

ORIGINAL ARTICLE

Seroprevalence of rubella among children suspected of having measles in Gadarif Hospital, Eastern Sudan

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ABSTRACT

While generally mild in children, rubella infection during pregnancy can lead to miscarriage, foetal death or congenital rubella syndrome. Rubella vaccination is not yet available as a part of routine immunisation in Sudan, and the burden of infection is unknown.

Using the clinical case definition adopted by the World Health Organisation, a total of 123 children suspected of having measles were enrolled in this study during January–December 2017 in Gadarif Hospital, Eastern Sudan. Those cases whose sera were negative for measles IgM antibodies were tested for rubella IgM antibody. A confirmed rubella case was a person who tested positive for rubella IgM. Sera were analysed for IgM specific antibodies against measles virus and rubella virus using enzyme-linked immunosorbent assay.

Among the total 123 children suspected to have measles, 92 (74.8%) children were

positive for measles IgM antibodies. Of the 31 children who had measles IgM antibodies negative, 20 (16.3%) children were seropositive for rubella IgM antibodies.

Implementation of a surveillance system will provide the improved estimates of rubella virus and estimated the burden of congenital rubella syndrome. Such information is necessary and it is an important step for future policy decisions for vaccine delivery strategies.

KEYWORDS

Rubella; measles; infection; Sudan.

INTRODUCTION

Rubella or German measles is a common viral infection caused by Toga virus of the genus Rubivirus and in most time occurs as a mild or a symptomatic disease and is transmitted by direct contact, droplets, or vertically from pregnant woman to the foetus [1]. Although in most cases

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rubella infection is mild, rubella infections in early pregnancy can lead to multiple birth defects known as congenital rubella syndrome (CRS). It has been estimated that each year more than 100,000 children, especially in countries with less resources, are born with CRS [2,3].

Rubella is vaccine-preventable disease; the main goal of rubella vaccine is to minimise the rate of rubella virus infection and hence CRS [4]. Despite the success of the rubella vaccine in decreasing the number of CRS cases worldwide, rubella infections remain a public health problem in many African countries including Sudan [5–7].

The World Health Organisation (WHO) targets elimination of rubella, as well as measles, which is another a vaccine-preventable disease, caused by measles virus [8]. Both rubella and measles are associated with rash, fever and catarrhal symptoms. In African countries, including Sudan, information on rubella epidemiology is very limited [9–12]. In Sudan, rubella surveillance has not yet been established. Furthermore, rubella vaccine is not yet included in the childhood immunisation schedule in Sudan. Moreover, all the cases of skin rashes and fever are regarded as measles based on WHO case definition [13]. Thus, the present study was aimed to assess the proportion of rubella infection among the children suspected to have measles in Gadarif hospital in Eastern Sudan. The data on rubella among Sudanese children are important for health planners as well as practising clinicians.

METHODS

Study design and study area

A cross-sectional hospital-based study was conducted during the period of 1st January 2017–31st December 2017 in Gadarif Hospital in the Eastern Sudan to estimate the proportion of rubella infection among children suspected to have measles infection. Gadarif is situated at a mean altitude of 496 m above sea level, with a population of 1,727, 401 residents, covers 75,000 km², and lies between latitude 14 and 16 north and longitude 33 and 36 east. It is 400 km from the capital Khartoum, on the Ethiopian and

Eritrean borders. Gadarif Hospital is a 400-bed tertiary care facility that serves as a referral centre for Gadarif State. The average patient turnover at the hospital is 150–200 patients per day.

Participants

The participants were all children suspected to have measles during the study period. The World Health Organisation (WHO) guidelines have been adopted for the diagnosis of measles, which is defined as any person with fever plus generalised non vesicular maculopapular rash and at least one of the following: cough, coryza (runny nose), or conjunctivitis [13]. After signing an informed consent (by the parents or the guardians), the socio-demographic and clinical characteristics (age, sex, residence and vaccination status) were gathered using questionnaires. Other information, such as clinical presentation, duration of illness, previous history of suspected measles and outcome, were included.

Then, 5 ml of blood was drawn from the suspected cases and sent for confirmation of the diagnosis as well as investigation of rubella infection. For measles and rubella testing, samples were transported in a cold box to Sudanese National Measles and Rubella Laboratory located in Khartoum. Measles-virus-specific serum IgM antibodies were tested using an enzyme-linked immunosorbent assay kit (IBL, Hamburg, Germany) and for rubella-virus-specific IgM antibodies. Likewise, rubella-specific IgM antibodies were tested out according to the manufacturer's instructions (Enzygnost Anti-Rubella Virus/IgM kit; Siemens, Erlangen, Germany). Patients with rubella IgM-positive serum samples were classified as laboratory-confirmed rubella cases. A non-probability convenient sample size of ≥ 100 suspects was used to sample study participants.

Statistical analysis

Data were entered into a computer database using SPSS software (SPSS Inc., Chicago, IL, USA, version 21.0). Proportions of the socio-demographic characteristics were compared between the groups of the study using χ^2 test and $p < 0.05$ was considered as significant.

RESULTS

Participants' characteristics

Among 123 measles suspects, 60 (48.8%) were male and 63 (51.2%) were female, which give the female: male ratio of 1:0.9. The age ranged between 3 to 14 year with mean (SD) 7.3 (3.2). More than half (82, 66.6%) were of urban residence. A personal history of febrile illness and skin rashes was reported in four children (3.3%). Of the total, 87 (70.7%), 29 (23.6%), and 7 (5.7%) children were not vaccinated, vaccinated, and do not mention the status of vaccination against measles infection, respectively.

Clinical presentation

All the children brought to the hospital with fever and skin rash. 103, 96 and 84 had coryza, cough and conjunctivitis, respectively. The duration of the disease ranged between 1 and 3 days. Among the total, 92 (74.8%) children enrolled with suspected measles were found positive for measles IgM antibodies. The measles-negative samples (31) were tested for rubella infection; 20 (16.3%) were positive for rubella IgM antibodies (Figure 1).

Children with rubella IgM seropositive were younger, and of rural residence (Table 1).

DISCUSSION

The current study showed that 16.3% of the children suspected to have measles were IgM seropositive for rubella. Interestingly, in neighbouring Ethiopia, in the national measles case based surveillance system, a total of 11,151 (39.4%) of 28,284 samples were measles IgM antibody positive. Three-fourth of these confirmed rubella cases were aged less than 10 years [11]. Previous study has shown that in Congo among the 7,195 children, 33% were positive for rubella antibodies and seropositivity was positively associated with age of the mother and child [9]. In Nigeria, of the 757 febrile rash cases, 81 (10.7%) were IgM positive for rubella antibodies [14]. A low rubella seroprevalence rate (1.8%) was reported among children in a population based cross-sectional study in Tanzania [10]. In their meta-analysis, Mirambo et al. [6] have shown a high rate (45.1 %) of acute rubella infection among African

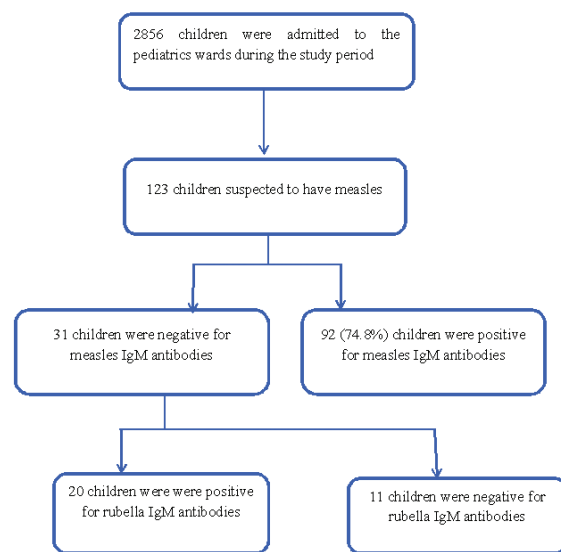


Figure 1. Flow chart and the results of the study.

children. It has recently been shown that rubella virus was detected in 15 of 18 exanthematous patients in Japan [15]. Likewise, rubella virus was isolated in three travellers suspected of measles infection in São Paulo, Brazil [16].

In Sudan, as far as we know, there is no published data on the proportion of rubella infection among children who were diagnosed as measles based on WHO case definition. Furthermore, there is no data on the incidence of rubella in Sudan to guide evidence-based decision making for rubella vaccine introduction. Measles provides a clinical similarity for rubella, as it is another viral childhood disease with very similar clinical features.

Absence of rubella vaccine in Sudan as well as overlapped symptoms between the two diseases and the health care provider perception may be contributing factors to underestimate rubella infection.

In Ethiopia, a country neighbouring the study area, the proportion of rubella positive cases increased from 4.2% in 2009 to 23.9% in 2013 but dropped to 10.6% and 15.3% in 2014 and 2015, respectively [11]. These findings indicate that the prevention and control of rubella through the use of rubella containing vaccine should be considered as per WHO regional and global guidelines virus

Table 1. Comparing number (proportion) between children with measles and rubella infections in Gadarif Hospital in the Eastern Sudan.

Variables	Measles (N = 92)	Rubella (N = 20)	Without measles or rubella (N=11)	p
Age ≤ 10 years	23 (25)	18 (90)	1 (9.1)	<0.001
Rural residence	24 (26.1)	7 (35)	10 (90.9)	0.031
Gender, male	45 (48.9)	10 (50)	5 (45.5)	0.472

[8]. Although it is small size study, our finding in this study showed that younger children ≤10 years were likely to be affected by rubella. This is in agreement with previous results from Ethiopia [17], Nigeria [14] and Kenya [18]. The low proportion of rubella cases in person older than 10 years is likely due to the development of natural immunity against rubella at earlier ages. In our study and in consensus with Getahun et al. [11] from Ethiopia, both sexes were affected equally [11].

CONCLUSION

Overall, this study highlights significant seroprevalence of rubella antibodies among measles children suspects. Implementation of a surveillance system will provide the improved estimates of rubella virus and estimated the burden of congenital rubella syndrome. Such information is necessary and it is an important step for future policy decisions for vaccine delivery strategies.

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Conflict of interests

The authors declare that they have no conflict of interests.

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Ethics

The study was approved and received ethical clearance from the Research Board at the Ministry

of Health, Gadarif State, Sudan. An informed consent was obtained from all parents or the guardians.

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