Recent improvements in the Turkish childhood national immunization program

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The Childhood National Immunization Program (NIP) is a key element of the primary healthcare and plays a major role in the national health status. The Turkish NIP, which is run by the Ministry of Health, included mainly the basic vaccines (Bacillus Calmette-Guérin [BCG], diphtheria-pertussis-tetanus [DPT], polio, measles) until 2005. However, a change in the governmental policies in 2002 and a close collaboration with the Advisory Board of Immunization have improved the Turkish NIP not only in terms of the quality of the vaccines and vaccination rates but also the number of pathogens covered. Currently, Turkey has a NIP that is equivalent to or better than that of the other European countries. However, making vaccination a constant part and priority of the state health policies is necessary for sustainability. Political commitment and efficient multi-sectorial collaboration and awareness are crucial.

Key words: childhood, universal vaccination, policy.

Childhood vaccination is a major factor affecting the public health status of nations. In 1980, the World Health Organization (WHO) recommended six vaccines for the Expanded Program on Immunization (EPI), namely vaccines against tuberculosis (Bacillus Calmette-Guérin [BCG]), poliomyelitis (OPV), diphtheria-tetanus-pertussis (DTP), and measles[1]. WHO added yellow fever (YF) vaccination for all infants living in endemic countries in 1988 and hepatitis B (HepB) vaccine in 1992 to the EPI list. In 1997, the Scientific Advisory Group of the WHO Global Immunization Program (GIP) endorsed use of the conjugated vaccine against *Haemophilus influenzae* type b (Hib) in countries where Hib disease is recognized as a public health problem. Although many developing countries implemented their EPI, coverage for the first six vaccines has not exceeded 80% of the annual global birth cohort in many of them.

The Decision-Making Process in Turkey

The decision about implementation of a new vaccine into the National Immunization Program (NIP) is a complex process in Turkey. It necessitates a wide range of information, and it is often influenced by scientific and logistic issues. The final decision is made by the Ministry of Health (MoH) in close collaboration with experts who contribute to the decision-making process on new vaccines. This contribution comes mainly from the Advisory Board of Immunization (ABI). It is formed by the participation of academic experts from different national universities and different disciplines, such as pediatrics, infectious diseases and public health. It consists of 20 to 30 academicians and meets 3 to 4 times a year. More than 50% of its members did not change in the last 15 years.

Scientific decision is the first step. It mostly depends on global and local epidemiology of the disease to be prevented (age-specific disease burden, common serotypes/genotypes of the pathogen, etc.), safety and efficacy of the candidate vaccines and cost-effectiveness of vaccination. Until recently, there was no efficient nationwide active surveillance system for vaccine-preventable diseases. Therefore, decisions were usually made by using the data of neighboring and/or epidemiologically

similar countries, as was done for the inclusion of measles-mumps-rubella (MMR) and Hib vaccines into the NIP. This has been a major issue, especially when there were no such countries already using the vaccine to be introduced in Turkey.

In the absence of sufficient local epidemiological data, a strong political motivation and consistency may become even more important as factors for taking public health measures as a priority and adding new vaccines into the NIP. Though such decisions are mainly political and administrative, they would have a strong scientific basis as long as they are made in close collaboration with scientific experts. Thoughtful and thorough evaluation helps decision-making to be rational, scientifically sound and well accepted.

Various other factors may also influence the final decision. Turkey is a large developing country with a population of 70,586,256 and 1,262,333 annual birth cohort (Turkish Statistical Institute 2008 data). For such a developing country with limited resources that has invested much in recent years to improve many other aspects of the health service, the cost of the immunization matters more than it does for developed countries.

Social values, perceptions, and political concerns are also important. Therefore, coordination of the different activities (e.g., awareness campaigns, staff-motivating measures, etc.) determines the success of the NIP and the achievement of high vaccination coverage.

System of National Immunization

National Immunization Programs (NIPs) differ in each country, according to the public health approach of the country, presence of compulsory vaccination, public perception, and decision- making, importation, tracking, introduction, and reimbursement processes. Decision-making for NIP vaccines, funding for the program and introduction of the vaccines are the most important steps. In the United States of America (USA), the decision is made by the *Advisory Committee on Immunization Practices* (ACIP) consisting of the representatives of the Centers for Disease Control and Prevention (CDC), American Academy of Pediatrics (AAP), and American Academy of Family Physicians (AAFP). The NIP is funded by private health insurance companies with support from governmental sources. Vaccines are applied by pediatricians and family physicians in private and public health centers.

The current Turkish system of national immunization is more similar to the system in the United Kingdom (UK) (Table I). In Turkey, the decision for a vaccine to be included in the NIP is made by the MoH in consultation with the ABI. Funding for the vaccines and immunization services including the import, tracking and introduction of vaccines are directly paid and managed by the MoH. Immunizations are performed mainly in public health centers of the MoH. Briefly, the MoH makes the decisions for the NIP, applies the program and pay for all. It is also the authority for licensure of the new vaccines.

Private pediatricians are allowed to vaccinate children as well but this constitutes only 5% of the vaccinations in the NIP. For older children and adults, there is no public or private reimbursement for vaccination other than HepB, pneumococci and influenza for certain high- risk groups.

Changes in the NIP and the Impacts of These Changes on the Disease Burden

The NIP and national immunization system did not change for 20 years in Turkey, until 2005. In those days, the Turkish NIP included six diseases (BCG, DTP, polio, and measles) with low vaccination coverage. HepB vaccine was included in 1998, but coverage rates of the vaccinations were still low (Fig. 1)[2]. During the last 10-15 years, the ABI kept recommending that MoH add MMR and Hib vaccines to the

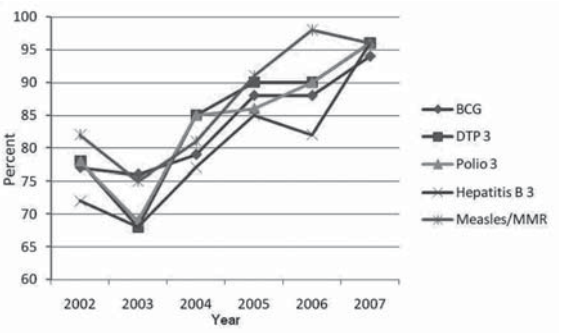

Fig. 1. Vaccination rates of some vaccines between 2002 and 2007 in Turkey.

Table I. National Immunization Systems in the USA, the UK and Turkey

	USA	UK	Turkey
Public health approach	Individual	Public	Public
Compulsory vaccination	+	-	-
Perception of public	Individual right	Responsibility of government	Responsibility of government
Decision	CDC, AAP, AAFP*	Government	Government
Importation and tracking	Private sector	Central (government)	Central (government)
Application	Private sector	Government	Government
Payment	Private insurance companies	Government	Government

*CDC: Centers for Disease Control and Prevention. AAP: American Academy of Pediatrics. AAFP: American Academy of Family Physicians.

NIP; however, such recommendations were not followed by previous governments due to the budget limits. The annual budget for the NIP was about 17 million US dollars by the end of 2000 (exchange rate of $1 USD was 1.587 Turkish liras on June 4, 2010) (Fig. 2)[3].

An important MoH initiative of those days was the polio eradication program. The last case of wild polio infection was detected on November 26, 1998, and Turkey received a "polio-free country certificate" in 2002. With efficient activities on acute flask paralysis surveillance, campaigns such as national immunization days and mopping-up, environmental surveillance, and increased rate of routine vaccination, no new wild poliovirus infection has been seen since the certification.

The current government, which took office in 2002, changed the NIP picture dramatically. The program became a priority and dramatic improvements were seen not only in the budget (Fig. 2) but also the staffing, with the current Minister who has been in office since then.

The total number of health service staff increased from around 270,000 in 2002 to 414,000 in 2008[4]. Such improvements

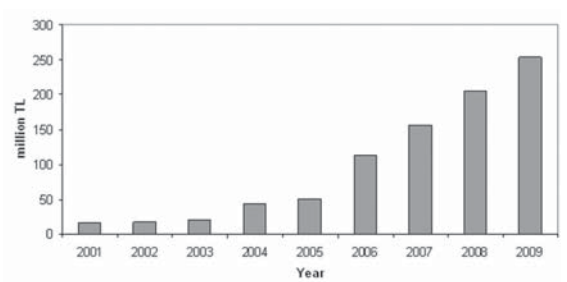

Fig. 2. Annual MoH NIP budgets in Turkey.

significantly increased the NIP coverage rates for all vaccines included (Fig. 1). Vaccine coverage rates in the NIP ranged between 70-80% in 2002. The rate increased up to more than 90%, reaching about 95% in 2007 (Fig. 1).

In addition to the overall improvement in health service accompanied by the increase in staffing and number of health centers, the high motivation of the MoH for vaccination is based on the decisive approach of the Minister, who is a Professor of pediatrics, and it has been the major factor responsible for the remarkable achievements.

Recent Improvements in the NIP

The Minister's personal dedication to the issue of vaccines has been a major factor in the recent improvement in immunization policies in Turkey. In the last 5-10 years, the MoH started a very productive collaboration with the ABI and Turkey had significant improvements in the NIP. None of them would have been possible without the political will and consistency.

On September 2, 2005, the ABI refreshed its recommendations for the addition of MMR and Hib vaccines to the NIP. With the Minister's positive approach to the issue, after years of efforts of the scientific experts, Turkey finally implemented the MMR vaccine into the NIP as the 86th and Hib vaccine as the 26th country, respectively. In addition, all children older than six years of age and adolescents started to be vaccinated with rubella vaccine to prevent congenital rubella syndrome cases because of the possible decrease in public immunity level against rubella after national vaccination

in one year. This was the first step of major developments in the NIP and was followed by others.

A year later, the Minister actively imposed taking the 5-valent combined vaccine (DTaP-IPV-Hib) on to the agenda of the ABI. Following the strong recommendation of the ABI, it was also included in the NIP schedule by the end of 2006. This change not only decreased the number of injections, but also replaced the whole cell pertussis vaccine with the safer acellular pertussis vaccine and combined IPV with OPV in the NIP (OPV is still used since polio surveillance in neighboring Iraq is not reliable).

Measles was another important health problem in Turkey before 2005. A dramatic decrease in the incidence of measles cases was achieved by high routine vaccination rate supported by vaccination campaigns carried out as a part of the elimination program. The annual number of measles cases decreased from 7810 in 2002 to 3 in 2007 (Fig. 3)[2].

The number of officially reported annual pertussis cases decreased from 193 to 51 from 2002-2007. We hope that the number of rubella cases, as well as mumps cases, for which we do not have reliable statistics, will decrease in the following years with the national MMR vaccination.

Haemophilus influenzae type b (Hib) was found to be responsible for 20.5% of childhood acute bacterial meningitis cases in a nationwide multicenter study in Turkey in 2005[5]. The national Hib vaccination started the same year and we are expecting to see a decrease in Hib cases. Annual neonatal tetanus cases decreased from 32 to 3 in the same six-year period, possibly because of the increasing vaccination rate and better baby delivery facilities (Fig. 3). In spite of the high national vaccination rates, hepatitis B incidence did not decrease in the same period because risk-group vaccination did not reach the desired levels.

Latest Achievement in the NIP: 7-Valent Conjugate Pneumococcal Vaccine (PCV7)

The WHO states that *Streptococcus pneumoniae* (pneumococcus) is the leading vaccine-preventable cause of morbidity and mortality, especially in early childhood (<5 years). It is estimated that up to 1 million children

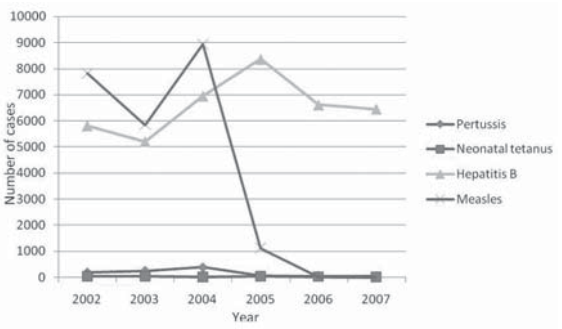

Fig. 1. Vaccination rates of some vaccines between 2002 and 2007 in Turkey.

aged <5 years die of pneumococcal diseases every year, with developing countries bearing the greatest burden[6,7]. Pneumococcus causes both invasive (meningitis, sepsis, etc.) and noninvasive (pneumonia, acute otitis media (AOM), etc.) diseases in children[6].

Pneumonia has always been a major public health issue for the pediatric age group in Turkey. MoH data indicated that it is the most important cause of post-neonatal death in those <5 years. Pneumonia and bronchopneumonia lead, accounting for almost 20% of all deaths in this age group (far more than diarrhea, etc.)[8].

The PCV7 has quite a long global history of use, which brings a considerable amount of scientific evidence about its performance[9-11]. It was licensed by the Food and Drug Administration (FDA) in 2000 and by the European Medicines Agency (EMEA) in 2001, and around 300 million PCV7 doses have been delivered worldwide since 2000. Its immunogenicity and efficacy results set up the scientific standards for PCVs[12]. In 2007, WHO recognized the safety and efficacy of PCV7 and recommended it as a priority for the NIPs of developing countries. By August 2008, PCV7 had been licensed in more than 90 countries and introduced into national childhood immunization programs of 26 countries[13]. Currently, it is the only PCV with NIP effectiveness results not only for invasive pneumococcal disease (IPD) but also pneumonia and AOM[10,11,14-16].

In 2008, ABI placed a recommendation to introduce PCV7 into the NIP. The MoH agreed and started national PCV7 vaccination in

November 2008 (Table II). This has been a major step forward for the health of new generations in Turkey. It is estimated for Turkey that routine PCV7 vaccination of infants and toddlers would prevent more than 900 meningitis, 1500 bacteremia, 19,000 pneumonia, and 230,000 AOM cases, and more than 300 deaths in children annually[17]. This shows that national PCV7 vaccination will provide significant support to Turkey to reach the targets mentioned in the United Nations Millennium Development Goals-2015 for child health. Such significant numbers clearly justify the cost-effectiveness of the vaccine for Turkey as well.

The remarkable progress in the Turkish NIP in recent years has reached another turning point with the inclusion of the PCV7. Turkey is currently the largest developing country in Europe (in terms of birth cohort) having PCV7 in its national childhood vaccination.

This has also been a very important measure for the flu (H1N1) pandemic preparedness. It is well known that secondary pneumococcal infection was a major factor of mortality in the 1918 flu pandemic[18]. According to recent reports from the CDC, pneumococci were isolated from the lungs in 10 of the 77 patients who died of H1N1 flu[19].

With this last step forward, the annual NIP budget increased to 200 million US dollars, meaning that the total cost of the NIP increased about 12 times in the last three years, with the number of diseases covered by national immunization increasing from 7 to 11.

In this period, a vaccine-related side effect notification system was also revised. With a new circular order published in 2003, a commission for vaccine-related side effect notification was established and new forms were prepared and sent to immunization centers[2]. The number of cases with vaccine side effects increased five times with the close follow-up of the return of these forms to MoH.

Further MoH Initiative About NIP: Surveillance Programs

Surveillance of infectious diseases is a crucial complementary component of NIPs. It is important for determining the morbidity and mortality profiles of certain diseases or disease groups caused by certain pathogens. This information usually plays a major role in policy making of the MoH about infectious diseases, including the decision-making process about vaccines. It is also the major tool to track the impact of various interventions like vaccines, antibiotics or other measures to impede infectious diseases in the country.

The MoH has a compulsory reporting list of contagious diseases that runs in compliance with the current ICD-10 system. In 2004, they updated the list and published a comprehensive guideline to standardize diagnosis and reporting of these diseases. This was followed by a new regulation in 2007, further improving the list with additional infections including

Table II. Turkish NIP in 2010[20]

	Age								
Vaccines*	Birth	1st month	2nd month	4th month	6th month	12th month	18-24th month	6th year (1st grade)	13th year (8th grade)
BCG			I						
DTaP-IPV-Hib			I	II	III		IV		
OPV					I		II	III	
MMR						I		II	
Td								√	√
PCV-7			I	II	III	IV			
Hepatitis B	I	II			III				

BCG: Bacillus Calmette-Guérin. DTaP-IPV-Hib: Diphtheria-tetanus-acellular pertussis-inactivated polio vaccine-*Haemophilus influenza* ty pe b. OPV: Oral polio vaccine. MMR: Measles-mumps-rubella. Td: Tetanus-diphtheria (low antigenic type). PCV-7: 7 Valent conjugated pneumococcal vaccine.

pneumococcal diseases. Furthermore, a national laboratory surveillance system is in place to follow especially the vaccine-preventable diseases. IPD will soon be included as well. For instance, PCV7 includes the seven most common and pathogenic of the 91 different pneumococcal serotypes. This will provide the opportunity to measure not only the protective impact of PCV7 but also to screen the pathogenic pneumococcal serotype profile, which was reported by several countries to gradually change with mass vaccination. In Turkey, serotype 19A was the leading non-vaccine serotype of IPD in the two years before the PCV7 NIP started[21]. Surveillance data will show whether non-vaccine serotypes like 19A will also dominate in time like they did in different countries[22,23].

Clearly, the improved national surveillance system of vaccine-preventable diseases will provide the necessary information to track infectious diseases in Turkey and will definitely help the ABI and the MoH in the selection of appropriate vaccines and vaccination strategies for the nation.

Conclusion

Politicians (e.g. a Minister) with a strong medical background and awareness about the value of vaccination in public health and political commitment and consistency may play a major role in the addition of new vaccines into the NIP. This may become a major factor, especially in countries with insufficient resources or infrastructure (i.e. well-established surveillance system) to build data-driven policies. Therefore, active interaction of politicians with relevant scientific experts and boards about the importance of new vaccines is necessary to improve the NIP.

However, this carries certain risks. Politicians may serve for limited periods and investment in secondary and tertiary healthcare services would be more appealing than primary care and protective measures. Building new hospitals, importing modern equipment and supplying therapeutics would undoubtedly take more space in the news and attract more public attention. Primary care services and preventive medical practices do not provide quick and visible benefits. This may lead to a limited popularity in the medical community as well. Furthermore, public awareness about vaccine-preventable diseases remains low unless an outbreak or a pandemic occurs.

However, the fight against infectious diseases is never-ending. The world has been shaken with several emerging infectious diseases in the last five years. Sudden acute respiratory syndrome (SARS) and the bird flu (H5N1) were followed by the swine flu (H1N1).

Economists have always been underlining the value of vaccination as well[24]. The global economical crisis bringing severe budget cuts for health services has further increased the importance of vaccination as a cost-effective measure to improve public health. It has become even a more important and rational tool to use.

Therefore, it is necessary to build a strong awareness about the critical importance of childhood and also adult vaccination, not only at the ministry level but also at the governmental and even national level. Vaccination must be a structural and primary component of state health policies. An active interaction and collaboration between the MoH, academia, vaccine industry, media, and public bodies need to be settled and maintained. Such collaboration can provide more opportunities for countries like Turkey to further improve their public health.

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