

The Trend of the Extended Program of Immunization (EPI) in Iran from the Beginning (1984) to 2013

Zohreh Arefi¹, Zhila Kazemi², Zahra Shaahmadi³, Saeid Mahmoudi⁴, *Faramarz Shaahmadi⁵

¹ School of Public Health, Kurdistan University of Medical Sciences, Sanandaj, Iran.

² School of Public Health, Kermanshah University of Medical Sciences, Kermanshah, Iran.

³ Clinical Research Development Center, Imam Khomeini Hospital, Kermanshah University of Medical Sciences, Kermanshah, Iran.

⁴ Department of Health Management and Economics, School of Public Health, Tehran University of Medical Sciences, Tehran, Iran.

⁵ Savojbolagh Health Center, Alborz University of Medical Sciences, Karaj, Iran.

Abstract

Introduction

The extended program of immunization (EPI) in Iran is started in 1984, and it played an important and effective role in controlling many infectious diseases in community. The objective of this study was to determine the time trends of vaccination coverage by the type of vaccine among children, in the age group of 0-24 months, in Iran from the beginning of EPI (1984) to 2013.

Materials and Methods

This study has been conducted as a descriptive analytical research to evaluate the vaccines of extended program of immunization in Iran from 1984 to 2013. The data of this study have been obtained from the World Health Organization and UNICEF. The data of this study included the percentage of coverage for routine vaccines in Iran National immunization program in children, aged 0-24 months. The data analysis has been done by STATA, Version 12.

Results

The coverage of all vaccines has been continuously increased from 1984 to 2013, and now the coverage for all of them is about 99 percent. All coefficients in the regression models are positive and statistically significant ($P < 0.05$). Birth dose of Hepatitis B (HepBB) and third dose of diphtheria-tetanus-pertussis containing vaccine (DPT3) variables with coefficients of 1.52 and 1.34 had the highest rate of increasing during this period, respectively. The first dose of diphtheria-tetanus-pertussis containing vaccine (DPT1) with a coefficient of 0.65 had the lowest coefficient among other variables.

Conclusion

According to the findings, maintaining the wide coverage, monitoring and updating the program can play an important role to improve children's health, contagious disease prevention, and health promotion.

Key Words: Children, EPI, Immunization, Iran, Vaccine.

* Corresponding Author:

Faramarz Shaahmadi, Savojbolagh Health Center, Alborz University of Medical Sciences, Karaj, Iran.

E-mail: f-shaahmadi@razi.tums.ac.ir

Received date: May 12, 2015; Accepted date: Jun 12, 2015

Introduction

The national immunization program is one of the most common and important steps of controlling, elimination and eradication of some of infectious disease such as hepatitis B, measles and diphtheria (1-4). The extended program of immunization (EPI) in Iran started in 1984, and it played an important and effective role in controlling many infectious disease in community, also the extensive immunization coverage for children and pregnant women was one of the main objectives of the program (5, 6). Therefore, this program has been considered as an independent and vertical project, and different strategies have been considered for urban and rural areas. The main aim in urban area was to reinforce the immunization units within existing health centers. The mobile teams were considered for rural areas. They should visit villages and remote area in fixed schedule. Immunization services have been integrated into the routine activities of the Primary Health Care (PHC) network for extensive coverage in rural area and improving the effective cost of the program by passing the time, and expanding the primary health care services in Iran(7).

This program focused on childhood immunization, so it has good impact on child health and prevention of child mortality from infectious disease. For example poliomyelitis has been reduced to the near of eradication point (8).

The extended program of immunization (EPI) in Iran vaccinate children against nine disease with five vaccine including, Bacillus Calmette-Guerin (BCG), Oral Poliovirus Vaccine (OPV), Hepatitis B (HepB), Diphtheria, Tetanus and Pertussis (DTP) and Measles-Mumps-Rubella (MMR) . The vaccination schedule of EPI in Iran, for December 2013, has been shown in Table. 1.

Considering the important and effectiveness of children vaccination in prevention of infectious disease and child mortality the vaccination coverage is one of the most important indicator for evaluating the performance of primary health care in many countries and Iran. Also, evaluating vaccination coverage is a critical part of vaccination programs' monitoring and it could helpful for recognizing possible gaps of vaccination coverage (9, 10). The objective of this study was to determine the time trends of vaccination coverage by the type of vaccine among children, aged 0-24 months, in the Iran from the beginning of EPI (1984) to 2013.

Table1: The vaccination schedule in extended program of immunization (EPI) in Iran (Dec.2013).

Vaccine	Schedule
BCG	Birth
OPV	Birth; 2, 4, 6, 18 mo and 6 y
HepB	Birth; 2 and 6 mo
DTP	2, 4, 6, 18 mo and 6 y
MMR	12 and 18 mo
Bacille Calmette-Guerin (BCG), Oral Poliovirus Vaccine (OPV), Hepatitis B (HepB), Diphtheria-Tetanus- Pertussis (DTP) and Measles-Mumps-Rubella (MMR).	

Materials and Methods

This study has been conducted as a descriptive analytical research to evaluate the vaccines of extended program of immunization in Iran from 1984 to 2013. The data of this study have been obtained from the World Health Organization (WHO) and UNICEF (11). The data of this study included the percentage of coverage

for routine vaccines in Iran National immunization program in children, aged 0-24 months, and their definitions have been defined according to WHO and UNICEF as follows (11):

BCG coverage = Percentage of live births who received Bacillus Calmette-Guérin (vaccine against tuberculosis);

Hepatitis B vaccination coverage = Percentage of live births who received Hepatitis B vaccine within 24 hours of birth;

DTP1 = Percentage of surviving infants who received the first dose of DTP containing vaccine;

DTP3 = Percentage of surviving infants who received the third dose of DTP containing vaccine;

Hep B3 = Percentage of surviving infants who received the third dose of HepB containing vaccine;

Pol3 = Percentage of surviving infants who received the third dose of polio vaccine;

MCV1 = Percentage of surviving infants who received the first dose of measles containing vaccine;

MCV2 = Percentage of children who received the second dose of measles containing vaccine by their second birthday.

The data of HepBB and HepB3 have been analyzed from 1994 to 2013, because they were not a part of national immunization program at the beginning of the program. Likewise, the results for these two variables are related to the period. MCV2 also has been excluded from the analysis because of incomplete data. After extracting and refining the data, first descriptive statistics of the variables have

been obtained such as the mean, Standard deviation (SD), minimum and maximum. Then, the time trend in vaccination coverage has been evaluated by 7 regression models, one for each vaccine. The dependent variable in each model was the percentage of a vaccine coverage and the independent variable was the year, 1984 to 2013, as follows:

$$Y = \beta_0 + \beta_i T + \varepsilon_i$$

Where:

Y: percentage of coverage for a special type of vaccine;

T: year (1984-2013);

β_0 : constant term;

β_i : the coefficient of time, ε_i : error terms.

The robust standard error has been applied for possible heteroscedasticity over the time. Also, the β coefficient indicates the direction and magnitude of the trend in the vaccination coverage for a vaccine (8). Negative β implies that the vaccination coverage decreased over time. A P_value less than 0.05 have been considered statistically significant. The data analysis has been done by Stata, Version 12.

Results

The results of descriptive statistics for the variables in this study have been shown in Table. 2. According to (Table. 2), DPT1 with 94.8 percent and HepBB with 61.46 percent had the highest and the lowest mean coverage, respectively. The mean coverage of MCV1 was 89.56 percent, but the other vaccines had a mean coverage more than 90 percent. The lowest and the highest level of vaccination coverage during this period were 10% (BCG) and 99%, respectively.

Table2: The descriptive analysis of EPI coverage in Iran; 1984-2013.

Vaccine	Mean	SD	Min	Max
BCG	90.46	8.8	10	99
HepBB	92.2	13.24	55	99
DPT1	94.8	9.31	58	99
DPT3	90.3	17.18	33	99
HepB3	92.7	11.58	59	99
Pol3	90.66	16.05	34	99
MCV1	89.56	16.05	38	99

Figure. 1 depicts the extended program of immunization in Iran from 1984 to 2013 according to the type of vaccine. It is obvious that all vaccines have been

continuously increased during this period despite fluctuations, and now the coverage for all of them is about 99 percent.

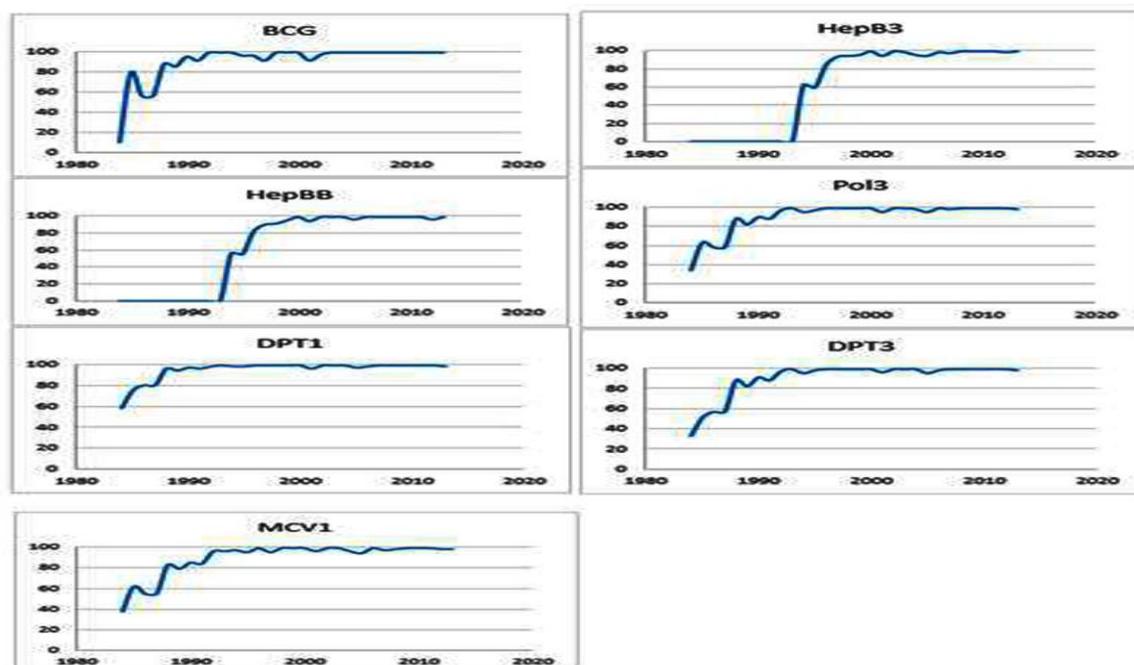


Fig.1: Time trend of extended program of immunization in Iran (by type of vaccine); 1984-2013

The time trend analysis of EPI coverage in Iran has been shown for the variables of this study in Table. 3.

All coefficients in the regression models are positive and statistically significant ($P < 0.05$). HepBB and DPT3 variables with coefficients of 1.52 and 1.34 had the highest rate of increasing during this period, respectively. DPT1 with a

coefficient of 0.65 had the lowest coefficient among other variables. When the coefficient of a vaccine is positive it means that the coverage of that vaccine had been increased during the time period, and vice versa.

Also, higher amount of a coefficient indicates a greater impact of time on the coverage. For example the coefficient of

BCG is 1.30 and it is greater than DPT1 (0.65). Therefore, we conclude, in average,

the BCG coverage had been more increase during the time period.

Table3: The time trend analysis of EPI coverage in Iran (by type of vaccine) from 1984 to 2013.

Dependent variable	Coefficient	Robust Std. Err*	p-value	LB**	UB***
BCG	1.30	0.48	0.011	0.32	2.29
HepBB	1.52	0.58	0.019	0.27	2.75
DPT1	0.65	0.22	0.008	0.18	1.19
DPT3	1.34	0.36	0.001	0.59	2.08
HepB3	1.31	0.51	0.02	0.23	2.39
Pol3	1.25	0.34	0.001	0.550	1.95
MCV1	1.32	0.31	0.000	0.69	1.96

* Robust standard error, **lower band, ***upper band.

Discussion

One of the major innovations of human is vaccine that could help to prevent a lot of the contagious disease. Nowadays, the effective vaccines are available for many infectious diseases, and the vaccine is inoculated in the form of national immunization programs or based on the specific circumstances of each country. National immunization programs are one of the strongest and most cost-effective health interventions that have many advantages in the development of primary health care (12-14). In this study, the status of the coverage of the existing vaccines in national immunization program for children under six years from 1984 to 2013 has been investigated, and the routine vaccination coverage of the program has been evaluated. The results indicated that the vaccine coverage of all national immunization programs in Iran such as BCG, HepBB, DPT1, DPT3, HepB3, Pol3, and MCV1, had the rising trend. Furthermore, vaccine coverage, particularly in the past two decades, was highly desirable and more than 90 percent. Likewise, regression analysis showed that vaccination coverage of all vaccines has been increased during the period, and this increase was statistically significant for all

vaccines. For example, the regression coefficient of BCG vaccine was 1.3 which implies that the mean percentage of coverage for this vaccine has been increased in the rate of 1.3 by passing each year and remaining other conditions constant.

The Primary health care (PHC) is one of the main reasons for developing national program of vaccination coverage in Iran. The Alma Ata declaration showed the importance of primary care, so and health care systems in many countries, including Iran, have been verified to achieve the goal, health for all, up to 2000. This declaration is adopted by Iran's parliament in 1984, and it led to create the PHC network in Iran. Many objectives have been pursued in PHC, one of the main goals was the expanding of vaccination coverage, especially in children. The expansion of PHC network led to even the remotest parts of the country, including rural areas, receive the primary health care services. One of the most important advances in PHC was the formulation and implementation of national immunization programs or extended program of immunization (EPI) so that vulnerable groups, especially children were

vaccinated against infectious diseases by a compiled program (7).

After the implementation of PHC and EPI program in Iran, the morbidity and mortality rates of infants and children under 5 years have been declined sharply, and the vaccination coverage has been increased. The mortality of children under 5 years from 79.4 per thousand live births in 1984 reaches to 16.8 per thousand live births which can be one of the main causes for the strict implementation of child vaccination program and increase its coverage (15, 16).

Nowadays, the vaccination coverage in rural and remote areas is very high in Iran, because the health network in rural areas has been expanded through health centers and the health houses which provide services to people in rural areas. It should be noted that the vaccination process, including the preparation, distribution, storage (cold chain compliance) and accurate and timely insemination is also very effective in vaccination efficacy which can be controlled by continuous monitoring the PHC network of Iran. The PHC program focused on community participation in maintaining and improving their health which leads to rapid expansion of health programs such as the vaccination. In general it can be stated that the percentage of coverage and the quality of child vaccination have been improved significantly during the beginning of the PHC program. The most important reasons for this improvement probably are an accurate and comprehensive planning by health policy makers, the efforts of health personnel, the enhancement of socio-economic level of the society and the most important one which is the involvement of the community (17-19).

In this study, the status of vaccination coverage in the national immunization program for infants and children since its formation has been investigated, and the

process of expanding the program has been comprehensively analyzed for the first time. The data of this study have been obtained from WHO and UNICEF, and the percentage of vaccination coverage has been estimated by these organizations which may have influenced the results in some cases. It should be recommended that the impact of vaccination on the incidence of vaccine-related illnesses and child mortality could be investigated in future studies.

Conclusion

The results showed that the extended program of immunization (EPI) for children has been continuously increased from the beginning of this program, and this implies the success of the program in the appropriate vaccination coverage for children. However, policy-makers and health planners need to monitor the quality and coverage of children's vaccination. Also, they should continuously revise the vaccination program based on the epidemiological status of the country.

Conflict of interest: None.

References

1. Moradi-Lakeh M, Esteghamati A. National Immunization Program in Iran: Whys and why nots. *Human Vaccines & Immunotherapeutics* 2013;9(1):112-4.
2. Bloom DE. The value of vaccination. *Hot Topics in Infection and Immunity in Children VII*: Springer; 2011. p. 1-8.
3. de Timóteo Mavimbe JC, Muquingue HN, Braa J, Bjune G. Immunization coverage in Mozambique: from concepts to decision-making. *Health policy* 2006;79(1):92-100.
4. Control CfD, Prevention. Vaccine preventable deaths and the Global Immunization Vision and Strategy, 2006-2015. *MMWR Morbidity and mortality weekly report* 2006;55(18):511.

5. Zahraei SM, Marandi A, Sadrizadeh B, Gouya MM, Rezaei P, Vazirian P, et al. Role of National Immunization Technical Advisory Group on improvement of immunization programmes in the Islamic Republic of Iran. *Vaccine* 2010;19(28):030.
6. Moussavi T, Sadrizadeh B, Zahraei M, Nategh R, Nadim A. Polio eradication in Iran. *Arch Iran Med* 2012;15(2):107-9.
7. Asadi-Lari M, Sayyari A, Akbari M, Gray D. Public health improvement in Iran—lessons from the last 20 years. *Public health* 2004;118(6):395-402.
8. Asaei SE. Iran's Excellent Primary Health Care System. Available at: http://www.unicef.org/iran/media_4427.html. Accessed Dec 2014.
9. Martinot A, Cohen R, Denis F, Gaudelus J, Lery T, Le Danvic M, et al. [Annual trends (2008-2011) in early childhood vaccination coverage for the French population: the Vaccinoscopie (®) study]. *Archives de pediatrie: organe officiel de la Societe francaise de pediatrie* 2013;20(8):837-44.
10. Control CfD, Prevention. Vaccine preventable deaths and the Global Immunization Vision and Strategy, 2006-2015. *MMWR Morbidity and mortality weekly report* 2006;55(18):511.
11. Iran (Islamic Republic of): WHO and UNICEF estimates of immunization coverage: 2013 revision. Available at: http://www.who.int/immunization/monitoring_surveillance/data/irn.pdf. Accessed Dec 2014.
12. Bloom DE, Canning D, Weston M. The value of vaccination. *WORLD ECONOMICS-HENLEY ON THAMES* 2005;6(3):15.
13. Clemens JD, Stanton BF, Chakraborty J, Chowdhury S, Rao MR, Mohammed A, et al. Measles vaccination and childhood mortality in rural Bangladesh. *American journal of epidemiology* 1988;128(6):1330-9.
14. Jefferson T, Smith S, Demicheli V, Harnden A, Rivetti A, Di Pietrantonj C. Assessment of the efficacy and effectiveness of influenza vaccines in healthy children: systematic review. *The lancet* 2005;365(9461):773-80.
15. Estimates generated by the UN Inter-agency Group for Child Mortality Estimation (IGME) in 2014, available at: <http://data.unicef.org>. Accessed Dec 2014.
16. Ghazizade Hashemi AH, Bayyemat S, Purbafrani A, Taghizade Moghaddam H, Saeidi M. Comparison of Immunization in Iran and Turkey between Years 1980- 2013. *Int J Pediatr* 2014; 2(3.3):75-83.
17. Rosato M, Laverack G, Grabman LH, Tripathy P, Nair N, Mwansambo C, et al. Community participation: lessons for maternal, newborn, and child health. *Lancet* 2008;372(9642):962-71.
18. Vakili R, Soltani SM, Khakshour A, Khademi Gh, Saeidi M. Poliomyelitis: Current Status in Iran and Worldwide. *Int J Pediatr* 2015; 3(3.2):655-63.
19. Vakili R, Ghazizadeh Hashemi AH, Khademi Gh, Ajilian Abbasi M, Saeidi M. Immunization Coverage in WHO Regions: A Review Article. *Int J Pediatr* 2015; 3(2.1):111-18.