ORIGINAL ARTICLE

Evaluation of The Efficiency of Immunization Services at A Primary Health Care Centre of a Squatter Settlement in Karachi

Research work was done at Ziauddin University, Karachi

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ABSTRACT

Background: According to the WHO and UNICEF only 73% of the target children in Pakistan receive all antigens up to the third dose of Diphtheria-Tetanus-Pertussis vaccine and the vaccine wastage rate is estimated to be 50% around the world as reported by World Health Organization. The objective of this study was to find out the efficiency of Expanded Programme on Immunization programme at the primary health care level at a health centre run by a private university in a squatter settlement.

Methods: This cross-sectional survey was conducted from April to June 2008. The vaccination data used in the study was obtained through record documents for the period of January 2007 to June 2008 and interviews from the staff of the center. Estimated dropout rates and efficient use of vaccine vials were the main outcome variables.

Results: The estimated dropout rate for Measles vaccine was 38.8%. The vaccine wastage rates were calculated using vaccine usage records from the period of January 2007 till June 2008. The wastage rates were the highest for Bacillus Calmette Guérin vaccine (35.9%) followed by Measles vaccine (29.4%) and the lowest for Diphtheria-Tetanus-Pertussis and Hepatitis B vaccines (3.9%).

Conclusion: Our study concludes that the wastage rates of BCG and Measles are much higher than other vaccines. The record of vaccine wastage rate and its reasons are not properly documented at the PHC centre.

Key words: Immunization, Vaccine Wastage Rate, DPT vaccine, BCG vaccine, Measles vaccine, Primary Health Care

INTRODUCTION

The Expanded Programme on Immunization (EPI) of Pakistan has had a significant impact on regional immunization indicators, as well as elimination of measles and maternal and neonatal tetanus.[1] According to the joint report, for the year 2008, by the World Health Organization (WHO) and United Nations International Children's Emergency Fund(UNICEF) only 73% of the target children in Pakistan received all antigens up to third dose of Diphtheria-Tetanus-Pertussis (DPT_3) out of total surviving infants.[2] The WHO estimated a coverage of 88% for three doses of DPT in Pakistan for the year 2013. [3] Vaccination coverage rates for difficult-to-reach populations is often low in many countries; similarly urban and rural coverage rates are also different in many developing countries including Pakistan.[4-6] The EPI offers services to the population free of charge but these activities are costly with the greatest part being the cost of vaccines. WHO reports vaccine wastage rate of over 50% around the world. Despite the availability of many tools for reducing vaccine wastage, higher wastage rates are still occurring in many countries.[7]

This excessive wastage of vaccines is a cause of concern for governments, donor agencies and health managers around the world. There are many tools available to monitor and control vaccine wastages at fixed and outreach facilities. In 2003, the Global Alliance for Vaccines and Immunization (GAVI) recommended that all countries should reduce maximum wastage to 25% for the first year and gradually bring down to 15% in the next three years time.[7] This wastage is

highly dependent on the choice of vial size and the expected number of participants for which the vaccination session is planned (i.e., session size). The use single-dose vials results in zero open vial wastage, but it increases the vaccine purchase, transportation, and holding costs per dose as compared to those resulting from using larger vial sizes.[8]

The PHC centre was run by Ziauddin University, Karachi and vaccines were supplied free of cost through EPI programme via the office of the Executive District Office Health, Kemari, Karachi. This study was conducted to evaluate efficiency of EPI services by checking data of immunization, observe cold chain arrangements and interview staff at a primary health care (PHC) centre run by a private medical university in a squatter settlement in Karachi.

METHODS

This study was conducted at the PHC Sikanderabad, which is run by the Ziauddin Medical University. It is situated in a squatter settlement comprising mainly of the families of laborers and transporters from the Northern areas of Pakistan as well as migrants from Afghanistan. The population covered by the PHC center is approximately 25,000 living in around 2500 households in the area. The data of all children aged less than one year who were residents of Union Council-2 of Kemari, District South, Karachi, brought to local PHC centre for routine EPI vaccination from January 2007 to June 2008, was used in this study. The method used to collect relevant data included reviewing of vaccination records from log books / registers to find out estimated dropout rates of immunization. Vaccine wastage rates were calculated by interviewing the staff and analyzing vaccine inventory records.

The maintenance of cold chain was evaluated by practical observation of services at the center and structured interviews of staff using a checklist. The checklist included questions about secured power supply, availability of digital thermometer in the fridge, rotating vaccines, checking expiry, storage of vaccines in correct compartment, and recording of minimum and maximum temperature each day. Data entry and analysis were carried out by using SPSS 15. Moreover, the frequencies of different variables were also determined. Vaccine usage rate was calculated by the formula recommended by WHO as mentioned below:[7]

Vaccine Usage Rate = Number of doses administered x 100
Number of doses issued

Vaccine wastage rate has been calculated by the following WHO formula:-[7]

Vaccine Wastage Rate = 100 – Vaccine Usage Rate

Or

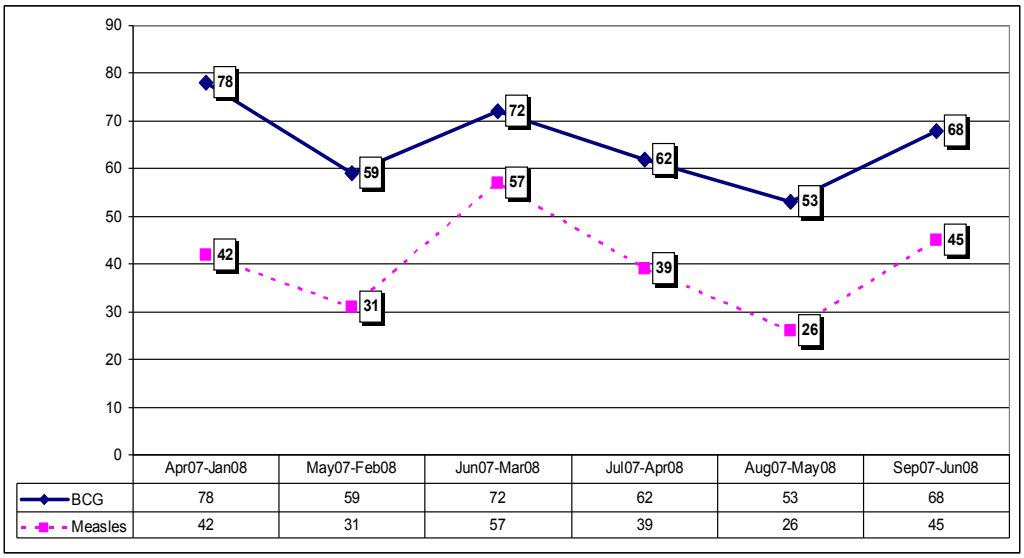
Vaccine Wastage Rate = Number of doses wasted x100 Number of doses supplied

RESULTS

A total of 240 children came for measles vaccination at the PHC centre during January to June 2008 as compared to the expected number of 392 children, who were vaccinated with Bacillus Calmette Guérin (BCG) during April to September 2007. This showed that only 61.2% of the expected number of children appeared for Measles vaccination during January 2008 to June 2008 and the estimated dropout rate was 38.8%. Analysis of the vaccination pattern for six different nine-month time periods i.e. April 2007 – January 2008, May 2007 – February 2008, and so on till September 2007 – June 2008 showed a mean dropout rate of 39.4 ±11.2% as depicted in figure 1.

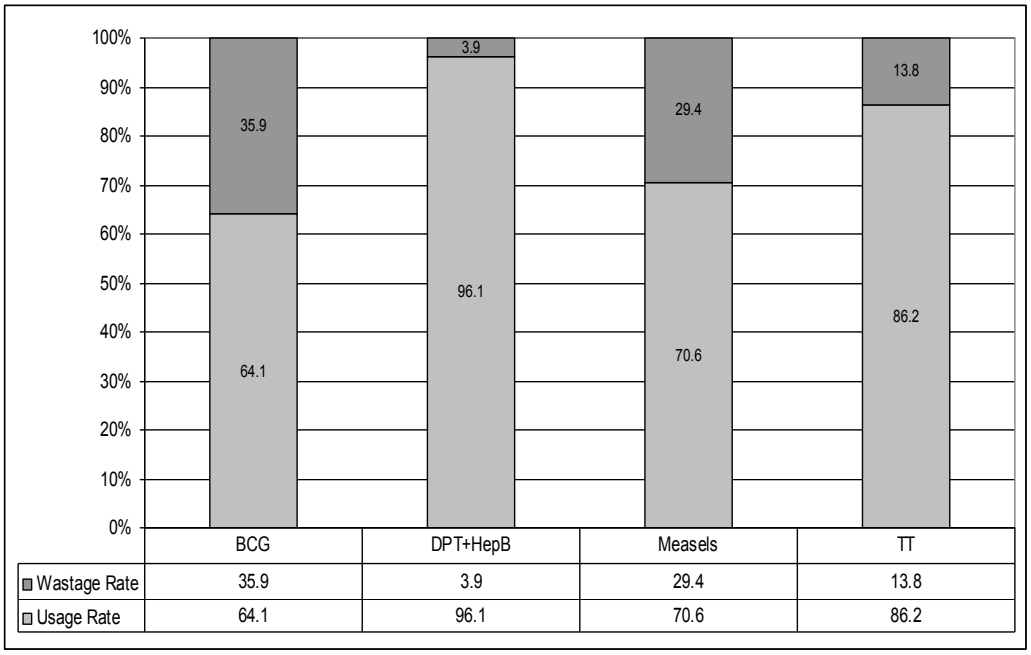
The vaccine wastage rates were calculated using vaccine usage records for the period January 2007 to June 2008 (Table 1). The average vaccine wastage rate was highest for BCG 35.9% and lowest for DPT and Hepatitis B vaccines i.e. 3.9%. (figure 2). The staff at the PHC centre was aware of cold chain requirements of EPI vaccines and following them except recording of minimum and maximum temperature every day.[5]

Fig 1: Estimated Dropout Rate of Measles Vaccine as Compared to BCG Vaccine at PHC Centre (April 2007 to June 2008)



	Apr07-Jan08	May07-Feb08	Jun07-Mar08	Jul07-Apr08	Aug07-May08	Sep07-Jun08
BCG	78	59	72	62	53	68
Measles	42	31	57	39	26	45

Fig. 2: Vaccine Wastage Rates at the Primary Health Care Centre (January 2007 to June 2008)



	BCG	DPT+HepB	Measels	TT
Wastage Rate	35.9	3.9	29.4	13.8
Usage Rate	64.1	96.1	70.6	86.2

Table 1: Vaccine Wastage Rates at PHC Centre, Kemari, Karachi (January 2007 to June 2008)

Antigen	Global Accepted wastage rate	PHC Centre Wastage rate	Wastage Factor*	Excess Vaccine Required at PHC %
BCG	50%	35.9%	1.56	56%
DPT + Hep-B / Penta	5%	3.9%	1.04	4%
Measles	25%	29.4%	1.42	42%

*The formula for calculating vaccine wastage factor is as follows:-
Vaccine wastage Factor = 100 / (100 – vaccine wastage rate)[7]

DISCUSSION

In this study dropout rates were estimated using the number of children coming for BCG vaccination and comparing these with the number of children given Measles vaccine after nine months. After studying the records of the PHC centre it became evident that it was difficult to follow children being vaccinated at the center with due course of time based on the information entered in the vaccination registers. Because there was no allocated medical record (MR) number for each child being vaccinated, the records were maintained manually in the registers with incomplete or missing addresses and no permanent home address of the residents were available as the area was a squatter settlement. This limitation was tried to be minimized by using the data of six different nine-month time periods including those children who had been vaccinated with BCG in these six time periods. Regardless of the effort, there is a possibility that the calculated rate does not reflect the actual drop-out rate so termed as 'estimated' dropout rate.

The estimated dropout rate of 38.8% from BCG to Measles vaccines needs to be improved. One of the objectives of EPI is to achieve the immunization coverage rate of at least 80% in every district of Pakistan by 2010-2012.[9, 10] WHO has reported over 50% vaccine wastage around the world.[7] If compared to this the maximum vaccine wastage rate of 35.9% for BCG at the center appears to be well below the available reference. GAVI has requested to bring down the vaccine wastage rates stating that "aim for a maximum wastage rate of 25% set for the first year with a plan to gradually reduce it to 15% by the third year".[7]

In order to implement the GAVI recommendations the PHC centre needs to decrease its vaccine wastage rates with proper documentation, maintenance of vaccine wastage records and its causes so that preventive strategies can be planned for future studies. Monitoring vaccine wastage has become increasingly important as the costs of the vaccines are significantly high. It also serves as a tool for improving the vaccination practices of health centers where wastage rates are found to be unacceptably high. In 2007, WHO conducted a study in Ghana which identified training of staff as an important factor in reducing vaccine wastage in EPI programmes.[11]

Results of this study point out that wastage rate of BCG (35.9%) and measles vaccines (29.4%) are much higher than other vaccines of EPI. One of the reasons could be less number of children coming for BCG and measles as compared to DPT in a particular immunization session / day. This may result in discarding remaining doses at the end of the day when larger vial sizes are used. The WHO recommends discarding DPT and Measles vaccines after six hours of their reconstitution because these become ineffective after that period.[12] Bangladesh has also reported very high multi-dose wastage rates, 30–59% at ward level for DPT and as high as 84% for BCG.[13]

Some wastage of vaccines is inevitable when children are being immunized in the remote areas of the world, when multiple dose vials are used for routine immunizations. In many countries, however, wastage far exceeds the necessary levels.[14-16] The wastage factors need to be calculated along with wastage rates so that future vaccine needs can be accurately forecasted to ensure the availability of right quantity of vaccines when and where needed. Efficient forecasting results not only in efficient management of logistics, but also increases the efficiency of immunization services. Finding out the vaccination coverage rates of the area was out of the scope of this study and was also not possible due to presence of alternate vaccination facilities in the locality or the people going to other areas for vaccination purpose.

CONCLUSION

This study concludes that the wastage rates of BCG and Measles are much higher than other vaccines. The record of vaccine wastage rate and its reasons are not properly documented at PHC centre. The cold chain was well maintained at the PHC centre. It is recommended that the estimated dropout rate of Measles vaccines needs to be improved by better monitoring of the children and recording of their addresses for follow-up.

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