Progress Toward Control of Rubella and Prevention of Congenital Rubella Syndrome — Worldwide, 2009

Rubella usually is a mild, febrile rash illness in children and adults; however, infection early in a woman’s pregnancy, particularly during the first 16 weeks, can result in miscarriage, fetal death, or an infant born with birth defects (i.e., congenital rubella syndrome [CRS]) (1). In 2000, the World Health Organization (WHO) published the first rubella vaccine position paper to guide introduction of rubella-containing vaccine (RCV) in national childhood immunization schedules (2). As of December 2009, a total of 130 WHO member states have introduced RCV, a 57% increase from 83 member states in 1996. In addition, goals to eliminate rubella and CRS have been established in the WHO Region of the Americas (by 2010) and the WHO European Region (by 2015), and the WHO Western Pacific Region has established targets for accelerated rubella control and CRS prevention by 2015. During 2009, a total of 121,344 rubella cases were reported from 167 member states to WHO, an 82% decrease from 670,894 cases reported in 2000 from 102 member states. This report summarizes reported rubella and CRS cases globally and progress toward global introduction and use of RCV.

Member states submit information to WHO on the number of reported cases of rubella and CRS, and the use, timing, and number of RCV doses administered in the national immunization schedule using the WHO/UNICEF Joint Reporting Form (JRF). JRF data were analyzed for 1996 and 2009 to assess changes in rubella vaccine use, and from 2000 to 2009 to measure changes in reported burden of rubella and CRS. Case definitions for rubella and CRS have been published by WHO; however, the exact definition used might differ slightly to reflect specific regional conditions (3). WHO recommends that member states have first-dose measles-containing vaccine (MCV1) coverage of >80% before introducing RCV (2). To assess member state eligibility for RCV introduction, WHO/UNICEF MCV1 coverage estimates for 2009 were reviewed. To assess overall MCV1 coverage for 2009, median and interquartile ranges of MCV1 coverage estimates were calculated separately for member states using RCV and for member states not using RCV.

Use of rubella-containing vaccine

As of December 2009, a total of 130 of the 193 WHO member states used RCV in national immunization schedules (Figure), including two (4%) of 46 member states in the WHO African Region (AFR), 35 (100%) in the Region of Americas (AMR), 15 (71%) of 21 in the Eastern Mediterranean Region (EMR), 53 (100%) in the European Region (EUR), four (36%) of 11 in the South-East Asia Region (SEAR), and 21 (78%) of 27 in the Western Pacific Region (WPR). In comparison, only 83 member states used RCV in their national immunization schedules in 1996.

Among the 130 member states with RCV in their national immunization schedules as of December 2009, the first dose is recommended to be administered at ages 12–24 months in 122 (94%) member states. Although only one RCV dose is recommended routinely, 119 (92%) member states use a 2-dose schedule because rubella vaccine is combined with measles vaccine, which requires a 2-dose schedule. Measles-mumps-rubella (MMR) vaccine is used in 115 (88%) member states, measles-rubella (MR) vaccine is used in 12 (9%) member states, measles-mumps-rubella-varicella vaccine is used in two (2%) member states, and single-antigen rubella vaccine is used in one member state.

In 2009, median MCV1 coverage was 96% (interquartile range: 92%–99%) for the 130 member states using RCV, including nine member states (Azerbaijan, the Cook Islands, the Dominican Republic, Ecuador, Haiti, Iraq, Lebanon, Palau, and Samoa) with MCV1 coverage <80%. For member states not using RCV, the median MCV1 coverage was 76% (interquartile range: 70%–80%).

* During the September 2010 WHO Regional Committee for Europe meeting, the goal of eliminating measles and rubella and prevention of CRS was changed to 2015.
† WHO/UNICEF started requesting reports for rubella and CRS in 2000.
§ Laboratory-confirmed CRS = clinically confirmed CRS in an infant who has a positive blood test for rubella-specific immunoglobulin M or where available, detection of rubella virus in specimens from pharynx and urine. CRS is clinically confirmed in an infant if a qualified physician detects at least two of the following complications in the infant: cataract(s), congenital glaucoma, congenital heart disease, loss of hearing, or pigmented retinopathy, or one of those complications and one of the following: purpura, splenomegaly, microcephaly, mental retardation, meningoencephalitis, radiolucent bone disease, or jaundice that begins within 24 hours after birth.
range: 74%–91%), including 22 member states with sustained MCV1 coverage >80% in 2009 that have met the vaccination coverage criteria for introduction of RCV (Figure).

Reported Rubella and CRS Cases

During 2009, a total of 121,344 rubella cases from 167 member states were reported to WHO, an 82% decrease from 670,894 cases reported during 2000 from 102 member states (Table). The greatest percentage decrease between 2000 and 2009 was in AMR, where reported rubella cases decreased nearly 100%, from 39,228 to 18, and the number of reporting member states increased from 25 to 34. In EUR, which shares with AMR the goal of eliminating rubella virus transmission, the number of cases reported decreased 98%, from 3,122 to 34. In WPR, the number of rubella cases increased 12-fold during 2000–2009, from 5,475 to 73,077. During that period, China started to report rubella cases in 2004 and the number of reporting member states increased from 20 to 46. In EMR, the number of rubella cases decreased 35%, from 3,122 to 2,030, and the number of reporting member states increased from 11 to 15. In contrast, during 2000–2009, reported rubella cases in AFR increased 20-fold, from 865 to 17,388, and the number of reporting member states increased from seven to 38. In SEAR, reported cases increased 14-fold during the period, from 1,165 to 17,208, and the number of reporting member states increased from three to nine. Neither AFR nor SEAR have specific goals for rubella control. In WPR, the number of rubella cases increased 12-fold during 2000–2009, from 5,475 to 73,077. During that period, China started to report rubella cases in 2004 and the number of reporting member states increased from 15 to 25. Globally, a total of 165 CRS cases were reported from 123 member states during 2009, compared with 157 CRS cases reported from 75 member states during 2000.

---

* Member states that have not introduced rubella-containing vaccine into their childhood schedule.

---

Algeria, Bangladesh, Botswana, Burundi, Cambodia, Cape Verde, Democratic Republic of Korea, Eritrea, Gambia, Ghana, Indonesia, Lesotho, Malawi, Myanmar, Rwanda, Sao Tome, Sudan, Swaziland, Togo, United Republic of Tanzania, Vietnam, and Zambia.
The primary purpose of rubella vaccination is to prevent congenital rubella virus infection, including CRS, which affects an estimated 110,000 infants each year in developing countries (4). Safe and effective RCVs have been available since 1969. However, until the 1990s, developed countries primarily used RCV because the disease burden caused by rubella virus had not been documented sufficiently in the developing world, and because of the additional cost of the rubella vaccine component when combined with MR or MMR vaccine and concern that the risk for CRS might increase if high vaccination coverage could not be achieved and maintained. Low coverage might result in decreased virus circulation, which could increase the average age of rubella infection for females from childhood to the childbearing years.

Rubella and CRS are vastly underreported to WHO through routine disease surveillance systems. Reporting of rubella and CRS cases in a region is dependent on the number of member states with surveillance systems and the quality of those systems. As a country makes progress on rubella control and surveillance continues to improve in SEAR, the number of reported CRS cases might increase. WHO has published guidelines on CRS surveillance that recommend identifying infants born with congenital defects associated with CRS and follow-up of pregnant women who are infected during pregnancy (5). Documenting the extent of CRS is challenging because of the difficulty of diagnosis and reporting in settings with limited medical resources. Nevertheless, clusters of children born with CRS have been identified after rubella outbreaks, even in resource-poor settings (e.g., Romania) (6). In the majority of member states in all WHO regions, rubella cases are identified through integrated measles-rubella case-based surveillance.

During the past decade, most member states have increased the frequency of laboratory testing of suspected measles and rubella cases. However, because 20%–50% of rubella infections do not include a rash, many rubella cases will not be detected or reported. In all regions, widespread rubella virus circulation has been documented through serosurveys (7).

In 2009, two thirds of all WHO member states included RCV as part of their national immunization schedule; however, these member states represent <50% of the global birth cohort. As other member states consider RCV introduction, the potential risk needs to be considered that rubella virus transmission dynamics might be altered such that susceptibility might increase among women of childbearing age, resulting in increased risk for CRS. Therefore, for countries introducing RCV, achieving and maintaining high vaccination coverage is essential. In 2009, of the 130 member states that have introduced RCV, 121 member states had sustained MCV1 coverage >80% and median MCV1 coverage was 96%.

<table>
<thead>
<tr>
<th>WHO region</th>
<th>No. of member states in region</th>
<th>Member states reporting</th>
<th>No. (%)</th>
<th>No. of cases</th>
<th>Incidence per 100,000 population</th>
<th>Member states reporting</th>
<th>No. (%)</th>
<th>No. of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>African</td>
<td>46</td>
<td>38 (83)</td>
<td>17,388</td>
<td>2.11</td>
<td></td>
<td>15 (33)</td>
<td>47</td>
<td></td>
</tr>
<tr>
<td>Americas</td>
<td>35</td>
<td>34 (97)</td>
<td>18</td>
<td>&lt;0.01</td>
<td></td>
<td>34 (97)</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Eastern</td>
<td>21</td>
<td>15 (71)</td>
<td>2,030</td>
<td>0.34</td>
<td></td>
<td>10 (48)</td>
<td>67</td>
<td></td>
</tr>
<tr>
<td>Mediterranean</td>
<td>European</td>
<td>53 (87)</td>
<td>11,623</td>
<td>1.30</td>
<td></td>
<td>43 (81)</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>South-East Asia</td>
<td>11</td>
<td>9 (82)</td>
<td>17,208</td>
<td>0.96</td>
<td></td>
<td>4 (36)</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Western Pacific</td>
<td>27</td>
<td>25 (93)</td>
<td>73,077</td>
<td>4.08</td>
<td></td>
<td>17 (63)</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>193</td>
<td>167 (87)</td>
<td>121,344</td>
<td>1.78</td>
<td></td>
<td>123 (64)</td>
<td>165</td>
<td></td>
</tr>
</tbody>
</table>

**TABLE. Reported cases of rubella and congenital rubella syndrome, by World Health Organization (WHO) region, 2009**
Incorporation of RCV into national childhood immunization schedules is both cost-beneficial and cost-effective (8). Studies in Barbados and Guyana estimated a lifetime cost of treating a single CRS case to be approximately $50,000 in Barbados and $64,000 in Guyana (8). In contrast, rubella vaccine is highly affordable; the incremental costs of incorporating rubella vaccine in MR and MMR vaccines using a 10-dose vial are $0.31 and $0.70–$1.37** per dose, respectively. In introducing RCV, MR and MMR vaccines easily replace single-antigen measles vaccines in routine childhood immunization schedules.

In AMR and EUR, the two WHO regions with rubella elimination goals, rubella cases have decreased more than 97% (9). In September 2010, the Pan American Health Organization (PAHO) announced that AMR had achieved the rubella and CRS elimination goals, based on analysis of surveillance data; efforts are under way to document the elimination of rubella and CRS (10). As regions and member states make progress toward achieving rubella and CRS elimination goals, challenges remain, including the risk for disease importation. To achieve and maintain the elimination goals, member states will need to ensure high vaccination coverage and maintain high-quality, integrated measles-rubella and CRS surveillance.

With the substantial morbidity and cost resulting from infants born with CRS and the ease of introduction of RCV into the routine vaccination program, member states and regions that have not yet introduced RCV are encouraged to assess their burden of CRS and rubella and to determine whether introduction of RCV is appropriate, and if so, to explore financially sustainable options for providing RCV. Twenty-two member states have sustained MCV1 coverage >80%, but have not yet introduced RCV, largely because of a lack of financial resources. Rubella control and prevention of CRS can be accelerated by integrating rubella into the measles case-based surveillance system, establishing CRS surveillance, and using combined MR and MMR vaccines as part of current measles elimination and global mortality reduction activities.

References