

Negative attitude of highly educated parents and health care workers towards future vaccinations in the Dutch childhood vaccination program

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Abstract

Background: It is unknown whether further expansion of the Dutch childhood vaccination program with other vaccines will be accepted and whom should be targeted in educational strategies.

Aim: To determine attitudes of parents towards possible future vaccinations for their children and the behavioural determinants associated with a negative attitude.

Design: Questionnaire study.

Methods: Parents of children aged between 3 months and 5 years of day-care centres were asked to fill out a questionnaire. Determinants of a negative attitude to comply with possible future vaccinations against example diseases such as pneumonia or influenza, hepatitis B, TBC, smallpox and SARS were assessed using polytomous logistic regression analysis.

Results: Of the 283 respondents, 123 (43%) reported a positive attitude towards all vaccinations, 129 (46%) reported to have a positive attitude to have their child vaccinated against some diseases and 31 (11%) had no intention to comply with any new vaccination. Determinants of a fully negative attitude were a high education of the parent (odds ratio [OR] 3.3, 95% confidence interval [95% CI]: 1.3–8.6), being a health care worker (OR 4.2, 95% CI: 1.4–12.6), absence of religion (OR 2.6, 95% CI: 1.0–6.7), perception of vaccine ineffectiveness (OR 6.9, 95% CI: 2.5–18.9) and the perception that vaccinations cause asthma or allergies (OR 82.4, 95% CI: 8.9–766.8).

Conclusion: Modifiable determinants for a negative attitude to comply with new vaccinations are mainly based on lack of specific knowledge. These barriers to vaccinations might be overcome by improving health education in the vaccination program, especially when targeted at educated parents and health care workers.

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1. Introduction

Although in The Netherlands vaccination rates are high among children (97%), a recent report published data showing that over the last 5 years rates have declined by 0.7% for the third vaccination series and such a decline was most noticeable among infants [1]. Since the start of the Dutch vaccination program in 1957, most vaccine-preventable in-

fectious diseases covered by the childhood vaccination program have disappeared or occurrences of such infections have been rare. Apart from individual protection by the vaccines, the high vaccination rates induce herd immunity as well [1,2]. The World Health Organisation stated that 80% of newborns should receive the primary vaccine series of diphtheria, pertussis, tetanus and polio (DTP) and 90% the series of mumps, measles and rubella (MMR) vaccines to maintain herd immunity. To prevent local epidemics the Dutch authorities recommend an even higher vaccination rate of 90% for all vaccine-preventable infectious diseases [1].

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Recently, the Dutch vaccination program has been changed by starting at two instead of three months in 1999, addition of a pertussis vaccine in 2001 for 4-year olds and addition of Meningococcal-C vaccination at the age of 14 months in 2002. In 2003, hepatitis B vaccination was added for children from endemic areas. In the near future, a combined meningococcal-B and pneumococcal vaccination might be incorporated into the program [1].

To date, it is unknown whether further expansion of the vaccination program with other vaccines will be accepted by the target population. Therefore, we conducted a questionnaire study among parents of preschool children to determine the attitude towards compliance with future vaccinations in the Dutch childhood vaccination program and the behavioural determinants associated with a negative attitude.

2. Methods

2.1. Study population

The study was conducted among parents of children aged between 3 months and 5 years who attended day-care in the centre of the Netherlands with similar vaccine uptake as in the Netherlands as a whole.

2.2. Focus group session

By means of a structured focus group interview among parents of children from the day-care centre “Petit Petit”, Breukelen, we explored possible determinants of attitudes to comply with vaccinations. In that interview elements that were observed in previous qualitative studies [2,3] and quantitative studies [4–8] were discussed extensively. In general, the parents assessed the child’s health as most relevant to have them vaccinated followed by the balance of risks of disease and side effects of vaccination, and the fact that infectious diseases may threaten public health.

2.3. Questionnaire

We sent out 800 questionnaires to day-care centres that were associated with the large organisation for day-care “De Blokkentoren” in the centre of The Netherlands. We asked the participants to fill out the questionnaire while focussing on their youngest child. The outcomes of the focus group interview and a questionnaire that was focused on pneumococcal and influenza vaccinations among elderly persons [4] were used to develop the present questionnaire for parents. In all, 54 questions were asked and the majority were based on determinants of health behaviour according to the “Health Belief Model” [9]. We evaluated demography, vaccination status according to the Dutch vaccination scheme (DTP, HiB, mumps, measles and rubella, Meningococcal-C, diphtheria, tetanus and polio, a-cellular pertussis). Also, we evaluated perceived individual and population protection by vaccina-

tion, and possible side effects, self-control of parents, social influence of persons as their doctor or friends as well as their opinion about the current educational program. Finally, we evaluated the attitude of parents towards compliance with example vaccinations that are currently available, but not included in the program for all children such as vaccines against pneumococcal disease or influenza [10,11], hepatitis B [12] and tuberculosis [13] as well as diseases that may occur by bio-terrorism (smallpox) [14] or in case of a pandemic (SARS) [15]. The respondents were asked to answer all propositions on a five-point scale ranging from ‘I certainly agree’ to ‘I certainly disagree’ [4].

2.4. Outcome measure

According to an earlier study [4], we defined a trichotomous outcome measure. Because the percentage of parents that had a positive attitude towards vaccination against pneumonia or influenza was much lower (36%) than for the other proposed diseases (ranging from 62% [hepatitis B], 64% [SARS], 67% [tuberculosis] to 79% [smallpox]), we choose to evaluate the attitude towards compliance with vaccination against these latter four diseases: (a) positive attitude: intention to comply with these four possible vaccinations; (b) partially negative attitude: intention to have the child vaccinated against some, but not all of the four proposed diseases; and (c) fully negative attitude.

2.5. Statistical analysis

We dichotomised the following variables: religion (yes or no), received education (high or low) and the variables on the five-point scale (1–2 [agree] and 3–5 [uncertain and disagree]) in accordance with a previous report [4]. First, we evaluated the univariate associations of potential determinants with both partially negative and fully negative attitude using two separate binary logistic regression analyses. A positive attitude was the reference category. Subsequently, we used the demographical determinants and the behavioural determinants with a *p*-value lower than 0.1 in at least one of the univariate analyses to determine the multivariate associations. Finally, all determinants in the multivariate logistic regression analysis with a *p*-value of 0.05 or lower were used to construct the polytomous logistic regression model [4].

3. Results

3.1. Study population

Of all 800 questionnaires that were sent out, 283 were returned (response rate 35%). Mean age (S.D.) of the respondents was 35 years (6 years) and 85% were female. Of all respondents, both the father and mother (if applicable) as well as the child were vaccinated according to the Dutch vaccination scheme. The mean number of children was 2.4 per household, the youngest child was 2 years on average.

3.2. Future vaccinations

Of the 283 participants, 123 (43%) reported a positive attitude towards all four proposed vaccinations, 129 (46%) reported to have the attitude to have their child vaccinated against some diseases and 31 (11%) had no intention to comply with any new vaccination. Of the respondents, 221 (83%) would have a positive attitude if the future vaccine would benefit the health of their child, 200 (76%) would have a positive attitude when public health would benefit and only 71 (27%) of respondents would be positive if the vaccine would save costs to society. If the schedule would be changed to include three or four vaccinations in one session instead of one or two 223 (73%) and 246 (87%) of the respondents, respectively, would object. If parents would be asked to pay extra themselves for the vaccines, 98% would continue to have their child vaccinated.

3.3. Determinants of a negative attitude towards future vaccinations

Determinants of a fully negative attitude were a high education of the parent (odds ratio [OR] 3.3, 95% confidence interval [95% CI]: 1.3–8.6), being a health care worker (OR 4.2, 95% CI: 1.4–12.6), absence of religion (OR 2.6, 95% CI: 1.0–6.7), perception of vaccine ineffectiveness (OR 6.9, 95% CI: 2.5–18.9) and the perception that vaccinations cause asthma or allergies (OR 82.4, 95% CI: 8.9–766.8) (see Table 1). We observed stronger associations in the fully negative group than the partially negative group.

3.4. Health education in the Dutch childhood vaccination program

According to 244 (89%) of the respondents there is a high need to improve the current health education for parents. Most respondents (47%) would favour oral education by health care

workers, 27% would like to receive an information leaflet at home and 14% would favour educational sessions on television.

4. Discussion

This study showed that among a group of parents fully vaccinated against infectious diseases as given in the Dutch childhood vaccination program, 11% objected against any newly introduced vaccination. In addition, the attitude among a large part of the respondents towards a new vaccine into the program was critically dependent on the type of vaccine. For example, vaccination against influenza or pneumonia would be accepted by only 36% of the respondents. These results indicate that group immunity might be threatened if new vaccines are introduced into the program.

Our data showed that education by health care workers at the vaccination centres, an information leaflet about vaccines and information on television might be effective in improving health education towards vaccinations. Highly educated parents and health care workers should receive high priority in such a strategy. Paulussen et al. also reported a high education to be predictive for a negative intention to comply with new vaccines in the vaccination program [2]. Opstelten et al. found a higher prevalence of non-compliers with influenza and pneumococcal vaccinations among highly educated elderly persons as well [4]. Because the average educational level has been increasing over the last decades, it might be assumed that more and more persons will adopt a critical attitude towards vaccinations. Besides, health care workers are important intermediaries for vaccinations and may therefore negatively influence parents, hence undermining the vaccination program.

Elements of the educational strategy should include information on the effectiveness of vaccines and potential side effects such as development of asthma and allergy.

Table 1
Determinants associated with a partially and fully negative attitude towards additional vaccines in the Dutch childhood vaccination program

Factors	Positive attitude (<i>n</i> = 121) Number (%)	Partially negative attitude towards additional vaccines (<i>n</i> = 129)			Fully negative attitude towards additional vaccines (<i>n</i> = 29)		
		Number (%)	Odds ratio (95% confidence interval)*	<i>p</i> -value	Number (%)	Odds ratio (95% confidence interval)*	<i>p</i> -value
Demographical							
High educational level	46/121 (38)	74/129 (58)	1.4 (0.6–3.5)	0.437	18/29 (58)	3.3 (1.3–8.6)	0.012
Health care worker	12/121 (10)	30/129 (24)	1.6 (0.6–4.1)	0.350	10/29 (32)	4.2 (1.4–12.6)	0.010
No religion	60/121 (49)	73/129 (57)	1.5 (0.6–3.8)	0.363	18/29 (58)	2.6 (1.0–6.7)	0.054
Barriers							
Vaccination does not guarantee protection against the infectious disease	17/121 (14)	18/129 (14)	5.8 (2.3–14.8)	0.000	14/29 (47)	6.9 (2.5–18.9)	<0.001
Vaccination leads to allergy and asthma	1/121 (1)	10/129 (8)	6.3 (2.0–19.4)	0.001	9/29 (30)	82.4 (8.9–766.8)	<0.001

Results of multivariate polytomous logistic regression analysis.

* Compared with parents with a positive attitude (n = 121).

Abovementioned studies among parents of young children [2] and elderly persons [4] support these findings. The population's perceptions that vaccinations lead to asthma and a weakened immune defence might be induced by certain non-scientific organizations such as the "Nederlandse Vereniging Kritisch Prikken" (Netherlands Society Knowledgeable Vaccinations) and an insufficient knowledge in the population about vaccinations. Also, the prevention and disappearance of vaccine-preventable diseases such as polio or diphtheria may have drawn the public's attention towards negative aspects of vaccinations. A recent report of the Dutch Health Council, however, showed that vaccines are safe [16]. Recent large-scale cohort studies provided strong evidence against autism, auto-immunity or asthma due to vaccinations [17–20].

We could not confirm earlier documented associations between negative attitudes towards vaccinations and organizational problems, difficulties to reach the vaccination theatre, low education of parents and young parents [4–8]. In the Netherlands, the Dutch vaccination program has been centrally organised via vaccination-administrative offices [1]. Also, most well-baby clinics in which the child's health is monitored and childhood vaccinations are given are close to the population and can be easily reached [1].

The fact that the majority of parents objected against more than two injections at a time underlines the importance of the development and application of combination vaccines. Currently, three of the four vaccines are given in combination, e.g., diphtheria, pertussis, tetanus and polio and Hib (since March 2003), diphtheria, tetanus and polio and mumps, measles and rubella. Only vaccination against Meningitis-C is given in a single injection. Presently, a combined Meningitis-B and pneumococcal conjugated vaccine is under development [21].

Some possible limitations of our study need to be addressed. First, a response rate of 35% might have influenced the results. However, there were only minor differences in the mean age of parents of these children (35 years versus 32 years) and the percentage of children vaccinated in the program (100% versus 97%) with the Dutch parental population [1]. For other demographic variables as mean number of children and percentage of parents with a religion there were no differences between the study group and the Dutch population [22]. The percentage of highly educated parents (48% versus 30%) and health care workers (18% versus 8%) was higher than compared with the Dutch parental population, which enhanced the statistical power to detect statistically significant associations [22]. However, this might have biased the proportion of persons that objected against all proposed vaccinations to some extent. In contrast, our finding that 11% of the study population will not accept any new vaccine in the program might be an underestimate given the fact that all parents were vaccinated according to the program whereas for the Netherlands as a whole less than 97% are vaccinated. Since many years, compliance with influenza vaccination among children with asthma has stabilised at 55% and rates are much lower in most other European countries [11].

Given this fact, it might be reasonable to assume that only 36% of the parents of healthy children will accept a vaccine against influenza or *S. pneumoniae*.

Furthermore, for reasons of statistical power, we choose to combine the outcome measure and not to analyse the separate vaccines in the multivariate methods. Importantly, the observed determinants for a negative attitude have been confirmed by earlier studies, which supports the validity of our findings.

Finally, it might be possible that our study was inadequate to detect statistically significant associations with rare determinants. In our study population, for example, none of the participants were orthodox-reformed (the group which is known to decline vaccination in general) and there were no parents from non-European countries in the study group. Hence, whether our results might be applicable to these groups is uncertain.

Over the last years, more and more parents have become sceptical and critical towards the Dutch childhood vaccination program. Our study has shown that adequate education can play an essential role to maintain the success of the program.

5. What this paper adds box

What is already known on this subject?

1. It has been shown that over the last few years there has been a decline in vaccine uptake among infants in the Dutch vaccination program.
2. The Dutch vaccination program will be expanded with new vaccines in the near future.

What does this study add?

1. More than 11% of the parents objected against any new vaccine in the vaccination program and for 46% of the parents a negative attitude was critically dependent on the type of vaccine.
2. Among health care workers and highly educated parents a negative attitude towards future vaccinations was more common than among others.
3. Fear for development of allergy or asthma and perception of ineffectiveness of vaccination were highly associated with a negative attitude towards future vaccinations.

6. Policy implications

The study emphasises the importance of an improved health education in the Dutch vaccination program.

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References

- [1] Inspectorate for Dutch Health Care. Vaccination situation in the Netherlands per January 2002 [with abstract in English]. The Hague, August 2004.
- [2] Paulussen ThGW, Lanting CI, Buijs GJ, Hirasing RA. Parents about the Dutch Childhood Vaccination program; satisfaction and preparedness towards vaccinations of parents of young children [in Dutch]. TNO (PG/JGD/2000.033), 2000.
- [3] Bond L, Nolan T, Pattison P, Carlin J. Vaccine preventable diseases and immunisations: a qualitative study of mother's perceptions of severity, susceptibility, benefits and barriers. *Aust N Z J Public Health* 1996;22:441–6.
- [4] Opstelten W, Hak E, Verheij TJM, Van Essen GA. Introducing a pneumococcal vaccine to an existing influenza immunization program: effects on vaccination rates and attitudes. *Am J Med* 2001;111:474–9.
- [5] Gore P, Madhavan S, Curry D, McClung G, Gastiglia M, Rosenbluth SA, et al. Predictors of childhood immunization completion in a rural population. *Soc Sci Med* 1999;48:1011–27.
- [6] Miller LA, Hoffman RE, Baron AE, Marine WM, Melinkovich. Risk factors for delayed immunization against measles, mumps and rubella in two-year olds. *Pediatrics* 1994;94:213–9.
- [7] Tuma JN, Smith SM, Kirk RH, Hagmann CE, Zemel PC. Beliefs and attitudes of caregivers toward compliance with childhood immunisations in Cameroon. *Public Health* 2002;116:55–61.
- [8] Goodman KJ, Wu JS, Frerichs RR. Compliance with childhood immunizations in Kern County, California. *J Immigrant Health* 2000;4:213–22.
- [9] Rosenstock IM. The health belief model and preventive health behavior. In: Becker MH, editor. *The health belief model and personal health behavior*. Thorofare: Charles B. Slack; 1974. p. 27–59.
- [10] Black SB, Shinefield HR, Ling S, Hansen J, Fireman B, Spring D, et al. Effectiveness of heptavalent pneumococcal conjugate vaccine in children younger than five years of age for prevention of pneumonia. *Pediatr Infect Dis J* 2002;21:810–5.
- [11] Hak E, Hoes AW, Verheij TJM. Influenza vaccinations: who needs them and when? *Drugs* 2002;62:2413–20.
- [12] CDC. From the Centers of Disease Control and Prevention. Recommended childhood immunization schedule, United States, 2002. *J Am Med Assoc* 2002;287:707–8.
- [13] Colditz GA, Brewer TF, Berkey CS, Wilson ME, Burdick E, Fineberg HV, et al. Efficacy of BCG vaccine in the prevention of tuberculosis. Meta-analysis of the published literature. *J Am Med Assoc* 1994;271:698–702.
- [14] Friedlander AM, Pittman PR, Parker GW. Anthrax vaccine: evidence for safety and efficacy against inhalational anthrax. *J Am Med Assoc* 1999;282:2104–6.
- [15] Peiris JS, Yuen KY, Osterhaus AD, Stohr K. The severe acute respiratory syndrome. *N Engl J Med* 2003;349:2431–41.
- [16] Dutch Health Council. Side effects of vaccinations in the Dutch vaccination program 1997–2001 [2002/16, with abstract in English]. The Hague, 2002.
- [17] Madsen KM, Hviid A, Vestergaard M, Schendel D, Wohlfahrt J, Thorsen P, et al. A population-based study of measles, mumps, and rubella vaccination and autism. *N Engl J Med* 2002;347:1477–82.
- [18] Hviid A, Stellfeld M, Wohlfahrt J, Melbye M. Childhood vaccination and type 1 diabetes. *N Engl J Med* 2004;350:1398–404.
- [19] Confavreux C, Suissa S, Saddier P, Bourdes V, Vukusic S, Vaccines in Multiple Sclerosis Study Group. Vaccinations and the risk of relapse in multiple sclerosis. *Vaccines In Multiple Sclerosis Study Group*. *N Engl J Med* 2001;344:319–26.
- [20] Anderson HR, Poloniecki JD, Strachan DP, Beasley R, Bjorksten B, Asher MI, ISAAC Phase 1 Study Group. Immunization and symptoms of atopic disease in children: results from the International Study of Asthma and Allergies in Childhood. *Am J Public Health* 2001;91:1126–9.
- [21] Dutch Health Council. General vaccination against Meningitis C and pneumococcal disease [2001/27, with abstract in English]. The Hague, 2001.
- [22] <http://statline.cbs.nl>, accessed 17th February 2003.