Determinants of measles seroprevalence among pregnant women in Paris, France

H. Bodilis[1,2], F. Goffinet[3,4,5,6], A. Krivine[7], T. Andrieu[4], O. Anselem[5,6], V. Tsatsaris[3,5,6], F. Rozenberg[3,6,7] and O. Launay[1,2,3,4,6]

1) *Inserm, CIC BT 505,* 2) *Centre d'Investigation Clinique en Vaccinologie, Assistance Publique-Hôpitaux de Paris (AP-HP), Hôpital Cochin,* 3) *Université Paris Descartes, Sorbonne Paris Cité,* 4) *Inserm U953,* 5) *AP-HP, Hôpital Cochin, Maternité Port Royal,* 6) *DHU Risques et Grossesse, and* 7) *Department of Virologie, AP-HP, Hôpital Cochin, Paris, France*

Abstract

Non-immune pregnant women are at risk of severe measles. As the measles vaccination is contraindicated during pregnancy, women should be vaccinated before conception or during the postpartum period. Nevertheless, measles serology is not recommended during pregnancy in France, and there are no data available concerning measles susceptibility and its associated risk factors among pregnant women. The socio-demographic determinants of measles seronegativity have been identified in a prospective cohort of 826 pregnant women in Paris, France. Measles seronegativity was 10.41% (95% CI 8.32–12.50). Women from higher socio-economic groups, born in France after 1980, were more frequently seronegative.

Keywords: Immunity, measles, pregnancy, seroprevalence, susceptibility

Original Submission: 22 October 2013; **Revised Submission:** 5 December 2013; **Accepted:** 20 November 2013

Editor: L. Kaiser

Article published online: 7 January 2014

Clin Microbiol Infect 2014; **20:** O501–O504

10.1111/1469-0691.12469

Corresponding author: O. Launay, CIC de Vaccinologie Cochin Pasteur, 27, rue du Faubourg Saint Jacques, 75 014 Paris, France
E-mail: odile.launay@cch.aphp.fr

Dr Odile Launay (Head of the CIC Cochin-Pasteur), MD, PhD, infectious diseases specialist, has been principal investigator of many international clinical trials, especially concerning vaccines, HIV and flu. She is the coordinator of the French vaccinology research network.

Background

Vaccination against measles has been standard practice in France since 1983: one initial dose at 12 months, with a second dose (since 1996) recommended initially at 6 years and now given at18 months. A 'catch-up' dose is recommended for adults born after 1980, who received only one dose during childhood [1]. There has been an ongoing measles outbreak in France since 2008, with a high number of cases among infants under 1 year of age and young adults, including pregnant women [2]. When measles occurs during pregnancy, maternal and foetal morbidity is increased [3–5]. In addition, infants born to seronegative women are not protected until they have been vaccinated [6–8]. Identification of women at risk of developing measles could help to develop appropriate action for this population.

Method

The COFLUPREG (COhort on FLU during PREGnancy) study was a prospective cohort study carried out on pregnant women in three tertiary maternity centres in Paris (France), during the 2009 A/H1N1 influenza pandemic. Nine hundred and nineteen pregnant women, between 6 and 35 weeks of gestation, were randomly selected in order to obtain a representative sample of pregnant women. They were included from 12 October 2009 to 3 February 2010, in order to assess the incidence rate of serious forms of A/H1N1 influenza. Women aged ≥18 years and able to understand French were eligible to participate [9]. The exclusion criteria were vaccination for the 2009 A/H1N1 pandemic or a virologically confirmed 2009 A/H1N1 infection during the previous 6 months. Socio-demographic and obstetrical characteristics were collected at the time of inclusion. Socio-professional categories established by the French INSEE were ranked in three major groups: upper (managers, engineers and scientists), middle (teachers, craftsmen, intermediate administrative and health professionals) and lower (employees, technicians, the unemployed and manual workers). Because epidemiological data [1] show that people born before 1980 are naturally protected, two age categories were created: born either 'before' or 'after' 1980.

Blood samples were available from 826 women. Measles IgG antibody levels were measured using the 'Captia® Measles IgG' technique (Trinity Biotech, Jamestown, NY, USA); < 60 IU/mL was considered to be negative.

To compare percentages, the χ^2 or Fisher exact tests were used whenever $n < 5$. In order to compare mean values, the

Student or Mann–Whitney *U*-test was used whenever $n < 30$, and the Kruskall-Wallis test was used when more than two groups were compared. All possible correlations between the determinants and measles seronegativity were analysed using univariate analysis. The determinants having a p-value < 0.25 with the univariate analysis were included in the final logistic regression. Statistical analyses were performed using the STATA software for Windows (version 11.0; College Station, Texas, USA).

Results

The characteristics of the population are described in Table 1. The median age was 33.1 years (minimum, 18.8; maximum, 49.1), 78.4% of the women were born before 1980 and 46.97% were primiparous. The measles seronegativity rate was 10.41% (95% CI 8.32–12.50) for the full sample population, 8.64% (95% CI 6.47–10.81) for women born before 1980, and 16.85% (95% CI 11.30–22.41) for women born after 1980. Among women with measles antibodies, the mean titre was 502.3 IU/mL (range 60–2510): 399.9 IU/mL for women born after 1980 and 527.9 IU/mL for those born before (p = 0.0001). The univariate analysis showed that age, geographical origin and number of children aged <18 years living at home were significantly associated with measles seronegativity (Table 1). In the multivariate logistic regression, the determinants associated with measles seronegativity were: age (18–29 years, adjusted odds ratio (aOR) 2.5, 95% CI 1.5–4.1; compared with the 30–50 years age group), geographical origin (sub-Saharan African origin, aOR 0.5, 95% CI 0.2–1.4; North African origin, aOR 0.9, 95% CI 0.4–2.1; Asian origin, aOR 2.6, 95% CI 1.2–5.4; compared with French and European origin), and socio-economic category (middle or lower socio-economic category, aOR 0.5, 95% CI 0.3–0.9; compared with the upper socio-economic category) (Table 2).

TABLE 1. Characteristics of the studied population and determinants associated with measles serosusceptibility: univariate analysis

	Total No. (%)	Measles IgG negative No. (%)	Measles IgG positive No. (%)	p-value[a,b,c]
Total	826 (100)	86 (10.41)	740 (89.59)	
Maternity Centre (France)				
Saint Vincent de Paul	234 (28.33)	23 (9.83)	211 (90.17)	**0.012**[a]
Port Royal	397 (48.06)	32 (8.06)	365 (91.94)	
Necker	195 (23.61)	31 (15.90)	164 (84.10)	
Age (mean, years)	33.06	31.12	33.29	**<0.0001**[c]
19–24	23 (2.78)	4 (17.39)	19 (82.61)	**0.004**[a]
25–29	155 (18.77)	26 (16.77)	129 (83.23)	
30–34	327 (39.59)	37 (11.31)	290 (88.69)	
35–39	210 (25.42)	14 (6.67)	196 (93.33)	
40–50	111 (13.44)	5 (4.50)	106 (95.50)	
Year of birth before 1980	648 (78.45)	56 (8.64)	592 (91.36)	**0.001**[a]
Born after 1980	178 (21.55)	30 (16.85)	148 (83.15)	
Geographical origin (*N* = 823)				
French/European	603 (73.27)	63 (10.45)	540 (89.55)	**0.024**[a]
Sub-Saharan Africa/West Indies	85 (10.33)	5 (5.88)	80 (94.12)	
North Africa	85 (10.33)	7 (8.24)	78 (91.76)	
Asian and Other	50 (6.08)	11 (22.00)	39 (78.00)	
Socio-economic category (*N* = 825)				
Upper	312 (37.82)	41 (13.14)	271 (86.86)	0.137[a]
Middle	276 (33.45)	24 (8.70)	252 (91.30)	
Lower	237 (28.73)	21 (8.86)	216 (91.14)	
Healthcare worker (*N* = 544)				
Yes	120 (22.06)	9 (7.50)	111 (92.50)	0.204[a]
No	424 (77.94)	49 (11.56)	375 (88.44)	
Professionals in contact with the public (*N* = 446)				
Yes	380 (85.20)	39 (10.26)	341 (89.74)	0.334[b]
No	66 (14.80)	4 (6.06)	62 (93.94)	
Working with children (*N* = 445)				
Yes	82 (18.43)	9 (10.98)	73 (89.02)	0.89[a]
No	363 (81.57)	33 (9.09)	330 (90.91)	
Status (*N* = 825)				
In couple	570 (93.33)	84 (10.91)	686 (89.09)	0.108[b]
Single	55 (6.67)	2 (3.64)	53 (96.36)	
Gestity (mean)	2.34	2.10	2.37	0.055[d]
Number of children<18 years living at home (mean)	0.73	0.58	0.75	**0.045**[d]
Parity				
0.1	686 (83.05)	76 (11.08)	610 (88.92)	0.165[a]
>1	140 (16.95)	10 (7.14)	130 (92.86)	

[a]χ^2, [b]Fisher exact test, [c]Student, [d]Welch.
Bold values indicate statistical significance (p <0.05).