ACTA FAC. MED. NAISS. UDK 615.371

Original article

ACTA FAC. MED. NAISS. 2005; 22 (1): 21-28

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PROBLEMS IN THE ORGANIZATION OF SURVEILLANCE OF SAFE IMMUNIZATION PRACTICE CONDUCTING

SUMMARY

Immunization is the fastest, most efficient and cheapest prevention of infectious diseases. Thanks to immunization, many diseases have been eradicated, eliminated or brought down to individual cases. In order to achieve the expected effects, it is necessary that vaccination covers high percentage of the population (at least 95% of the planned individuals), but it also needs to be conducted timely.

Beside clear legislations in our country, there are still certain reasons (medical and non-medical) because of which children are not immunized. The survey was done in Primary Health Care Center in Niš, and the children included in the study were born in 2000 and 2001. 954 vaccination records were checked. 155 persons (12,05%) were vaccinated by different schemes and vaccines, and 23 persons (2,41%) were incompletely vaccinated by DPT vaccine. 3 persons (0,31%) have not been vaccinated by DPT at all, while 40 persons have not been vaccinated by MMR vaccine.

Speaking of both ages, DPT vaccine immunization started out late. 46% of children born in 2000 and 51,4% of children born in 2001 have not been vaccinated on time. The first re-vaccination was also late, especially in children born in 2000 (18,4%). In most of the cases, the reasons for this have not been noted, but most frequently mentioned is the refusal of parents to bring their children to immunization (42,1%).

Unlike DPT vaccination, only 16% of children born in 2000 and 4,7% born in 2001 have not been vaccinated by MMR on time.

The safe immunization surveillance is very difficult to monitor due to different codes (not only from 10th ICD) and, consequently, very long diagnoses of diseases.

Only a small namber of the usual post-vaccination reactions is registered, and there have not been cases of side effects or serious reactions that would be contra-indications for further immunization.

Key words: **immunization, surveillance, post-vaccination reactions**

INTRODUCTION

Immunization is the fastest, most efficient and cheapest prevention of infectious diseases. Thanks to this method, many diseases have been eradicated (*Variola vera* in the world and *Polio* in Europe) eliminated or brought down to individual cases. In order to achieve the expected effects, it is necessary that vaccination covers high percentage of the population (at least 95% of the planned individuals), but it also needs to be given timely.

To achieve all this in the process of immunization, all the aspects need to be ensured and monitored, starting from the production (vaccine quality) which is not influenced by the health service, then the preservation and use of vaccines (cold chain principle, ways of using bottles with larger number of doses, keeping them, etc.), safe vaccine application procedures and disposal of the harmful waste, i.e. the waste of the health institutions. Vaccines are basically safe and efficient, but as many biological matter they can produce side effects. That is why the WHO has established the programme for side effects probably caused by immunization monitoring (AEFIs) (1,2). Side effects were classified as the post-vaccine reactions, results of programme mistakes, reactions to vaccination and unknown reasons (3).

The significance of immunization and maintaining good quality in our country are historically pointed out as well, and our legislation is in accordance with the international regulations and experience (4,5).

Though there are clear legislations and long immunization tradition, still there are reasons out of which children are not immunized. These reasons are divided into two large groups: non-medical and medical. Medical reasons are the results of contraindications for certain vaccines application (5). They could be general and special, temporary and long-lasting, and they are determined according to the characteristics of the vaccines and the state of patients. Their primary goal is not to harm the patient.

However, in everyday practice, there are frequent so-called "false" contraindications that could either postpone or prevent the vaccination.

Non-medical reasons are a very important factor, since they can endanger this very important prophylactic measure. Most of all, these are mistakes in the immunization organization, shortage of vaccine and not showing for vaccination.

The correct setting and respecting the contra-indications protects the patient and enables the timely or alternative protection of the patient, while detection and monitoring (surveillance) of the side effects determine further activities for patients' health protection. Both activities are very important for the implementation of the immunization programme and protection from the unjustified criticism (especially by health workers, media, etc).

AIMS

The aim of the paper was to establish the existence and frequency of the contraindications for primary vaccination by DPT, OPV and MMR vaccines, as well as the revaccination by DPT and OPV, and also to establish the delays in vaccination and revaccination terms and observe the post-vaccine reactions.

MATERIAL AND METHODS

Medical database of children born in 2000 and 2001 was checked, and the established state was described. Data analysis of the observed variables was processed by the EPI INFO programme package.

Niš was chosen as the place for survey since the large population lives in it, and there are also vulnerable population groups. This is a University center with the health experts that are against cellular vaccination against pertusis and MMR vaccine.

The children born in 2000 and 2001 were chosen as they were born after the dynamic nineties, when the import of the vaccine and its types is still limited, but when there are still opposite information in the legislation regarding age in which the DPT and MMR vaccines should be given.

RESULTS

During the vaccinated persons database check, the first thing to do was to define the case of the timely vaccination and the post-vaccine reactions. Timely vaccination meant that the DPT and OPV vaccination started after the completion of 2 months of age (though the age of the baby is unclear), and that the rest of the doses have been given within the right periods after the previous ones, and that the MMR vaccine has been given between 12 and 18 months of age. Every state (disease) determined by the doctor examining the vaccinated child has been established as the post-vaccine reaction.

Each fourth medical record in the database has been analyzed as the random sample. The size of the sample has been determined by the following formula (3):

$$N = \frac{z^2 * p * q}{d^2} \quad \frac{1{,}96^2 * 0{,}5 * 0{,}5}{0{,}05^2} = 400$$

z: alpha risk express in z- score
p: expected prevalence
q: 1-p
d: absolute precision

This means that it was enough to examine 400 medical records of children born in each of the two years.

However, certain system mistakes and limitations were discovered. It was impossible to consider

all the records since immunization was carried out at the same time, so the records of a certain number of children were unavailable. Also, the records of refugees, IDPs and vulnerable population groups' children were separated, as well as the ones of rural and urban population groups.

The examined sample is not representative for the post-vaccine reactions since they were rarely presented and not well defined. Some of the outhospital findings could not be presented sistematically and properly in the Questionnaire since the design of the study was based on the expected one, so the Questionnaire needs to be changed for the future surveys.

954 vaccination records have been checked, out of which there were 459 records of children born in 2000 and 495 in 2001. According to the Census from April, 2002, there were no statistically significant differences in gender and number of children in the years they were born.

Table 1 presents the number of children who received the DPT vaccine. Out of the total number, 23 (2,41%) were incompletely vaccinated. Only 3 children (0,31%) haven't been vaccinated at all. It is more important whether all 3 doses were applied timely, since, according to WHO recommendations, the vaccination should be completed by the age of 6 months. Table 2 presents whether the vaccination was conducted on time, and it can be seen that in both groups there are large percents of children that haven't been vaccinated on time by the 1st dose of DPT vaccine (46% born in 2000 and 51,4% in 2001). The same is registered at the 1st revaccination in children born in 2000.

The reasons for the delay in children born in 2000 are presented in Table 3. The reasons haven't been noted in 37,4% of children for the 1st dose of DPT , 70,7% for the 2nd dose, 58,1% for the 3rd dose, and the 1st revaccination hasn't been performed in 51,5% of children. Presence of the acute disease is the reason for postponing in 11% of cases for the 1st , 14,6% for the 2nd and 38,7% for the 3rd and 38,8% for the 1st revaccination by DPT vaccine. Other diagnoses were the reason for 51,5% of delayed cases for the 1st dose of DPT vaccine, 14,6% for the 2nd, 3,2% for the 3rd and 9,7% for the

Table 1. Registered DTP immunization status (3 doses in the 1st year of life and revaccination after 12 months from the 3rd dose)

Born in	1st dose		2nd dose		3rd dose		Rev	
	Yes	No (%)	Yes	No (%)	Yes	No (%)	Yes	No (%)
2000	493	1 (0,2)	492	1 (0,2)	487	5 (1)	337	134 (18,4)
2001	449	2 (0,4)	441	8 (1,8)	433	6 (1,4)	394	34 (7,9)

Table 2. DPT immunization performed on time

Born in	1st dose		2nd dose		3rd dose		Rev	
	Yes	No (%)	Yes	No (%)	Yes	No (%)	Yes	No (%)
2000	266	227 (46,0)	451	41 (8,3)	456	31 (6,4)	337	134 (28,4)
2001	218	231 (51,4)	417	24 (15,4)	426	7 (1,6)	376	18 (14,6)

Table 3. Reasons for postponing or not immunizing with DPT vaccine, generation of children born in 2000.

Reason	1st dose		2nd dose		3rd dose		Rev	
Not mentioned	85	37,4%	29	70,7%	18	58,1%	69	51,5%
Acute diseases	25	11,0%	6	14,6%	12	38,7%	52	38,8%
Other diagnoses	117	51,5%	6	14,6%	1	3,2%	13	9,7%

1st revaccination. Reasons for the delay in the group of other diagnoses are hyper-bilirubinemia, i.e. jaundice immediately after the birth, recommendations of neurologists due to the so-called "development monitoring", sickness of a brother or a sister who had recently been vaccinated by other vaccines.

Table 4 presents the reasons for delay or non-vaccination by DPT vaccine of children born in 2001.The results are similar to the ones of the children born in the previous year. The vaccination has been postponed in 46,7% of cases without any noted reasons. Each 2nd child hasn't been given the second dose on time, 57,2% 3rd, and revaccination was late in one third (66,6%) of cases with no explanation. The acute disease was a very rare reason. Other diagnoses were present in 48,1% for the 1st dose of DPT, 12,5% for the 2nd, 42,8% for the 3rd and 16,7% of cases for the delay of the 1st revaccination. Other diagnoses are similar in this case, too, and they are not the real contraindications (hyper-bilirubinemia – jaundice, development monitoring, low birth weight, etc).

Table 5 presents the totals of children vaccinated by MMR. Only 1,4% of children born in 2000 and 7,2% born in 2001 haven't been vaccinated. Unlike DPT vaccine, only 16% and 4,7% of children haven't been vaccinated on time. Reasons for delay or non-vaccination (table 6) haven't been noted in 80% of children born in 2000 and 65% born in 2001. Acute diseases were noted as reasons in 12,8% and 10% of cases, and the rest of diagnoses in 6,4% and 25% of cases.

Post-vaccine reactions after the application of DPT and MMR vaccines are presented in Tables 7, 8 and 9. Only a small number of the usual reactions is registered, and it is far below the expected ones. There were no registered cases of the rare serious side effects that could represent contraindications for further immunization.

Table 4. Reasons for postponing/not immunizing with DPT vaccine, generation of children born in 2001.

Reason	1st dose		2nd dose		3rd dose		Rev	
Not mentioned	108	46,7%	12	50,0%	4	57,2%	12	66,6%
Acute diseases	12	5,2%	9	37,5	-	-	3	16,7%
Other diagnoses	111	48,1%	3	12,5%	3	42,8%	2	16,7%

Table 5. Registered MMR immunization status and timeliness of immunization (1st dose between 12 and 18 months of age)

	Vaccinated		On time	
Year of birth	Yes	No (%)	Yes	No (%)
2000	488	7 (1,4)	410	78 (16)
2001	426	33 (7,2)	406	20 (4,7)

Table 6. Reasons for postponing/not immunizing with MMR vaccine

	Year of birth			
Reason	2000		2001	
Not mentioned	63	80,8%	13	65%
Acute diseases	10	12,8%	2	10%
Other diagnoses	5	6,4%	5	25%

Table 7. Registered post-vaccine (pv) reactions, by number and type

	Born in 2000			Born in 2001		
Vaccine type	Number of pv reactions (%)	No. of immunization performed	Kind of reaction	Number of pv reactions (%)	No. of immunization performed	Kind of reaction
DPT1	5 (1)	493	• febrile	3 (0,7)	449	• granuloma • haematoma • swelling
DPT2	2 (0,4)	492	• febrile	1 (0,2)	441	• local erithema
DPT3	2 (0,4)	487	• febrile • abscess	1 (0,2)	433	• swelling
DPTr	1 (0,2)	471	• swelling	1 (0,2)	394	• swelling
MMR	4 (0,8)	488	• febrile • swelling • rash swelling of lymphatic nodes on the neck	0 (-)	426	• -

Table 8. Registered post-vaccine reaction after 3660 given DPT doses and expected values

Symptoms	No. of persons	%	Expected %	No/million doses
Febricity	8	0,22	up to 44,5%	2186
Swelling, granuloma, haematoma	6	0,16	up to 50 %	1639
Abscess	1	0,03		273
Local erithema	1	0,03		273
Total	16	0,44		4372

Table 9. Registered post-vaccine reaction after 914 given MMR doses and expected values

Symptoms	No. of persons	%	Expected %	No/million doses
Febricity	1	0,11	up to 15%	1094
Local swelling	1	0,11	up to 10 %	1094
Rash	1	0,11	up to 5%	1094
Swelling of lymphatic nodes on the neck	1	0,11		1094
Total	4	0,44		4376

DISCUSSION

Immunization is the fastest, most efficient and cheapest prevention of infectious diseases. Thanks to this method, many diseases have been eradicated (*Variola vera* in the world and *Polio* in Europe), eliminated or brought down to individual cases. In order to achieve the expected effects, it is necessary that vaccination covers high percentage of the population (at least 95% of the planned individuals), but it also needs to be given timely.

Vaccines are basically safe and efficient, but as any biological matter they can produce side effects. That is why the Global Immunization Programme established in 1997 by WHO paid special attention to the monitoring of side effects that follow immunization (Adverse Events Following Immunization-AEFIs) (1). According to this programme , the side effects are:

• Post-vaccine reactions, such as the usual mild reactions to vaccine, local reactions (pain, swelling, redness), temperature and systemic symptoms which are the results of a normal immune response and rare (side) serious reactions like convulsions, thrombocytopenia, hypotonic-hyposensitive episodes, persistent crying and screaming, anaphylaxis and encephalopathy.

• Programme mistakes caused by mistakes in transport, keeping, handling an application of the vaccine.

• Reaction to injection, fear of or pain caused by injecting.

• Unknown reason, when the cause cannot be determined.

Although there are clear legislations in our country, still there are certain reasons out of which children are not immunized. Those reasons can be medical and non-medical. Medical reasons are the results of presence of general or special contraindications for the certain vaccines application. Their aim is not to harm the patient. Contra-indications are set in cases of the acute disease, febrile state, allergy to some vaccine component, in live viral vaccines due to immunodeficiency, pregnancy, and if the person has evolutionary neurological disease, the pertusis vaccine must not be applied, and if the cellular immunity is damaged by the HIV infection then the BCG vaccine must not be applied.

However, the so-called "false" contra-indications are more frequent in daily practice. There are: usual mild local reactions (pain, swelling, redness) after earlier vaccinations, mild respiratory tract infections, diarrhea, body temperature lower than 38,5 degrees C, allergy to penicillin, pollen, house dust, asthma, convulsions in the family anamnesis, dermatomicoses, eczema, local skin infections, chronic disease of heart, lungs, liver, kidneys, stable neurological states, jaundice immediately after birth, low birth weight, premature birth, breastfeeding, pregnancy, earlier diseases etc. Non-medical reasons can endanger the immunization. Most frequent are mistakes in the immunization organization, shortage of vaccines and not showing for vaccination. The survey has been done in the Primary Health Care Center in Niš, since the population in town is large, and there are vulnerable groups of people as well. This is a University Center with the health experts that are against cellular vaccination against pertusis and MMR vaccine.

The children born in 2000 and 2001 were chosen as they were born after the dynamic nineties, when the import of the vaccine and its types are still limited, but when there are still opposite information in the legislation regarding the age in which the DPT and MMR vaccines should be given.

954 vaccination records have been checked, out of which there were 459 records of children born in 2000 and 495 in 2001. According to the Census from April, 2002, there were no statistically significant differences in the gender and number of children in the years they were born.

Out of the total number of examined records, 115 persons (12,05%) have been vaccinated by different schemes and vaccines (DT, IPV, Pentavax, etc) and 23 persons were either not or incompletely vaccinated (2,414%). 3 (0,31%) persons have not been vaccinated by DPT vaccine at all, whereas 40 persons (4,19%) have not been vaccinated by MMR.

In both years the immunization by DPT and thus OPV vaccines started out late. 46% of children born in 2000 and 51,4% in 2001 haven't received the 1st dose of DPT. The 1st revaccination is significantly late as well, especially in children born in 2000 (18,4%). The reason is most frequently unnoted, but the most frequently listed is parents' not bringing their children for immunization (42,1%). A confusing information regarding group of the acute diseases is that the child was ill for 5 months. The rest of diagnoses were frequently reasons for postponing the vaccination (the 1st dosage of DPT vaccine in 51,5% of children born in 2000 and 48,1% born in 2001). There is a variety of diagnoses here, too, the most frequent being "the risk for the baby", "development monitoring", whereas the icterus is the reason of immunization delay in 15,3% of cases. Almost each 4th child (23,8%) is late for vaccination because of a neurologist's recommendation.

It is confusing that there are different recommendations for the same diagnoses regarding the start and way of immunizations, even by doctors of the same specialization.

Unlike DPT vaccination, only 16% of children born in 2000 and 4,7% in 2001 weren't vaccinated by MMR on time. The explanation for this is that MMR vaccination could be conducted between 12 and 18 months of age, but it is recommended after turning 12 months. Reasons for the delay have not been noted in 80% of cases of children born in 2000 and 65% of children born in 2001. The acute disease was the reason for the delay in 12,8% and 25% of cases.

High percentage of postponing the MMR vaccination was caused by the unresolved problem of the continuous supply (import) of this vaccine.

Surveillance over the implementation of the safe immunization is very difficult to monitor in the existing conditions, and also because the codes from the 10th ICD revision are not applied, so very long diagnoses are noted: "Sy. Aspirationem, Anemiae, Hyperbilirubinemia, Development monitoring", "Risk for the baby", etc. Also, the medical records have not been modified, so it is impossible to track the vaccine by the type and manufacturer, especially since the new vaccines have been introduced, i.e. when there are the alternative schemes of immunization. Medical records also do not contain questions about gender, and sometimes it is difficult to distinguish the gender due to similar names.

Only a small number of the usual post-vaccine reactions are registered. After the application of DPT vaccine there is only 0,22% of febrile state cases out of the total of 3660 applied doses, and the expected effects could be up to 45% of the total persons vaccinated. 50% of swellings, redness and granulomae at the place of application could also be expected, and only 0,16% were reported. The situation is the same after MMR vaccine immunization. Out of 914 applied doses there were only 4 cases of post-vaccine reactions which is far below the expected result presented in the textbooks.

There were no cases of the unwanted, serious reactions that would represent contra-indications for further immunization.

CONCLUSION

It is impossible to carry our vaccination between 2 and 6 months of age, if we continue with late start of immunizations. Better informing of parents through the joint activities of health workers of all the specialities could improve the timely primary vaccination. The way of organizing the database and medical records of the vaccinated persons needs to be modified and adjusted to the new laws, new vaccines and new manufacturers. Contra-indications needs to be precisely defined, and diagnoses need to be adjusted to the new codes (10th revision of ICD). There is no joint opinion of different doctors on the advantages of immunization and its start at the certain age. Finally, it is necessary for all the experts (pediatricians, neurologist, neonatologist, immunologists and epidemiologists) at the state level to decide what to do and how to do it, because there is no use of the situation as it is neither for population nor medical professionals. Most probably, only media benefit from it.

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PROBLEMI U ORGANIZOVANJU NADZORA NAD SPROVOĐENJEM BEZBEDNE IMUNIZACIONE PRAKSE

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SAŽETAK

Imunizacija predstavlja najbržu, najefikasniju i najjeftiniju zaštitu od zaraznih bolesti. Zahvaljujući imunizaciji mnoge bolesti su eradicirane, eliminisane ili svedene na pojedinačne slučajeve. Da bi se postigli očekivani efekti neophodno je vakcinom obuhvatiti visok procenat osoba (najmanje 95% od broja planiranih), ali isto tako i vakcinaciju izvršiti pravovremeno.

I pored postojanja jasnih zakonskih propisa, kod nas ipak postoje određeni razlozi (medicinski i nemedicinski) neimunizovanja dece.

Ispitivanje je rađeno u Domu zdravlja u Nišu, a izabrana deca su rođena 2000. i 2001. godine. Ukupno je pregledano 954 kartona vakcinacije. U ukupnom uzorku pregledanih kartona 155 osoba (12,05%) vakcinisano je različitim šemama i vakcinama, a nepotpuno je vakcinisano DTP vakcinom 23 osoba (2,41%). Tri osobe (0,31%) nisu uopšte vakcinisane DTP vakcinom, dok MMR vakcinu nije primilo 40 osoba.

U oba posmatrana godišta postoji kašnjenje sa započinjanjem imunizacije DTP vakcinom. Prvu dozu DTP nije primilo na vreme 46,0% dece rođene 2000. godine, odnosno 51,4% dece rođene 2001. godine. Kašnjenje je značajno i za prvu revakcinaciju ovom vakcinom, naročito kod dece rođene 2000. godine (18,4%) najčešće nema upisanog razloga za kašnjenje, ali se najčešće navodi neodazivanje roditelja na pozive za imunizaciju (42,1%).

Za razliku od vakcinacije DTP vakcinom, samo 16,0% dece rođene 2000. godine, odnosno 4,7% rođene 2001. godine, nije vakcinisano na vreme MMR vakcinom.

Nadzor nad sprovođenjem bezbedne imunizacije je veoma teško pratiti jer se ne primenjuju uvek šifre iz 10. revizije MKB, pa se upisuju veoma duge dijagnoze bolesti.

Registruje se veoma mali broj uobičajenih postvakcinalnih reakcija, a nije registrovan ni jedan slučaj neželjenih, ozbiljnih reakcija koje bi bile kontraindikacije za dalju imunizaciju.

Ključne reči: **imunizacija, nadzor, postvakcinalne reakcije**