

# Frequency of Immunisation of Children upto Five Years of Age According to Vaccination Card in Karachi - A Multicentre Study

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## Abstract

**Objective:** To determine the frequency of immunisation of children upto 5 years of age according to vaccination card in the outpatient department of Abbasi Shaheed Hospital and Pakistan Naval Station (PNS) Shifa, Bahria University Hospital Karachi.

**Methods:** A hospital based cross-sectional study was done for the period of two years from 2014 to 2016 in the Paediatric outpatient department (OPD) and vaccination center of Abbasi Shaheed Hospital and PNS Shifa Hospital. The study was done after the approval of ethical review board of Karachi Medical and Dental College (KM&DC). Sampling procedure was non-probability convenience sampling. A total of 1408 children were included in study. The informed valid verbal consent was taken from the parents before entering the data on pre designed vaccination charts according to the Expanded Program of Immunisation (EPI) schedule. Data was entered after confirmation from child's vaccination card only. Data was analysed using SPSS version 20.0 for statistical analysis.

**Results:** Out of 1408 children 53.8% were male, 46.2% females. Age of the children was 0 to 60 weeks (5 years) out of which 73.0% were under one year of age. At birth, 46.3% received Bacille Calimette-Guerin (BCG) vaccine, 64.5% received both Oral Polio Vaccine (OPV) and Pentavalent 1 (Diphtheria, Pertussis, Tetanus, Hep-B, H. influenza) at 6 weeks, 57.8% received OPV and Pentavalent 2 at 10 weeks, 56.4% received OPV and Pentavalent 3 at 14 weeks. Only 34.9% were vaccinated for measles at 9 months, which was reduced to 22.7% at 15 months. A total of 51.8% were completely vaccinated, 41.6% were incompletely vaccinated and 6.6% were unvaccinated.

**Conclusion:** This study suggests that the rate of complete immunisation is still low and there are drop-outs to the subsequent vaccines that needs immediate control. Moreover, about 40% of children appear incompletely vaccinated which is indeed an alarming situation.

**Keywords:** Immunization, vaccination, immunisation program, pediatric, multicenter study.

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## Introduction

Immunisation is the process whereby a person is made immune or resistant to an infectious disease, typically by the administration of a vac-

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cine. Vaccines stimulate the body's own immune system to protect the person against subsequent infection or disease<sup>1</sup>.

World Health Organization (WHO) and United Nations Children's Fund (UNICEF) launched expanded program on immunisation (EPI) in 1976<sup>2</sup>. The basic purpose of EPI was to prevent the deaths and disability in the paediatric population keeping the cost effectiveness and potency of such measures in the mind. EPI offers series of vaccination that include Bacille Calimette-Guerin (BCG) and Oral polio vaccine (OPV) at birth, three doses of Diphtheria-Pertussis-Tetanus (DPT)/OPV/Hepatitis B vaccine (HBV)/Hemophilus influenza B vaccine

(H1b) at 6<sup>th</sup>, 10<sup>th</sup> and 14<sup>th</sup> week respectively, and measles vaccine at 9<sup>th</sup> and 15<sup>th</sup> month after birth. Immunisation controls and prevents the life threatening infectious diseases. According to a study in Africa and Asia, around 2.5 million deaths are estimated due to vaccine preventable diseases under 5 years of age<sup>3</sup>, clearly indicating the significance of routine vaccination according to the EPI recommendations.

Being a developing country, Pakistan has got a very high infant mortality rate for which infectious diseases are one of the major causes<sup>4</sup>. Statistical data shows that every 5<sup>th</sup> child in Pakistan is not immunised<sup>5</sup>. In comparison with 8-10% of deaths in the developed countries around 50% of all the deaths are unfortunately under the age of 5 years<sup>5</sup>, thus causing an alarming infant mortality rate in Pakistan.

In accordance with the Millennium Development Goal (MDGs) 2015, though the rates of deaths of children is gradually decreasing but the progress is slow, in Pakistan, in executing the target of 52 to 87 deaths per 1000 live birth<sup>5</sup>. Data of vaccine coverage according to the EPI is variable in developed and developing countries. Whereas the vaccine coverage is more than 90% in Europe<sup>6</sup>, unfortunately Pakistan is far behind in the immunisation coverage. Pakistan's demographic health survey of 2012-2013 stated that over all vaccination coverage is 54% and it varies in all four provinces. Baluchistan, with 16%, have the least coverage of all while Punjab has the highest vaccination rate of 66%. In Sindh, it is around 29%<sup>7</sup>. This could also be due to the fact that the province of Punjab has the maximum population compared to the remaining provinces.

A Peshawar based study indicated the immunisation coverage of children in government hospitals was 47%. Another study from Punjab teaching hospital reported 57.4% vaccination coverage in urban Punjab<sup>8</sup>. A surveillance based study from the private sector of Karachi reported overall 84% of vaccination coverage<sup>9</sup>. Also the vaccination coverage varies according to the type of vaccine as

noted by the fact that the coverage recorded is highest for BCG and lowest for polio<sup>5</sup>. This may be due to the easy availability of BCG in most hospitals and the vaccine being given at birth, after which the baby may be lost to follow-up despite counselling of the parents.

Accelerated Health Plan (AHP) of the government has somewhat improved the coverage of immunisation in Pakistan<sup>10</sup>, which was launched by the government in 1982 to out do the status and coverage of immunisation in the children. Other than such policies, campaigns like "National Immunisation Days" (NIDS), provision of free vaccines in the government setups and door to door vaccination in high risk areas have improved the overall frequency rates for immunisation, specifically for polio<sup>11</sup>.

Side effects of vaccines may vary according to vaccine type, but generally mild side effects include pain, redness, tenderness or swelling at injection site, itching at injection site, fatigue, headache, nausea, dizziness or fainting, fever, mild rash etc. Vaccines prepared from whole killed organisms (pertussis & influenza) may cause neurological allergic reactions producing encephalopathy. Vaccines prepared from live attenuated virus (measles, mumps, rubella & trivalent oral polio virus) can cause symptomatic viral infections of nervous system<sup>12</sup>.

However, the outcome of non-vaccinated children may result in an increased frequency of morbidity and mortality due to vaccines preventable diseases like poliomyelitis, neonatal tetanus, measles and pneumonia<sup>13</sup>. All the vaccines in the EPI are safe and do not produce any life threatening complications until and unless some human error in handling the vaccines which can be dangerous, therefore all careful precautions should be taken before vaccinating the child. As all the vaccines require low temperature for storage, it is important to have a very good cold chain system for the storage and transportation of vaccines.

There is a need to gather more firm information and knowledge about the status of vaccination

coverage and the factors causing the hindrance in achieving the desired vaccination rates so that new interventional policies and strategies should be introduced to improve the vaccination status and reach the desired targets as early as possible, and hence reduce the infant morbidity and mortality worldwide. Several factors have lead to the lack of immunization coverage according to the desired rates. Scarcity of education, poor socioeconomic status, difficult access to the health care providers in rural areas and lack of trained staff are main obstacles for immunisation coverage in Pakistan.

Vaccination coverage data is one of the best indicator to know about the health status of any country as it displays the management, access and utilization of health services by a state<sup>14</sup>, therefore the purpose of this study was to know the frequency of immunisation of children according to vaccination card who came to out-patient department in Abbasi Shaheed Hospital and Pakistan Naval Station (PNS) Shifa (Bahria University Hospital) of Karachi.

### Subject and methods

A cross-sectional study was done during October 2014 to May 2016 in Abbasi Shaheed Hospital and PNS Shifa (Bahria University Hospital) of Karachi to assess the vaccination coverage in children according to the EPI schedule. The study was performed in paediatric outpatient department (OPD) and vaccination center of both tertiary care hospitals, which include children from 0 upto 5 years of age. This study was done after the approval of synopsis by Research Evaluation Unit of Karachi Medical and Dental College, Karachi followed by permission from the Ethical Review Board of KM&DC (Reference No. 034/16), and data was collected.

Sampling procedure was non probability convenience sampling. Total sample size was 1408 which was calculated through the formula:

$$\text{Sample size (N)} = Z^2 \frac{p(1-p)}{d^2}$$

where the prevalence was taken 45%<sup>15</sup>, absolute precision of 5% and type 1 error of 5% the value of which was 1.96.

Inclusion criteria of study were all children upto 5 years of age coming to outpatient department of Abbasi Shaheed and PNS Shifa hospital, whereas children without vaccination card were excluded. Valid verbal consent in local language (Urdu, Sindhi, Pushto) was taken from all parents of children who came to paediatric OPD and vaccination room for their routine vaccination and vaccination card was checked of all children to see whether vaccination was updated according to the EPI schedule. Data was collected on a pre-formed standardized form. The main outcome variable was the vaccination status of the child coming to the OPD. Vaccination status indicated if the child was unvaccinated incompletely vaccinated or completely vaccinated according to the age in the EPI schedule. Majority of the cases, mother was interviewed using information from the card.

Unvaccinated was defined as reception of no vaccine by the child according to the EPI schedule. Incomplete vaccination was defined as reception of atleast one vaccine but having not received all the vaccines included in the EPI up to the particular age of the respective child. While complete vaccination was defined as reception of all the vaccines included in EPI in the first year of life.

Charts were filled after taking proper consent and history from either parent then confirming through vaccination card. The BCG scar in children was also examined after the consent of parents. Data was entered on Microsoft Excel worksheet and was analysed using SPSS version 20.0 for statistical analysis. Mean and standard deviation was calculated for quantitative data that is age, whereas categorical variables like gender, vaccination frequency and vaccination status were expressed in frequencies and percentages, p value  $\leq 0.05$  taken as significant.

## Results

There were 1408 children included in the study out of which 757 (53.8%) were males and 651 (46.2%) females. Age of the children was taken from 0 upto 60 weeks out of which 73.0% were between 0-12 weeks of age, 13.5% between 13-24 weeks, 6.5% between 25-35 weeks, 3.6% between 37-48 weeks and 3.4% 49-60 weeks as illustrated in the Table 1.

Table 1 also illustrates that at 0 weeks (birth upto 1<sup>st</sup> year of life) 46.3% received BCG only, 35.7% received BCG and OPV, 1.5% BCG and HBV, 0.5% OPV and HBV, 1.1% OPV only, 0.1% HBV only, 14.8% received no vaccine. At 6<sup>th</sup> week 2.4% received OPV only, 1.6% DPT/HBV/Hib: Penta 1 (first dose) only, 64.5% both, 31.5% received no vaccine. At 10<sup>th</sup> week 2.2% received OPV only, 2.7% DPT/HBV/Hib: Penta 2 (second dose) only, 57.8% both, and 37.3% received no vaccine. At 14<sup>th</sup> week 1.1% received OPV only, 1.8% DPT/HBV/Hib.

Penta 3 (third dose) only, 56.4% both, 40.8% received neither. At 9<sup>th</sup> month 34.9% received measles vaccine while 65.1% did not, and at 15<sup>th</sup> month only 22.7% received measles booster while 77.3% did not receive it. All of this data was recorded from the vaccination card.

Fig.1 illustrates the vaccination status which was the main objective of this study. Out of 1408 children 729 (51.8%) were completely vaccinated, while 94 (6.6%) were unvaccinated and 585 children (41.6%) were incompletely vaccinated.

## Discussion

This research was conducted mainly in two departments; paediatric OPD and vaccination room of two tertiary care hospitals of Karachi. Children data from 2014 to 2016 was calculated by checking their vaccination card in order to check the immunisation coverage according to EPI Schedule. Along with the vaccination card, child's BCG scar was also examined after taking consent from parents but vaccination card remained the focal point in this

research and became the heart of our study because previously many studies on immunisation coverage had been done where data was collected by the memory recall of mothers which can lead to the evident recall bias, therefore we determined the immunisation frequency in this particular study on the basis of vaccination card.

The outcome of this study demonstrates that more than half of the children coming to the OPD are fully vaccinated (51.6%) according to the EPI recommended vaccines. This immunisation rate was comparable with the study of Pakistan Demographic and Health Survey (PDHS) 2012-2013 where the frequency of completely vaccinated children was 54%<sup>16</sup>. This coverage is lower than the desired target, as the study conducted in United States reports 93% coverage of immunisation in pre-school children<sup>17</sup>.

Our results are comparable to Pakistan demographic and health survey report, where immunisation coverage of Punjab is highest i.e. 53% whereas Khyber Pakhtunkhwa, Sindh and Baluchistan are 47%, 37% and 35% respectively<sup>18</sup>.

We found more than half of the children were completely immunised that is 51.8% according to the EPI schedule which is very pleasing but surprisingly we have a large magnitude of incompletely vaccinated children in our study, 41.6%, rather than not being vaccinated at all. It indicates the unawareness and lack of knowledge of parents and public about the significance of completing their child's vaccination and its role in reducing the morbidity and mortality of their children. The emphasis should be made by doctors to make sure that parents keep up the follow up of their children in the vaccination centers on time and get their children completely immunised at all cost. The drawback of not taking the EPI vaccines can be reminded on every visit to the parents and they should be informed about the risks, which their children are exposed to in the case of not getting vaccinated.

As we found out that 56.2% children were present to get themselves vaccinated for Penta 3

**Table 1.** Frequency of immunisation of children under 5 years of age according to Vaccination card in Abbasi Shaheed Hospital and PNS Shifa of Karachi as per the EPI schedule of Pakistan (N=1408)

Variables	Frequency 'n'	Frequency (%)
Vaccination according to age group		
(a) 0-12 weeks	1028	73.0
(b) 12-24 weeks	190	13.5
(c) 25-36 weeks	92	6.5
(d) 37-48 weeks	50	3.6
(e) 49-60 weeks	48	3.4
Gender		
(a) Male	757	53.8
(b) Female	651	46.2
Vaccination at day 0 (n = 1408)		
(a) BCG only	652	46.3
(b) BCG & OPV	502	35.7
(c) BCG & HBV	21	1.5
(d) OPV & HBV	7	0.5
(e) OPV only	15	1.1
(f) HBV only	2	0.1
(g) None	209	14.8
Vaccination at 6th Week (n = 1408)		
(a) OPV only	34	2.4
(b) Penta 1 only	22	1.6
(c) Both	908	64.5
(d) None	444	31.5
Vaccination at 10th Week (n = 1408)		
(a) OPV only	31	2.2
(b) Penta 2 only	38	2.7
(c) Both	814	57.8
(d) None	525	37.3
Vaccination at 14th Week (n = 1408)		
(a) OPV only	15	1.1
(b) Penta 3 only	25	1.8
(c) Both	794	56.4
(d) None	574	40.8
Vaccination at 9th Month (n = 1408)		
(a) Measles done	491	34.9
(b) Measles not done	917	65.1
Vaccination at 15th Month (n = 1408)		
(a) Measles done	319	22.7
(b) Measles not done	1089	77.3
Vaccination status (n = 1408)		
(a) Complete vaccinated	729	51.8
(b) Incomplete vaccinated	589	41.6
(c) unvaccinated	94	6.6

\*Vaccination against Streptococcus Pneumonia was not included as it was not introduced at Abbasi Shaheed Hospital and PNS Shifa when study was initiated (2014). Bacille Calimette-Guerin (BCG), Oral polio vaccine (OPV), pentavalent 1: Diphtheria-Pertussis-Tetanus (DPT)/Hepatitis B vaccine (HBV)/ Hemophilus influenza B vaccine (Hib)

along with OPV at 14 weeks but this frequency declined to 34.7% to get measles vaccine at 9 months, which further reduced to 22.6% in the second dose of measles at 15 months. This is exactly in concurrence with the PDHS 2012-13 report,

where drop-out rate of 14% was calculated between the 1<sup>st</sup> and 3<sup>rd</sup> dose of DPT<sup>16</sup>. The longer interval between DPT 3 and Measles Vaccine can be the reason for high drop-outs of measles<sup>19</sup>. This signifies our study results which are not only indicating the overall immunisation coverage but are also sug-

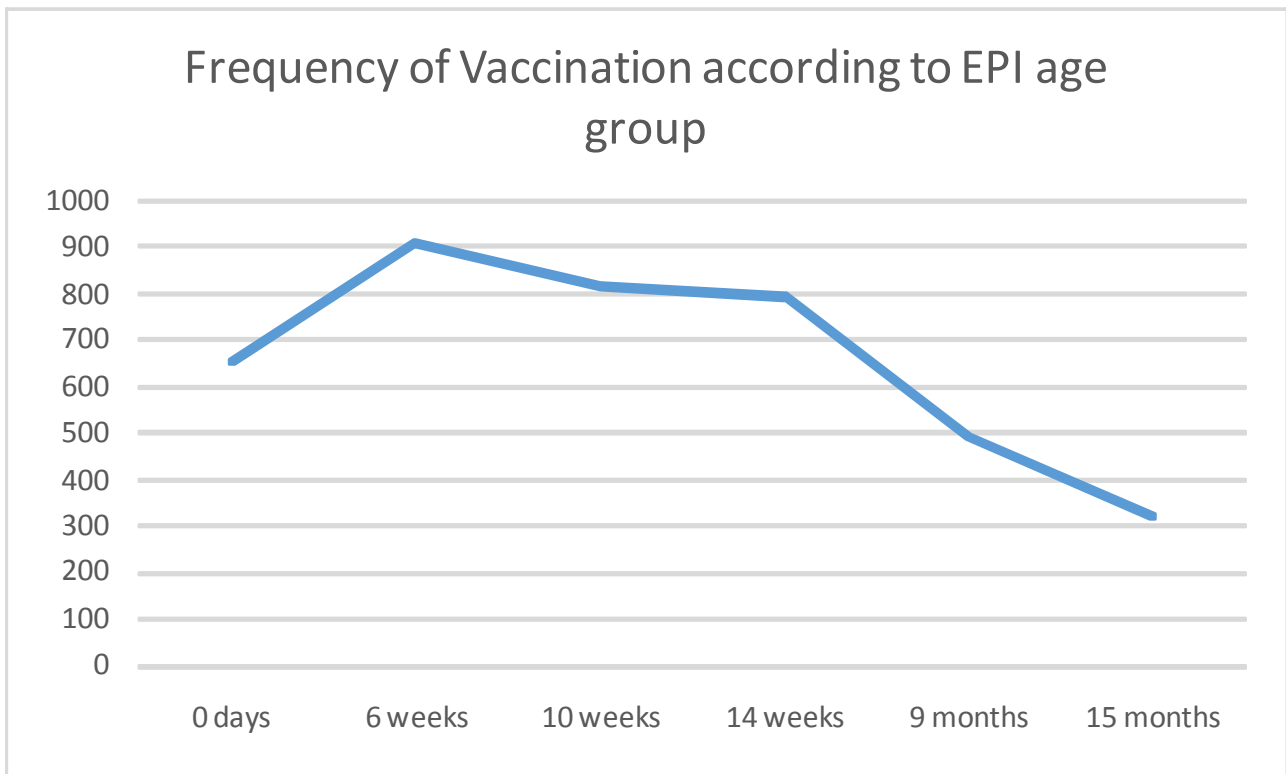


Fig 1. Vaccination status according to age, as recorded on the EPI card, at Abbasi Shaheed hospital and PNS Shifa, Karachi

gest some key factors lacking in the good coverage rates along with the coverage of individual vaccines (according to age) as stated by the EPI.

A study in Kenya, reported that those mothers who received reminders to bring the child to the next vaccination, were three times more compliant to get their children immunised<sup>20</sup>. Therefore vaccinator should repeatedly counsel the mothers to bring her child for next dose of vaccination on time. Doctor, nurses, healthcare providers and media should play their role to promote vaccination.

In the previous studies conducted regarding immunisation coverage of Peshawar<sup>21</sup> and Punjab<sup>18</sup>, it has been identified that there are several socio-cultural factors that have led to hindrance in achieving the better immunisation coverage despite of funding for the EPI. It is evident that parent education/awareness about vaccination, difficulty to reach vaccination centers, ill children, family income, lack of vaccination services in certain areas, domestic works of mothers, myths about vaccination like “my

child can get sick after a vaccine” and side effects of vaccines are the key factors of poor immunisation coverage<sup>18</sup>. However, this study focused only on covering the frequency of vaccination as per vaccination card in two hospitals as researches for maternal awareness and education have already been conducted in the past and the results are similar<sup>18,21</sup>.

Very little published material is available to highlight the frequency of children who are not immunised and hence they are susceptible to common vaccine preventable and life threatening diseases like hepatitis B, poliomyelitis, tuberculosis and meningitis. Therefore, we decided to conduct this study to know the frequency of immunisation in children under five and take into account that lack of complete immunisation is leading to a grave situation for children of Karachi, Sindh. This is building up to an increase morbidity and mortality of paediatric population under five years of age in our country giving us a very high infant mortality rates in the world.

There are a few limitations to this study. Only those children are taken into account who came to the paediatric OPD and vaccination room with their vaccination cards. The children admitted in ward were not considered, as they were sick. There was no correlation with the presenting complain of the child. The vaccination coverage was not correlated with the educational level of mother in this particular study. Moreover, the data was collected only from two tertiary care hospital so the result is not applicable to all population.

It is recommended that the reminders to be given to the mothers to bring their child for vaccination on time along with vaccination card. Furthermore, all stakeholders including the private and public sectors should contribute to strengthen the activities of EPI to achieve the targeted goal for desired vaccination coverage and rates. This study will help the concerned authorities and department to know exactly about the situation of immunisation and the factors to work on. The awareness campaign specifically needs to focus on the importance of completely vaccinating child on time and raising the knowledge level about immunisation in our population as a whole. Furthermore, the frequency of immunised children should be known at mass levels, targeting both, the rural and urban populations; therefore such studies should be conducted more frequently. It is time that policy makers and higher authorities along with the concerned departments should introduce and implement better policies and plans to improve the immunisation coverage based on such studies.

## Conclusion

Based on this study, it is concluded that rate of complete immunisation is still low and there are drop-outs to the subsequent vaccines that needs immediate control. The public should be encouraged through awareness programs and campaigns for EPI vaccination to immunise their children completely.

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## Conflict of Interest

Authors have no conflict of interests and no grant/ funding from any organization for this study

## References

1. Immunization [Internet]. World Health Organization;2016. Available from: [www.who.int/topics/immunization/en/](http://www.who.int/topics/immunization/en/). Accessed on: 23<sup>rd</sup> February 2017.
2. Siddiqi N, Khan A, Nisar N, Siddiqi AE. Assessment of EPI (Expanded program of immunization) vaccine coverage in a peri-urban area. *JPak Med Assoc.* 2007;57:391-5.
3. Jheeta M, Newell J. Childhood vaccination in Africa and Asia, the effects of parents knowledge and attitudes. *Bull World Health, Organ* 2008;86:419.
4. Zaman IF, Rauf A. Working toward decreasing infant mortality in developing countries through change in the medical curriculum. *Asia Pac Fam Med* 2011;10:11
5. Childhood immunization in Pakistan. Research And Development Solutions [Internet]. Policy Briefs Series No. 3. 2012. Available from: [www.resdev.org/files/policy\\_brief/3/3.pdf](http://www.resdev.org/files/policy_brief/3/3.pdf). Accessed on: 23<sup>rd</sup> February 2017.
6. Duclos P, Okow-bele JM, Gacic-dubo M, Cherian T. Global immunization: status, progress, challenges and future. *BMC Int Health Hum Rights* 2009;9:2.
7. Pakistan Demographic Health Survey 2012-2013 [Internet]. Islamabad: National institute of Population Studies; 2014. Available from: [www.nips.org.pk/abstract\\_files/PDHS%20Final%20Report%20as%20of%20Jan%202012-2014.pdf](http://www.nips.org.pk/abstract_files/PDHS%20Final%20Report%20as%20of%20Jan%202012-2014.pdf). Accessed in May, 2015
8. Status of Immunization Coverage and Maternal Child Healthcare in Punjab Province, Pakistan [Internet]. Pakistan CSOs Collation for Health and Immunization; 2014. Available from: <http://www.chip-pk.org/wp-content/uploads/2015/02/Status-of-Immunization-Coverage-Maternal-Child>

- Health-Care-Punjab-2014.pdf. Accessed in May, 2015.
9. Naeem M, Khan MZ, Adil M, Abbas SH, Khan MU, Khan A, et al. Inequity in childhood immunization between urban and rural areas of Peshawar. *J Ayub Med Coll Abbottabad* 2011;23:134-7.
  10. Mansuri FA, Baig LA. Assessment of immunization service in perspective of both recipients and the providers: a reflection from focus group discussions. *J Ayub Med Coll Abbottabad* 2003;15:14-18.
  11. Shaikh S, Taj MT, Kazi A, Ahmed J and Fatmi Z. Coverage and Predictors of Vaccination Among Children of 1-4 Years of Age in A Rural Sub-District of Sindh. *Journal of the College of Physicians and Surgeons Pakistan* 2010;20:806-810.
  12. Ward KN, Bryant NJ, Andrews NJ. Risk of serious neurologic disease after immunization of young children in Britain and Ireland. *Pediatrics* 2007;120:314-21
  13. Shafi K, Nawab F. Vaccination Practices of Children Under Two Years of Age Admitted in Tertiary Care Hospital of Karachi, Pakistan. *Annals of Abbasi Shaheed Hospital & Karachi Medical & Dental College* 2016; 21:1. Available at: <http://www.annals-ashkmdc.org/pdfs/2016/1/5.pdf>. Accessed on February 23, 2017
  14. Khan M, Shah M, Khan MJ, Wassan SM, Shaikh AW, Maheshwari AK. Enhanced disease surveillance through private health care sector cooperation in Karachi, Pakistan: experience from a vaccine trial. *Bulletin of the World Health Organisation* 2006; 84:72-7.
  15. Siddiqui N, Siddiqui AE, Nisar N, Khan A. Mothers' knowledge about EPI and its relation with age-appropriate vaccination of infants in peri-urban Karachi. *J Pak Med Assoc* 2010;60:940-4.
  16. Usman HR, Kristensen S, Rahbar MH, VermundSH, Habib F, Chamot E. Determinants of third dose of diphtheria-tetanus-pertussis (DTP) completion among children who received DTP1 at rural immunization centres in Pakistan. *Trop Med Int Health* 2009;15:40-7.
  17. Sharma S. Immunization coverage in India [Internet] Delhi: Institute of Economic Growth; 2007. Available from:<http://iegindia.org/workpap/wp283.pdf>/ Accessed in May, 2015
  18. Loevinsohn B, Hong R, Gauri V. Will more inputs improve the delivery of health services, analysis of district vaccination coverage in Pakistan. *Int J Health Plan Manage* 2006;21:45.
  19. Shoma F, Shah N, Sarker M, Islam M, Saad T, Mollah, A. EPI Coverage among Under 5 Children Attending Pediatric Department of Dhaka Medical College Hospital. *Faridpur Medical College Journal* 2013;7:59-62. Available at: <http://www.banglajol.info/index.php/FMCJ/article/view/13499>. Accessed on February 23, 2017.
  20. Maina LC, Karanja S, Kombich J. Immunization coverage and its determinants among children aged 12-23 months in a peri-urban area of Kenya. *Pan Afr Med J.* 2013;14:3.
  21. Naeem M, Khan MZ, Adil M, Abbas SH, Khan A, Khan MU, et al. Coverage and causes of non-immunization in national immunization days for polio; a consumer and provider perspective study in Peshawar. *JPMI* 2012;26:48. Available at: <http://www.jpmi.org.pk/index.php/jpmi/article/view/1203/1111>. Accessed on February 23, 2017.