

Measles vaccines: WHO position paper - 28 August 2009

Grading of scientific evidence in support of key recommendations

Table I: Effectiveness of measles vaccine in young children and adolescents

Question 1: Are measles vaccines effective in young children and adolescents?

Settings: Global

Conclusion: Compared with no vaccination, measles vaccination is more effective at reducing the incidence of measles infection (High level of scientific evidence).

Question 2: Are two doses of measles containing vaccine more effective than one dose in protecting against measles?

Settings: Global

Conclusion: Two doses of measles containing vaccine are more effective than one dose in protecting against measles (High level of scientific evidence)

Quality assessment						Summary of Findings	Importance
No of studies	Design	Limitations	Inconsistency	Indirectness	Imprecision	Quality	
Effectiveness of measles vaccine for preventing measles in young children and adolescents							
1	RCT	Serious ¹	No serious	No serious	No serious	High ²	Critical
3	OBS	No serious	No serious	No serious	No serious	High ²	
Effectiveness of 1 versus 2 doses of MCV for the prevention of measles in young children and adolescents							
4	OBS	No serious	No serious	No serious	No serious	High ³	Critical

¹Groups were systematically assigned based on date of birth. Some children who were originally assigned to the control group received measles vaccination at 9 months, thereby changing the systematic allocation of groups in the final comparison.

²The quality of evidence was upgraded to "High" based on evidence of a very strong association (>90% VE seen across multiple studies)

³The quality of evidence was upgraded to "High" based on evidence of a very strong association (97% of children who did not develop neutralizing antibody after one dose of measles vaccine seroconverted after the second dose)

In the systematic review by *Elliman D et al (2007)*, grading of scientific evidence for protection against measles infection following immunization was based on the study by *Anonymous (1968)*, a quasi-randomized, controlled trial that followed 21,653 UK children aged 10 – 24 months for 2 years and 9 months after vaccination. The protective effect of live, monovalent vaccine was 94%.

The proven benefit of the vaccine makes it unethical to withhold vaccination in control groups and hence, randomized controlled trials in this field are scarce. However, numerous observational studies underline the high protective efficacy of measles vaccine. Since the literature search by *Elliman D et al* (2007), three observational studies have been published that include assessments of the effectiveness of measles containing vaccine. These three studies also allow a comparison between the levels of protection induced by one versus two doses of the vaccine.

Marin M et al (2006) studied the effectiveness of MMR vaccination in 72 households during a large outbreak on the Marshall Islands. The vaccine effectiveness (VE) was 92% (95% confidence interval [CI], 67-98%) for 1 dose and 95% (95% CI, 82-98%) for 2 doses.

Wichmann O et al (2007) investigated vaccine effectiveness based on a large outbreak of measles in a German public school. Among 1098 students the attack rate was 53% in unvaccinated individuals, 1.0% in students with one, and 0.4% in those with two MCV-doses. VE was 98.1% (95% CI: 92-100%) in students with one and 99.4% (95% CI: 97-100%) with two MCV-doses.

Velicko I et al (2008) conducted a case-control study during a major measles epidemic in Ukraine. The two-dose VE was 93.1% (95% CI: 80.5-98.0%) when controls were matched by class and 92.0% (95% CI: 79.4-97.2%) when controls were matched by school/university. One-dose VE was 50.0% (-57.4-98.3)¹ when controls were matched by class and 63.0% (-92.3-93.9%) when controls were matched by school/university, but the authors highlight the wide confidence intervals and note the small number of cases and controls with one dose of vaccine, predicting one-dose VE to be significantly higher.

Watson JC et al (1996) screened 659 children who had received one dose of measles vaccine between the ages of 15-17 months for measles antibody. Of the 37 children who were seronegative (but positive for Rubella IgG antibody), 36 (97%) seroconverted after revaccination.

References

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Marin M, Nguyen HQ, Langidrik JR, Edwards R, Briand K, Papania MJ, Seward JF, LeBaron CW. Measles transmission and vaccine effectiveness during a large outbreak on a densely populated island: implications for vaccination policy. *Clin Infect Dis*. 2006 Feb 1;42(3):315-9.

¹ Corrected from manuscript through personal communication by the author

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Wichmann O, Hellenbrand W, Sagebiel D, Santibanez S, Ahlemeyer G, Vogt G, Siedler A, van Treeck U. Large measles outbreak at a German public school, 2006. *Pediatr Infect Dis J*. 2007 Sep;26(9):782-6.