus alone, secondary viral infection, or secondary bacterial infection. In recent years, pneumonia was present in 9% of children less than 5 years old with measles in the United States [8]. One of the important findings in our study was the relatively high incidence of pneumonia (35%) which could be related to the age group involved in the study. Otitis media occurs in 14% of children with measles in the United States, inflammation of the eustachian tube causes obstruction and secondary bacterial infection. Our higher rates (20%) may be related to age, most likely due to the small diameter of the eustachian tube and the increasing risk of obstruction [8]. Measles virus infects the intestinal tracts

of most patients with measles and it is responsible for most of the diarrhea episodes. Diarrhea was a complication in 8% of measles cases during 1987–2000 in the United States [8, 10]. In this study measles was complicated with diarrhea in 65%. Acute measles encephalitis is characterized by the resurgence of fever during the convalescent phase, along with headaches, seizures, and altered consciousness. It is more common in adults than in children [2, 5]. It is not clear whether acute measles encephalitis represents direct invasion of the virus or a post infectious process from a hypersensitivity to the virus [5]. Encephalitis occurs in 0.1% of children with measles [4, 8]. It was reported in 0.8% of our cases. Keratitis can lead to permanent corneal scarring and blindness especially in children in developing countries with vitamin A deficiency [8, 11]. No slit lamp examination was done in this study, and all patients were given vitamin A supplement. Up to 20% of measles associated deaths occur in children younger than 1 year [3]. Measles patients with deficiencies of cell mediated immunity including HIV infection, congenital immunodeficiency and cancer have a prolonged, severe, and often fatal course [5]. Death had occurred in only 3 cases; one case had AIDS and another had lymphopenia.

Conclusion

Measles is highly communicable viral disease, with measles outbreaks usually occurring in settings where there are unvaccinated populations. Although measles vaccine is highly effective, nationwide outbreak including Libya has occurred during 2013- 2014. In this study a wide childhood age range was affected, infants younger than 1 year were the main victims. This measles outbreak highlights that Libya is vulnerable to large measles outbreaks possibly due to late vaccination age at 1 year instead of 9 months as well as the inadequate vaccination coverage. Less effective maternal immunization may be a contributing factor and needed to be further studied.

Recommendations

Efforts to maintain high routine measles vaccination coverage at 9 and 18 months should

be emphasized. In addition, a booster dose at school entry should be considered.

Immunization awareness days should be held for education of the general public about the vaccination program and the impact of measles on health and the role of vaccination in its eradication.

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