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Rubella immunity among pregnant women aged 15–44 years, Namibia, 2010☆

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SUMMARY

Background: The level of rubella susceptibility among women of reproductive age in Namibia is unknown. Documenting the risk of rubella will help estimate the potential burden of disease in Namibian women and the risk of congenital rubella syndrome (CRS) in infants, and will guide strategies for the introduction of rubella vaccine.

Methods: A total of 2044 serum samples from pregnant Namibian women aged 15–44 years were tested for rubella immunoglobulin G antibody; the samples were obtained during the 2010 National HIV Sentinel Survey. The proportion of women seropositive for rubella was determined by 5-year age strata, and factors associated with seropositivity were analyzed by logistic regression, including age, gravidity, HIV status, facility type, and urban/rural status.

Results: Overall rubella seroprevalence was 85% (95% confidence interval (CI) 83–86%). Seroprevalence varied by age group (83–90%) and health district (71–100%). In the multivariable model, women from urban residences had higher odds of seropositivity as compared to women from rural residences (odds ratio 1.40, 95% CI 1.09–1.81).

Conclusions: In the absence of a routine rubella immunization program, the high level of rubella seropositivity suggests rubella virus transmission in Namibia, yet 15% of pregnant Namibian women remain susceptible to rubella. The introduction of rubella vaccine will help reduce the risk of rubella in pregnant women and CRS in infants.

1. Introduction

Rubella is a vaccine-preventable viral disease that is characterized by a febrile illness and rash.[1] Rubella infection in pregnant women can lead to congenital rubella syndrome (CRS), which can result in severe illness, disability, and death in the fetus.[2] Worldwide, more than 100 000 children are born each year with CRS.[3,4]

From 2000 to 2009, reported rubella cases increased 20-fold in the World Health Organization (WHO) African Region.[5] Despite this increase in reported number of cases, as of 2015, there is no rubella elimination, control, or prevention goal in the African Region.[4] Thus far, a small number of Sub-Saharan African countries have introduced rubella-containing vaccine in their Expanded Programme on Immunization (EPI) childhood immunization schedule (Burkina Faso, Ghana, Rwanda, Senegal, and Tanzania), and others are planning to do so in the next few years.[1]

The WHO recommends that countries without rubella vaccine assess the burden of rubella and CRS.[6] Serosurveys have suggested

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rubella virus circulation in a number of African countries,[7] but no published studies have investigated seroprevalence in Namibia. Currently, rubella-containing vaccine (RCV) is not available publicly in Namibia. Understanding the level of rubella susceptibility in pregnant women in Namibia will provide important information to help determine the burden of disease and the need for the introduction of rubella vaccine.[8]

Namibia is a country in southwestern Africa that gained independence from South Africa in 1990. It has an estimated population of 2.1 million.[9] The capital city is Windhoek, and the country is administratively organized into 34 health districts in 14 regions, including those with the highest populations in the northern part of the country along the border with Angola, and in the central and the southern parts of the country.[10] The majority (57%) of Namibian residents are rural dwellers.[9] In 2014, Namibia had one of the highest HIV prevalence rates for adults aged 15–49 years in the world at 16.0%;[11] overall prevalence was high compared with other countries in the Sub-Saharan Africa region.[12] The total fertility rate has been estimated at 3.1 per woman and the crude birth rate at 26 per 1000 population.[13]

To evaluate rubella immunity in pregnant women 15–44 years of age and examine factors associated with seropositivity, stored serum samples from the 2010 Namibia National HIV Sentinel Survey were tested. Rubella immunoglobulin G (IgG) antibody seroprevalence estimates will provide evidence to support the decision to introduce rubella vaccine as part of the Namibia national EPI and to guide efforts to prevent rubella and CRS.

2. Methods

In 2010, the Namibia Ministry of Health and Social Services (MoHSS) conducted a nationwide sentinel survey to estimate HIV prevalence in pregnant women aged 15–49 years. The survey was designed using the standardized WHO methodology for HIV prevalence surveys, using convenient consecutive sampling of women attending antenatal clinics (ANC) selected based on geographic representation from all regions and health districts, urban and rural clinics, areas with different population densities and sizes, and women of different socioeconomic status.[14,15] All pregnant women aged 15–49 years were included in the survey if they attended an ANC for the first time during their current pregnancy, were not referred from another health facility, and agreed to a routine blood draw.

The 2010 survey enrolled 7983 pregnant women from all 34 health districts, 35 main hospitals, and 93 satellite health centers and clinics; 7888 (98.8%) of the enrollees had specimens collected during March 22 to September 6, 2010.[15] Unlinked, de-identified specimens were tested for HIV antibodies. All de-identified data fields (unique identification, district abbreviation and site number, facility type, date of ANC visit, woman's age, gravidity, place of residence, antiretroviral therapy participation, and counseling for prevention of maternal-to-child transmission) were retained electronically. Specimens were stored at 4–8 °C at the Namibia Institute of Pathology in Windhoek.

To estimate the prevalence of rubella IgG antibody within each 5-year age group, it was determined that 428 specimens in each age group would be necessary, assuming seroprevalence of 50%, desired precision of ±5%, probability of achieving the desired precision of 0.95, and 10% loss due to specimens not found or inadequate. There were too few specimens in the 45–49 years age stratum for meaningful estimates, so these samples were excluded. The number of specimens in the 40–44 years age stratum was less than the targeted number, so all specimens were sampled. To control for the distribution of HIV-infected women within each age group, the target sample size was allocated to the HIV-positive and HIV-negative groups based on their observed distributions in the sentinel survey.[15]

Testing for rubella IgG antibody was performed by the Namibia Institute of Pathology in 2012, using an enzyme immunoassay (EIA) to detect rubella-specific IgG (Enzygnost; Siemens, Germany); tests were performed in accordance with the manufacturer's recommendations. Samples with corrected optical density (OD) values >0.2 were considered positive, samples with values <0.1 were considered negative, and samples with values of 0.1–0.2 were considered equivocal. Specimens that tested equivocal were retested as per the manufacturer's instructions, and if the result was confirmed, samples were classified as equivocal, otherwise as positive or negative. To monitor the performance of the EIA, an in-house positive control for rubella IgG antibody was included on every EIA plate in addition to the controls supplied by the manufacturer. A 5% random sample of specimens were tested at the US Centers for Disease Control and Prevention (CDC, Atlanta, GA, USA) for quality assurance; high concordance was found with the testing at the Namibia Institute of Pathology (results not shown).

Seroprevalence estimates and 95% confidence intervals (CI) were calculated using the Wilson-score method for each 5-year age group and for the following sub-groups: gravidity, HIV status, urban/rural residence, facility type (hospital, health center, or clinic), and health district. The odds of seropositivity were calculated by multiple logistic regression while controlling for age group, gravidity, HIV status, urban/rural residence, and facility type. All analyses included sampling weights, which were calculated based on the probability of selection within each of the 12 age–HIV strata and adjusted for non-response (i.e., specimens not available or inadequate for testing) in each of the strata by the propensity cell adjustment method. These weights were then scaled to the total sample size: (weight/sum of weights) × total sample. A large percentage of specimens were not

Table 1
Target and observed sample sizes among pregnant women aged 15–44 years by age group and HIV status, from the 2010 Namibia National HIV Sentinel Survey

Age group, years	HIV status	Total specimens	Target sample size	% of total specimens sampled	Observed sample size	% Not tested (target-observed/target)
15–19	Positive	86	32	37	24	25
	Negative	1264	450	36	335	26
20–24	Positive	282	60	21	46	23
	Negative	1994	422	21	321	24
25–29	Positive	410	110	27	81	26
	Negative	1398	372	27	283	24
30–34	Positive	373	145	39	110	24
	Negative	871	337	39	259	23
35–39	Positive	222	144	65	115	20
	Negative	523	338	65	252	25
40–44	Positive	71	71	100	53	25
	Negative	211	211	100	161	24
All ages	Both	7705	2692	35	2040	24