

Attitudes among Swedish medical
personnel toward universal varicella
vaccination and other new vaccines
for children

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Abstract

Background: The attitudes, knowledge, and experience of health personnel regarding vaccines and preventable diseases contribute importantly to the success of vaccination programs.

Aim: This study aimed to evaluate the opinions of health personnel involved in the care of children on the introduction of various new and older vaccines to the Swedish childhood vaccination. We particularly examined the knowledge of varicella disease as chickenpox and shingles and attitudes toward the varicella vaccine.

Method: We created and administered a questionnaire on vaccine prioritization for several vaccines, including hepatitis A and B, BCG (Bacille Calmette- Guérin) vaccine to prevent tuberculosis, pneumococcal, meningococcal, HPV (human papilloma virus), rotavirus, influenza, respiratory syncytial virus, and TBE (tick born encephalitis virus), and also explored health personnel's knowledge about the VZV (varicella zoster virus) vaccine and its diseases. In 2006, the study targeted 600 nurses and physicians in Gothenburg, Sweden, whereas the current study in 2012 followed up with 160 school healthcare personnel.

Results: The 2006 questionnaire generated 191/600 responses (32%), compared with the 2012 follow-up questionnaire, which generated 40/160 (25%) responses from school health care personnel. Medical personnel ranked vaccination against hepatitis B highest in both studies. However, our data showed an important shift in attitude regarding HPV and rotavirus vaccination, which ranked lowest in 2006 but higher priority in 2012. Respondents also gave high priority to BCG. In 2006, only 34 of 138 respondents (25%) knew that a varicella vaccine was available, and universal varicella vaccination was generally ranked lower compared with other various vaccines. Additionally, pediatricians and personnel from infectious diseases department in the hospital having direct experience with the severity of varicella and zoster diseases were more likely to support universal varicella vaccination. Interestingly, in 2012 only one third of school healthcare personnel favored universal varicella vaccination. The health professionals expressed a general demand for information and in-depth knowledge about the newer vaccines.

Conclusion: If Swedish authorities decide to implement universal varicella vaccine into the current successful vaccination program for children, relevant healthcare personnel will require further education about VZV vaccine and disease.

Key words

vaccination, attitudes of health personnel, varicella zoster virus

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1 INTRODUCTION

1.1 General aspects of vaccination of children

Immunization is one of the most successful and cost-effective public health interventions for reduction of infant and child mortality globally. The impact of vaccination on health is hard to exaggerate. With the exception of safe water, no other single modality, not even antibiotics, has had such a major effect on mortality reduction and population growth (1). From the 20th century, vaccination has, at least in parts of the world, diminished the burden, eliminated or eradicated 14 major diseases: smallpox, diphtheria, tetanus, yellow fever, pertussis, Hemophilus influenza type b disease, poliomyelitis, measles, mumps, rubella, typhoid, rabies, rotavirus, and hepatitis B. Smallpox has disappeared from the world. Cases of poliomyelitis have been reduced by 99% and this disease is also targeted by the World Health Organization for eradication. Endemic measles, rubella, and congenital rubella syndrome have been virtually eliminated, at least from the Americas as of 2010 (1). The “Expanded Program on Immunization” (EPI) was launched in 1974 to provide free routine vaccinations to children. Operated by Ministers of Health with technical support from the World Health Organization, EPI has contributed to the improvement in coverage of many vaccines, e.g. the global goal that > 90% of children in all countries should receive the third dose of DPT (Diphtheria-Pertussis-Tetanus). However, vaccination coverage still remains below expected targets in many low and middle income countries (2).

1.2 Nordic perspective

The health program for children and their immunization programs are basically similar in the Nordic countries though Finland has been more active than the others in introducing new vaccines. Recommended vaccines in common are diphtheria, tetanus, pertussis, polio, Hemophilus influenza type b (Hib), pneumococcal (PCV) measles, mumps and rubella (MMR) and Human papilloma virus (HPV) vaccines. Hepatitis B is recommended only to risk groups for hepatitis B infection in the same way in the Nordic countries. Greenland is an exception, with recommendation of general BCG vaccine to all newborns and hepatitis B vaccine to all children due to high prevalence of these diseases. Sweden recommends BCG to children with families with origin from Africa, Asia or Latin America, when the child is 6 months of age. Finland also vaccinates against tuberculosis with BCG (Bacille Calmette Guerin vaccine) to risk group newborns and an annual influenza vaccine was introduced in 2007 into the national vaccination program for children for 3-35 month-old children. Finland introduced universal rotavirus vaccination in September 2009 (3) and vaccine against Tick Born Encephalitis was introduced in 2006 to > 7 years old living permanently on Åland (4).

Economic evaluation of the cost-effectiveness of rotavirus vaccination included burden of disease was made before the decision was taken by the authorities in Finland. Norway plans to introduce rotavirus vaccination in their program in autumn 2014. Stockholm intends to start with rotavirus vaccination in their program 2014. Iceland vaccinate against meningococcal disease, influenza and varicella and risk groups against hepatitis B and hepatitis A.

1.3 Attitudes to vaccination among health care professionals

Vaccination with its goal of either eliminating diseases and / or decreasing the morbidity and mortality in diseases is dependent on high vaccine coverage. Multiple reasons for non-vaccination or under-vaccination are related to immunization system (outreach services, vaccine supply, and health worker training), family characteristics, parental attitudes and knowledge, communication and information (2). The goal is to obtain high vaccine coverage for different vaccines to eliminate diseases (1).

This paper examines if there is a case for making the VZV vaccine a routine part of the Swedish childhood immunization program. For such an undertaking to be successful, the health care professionals has to be onboard: the attitudes, knowledge and experience among physicians and nurses of vaccines, and the preventable diseases, are regarded to be of vital importance for the success of vaccination programs (5-7).

We therefore conducted studies to evaluate opinions among health and medical personnel involved in medical and health care of children on the introduction of various new and old vaccines into the Swedish childhood vaccination program, especially on their knowledge on the varicella (VZV) diseases, varicella and herpes zoster, also their attitudes to the VZV vaccine.

There are multiple causes related to non-vaccination and under-vaccination of children in low and middle income countries. For example: immunization systems, communication and information, family characteristics and parental attitudes and knowledge regarding vaccinations (8). Being completely unvaccinated might sometimes reflect caregiver beliefs that are unrelated to access of immunization but the attitudes among health personnel as physicians and nurses is regarded to be of vital importance for the success of vaccination programs (2). Attitudes among parents as well as public and healthcare professionals' attitudes towards vaccination are important.

Hesitant attitudes to vaccination are prevalent and may have been increasing since the influenza pandemic of 2009 (9). Attitudes towards the existing Swedish vaccination program seem solidly positive among the vast majority of health care workers. However, skepticism towards the need for new vaccines may severely hamper successful introductions (10-12). The attitudes among such health personnel as physicians and nurses towards vaccines have been in focus the last few years when new vaccines have been introduced into the child health immunization programs.

The value of a positive attitude to vaccination, including a good knowledge of vaccines is a must to be able to give correct information to the parents. It is regarded to be of vital importance for the success of vaccination programs (5, 7, and 13). A consolidated overview of public and healthcare professionals' attitudes towards vaccination in Europe was made in UK in 2014 (14). This review found that attitudes to vaccination are influenced by concerns about the value or safety of vaccination, other information sources apart from healthcare professionals such as online and social media sources, the increasing challenges of building a trustful relationship with patients to reassure hesitant patients. Reasons for vaccination attitudes are related to lack of awareness or misinformation and reasons that relate to issues of mistrust are cited more commonly in the literature than reasons that relate to information deficit. Also the attitudes towards vaccination are related to the trust in the institutions involved with vaccination. Therefore there will be a challenge for researchers and policy-makers to rebuild this trust that requires a co-ordinate strategy which is a multi-stakeholder problem.

Physicians are known to exert a direct influence on immunization rates, being the ones answering questions, clarifying misconceptions and being trusted by the patients (15). These attitudes of health personnel have been studied by researchers and shown to be important to obtain high vaccine coverage in children. Their view about their own vaccination status might reflect the attitudes of medical staff to recommend the same vaccines to their patients and to children. Most hospital healthcare workers in a study in the state of New South Wales, Australia regarded self- protection against diseases as the most important reason to be vaccinated, lesser priorities included the protection of co-workers, general protection, general support of vaccination, prevention of outbreaks /pandemics, protection of patients, staying healthy, and protection of family and friends. The study cited above shows that many physicians can be surprisingly skeptical of vaccinations. Some critics of mandatory vaccination base their opposition on the ethical principles of liberty, autonomy, choice and self-determination (16).

Nurses' attitudes to vaccination are also important. A previous study show that nurses experience stress when they are immunizing children who fear and resist needle injection. The strength of child resistance and sometimes the negative response from parents creates an ethical dilemma during the vaccination and make immunization difficult and unsafe (17). Medical staff, mainly nurses who give the vaccines, do not like children to get too many injections during the first years. It evokes the problem of causing pain resulting in a screaming child, a stressful situation for the child, its parents and the nurses. To support, to give comfort to the child and to give advice to the parents at the same time is stressful for all involved and is sometimes difficult to handle (18).

1.4 Newer vaccines

Another factor that explains evidence of health worker skepticism towards vaccines is the question of safety and side effects of vaccines.

There is clearly some tradeoff between the benefits of the vaccine, and the risk of side effect. For example, Varicella zoster virus (VZV) infection has both an acute and a chronic phase. Vaccines against such diseases are generally considered to be more difficult to develop because each phase requires its own vaccine to prevent infection. Vaccines for the diseases with a chronic phase such as varicella give a latent infection in themselves even if the amount of virus in these live-attenuated vaccines is very small compared with natural disease (19).

Given these factors, it is worth noting that Swedish health authorities have sometimes gone against WHO recommendations regarding taking on board new vaccine regimes for the country. At other times, authorities have been positive as towards e.g. recommendation of the annual up-dated influenza vaccine for risk groups.

It is a tradeoff between risks and perceived benefits. Surveys in different countries of pediatricians and nurses for their views on those vaccines considered for introduction into the Swedish program show that views span the board e.g. Doctors and nurses have shown, in different surveys, that they have varying views on the value of Hepatitis B and human papilloma virus (HPV) vaccines. These vaccines are considered to be safe and efficient to prevent infections.

Attitudes to the hepatitis B vaccine in previous studies have been examined. The World Health Organization, WHO, recommends that most countries should vaccinate all children against hepatitis B (20). Sweden has chosen not to do so, but the issue is reassessed regularly. One objective of a study in Sweden in 2005 was to assess knowledge and attitudes towards hepatitis B vaccine for children among parents. The willingness to accept hepatitis B vaccine for their child was correlated to the acceptance of the present childhood vaccination program ($p = 0.001$). The results reveal a high level of knowledge of the disease and a positive attitude to having their children vaccinated (21). Moving on from hepatitis B vaccines, attitudes to rotavirus vaccine among medical personnel has been examined in previous studies.

Rotavirus is the leading cause of dehydration and hospitalization due to gastroenteritis in young children. The main determinant of pediatricians' intention to recommend rotavirus vaccines was the perceived health and economic burden of rotavirus diseases (22).

Yet another vaccine that has been extensively studied for its cost benefit tradeoff is the Human Papilloma virus vaccine (HPV). Factors that impeded popularity of this vaccine have included safety concerns and a low perceived severity of HPV disease.

What about varicella? One study worth citing involved quality interviews with pediatrician and family medicine providers in Boston USA in 2012 (23).

Some physicians preferred varicella to take its natural course, instead of vaccinating, and believed that varicella disease was not severe enough to warrant vaccine. Others were waiting for a combined vaccine with varicella and believed that the children received too many injections. Attitudes to universal varicella vaccination have also been studied among health personnel after general recommendation by the authorities in Seattle USA and in Switzerland (24, 25). Despite a relatively low complication rate, though varicella can be, varicella is an important contributor to hospitalization and mortality. Medical personnel's views to universal varicella vaccination can vary (25, 26). Attitudes and practices among physicians in Minnesota showed in the year 2000 differences in pediatricians' and family physicians' attitudes and practice. The researchers concluded that the providers needed education and improved knowledge of the clinical burden of varicella disease to enhance the coverage as well as its sequel and duration about immunity and vaccination (27). The pediatrician's opinion about the varicella vaccine influences the parents' decision according to a survey on the varicella vaccine (15).

1.5 Varicella zoster virus disease Varicella and Herpes Zoster

When considering whether to introduce a universal varicella vaccine to Sweden, we have to ask: What is the burden of varicella disease in Sweden and globally? What are the complications of the diseases in children and adults? In a country such as Sweden, where the varicella vaccine is not part of the vaccination program, nearly all children contract the primary disease, chickenpox. In later life it may return as immunity is not lifelong. The clinical reactivation of the latent infection causes a disease called Herpes Zoster (HZ), also known as shingles.

The reactivation of the virus of those who have had chickenpox, occurring in childhood is rare, though not extremely so: About 10-20% of those who have had chickenpox (primarily varicella infection) eventually get shingles (secondary varicella infection) in later life.

What are the health consequences of letting the disease take its course? Varicella in populations where immunizations do not take place extensively occurs mainly in children. Chickenpox is extremely contagious (1). Due to its contagiousness, chickenpox is a very common disease of childhood, and affects over 90% of unvaccinated child populations. In Sweden, the infection rates are close to 100%, but infection occurs at different ages in different parts of the world (28). Changing social conditions and life-styles in Sweden may have affected the spread of varicella-zoster virus as well as of other herpes virus. Spread is different in Sweden compared to other parts of the world. Peak incidence age used to be between 5 and 9 years old in the northern temperate zone. However, over the past 50 years, the increased use of daycare centers and childcare facilities has decreased the peak incidence age to 1-4 years (29). The epidemiology of varicella is remarkably different between temperate and tropical regions.

Therefore, while varicella is a disease of pre-school and school-age children during winter and spring in temperate regions, in the tropics it often affects older age groups all year around (30). Thus, there are substantial differences in the sero-epidemiology of varicella, which will need to be taken into account in designing national policies regarding varicella vaccination (31).

Although varicella infection is a mild illness, 11 000 hospitalizations and 100 deaths due to varicella infection occurred annually in the United States with the greatest burden of the illnesses occurring among children before the vaccination was introduced in 1996 (32). In the Netherlands a medical record research was conducted on patients' hospitalized due to varicella in 2003-2006. Complications were recorded in 76% of the patients and 37% had at least one relatively severe complication. Bacterial super-infections of skin lesions (28%), imminent dehydration (19%), febrile convulsions (7%), pneumonia (7%) and gastroenteritis (7%) were most frequently reported. No varicella-related death occurred within the study population but 3% of the patients had serious rest symptoms (33).

In Sweden around 100 cases of varicella are hospitalized every year according to a report in 2005. The cases have mainly been children between 1-4 years of age. Mortality is estimated in 1/100 000 of infected persons with 0.01 deaths / 100 000 inhabitants. Mortality in Sweden, according to the death register was 1-6 deaths / year occurring in persons. In summary severe varicella is uncommon, and the chance of seeing a severe case even as staff in hospital is rather low with 100 hospitalizations yearly in the whole of Sweden (34).

A majority of the patients with varicella and CNS complications had neurological symptoms and sequels in follow-up studies (35). Reactivated varicella-zoster virus (VZV) and herpes simplex virus (HSV) are also considered to be the major causes of acute peripheral facial palsy (APFP). Ramsay Hunt syndrome is characterized by zoster around the ear, facial palsy and eight cranial nerve symptoms (hearing loss and / or vertigo) (36). Varicella virus causes APFP without skin lesions; these cases have been termed zoster sine herpette (ZSH). Thus, varicella infection should be considered as a possible causative agent of infection in patients with CNS disease of suspected viral origin, even in the absence of skin manifestations, and the total burden of neurological diseases due to VZV is probably still underestimated (37). Varicella is, as mentioned, usually more severe in adults than in children, but is often even more severe in pregnant women, especially in the last trimester, than in other adults.

Fetal morbidity is slightly increased in pregnant women with varicella. Neonatal varicella is mostly caused by maternal varicella acquired during the last 3 weeks of pregnancy. Transplacentally transmitted infections occur in the first 10 to 12 days of life, and the transplacental infection is often extremely severe and generalized neonatal varicella leading to death occurs in up to 20% of affected cases. Awareness of the more frequent lack of immunity in immigrants is clinically very important.

Varicella during pregnancy may in 0.4 to 2 % of infected mothers damage the fetal nervous system, resulting in permanent scarring of the skin, aplasia of extremities, chorioretinitis, microphthalmia, optic atrophy, cataract, Horner's syndrome, blindness, mental retardation, fetal demise and high incidence of incidence of zoster and death in infancy (1).

Herpes zoster is generally an illness among older people and physicians are well acquainted with herpes zoster - commonly called shingles, from the Latin *cingulum*.or, or "girdle" (38). More than two-thirds of herpes zoster (HZ) cases occur in people > 60 years of age and HZ incidence is high in persons with cellular immune deficiency of any kind and HZ in immunocompromised persons is likely to be severe and disseminated. The most common complication is persistence of significant pain, the post-herpetic neuralgia (PHN). The definition of PHN has varied with an interval between 30- 90 days after the onset of the rash (1). The risk for PHN in zoster is 10-18% another complication of zoster is eye involvement, which occurs in 10-25% of zoster episodes and can result in prolonged or permanent pain, facial scarring, and loss of vision. Approximately 3% of patients with zoster are hospitalized (39). Among the most debilitating and life-threatening complications of zoster is varicella zoster virus vasculopathy, a cause of transient ischemic attack (TIA) and stroke (40). Other severe neurological manifestations have been described in relation to varicella virus reactivation, such as facial palsy, encephalitis, meningitis and cerebral vasculitis, conditions that may occur without and dermal lesions (zoster sine herpeticum) (36,37). In Sweden, 500 patients with the most severe herpes zoster are admitted to Infectious Diseases Departments in hospitals every year (34).

1.6 Universal varicella vaccination Varicella Zoster vaccines

These figures have to be set against the success of the vaccine, first developed in Japan in 1974. There are two available live attenuated varicella vaccines (29). The varicella vaccine is 100% effective against moderate or severe chickenpox, and side effects of the vaccine are typically only a mild rash, the so- called "breakthrough varicella," which occurs in 15% of vaccinated individuals. A new two vaccine schedule has cut this rate to about 5%. Another possible side effect is that the mean age of developing varicella at the start of the program might increase, thereby increasing the severity of the disease in adolescence. To the objection that it increases the number of injections children have to endure, it is worth noting it is possible to combine a varicella vaccine with the MMR vaccine. The combination measles, mumps, rubella, and varicella vaccine (MMRV) has been registered in the USA in 2005 and in Europe since 2006. Given its success rate, including a two vaccine schedule the European Center for Diseases Control (ecdc) includes varicella vaccine among those recommended for the childhood vaccination program for Europe (41). In fact, many countries in Europe administer the vaccine more often than Sweden does. It is usually administered before exposure, as part of a national vaccination program of all children, but is also surprising effective if given after suspected exposure.

The vaccine was 90% effective in preventing disease if administered within 3 days of exposure, and 67% effective if administered within 5 days. It is 100% effective in preventing moderate or severe disease (1, 42). Thus, its immunogenicity is well accepted as well as the safety (1). The most common adverse events reported after varicella vaccination in healthy children have included mild tenderness and redness at the injection site, fever and mild rash. However, taking the combined MMRV vaccine is slightly more risky than taking the varicella vaccine separately together with the MMR vaccine. Of course, this has to be set against the greater unpleasantness endured by the child and also the nurse of having two injections at the same time. But the licensure studies of the MMRV vaccine febrile seizure occurred 5-12 days after vaccination in one child per 2.300-2.600 children aged 12- 23 months who received the first dose of MMRV vaccine compared with children who had received the first dose of MMR vaccine and varicella vaccine administered as separate injections at the same visit. Children aged 4-6 years who received the second dose of MMRV did not have increased risk for febrile seizures (43). There is as mentioned before also a risk for so called “breakthrough varicella”, defined as the appearance of a pruritic maculopapulovesicular rash with onset > 42 days after vaccination without any other apparent cause. However the post-vaccination varicella is generally milder than natural varicella but it can establish latency to cause herpes zoster (44).

Efficacy has been improved by introduction later of a two dose schedule of varicella vaccine recommended in the US in 2005 (1). The protective effect of vaccination against chickenpox is still not 100%. Before introductions of a second dose, breakthrough varicella took place in 15% in vaccinated children but after the 2nd dose it occurs in 5 % (45, 46).

The goals of varicella vaccination programs vary. It may be prevention of chickenpox and its complications, prevention of severe varicella disease and death, or disease prevention and control in selected target groups such as health care workers to prevent nosocomial spread (1). In several countries worldwide where the varicella vaccine has been implemented, disease severity and the cost-effectiveness of vaccination have been studied and analysed (1). Implementation of varicella universal routine vaccination has resulted in decreased rates of hospitalizations and complications (47, 48). Furthermore, the vaccination appears to be cost-effective in a societal perspective by preventing outbreaks in day-care centers and schools (46, 49). Patients with immunodeficiency will benefit from less virus circulation in society (50, 51).

Herpes zoster would probably become less common if the viral load of latent varicella-zoster virus in the ganglia of vaccinated persons were lowered. The reactivation of the latent infection caused by the live vaccine seems to be lower than after natural infection (52-55). Herpes zoster incidence changes in countries where universal varicella vaccination has been implemented. In some countries there has been an increase in herpes zoster hospitalization rates and in other a decrease (1). However, studies showing increasing rates of herpes zoster incidence in the absence of a varicella vaccination program suggest that there are unidentified risk factors for herpes zoster that are also changing over time (52,53).

A vaccine against herpes zoster was licensed in the United States may 2006 and is approved in the European Union, Canada and Australia (1). It is available in Sweden since 2013. The live attenuated herpes zoster vaccine has been shown to reduce the incidence of herpes zoster and post herpetic neuralgia (54). The current zoster vaccine to prevent reactivation is moderately efficacious and efficacy decreases with age at immunization (56). Thus, repeated vaccinations of the elderly are likely to be necessary. There are efforts being made to develop killed or subunits vaccines as booster vaccines against shingles, and these might be more efficacious than the live zoster vaccine. Whether such an inactivated vaccine would be immunogenic enough to also prevent varicella infection is not known (19).

Varicella vaccination recommendations in European Countries vary. Some countries as e.g. Germany and Greece and UK recommend 2 doses in early childhood. Others, such as Switzerland and Spain, recommend varicella vaccination to teen-agers with no history of varicella. Other countries as France and Slovenia recommend the vaccine only to risk groups. Varicella vaccine is recommended in many countries for health susceptible with close household contacts of immunocompromised patients, health care workers and children (Vaccine Schedule.ecdc.europa.eu).

Three of the Nordic countries form an exception. They do not recommend general immunization to varicella in children only to above risk groups except Iceland and Finland. Finland decided to introduce universal varicella vaccination in 2008, now implemented in their child health program (57). Before the introduction of varicella vaccination in Finland an analysis of the impact on vaccination on varicella and zoster was made. A childhood program against varicella would in the short perspective increase the incidence of zoster in the next 50 years. However, high vaccine coverage and two-dose program was regarded to be very effective in stopping varicella transmission in the Finnish population (58). Iceland recommends universal varicella vaccination. The other Nordic countries recommend the varicella vaccine only to children and adults who are at risk for increased morbidity of varicella (59).

1.7 Public Health relevance

The objective arguments are one thing. What health care workers believe is another matter. After all, their commitment is essential to the success of a varicella vaccination introduction. Here is a summary of the research on the efficacy of the vaccine: Despite a relatively low complication rate, varicella is an important contributor to hospitalizations and mortality. The varicella-zoster vaccine is effective in the prevention of varicella in children and in outbreaks of the disease in susceptible adults. Furthermore, the vaccine appears to be cost-effective from a societal perspective in preventing outbreaks in day-care centers and schools. Immunocompromised patients would benefit from lower levels of circulation of the virus in the community. The reactivated virus, herpes zoster, occurring in 10-20% of unvaccinated populations would probably become less common if the viral load of latent varicella-zoster virus in the ganglia of vaccinated persons were lowered.

On the negative side, however, the introduction of universal varicella vaccination might increase the mean age of developing varicella at the start of the program and thereby increase the severity of the disease as all children will not be vaccinated in the childhood immunization program. These children will be affected later in life probably first in adolescence due to less transmission of varicella zoster virus in the society. Furthermore, the incidence of zoster may temporarily increase if the immune-boosting virus circulation ceases.

In addition, it is important for regulatory authorities to consider attitudes among health personnel in their discussion of whether, when and how to introduce the vaccine in the general vaccination program. Should the vaccine be introduced, the motivation and advice from health staff to parents to let their children be immunized is of great importance to get high vaccination coverage among children.

2 AIMS AND RESEARCH QUESTIONS

The aim of the study was to evaluate the opinion among health- and medical personnel involved in the care of children on the introduction of various new vaccines into the Swedish childhood immunization program, especially on their knowledge on the varicella (VZV) disease and attitudes to the VZV vaccine and to study potential change in the attitudes in course of time.

What priority does the Swedish health care professional give to the new vaccines which are considered to be implemented into the Swedish child health immunization program?

Do medical and health personnel have good knowledge about varicella vaccine?

What is the opinion among Swedish health and medical personnel (nurses, pediatricians, generalists, infectious diseases specialists) on introduction of universal varicella immunization for children?

Is experience of and knowledge about complications due to chickenpox and of herpes zoster, related to a positive attitude to an introduction of universal varicella vaccination of children?

These results of these attitudes among health personnel might later be presented to the Swedish authorities, whether to consider varicella vaccine when deciding on a new vaccine to be introduced into the general child or school health program.

A positive attitude to new vaccines, especially varicella vaccine might be an important indirect tool to obtain high vaccination coverage in children with its goal of eliminating and / or decreasing morbidity and mortality in VZV diseases.

3 METHODS

3.1 Design, settings and questionnaires

A quantitative approach was chosen for the studies (60). Two almost identical questionnaire studies were conducted among various medical professionals in the city of Gothenburg Sweden in 2006 and 2012.

Questionnaires were created on the knowledge of vaccine preventable diseases and their complications and attitudes among medical personnel to universal varicella vaccination and other new vaccines for children. The author of this paper, a pediatrician created the questionnaires. Thereafter, the supervisor and the author together revised the questions.

The response formats were mainly “Yes/No” or “No opinion”/“Do not know” in dichotomous formats (61). Some questions were general for all personnel in the health and medical care sector, while other questions were directed only to the respective professions, namely, physicians, nurses in pediatric clinics and school health, and child health care. The asked questions were about experience about vaccine preventable diseases and their morbidity. A specific question to the personnel was the ranking and priorities of choices of various vaccines, included some new vaccines, which they would suggest could be implemented in the child health immunization program in a near future.

However, the focus was on varicella and herpes zoster and the experience and knowledge about these diseases and the attitude to universal varicella vaccination for children. Each question had 3 alternatives “yes”, “no”, and “do not know/ no opinion” related to the context. Some open-ended questions (single item questions) were added. Thus, the responders could in the questionnaire add written comments to some questions if they desired to do so (61).

Before finalization of the questionnaire, a preliminary version was tested in a pilot study in the autumn of 2005. The preliminary questionnaire was answered by staff in a Child and Adolescent Clinic in Gothenburg. Thirty questionnaires were distributed. 5/10 (50%) of pediatricians and 10/20 (50%) nurses responded. Questions which were regarded not comprehensible were disregarded before the final version was distributed. The respondents could voluntarily give their names on the questionnaire or remain anonymous. The reason for collecting names was to make in-depth, follow-up interviews possible.

After the pilot study was finished, the questionnaires were distributed to health and medical personnel in the Pediatric and Infectious Diseases Departments in the hospital and to the Child and Adolescent Clinics and to Child and School Health Centers in the city of Gothenburg in Sweden in 2006.

A new questionnaire was distributed in 2012 to the school health care personnel to get an update of attitudes to universal varicella vaccination and the knowledge and experience about the diseases varicella and herpes zoster with its eventual complications. A specific question was the ranking and priorities of eight new vaccines which could be implemented in the general child health vaccination program.

HPV vaccine and pneumococcal vaccine, implemented in 2012-2013 respectively 2009 was excluded as these vaccines had already been implemented in the general vaccine program. Instead, a question on the priority of TBE vaccine was added in the questionnaire of 2012.

3.2 Sample and Data collection. Study I in 2006

The study was conducted in 2006 and 600 questionnaires were distributed to health and medical professionals in the hospital and clinics. The numbers of questionnaire that were sent to different departments were roughly adapted to the number of persons working at each department, and having tasks that made it relevant for them to respond.

- The Infectious Diseases Department received 100 questionnaires in January and February 2006. As a sample size of 100 participants was chosen who might take part in the study in this department.
- 200 questionnaires were sent by post in paper versions to nurses in the city's Child Health Care service: the staff in Child Health Care service (CHC=BVC in Swedish) had been asked to participate in the study (Estimated to be 200 nurses).
- 200 questionnaires were sent by ordinary post or/ and distributed in school conferences as the entire staff in School Health Care (SHV) service in Gothenburg had been asked to take part in the study, a total of 160 nurses. The city's School Health Care professionals also received information, included in the monthly e-mail about the study. With a request to take part in the study from the School Health Care Consultant.
- A small proportion of the pediatricians and nurses in the city's Child and Adolescent Clinics were expected to participate by the author. 70 questionnaires were sent to the five clinics. However, nurses in the pediatric department at the hospital could not participate due to overload of clinical work.
- 30 questionnaires were distributed for pediatricians and nurses in pediatric oncology and neonatology department in Sahlgrenska university hospital in the city of Gothenburg.

The distribution of questionnaires in the hospital was carried out by the author, who visited the different wards in combination with information about the questionnaire.

No intervention was made beforehand, for example lecturing about vaccination or varicella disease. The questionnaires were handed over to a few nurses and administrative personnel, who later distributed the questionnaires to their colleagues. The responders returned the questionnaires to the author in preprinted envelopes. Two informal visits were undertaken by the author in the winter of 2006 to the Infectious Diseases Department to encourage the staff to answer the questionnaire. No visits to other departments in the hospital were made. The questionnaires to the Child and School Health Care personnel as well to the pediatricians and nurses in different Child and Adolescent Clinics in Gothenburg were sent by ordinary post to the respective clinic for later distribution among the personnel. School health personnel also received the questionnaires per post or e-mail or in local school conferences. After completion, questionnaires were returned by ordinary mail to the author.

3.3 Sample and Data collection. Study II in 2012

A new study with a questionnaire about attitudes to universal implementation of the chickenpox vaccine and other new potential vaccines was conducted in 2012, asking mainly the same questions. The questionnaire was sent to school health care professionals in the autumn of 2012 by e-mail. The questionnaire was added to the regular monthly information about school health issues sent by School Health Care Consultant to the personnel. The completed forms were resent by e-mail or in paper to the author.

3.4 Data analysis

The data obtained was analyzed with the help of a professional IT consultant. For descriptive statistical analysis, Microsoft Excel was used. In 2006 priorities of the future new vaccines and their ranking for introduction into the Swedish child health program were asked for in the questionnaire. The 2012 questionnaire was a shortened version of the 2006 study. Only the VZV-virus and its diseases varicella and herpes zoster with its morbidity in children and adults were analysed in the questionnaire from the year 2006 and asked for in an updated version in 2012. The hundred questions to the medical and health personnel in 2006 about knowledge on and experience of other diseases in children were disregarded in the analysis, as the focus was the varicella disease and vaccination. The other questions about the experience among health and medical professionals about other childhood diseases in the study in 2006 as e.g. measles, meningococcal diseases, pertussis, tbc, rotavirus infection and attitudes among personnel to their respective vaccines were not analyzed. The choice in 2012 was taken to focus on VZV disease and varicella vaccine and to make an up-dated study to compare eventual changes of attitudes and priorities among health care personnel in 2006 with 2012 to new vaccines, especially regarding VZV vaccine.

However, this generally obtained data from the study in 2006 might be regarded in another context as e.g. comparing experience and knowledge about other childhood diseases with attitudes to this various vaccines. The general opinion about the introduction of the new vaccines, especially the varicella vaccine was also expressed in written commentaries by the medical personnel in the questionnaires in 2006 and 2012. These opinions were added by the responders in free text with their own words in the questionnaire in connection to some of the questions (61).

3.5 Ethical considerations of the studies

The Ethics Committee in Gothenburg was contacted before the study started in 2006. At that time a study with a questionnaire, a quantitative study with general questions with simple answers was regarded not to be in need of a specific approval to conduct the study. There was no contact taken to the ethical committee in 2012 as the questionnaire was an up-dated version of the one from 2006. A letter of information was given to the health and medical personnel who were asked to participate in the studies. In each questionnaire, there was information about the aims of the studies included the names of the authorities from different clinics and departments in health and medical care who have given their approval to the author to conduct the studies. The health and medical personnel could choose to remain anonymous or to not answer the questionnaire. This might have reduced the possible ethical dilemma if the professionals would have been identified with a negative attitude to vaccination despite their tasks to give vaccines to children. Another ethical problem affecting the personnel by the studies was the extra work in time that was caused by the questionnaires in answering the questions. This might have delayed other administrative professional duties.

4 RESULTS

4.1 Participants

There were in total 191 responders out of 600 (32%) distributed questionnaires in the year 2006. The responders from different clinics are shown in Table 1. The pediatricians were mainly working at Child and Adolescent Clinics in the city. The nurses were the main responders from all departments.

Table 1. Participants in the study in 2006

Institution	Number of distributed questionnaires	Respondents	Respondents Physicians	Respondents Nurses
Infectious Diseases Department	100	38/100 (38%)	9/38 (24%)	29/38 (76%)
Child Health Care	200	51/200 (26%)	None	51/200 (26%)
School Health Care	200	76/160 (48%)	Included in the group below	76/160 (48%)
Child and Adolescent Clinics, Pediatric and Oncology and Neonatology departments	100	26/60 (43%)	Pediatricians 26/60 (43%) from all departments and clinics	Only answers from pediatricians were analyzed
Total	600	191 (32%)		

Table 2. Participants in the study in 2012.

Institution	Number of distributed questionnaires	Respondents total	Respondents Physicians	Respondents Nurses
School Health Care Personnel	160	40/160 (25%)	3/40 (7%)	37/40 (93%)

A majority of the respondents were nurses in the studies in 2006 and 2012. Their individual professional experience in years was not analyzed in 2006 but in 2012. The School Health Care personnel in 2012 had the following experience in their profession : 3/40 (7.5%) had 1-5 years' experience in the profession, 5/40 (12.5%) had 5-10 years, 6 /40 (15%) had 10-20 years, 9/40 (22.5%) had 20-30 years and 17/40 (42.5%) had more than 30 years of experience in the profession.

4.2 Priorities of new vaccines for implementation into the childhood vaccination program

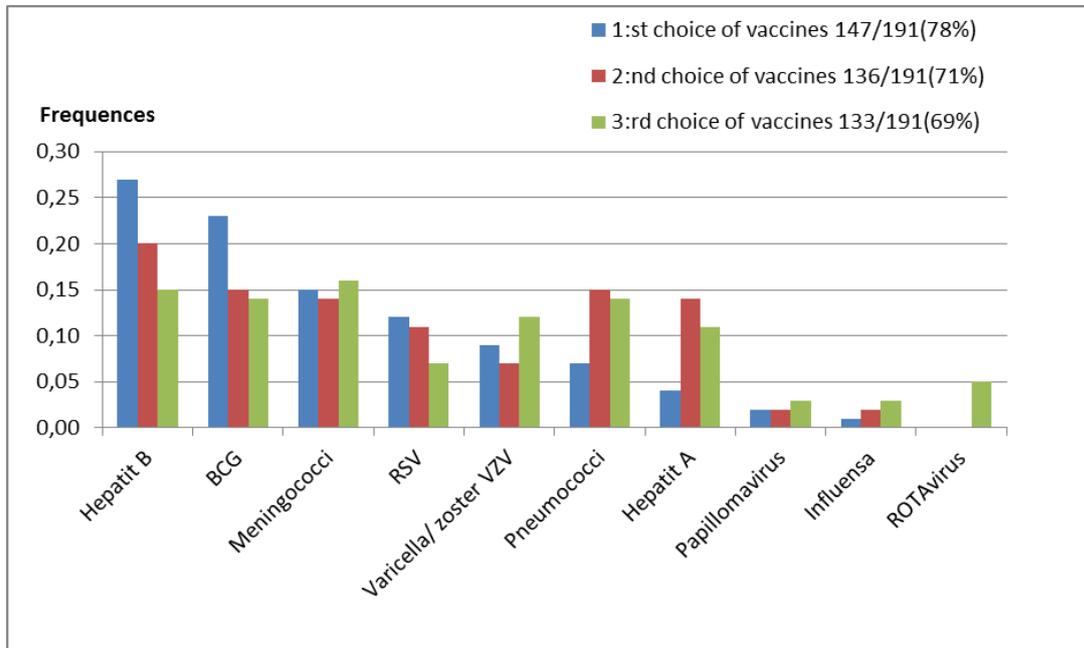


Figure 1. 1st 2nd and 3rd choice for introduction of new vaccines in the childhood vaccination program in 2006 among 191 respondents.

Priorities to the different vaccines were given by medical personnel. The participants in the study in 2006 were asked to grade ten various vaccines from 1-10 for implementation into the general Swedish childhood vaccination program. Grade 1 signified the highest priority and grade 10 the lowest. There were in total 112/191 (59%) respondents that graded the vaccines from 1-10 in priority in 2006 (Figure1). The first choices of vaccines to be recommended to be included were Hepatitis B followed by BCG and Meningococcal vaccine and thereafter followed in the 2nd choice by Hepatitis A and Pneumococcal vaccine. Varicella vaccine was, in aggregate, ranked 4th among vaccines to be recommended for introduction into the childhood vaccination program (Figure 1).

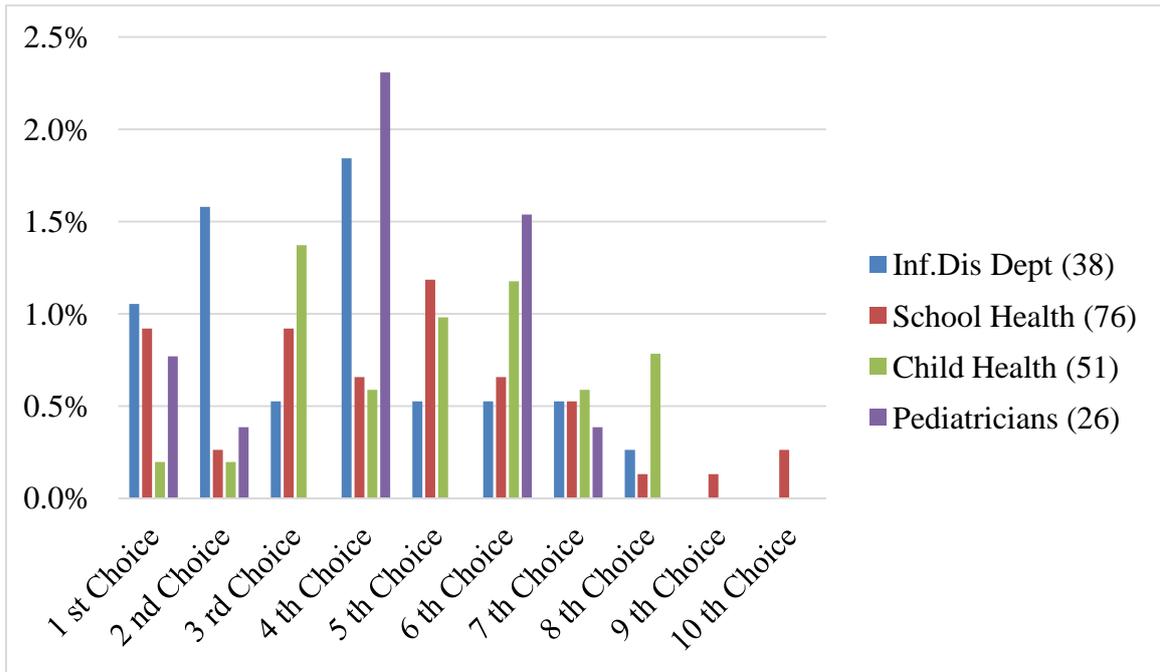


Figure 2. Grading of varicella vaccine in relation to nine other new vaccines in 2006 among 191 respondents.

The prioritization of the VZV vaccine for introduction into the childhood vaccination program by personnel at different work-places in relation to nine other vaccines in 2006 is shown in Figure 2. The varicella vaccine was in general ranked between the 3rd and 6th in comparison with the nine other vaccines. The most common rank for varicella vaccine was 4th by most health professionals in the ranking priority of the new vaccines. 70/112 (63%) of the total of respondents gave the priority 3rd to 6th to the varicella vaccine (Figure 2). 19/38 (50%) of the personnel in the Infectious Diseases Department ranked varicella vaccine between 3rd to 6th choice in comparison with the other vaccines. Child Health Care personnel ranked the vaccine between 3rd to 6th choice in 21/51 (41%) of case, the pediatricians in 10/26 (38%) and the School Health Care professionals in 9/76 (34%).

Thus, only a minority gave high priority to the varicella vaccine in 2006. However, the most positive professionals to universal varicella vaccination were the personnel from the Infectious Diseases Department.

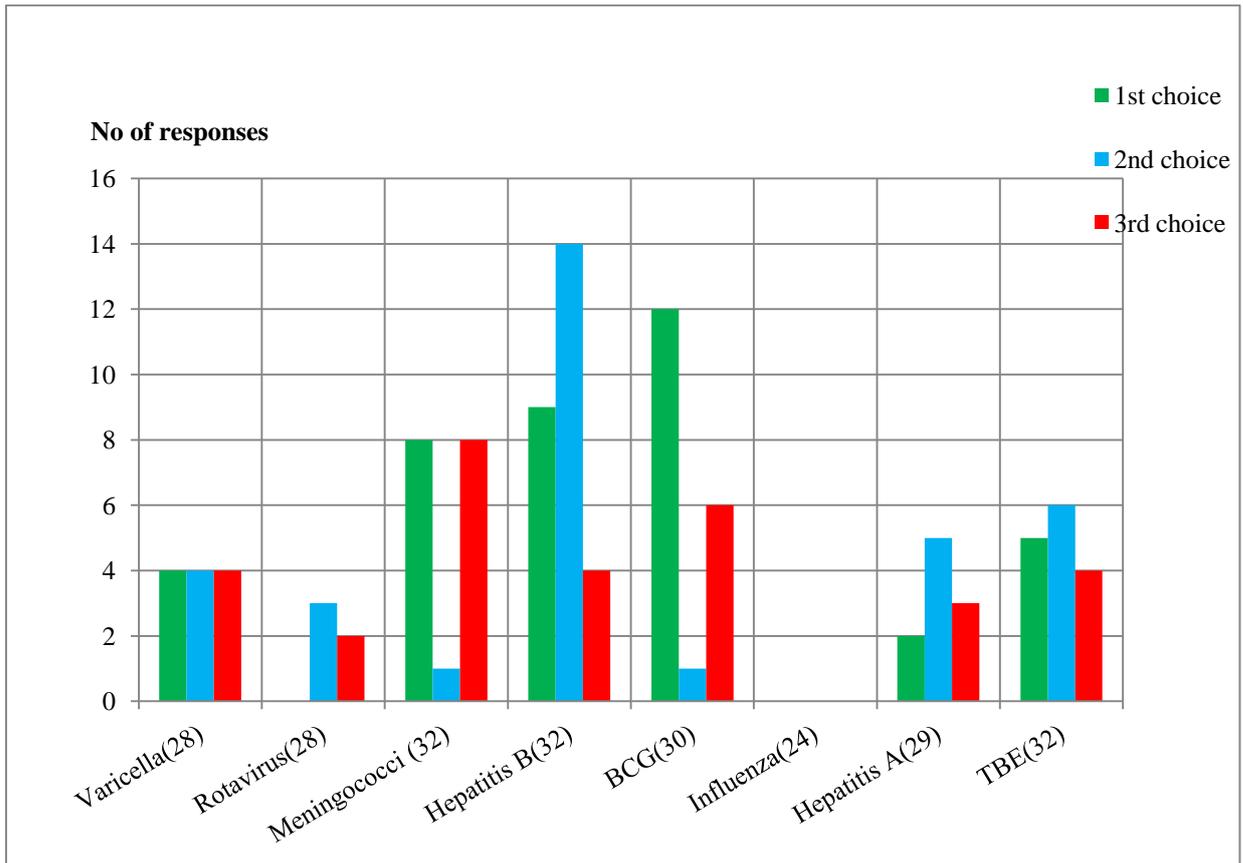


Figure 3. 1st 2nd and 3rd choice for introduction of new vaccines in the childhood vaccination program in 2012 among 40 respondents.

Figure 3 shows the priorities of new vaccines in 2012. The figure demonstrates the three first vaccines that were chosen to be included into the childhood immunization program by the School Health Care personnel in 2012. The questionnaire contained eight different vaccines which the health staff could choose among, only the 1st 2nd and 3rd priority areas shown in Figure 3.

BCG was given the highest priority 12/30 (40%) of cases, of all the eight vaccines followed by Hepatitis B that was given first priority among 9/32 (28%). The four vaccines most commonly given priority one to three were the following: Hepatitis B 27/32 (84%), BCG 19/30 (63%), meningococcal 17/32 (53%) and the VZV 12/28 (43%) of all the respective vaccines. Varicella vaccine was chosen as the 1st, the 2nd and 3rd choice by 4/28(14%) of the school health care professionals.

4.3 Priorities of vaccines in 2006 compared to 2012

Most of the school health care personnel responded the question about priorities of vaccines that might be introduced into the childhood vaccination program in 2012. The question was answered by 37/40 (92.5%) responders. The TBE vaccine which was added in 2012 questionnaire. 32/40 (80%) regarded TBE vaccine among the first three priorities of vaccines. The influenza was given no priorities among the first three grading of the eight vaccines. The Rotavirus vaccine was also given very low priority. The varicella vaccine was mainly graded as the 4th or 6th choice of vaccines in 2006 but was given a higher ranking in 2012. The detailed results are described in Figure 1, 2 and 3. The staff categories most positive to universal varicella vaccination was the personnel from the Infectious Diseases Department and pediatricians. Child Health Care personnel also gave a higher priority to the vaccine than the School Health Care professionals. Of the other vaccines, universal hepatitis B vaccine, BCG vaccine and meningococcal vaccines and hepatitis A were all given higher priority than VZV vaccine in both 2006 and 2012. Vaccination against pneumococcal disease was given a rather low priority in the year 2006 though well implemented into the child health program later in the year 2009. Influenza virus vaccine was low graded in 2006 but was not given any priority in 2012 among the new vaccines. Human papilloma virus (HPV) and Rotavirus vaccine had the lowest priority in the year 2006. Rotavirus vaccine was thereafter higher ranked in the study in 2012.

4.4 Knowledge about varicella vaccine

There were only a few respondents who had knowledge of the existence of a varicella vaccine in 2006. 34 out of 138 (25%) health workers from different departments knew that there was a varicella vaccine available. In total 104/ 138 (75%) were not aware of the presence of the vaccine.

In the study in 2012 no question about the existence of a varicella vaccine was asked as the school health care professionals in 2012 already had obtained the knowledge about an available varicella vaccine since the study in 2006.

4.5 Relationship between knowledge of varicella and zoster and a positive attitude to varicella vaccine

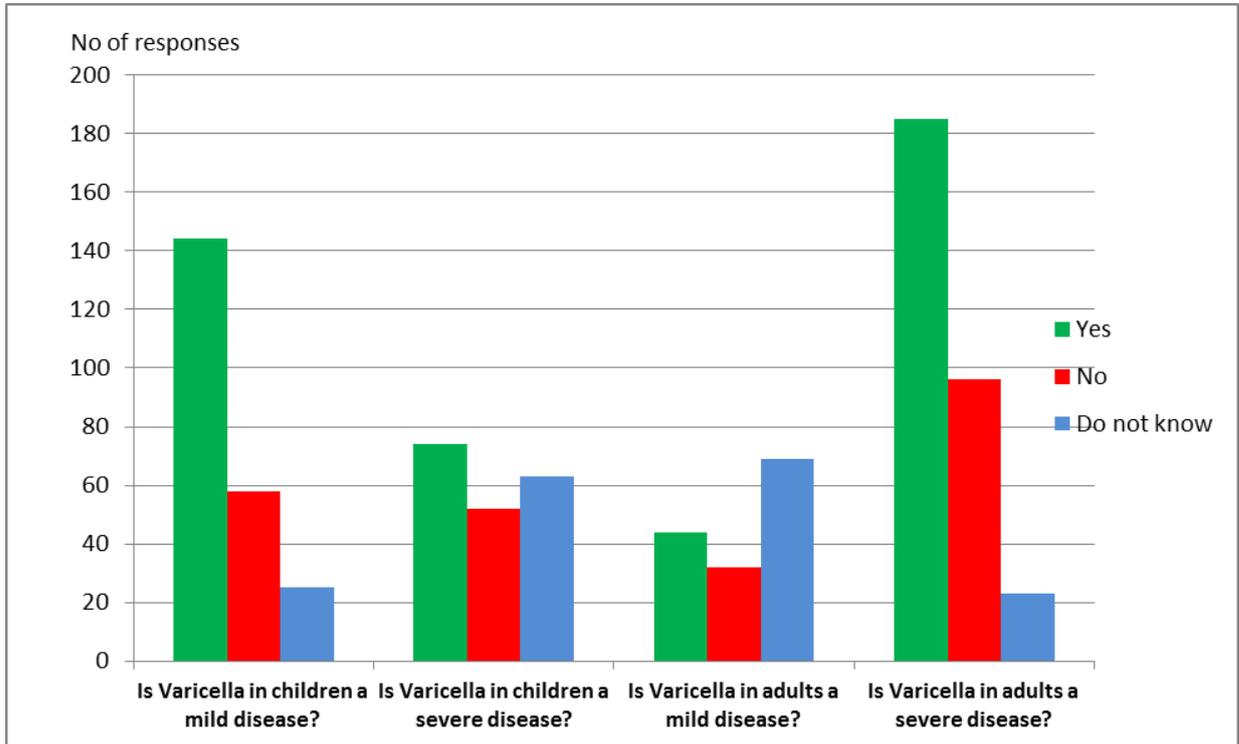


Figure 4. Opinion about the severity of varicella in children and adults. Views among 191 respondents in 2006.

Varicella in children was regarded as a mild disease by 144/227 (63 %) of the responders. However, varicella in adults was regarded as a severe disease according to 185/304 (61 %) of the responders. Varicella in children was regarded as a severe disease in children among 74/189 (39%) and as a mild in adults among 96/304 (32%). Mild symptoms in chickenpox in children were responded with the answer: no opinion/ do not know among 25/227 (11%). In adults among 69/145(48%) regarded varicella to be a mild disease. Some responders answered that varicella was “not a severe disease” in children 52/189 (28%) and among adults the result was 185/304 (61%) of the responders (Figure 4).

In the study made in 2012 a question about the experience of complications of varicella was asked. 69% of the school health personnel had never seen children with complications from chickenpox. Only 31% of the staff had this experience and knowledge of complications in patients related to varicella disease. (Table 3).

Table 3. Attitudes to universal varicella vaccination in comparison with experience of severity of chickenpox disease 2012.

	Positive to vaccination	Negative to vaccination	No opinion
Had seen chickenpox with complications 12/39 (31%)	4/12 (33%)	4/12 (33%)	4/12 (33%)
Had not seen chicken-pox with complications 27/39 (69%)	7/27 (26%)	7/27 (26%)	13/27 (48%)

Of the school health staff that had seen complications after varicella diseases, 1/3 answered yes, 1/3 no and 1/3 had no opinion about universal vaccination (Table 3).

Almost half of the health staff who had no experience of varicella with complications answered mainly “do not know” to varicella vaccination. Thus the experience of complicated VZV disease did not seem to strongly affect the attitude towards vaccination.

In the study of 2012 there was also a question about the experience of herpes zoster. Most of the school health personnel 34 out of 40 (85%) that responded to the questionnaire in year 2012 had seen adults with herpes zoster (shingles) while 6/40 (15%) had not done so.

4.6 Opinion about universal varicella vaccination for children

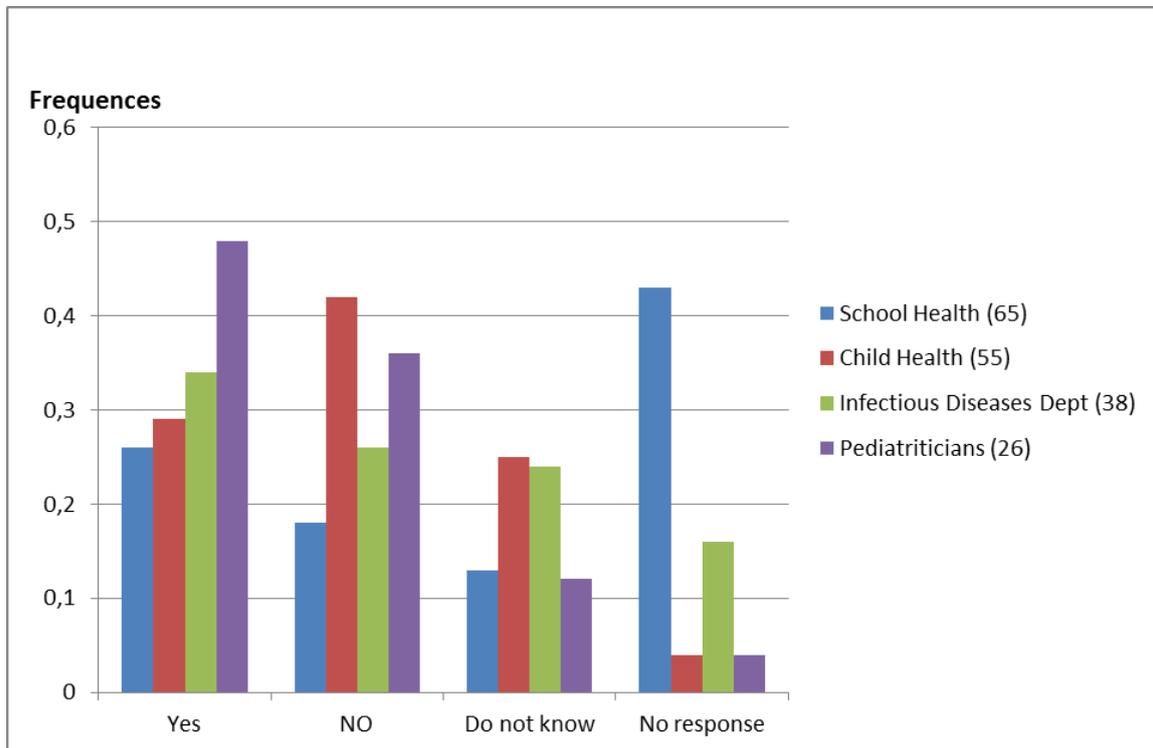


Figure 5. Attitudes to universal varicella vaccination among medical personnel from different work places in 2006 among 184 respondents.

Only one third of the medical personnel were positive to universal varicella vaccination in 2006 and the majority of the school health care personnel had no opinion on universal varicella vaccination in 2012 (Figure 5 and 6). The pediatricians, 12/26 (46%), were the most positive to universal varicella vaccination among all health staff in all workplaces compared with the nurses in Child Health Care who were the most negative to vaccination, 23/55 (42%). Of 184 persons, 1/3 of health personnel from each workplace was either positive or negative or had no opinion about universal varicella vaccination in 2006. The personnel most positive to universal varicella vaccination were the pediatricians, 12/26 (46%), and the staff in the Infectious Diseases Department, 13/38 (34%). There were 58/184 (31%) in favor of vaccination and 54/184 (30%) said no to vaccination. However, 35/184 (19%) had no opinion or did not know how to respond to universal varicella vaccination (Figure 5).

Thus, the most positive professionals to universal varicella vaccination were the pediatricians and personnel from the Infectious Diseases Department.

In the study in 2012 the participants were asked whether universal varicella vaccination should be implemented in the Swedish vaccination program or not. Of the respondents, 17/40 (43%) had no opinion on universal varicella vaccination. 11/40 (28%) said no to the vaccination while 12/40 (30%) were positive to universal vaccination.

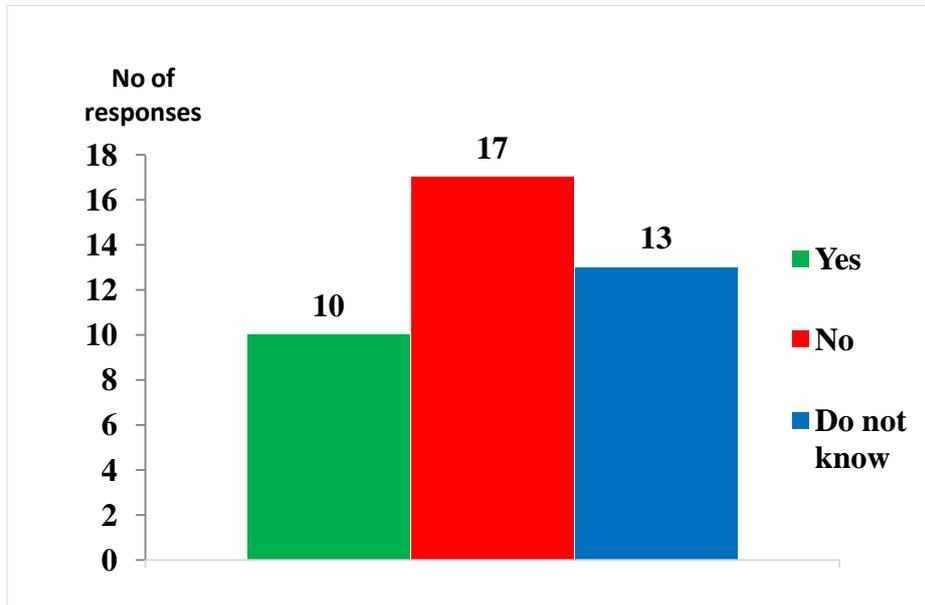


Figure 6. Opinion among 40 respondents about implementation of varicella vaccination as part of school health care in 2012.

The dominant answer among respondents was no to implementation of varicella vaccination as part of school health care 17/40 (42.5%). Only 10/40 (25%) said yes to vaccination, including all three physicians that took part in the study. However, 13/40 (32.5%) had no opinion about the issue (Figure 6).

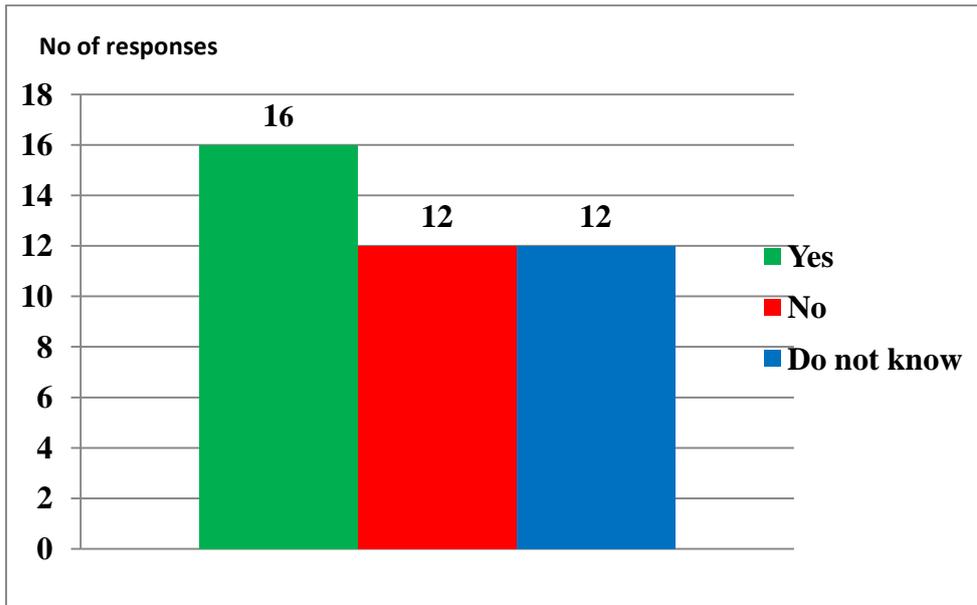


Figure 7. Opinions among the school health personnel on vaccinating their own child against varicella in 2012 among 40 respondents.

Opinion among school health care a personnel about letting their own child or children be vaccinated against varicella was also analyzed (Figure 7). 16 out of 40 (40%) responders in school health care would like to vaccinate their own child against varicella, 24/40 (60%) answered said “No” or “Do not know” to the question. A few nurses expressed in written comments that they would like to vaccinate their child in adolescence, if their child had not had clinical signs of varicella in early childhood.

The health care professionals also expressed their opinions in the following commentaries in their written responses in the questionnaires: They expressed their hesitation to immunize children with additional injections regarding the future new vaccines. They would prefer a combined vaccine such as MPRV instead of separate injections of MPR and varicella vaccines if universal varicella vaccination were to be introduced into the child health program. Other personnel questioned the safety of the new vaccines. They were positive to vaccines as long as the vaccines had no serious adverse effects. Others demanded guidelines and further information about the new vaccines, because they needed deeper knowledge about the severity of some of the diseases and their related vaccines. Otherwise they would not be able to assign priorities to the new vaccines, as requested in the questionnaires in these studies. Some expressed the importance of new employment of nurses in the school or in child health care to be able to fulfill all the extra administrative work that will be the result if new vaccines are added to the vaccination program. The families would need extra education from health care professionals about the new vaccines. Interpreters would have an increased workload in giving supplementary information to immigrant families to be able to convey the value of the new vaccines.

There would be less time for personnel in child and school health care for psychiatric and social work, which are given high priority in the care of parents and their children. To maintain the quality of child and school health care, these duties demand the employment of additional personnel if new vaccines are to be added to the current vaccination program.

5 DISCUSSION

5.1 Methodological considerations

Validity and possible issues of causality is the degree to which a procedure is capable of measuring what it is intended to measure (60). To obtain a strong internal validity of the study, procedures and questionnaires were designed and tested in a preliminary pilot study in 2005, where not comprehensible questions were withdrawn from the questionnaire. In the studies from 2006, medical and health personnel responded in 30-75% of cases depending on which department they represented. The low responses from some groups present an obvious risk for bias. The selection of participants was not chosen at random as the questionnaires were distributed first by the author and then later by nurses and administrative personnel at the hospital. This might influence the selection of participants, when the personnel themselves could choose who would receive the questionnaire. However, the author distributed the questionnaires to all the physicians in their individual postboxes in the Infectious Diseases Department respectively to the pediatricians in the outpatient clinic in the pediatric department in the hospital in 2006. There is also a chance that only personnel with specific interest and opinion about vaccination chose to respond the questionnaire. These variables could influence the results (62, 63).

We desired a response rate of at least 65% or even higher (60). No reminder letters were sent out by post due to lack of continuous finance of the project, and there were no resources to reach the respondents by individual e-mail in 2006. However, the reminding possibility and contact by e-mail was obtained later in the study in 2012, by which time the school health care had installed computers. If there had been a strong selection bias one could have expected responders that were only positive and interested in immunization. However, the results showed instead a variety of positive and negative answers regarding the questions of the various vaccines and immunization programs.

Were results externally valid? External validity addresses the ability to generalize results of the study to other contexts and other situations. Due to the low number of participants, who responded to the questionnaires it is not possible to draw reliable conclusions or to generalize the results to other contexts or situations. One must be aware of selection bias due to non-response effects. The research in 2006 was directed to health staff in different departments.

However, in 2012 only school health care staff answered the questionnaire as the child health care service personnel were not able to participate. The results of the priorities of vaccines from these two studies would therefore not be reliable to be compared to each other. An exception would be the personnel in the school health care- that was a smaller homogenous group of mainly nurses. School health care personnel in 2012 ranked varicella vaccine higher than in 2006. The shifting attitudes to varicella vaccination might reflect an increased knowledge about the morbidity of varicella, included the knowledge about an existing varicella vaccine. The questionnaires in 2012 were also meant to be sent to the personnel in the child health centers, where also immunization of children takes place. However, the nurses in child health care had no time to respond to an additional follow up questionnaire in 2012 due to overload in clinical duties. Studies of attitudes to implementation of VZV vaccine have also been investigated in other settings among health professionals (24, 26, 27, and 64). Therefore, this suggests that our studies, despite their limits, that the examined differences in attitudes are also likely to occur in other settings among health personnel, if future studies would be conducted.

5.2 Discussion of results

5.2.1 Priorities of vaccines

Universal Hepatitis B vaccination was given the highest priority among medical personnel to be implemented into the general child health immunization program in Sweden together with vaccination against meningococcal disease in 2006 as well as in 2012 (21). This supports the research question in the study that knowledge about and experience of severe disease outcomes often result in a positive attitude to vaccination as other studies also have indicated (14,65).

Rotavirus vaccine was given the lowest priority in our study among medical personnel in 2006 but was given higher priority in 2012. Similar to varicella, rotavirus infections are seldom lethal in industrialized countries, and the vaccine mainly prevents hospitalizations. The Rotavirus vaccine has been recommended and implemented in many countries, and the cost- effectiveness of the vaccine and attitude among medical personnel has been evaluated (22, 66, 67). The change in attitude to rotavirus vaccine might increase interest among health personnel to recommend the rotavirus vaccine when the vaccine is now being introduced in many Swedish counties, though a national recommendation is still lacking (3).

The HPV was given low priority among medical personnel in our study in 2006 as a choice of a new vaccine. However, publicity in the media announcing a vaccine against cancer increased the awareness of the value of the vaccine (68). The HPV was later recommended for all girls in 2012-2013 and introduced into the Swedish school health immunization program. However, the HPV coverage has not been as high as for other vaccines.

There may be many factors behind the more limited success of the HPV-vaccine campaign, such as the character of the infection and the many years between infection and disease.

In our study from 2006 the influenza vaccine was given low priority to be introduced annually into the child health immunization program. Nobody among the school health personnel gave priority to the influenza vaccine in the study in 2012. This might reflect an increased scare of side effects seen after the influenza vaccination against H1 N1 in 2009 with Pandemrix-associated narcolepsy (9).

BCG-Bacille Calmette Guerin-vaccine against tuberculosis was in favor among school health staff. The pneumococcal vaccine, however, was lower ranked than varicella vaccine in 2006. Independent of this opinion, this vaccine was successfully implemented into the Swedish child health immunization program in the beginning of 2009. This indicates that other factors than preconceptions are important for successful implementation of a vaccine.

5.2.2 Attitudes to universal varicella vaccination and experience of varicella disease

The attitude to universal vaccination for varicella in children was mainly similar in the year 2006 compared with the year 2012. About 1/3 of the health and medical personnel said yes to introduction of the vaccine, 1/3 said no and 1/3 had no opinion/ did not know in the answers during 2006 as well as in 2012. The varicella vaccine was mostly given rank 4-6 compared to other new vaccines that could be introduced in 2006 as well as in 2012. It was thus given a rather low priority in comparison to other vaccines that possibly could be introduced in the vaccination program, such as vaccines against hepatitis B, meningococcal disease or hepatitis A.

Varicella is a common childhood illness, but uncommonly associated with complications and hospitalizations in manly pre-school children (22). This may explain why the varicella vaccine was ranked higher by the hospital staff, more exposed to children with severe diseases, than by those involved in school health care. The pediatricians and the personnel at the Infectious Diseases Department also ranked the varicella zoster vaccine higher than other professionals in the study in 2006. This might strengthen the research question that experience of complications of varicella zoster diseases would result in a positive attitude to varicella vaccination by prevention of the VZV diseases. The answer of “no to vaccination against varicella” from nurses in child health care may thus reflect the general idea of chickenpox as only a mild disease in children. There seemed to be uncertain factors and probable association between knowledge about severe zoster and willingness to give universal varicella vaccination in children among school health personnel in the study in 2012. VZV infection differs from other childhood diseases because it is a disease complex, where a change at one end (varicella) needs to include possible effects at the other (19).

Introduction of varicella vaccination of children is predicted to increase herpes zoster for the first 40-60 years when the natural boosting of adults from the virus circulating among children ceases (29). Thus, the attitudes to universal varicella vaccination among medical personnel might also be influenced by this uncertainty about the risk of increase of herpes zoster after universal varicella vaccination to children (53). However, this aspect could be eliminated if the zoster vaccine would be recommended at the same time to adults as general varicella vaccine to children in order to minimize this risk. The zoster vaccine is expensive and would increase the financial cost for the total vaccination program against varicella zoster disease in short term. The cost for the burden and treatment of herpes zoster would in the future be eliminated (53). Other possible problem is that introduction of universal varicella vaccination might increase the mean age of varicella disease in the start of the program and thereby the severity of disease (1).

Some nurses who had seen children with complications with varicella would like to introduce universal vaccine to infants. Others hesitated to do so despite experience of severe disease. The school health personnel were ambivalent to recommend universal varicella vaccination in early childhood. The responses in the year 2012 were equally divided between the three alternative answers: “yes”, “no” or “do not know”. The staff with no experience answered in 50 % “do not know” to vaccination, suggesting a demand of information about the vaccine before making a decision. This contradicts the research question that experience of complications of VZV diseases favours a positive attitude to vaccination.

Experience of years in professional work was regarded. In our study from 2012 one third of the school health personnel that had worked more than 30 years in the profession were positive towards varicella vaccination. This might indicate little influence of professional experience on attitude to universal varicella vaccination. However, these results are not reliable since the numbers of responders in each group were too small. Thus, detailed analysis of the relation between time in profession and attitude was not possible due to this selection bias.

Other priorities of duties in child- and school health care than vaccination were also expressed by the nurses in child health care. The introduction of new vaccines will lead to an increased burden of daily duties in child health care, reducing time for tasks regarded to be more important. They also disliked the idea of giving the children an extra injection (8, 17). Thus, the main response of no to vaccination in the school health care for varicella in the year 2012 questionnaire might reflect the increased burden of duties for school health nurses in general. The negative response might not be related to a medical need in children to prevent chickenpox.

VZV Vaccine safety, efficacy and effectiveness are important. The goal of a vaccine in the vaccine program to reduce morbidity and mortality without causing severe side-effects is met by the varicella vaccine. Concerns about vaccine safety and efficacy suggested a need for provider education on these issues.

However, the risk of febrile convulsions with MMRV at age 18 months must be regarded by Swedish authorities before recommendation of introduction of an effective two-dose schedule of varicella vaccination (43). One might choose only the varicella vaccine at 18 months of age and MMRV vaccine at later age when no risk for febrile convulsions have been seen. This recommendation might increase a positive attitude to general varicella vaccination and in the future keep a high compliance for the vaccine. A lack of knowledge and appropriate information may be the main reason behind the negative attitude towards varicella vaccination in our studies. Compared with our study the knowledge, attitudes, and practices regarding varicella vaccination and disease have been studied among health care providers in California (64). There is ample evidence that general use of the VZV-vaccine in a two-dose schedule has been extremely successful in the USA (44-46). The results with conclusion that 2-dose varicella vaccination is preferred are of value for Sweden if the varicella vaccine later would be included in the child health immunization program.

Economic modeling indicates that it is cost-saving, especially if costs for sickness leave for parent is included in the calculations (45, 46, and 69). After cost-benefit analysis, our neighbour Finland has included the vaccine in their general vaccination program (58). The uncertainty on duration of protection and the risk of temporary increase of the HZ incidence after universal vaccination will be further pedagogic challenges, which have not been present concerning other vaccines (53).

However the safety of the varicella vaccine is undisputed and the prospect of preventing herpes zoster may in the future become a powerful argument to support varicella immunization in children, overriding the concern about waning immunity (26). However, the vaccine against varicella is a live-attenuated vaccine which in itself is not preventing latent infection but also causing latent infection (70). The possible extra preventive effort, vaccination of elderly against HZ to prevent the increase will demand extra resources and is further information challenge.

Knowledge about the varicella vaccine and the burden of chickenpox was low. Only a few responders 34/138 (25%) to the questionnaire in the year 2006 were aware of an available varicella vaccine. The vaccine had been in the market since 1974 and the vaccine has for many years been recommended in the USA and in Sweden for seronegative immunodeficient children and their siblings (71). However, the lack of knowledge about varicella vaccine may have contributed to a negative attitude despite their own experience of complications of chickenpox in children. There is obvious a need and a demand of knowledge about the varicella vaccine among health staff before general recommendation can be implemented.

The staff in the infectious diseases department generally had a positive attitude towards universal varicella vaccination. They had experiences of complications in VZV diseases as varicella in children and severe herpes zoster in adults. The personnel more often answered yes to vaccination in comparison with other clinics. This might support the research question that awareness of complications in varicella zoster diseases might lead to a positive attitude to VZV vaccination in comparison with other researchers (26, 27, and 64).

Pediatricians had also a positive grading of universal varicella vaccination to all children in relations to other future vaccines. A few pediatricians that took part in the study worked in the pediatric oncology department, where children with cancer are treated. These children with decreased immunity have an increased morbidity as well as mortality if they get varicella disease (1). These pediatricians are aware of the necessity of varicella protection for their patients and might be positive to universal vaccination-not only as recommended in the program to the siblings around a child in the treatment of cancer (66).

Eradication of varicella and of shingles is inseparable entities with a need of further research into the VZV infection complex. A proposal from professional in virology is that an inactivated and or/ subunit vaccines will in the future prevent latent infection of varicella or shingles even as it is a relative success of the live varicella vaccine (19). Nobody would question the merit of preventing varicella in children, but there seems to be a need for a major gain in sight at least for future generations for both varicella and shingles. Perhaps the most convincing argument for our generation that could lead to universal acceptance would be the vision of eradication of the whole complex of VZV infection (19). There would be a possibility with high immunization coverage and repeated immunization in teenagers and zoster vaccine to adults to eliminate both chickenpox (Varicella) with its complications and even shingles (Herpes Zoster) in the future (19).

5.2.3 Attitudes to other vaccines

Our studies in 2006 and 2012 examine the role of medical personnel and their attitudes and priorities of newer vaccines included varicella. The health and medical staff transfer information about diseases and vaccines to the parents. The new generation of medical and health personnel, including the parents have never experienced or seen the old, severe childhood diseases, now almost eliminated by immunization (10-12). It is important to maintain the knowledge of the childhood diseases, now almost eliminated by vaccination, among the new generation of health professionals in their role as vaccine providers and consultants to parents. Some of the health personnel also demanded more information about the new vaccines before they would be able to give priorities to vaccines that might be implemented into the general child health immunization program. Thus, continuous training and educational interventions are needed among child health care professionals in order to maintain and improve knowledge, attitudes, and behavior regarding vaccination for children (5).

6 CONCLUSIONS

Attitudes, knowledge and experience among health staff concerning vaccines and preventable diseases are regarded to be of vital importance for the success of vaccination programs. Universal vaccination against hepatitis B was given the highest priority among all medical personnel, and general BCG vaccination was given high priority among school health personnel. HPV and Rotavirus vaccines were the lowest ranked vaccines. Thus, health and medical personnel seemed to be positive to an implementation of universal Hepatitis B and BCG vaccines into the Swedish child and school health programs. There was a lower motivation among the personnel for the introduction of universal varicella vaccination for children. No relationship was evident between experience of complications of varicella disease and a positive attitude to varicella vaccination, even though the implementation of universal varicella vaccination was ranked higher among pediatricians and personnel from the Infectious Diseases Department than among the others. This might indicate a relationship between knowledge about severity of VZV disease and a positive attitude toward VZV vaccination. The level of knowledge about the existence of the varicella vaccine among health care professionals was low in view of how long the vaccine has existed. Universal varicella vaccination has now been implemented into the child health immunization programs of many countries. The health professionals in these studies expressed a general demand for education with in-depth knowledge and information about the newer vaccines, especially for VZV vaccine. From a public-health perspective, chickenpox and shingles could be eliminated in future generations with effective VZV vaccines and immunization programs. To attain this goal demands conscious and motivated health care professionals. Thus, there will be a need for further education about the VZV vaccine and VZV disease among relevant health care personnel, if the Swedish authorities decide to implement universal varicella vaccination into the current successful vaccination program in child and school health care.

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