INTRODUCTION

The main dogma behind vaccination is to immunize a person against an infectious disease. Immunization controls and eliminates life-threatening infectious diseases. It prevents an estimated 2-3 million children deaths every year in all age groups, which makes it one of the most successful and cost-effective public health intervention1. The Expanded Program on Immunization (EPI) was initiated in 1974 by WHO and UNICEF but it was launched in Pakistan in 1978 to protect children by immunizing them against Tuberculosis, Polio, Diphtheria, Tetanus, Pertussis and Measles. Hemophilus and Hepatitis B were included in the EPI program in 20092. EPI in Pakistan targets about 5.8 million children below 1-year of age to protect them against 8 vaccine-preventable diseases, in addition about 5.9 million pregnant women to prevent them and their children from tetanus3.

Pakistan is a developing country with very high Infant Mortality Rates (IMR), major cause being infectious diseases4. A study conducted in Pakistan showed that 2 out of top 3 causes of infant mortality were due to vaccine-preventable diseases5. Pakistan’s EPI indicators have failed to meet the expected targets3,6, especially in comparison with other regional countries3,6. For instance, Pakistan is among one of the three countries around the globe which are yet to interrupt the wild type transmission of the Poliomyelitis virus. Even India, a neighboring country has successfully eradicated the virus6,7.

Several studies are available in which prevalence rates of vaccination have been investigated in various cities of Pakistan8,9. Many authors have reported various barriers standing in the way of successful
vaccination, which are different in different regions and different time periods. Although in our case, convenient sampling of the hospital data was used. However, before the launch of full-fledge research on a massive scale in which adequate representation from every part of the province would be taken, the need of such pilot studies is vital and their importance cannot be denied as they serve to indicate whether such a large-scale research needs to be conducted or not.

The aims of this study were to investigate the immunization status of children admitted in Pediatrics Unit in a tertiary care hospital, to identify the causes of under-vaccination in children, assess the knowledge of parents regarding schedule of vaccination and then to compare the above finding in two time periods (2006 and 2010). The two time frames were chosen so as to look for any difference in the causes of under-immunization, whether there has been any development in the vaccination status due to the increasing stress on the EPI schedule and finally to sum up, the final aim was to decide whether a large scale study needs to be conducted to analyze the vaccination statistics of the pediatrics population in the province of Khyber Pukhtunkhwa.

METHODOLOGY

A cross-sectional study was performed in two phases; first phase was from 19th June to 30th June, 2006 and second phase was from 1st February to 12th February, 2010. The study was performed in Pediatrics Unit of KTH Peshawar, which is a 1200-beded tertiary care hospital in Peshawar and is affiliated with Khyber Medical College, Peshawar. The hospital receives patients from all over the Khyber Pukhtunkhwa province. The study was approved by the hospitals’ Institute Review and Ethics Board (IREB).

A total of 162 pediatric patients were included in the study. There were 81 patients on both occasions. The inclusion criteria were all parents who gave informed consent for the study and were admitted during the study time period.

The authors developed a researcher-administered questionnaire in Urdu language (the national language of Pakistan). The questionnaire was designed incorporating important parameters after extensive literature search of PubMed database. The format of majority of the variables was categorical with a yes or no format. There were few open ended questions. The 9-itemed questionnaire collected data on gender, age, address, current immunization status, causes of non/under immunization polio drops administered, knowledge of parents regarding schedule of vaccination and vaccination status of siblings of patient.

The questionnaires were filled by researchers themselves after getting an oral consent from parents of the patients. Questions were asked from parents and then double checked with vaccination card (if available) and physical examination (for BCG scar) was performed. Vaccination status was considered up-to-date if the vaccination had been administered regularly according to the EPI schedule. If under-not vaccinated, the reason of doing so was noted down. Awareness was based on patients knowledge of EPI schedule, if the parents of the patients could identify approximately the right time periods at which vaccination is administered to a child, they were considered as having reasonable knowledge regarding the EPI schedule and were categorized as “know the schedule” while those who could not identify the approximate time periods or had no know-how regarding vaccination fell into the non-aware category. While a third category was based on those who replied they had vaccinated their child according to the dates mentioned in the vaccination card. Only those patients were included in this category whose parents insisted on that they had followed the dates on the card rigorously till the completion of dates on vaccination card or those who could show the vaccination card.

Data was entered on Microsoft Excel Worksheet. Data was analyzed using Statistical Package for Social Sciences 14.0 (SPSS, Inc., Chicago, IL, USA). Fisher’s Exact Test was applied to test the association. Results were recorded as frequencies and p-values. For all purposes, a p-value of <0.05 (95% confidence level) was considered as the criterion of significance.

RESULTS

A total of 162 patients were included in the study (81 each in both phases). There were 42 male (51.8%) and 39 female (48.2%) patients in 2006 while 46 male (56.7%) and 35 female patients (43.3%) in 2010.

The immunization status of patients is given in Figure 1.

There was no statistically significant difference in vaccination status of patients in both time periods, although more number of children was vaccinated in 2006. The odds ratio was found to be 1.72**.

Amongst the 64 patients (35%) who were not vaccinated, the parents’ were asked to identify the main reason for not immunizing their child. The main reasons are shown and compared in Table 1.

The only significant difference was in ‘Internal Displacement’, which was more prevalent in 2010 compared with 2006. The most common reason for non-immunization was found to be lack of awareness.
**Table 1: Reasons for non-vaccination in 2006 and 2010**

<table>
<thead>
<tr>
<th>Reason</th>
<th>2006</th>
<th>2010</th>
<th>%age</th>
<th>p-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of awareness</td>
<td>20</td>
<td>12</td>
<td>50%</td>
<td>0.08</td>
</tr>
<tr>
<td>Peer pressure</td>
<td>3</td>
<td>0</td>
<td>4.8%</td>
<td>0.08</td>
</tr>
<tr>
<td>Unwell condition</td>
<td>2</td>
<td>6</td>
<td>12.5%</td>
<td>0.46</td>
</tr>
<tr>
<td>Did not consider it important</td>
<td>1</td>
<td>3</td>
<td>6.2%</td>
<td>1</td>
</tr>
<tr>
<td>Not present in area</td>
<td>1</td>
<td>0</td>
<td>1.5%</td>
<td>0.43</td>
</tr>
<tr>
<td>Internal displacement</td>
<td>0</td>
<td>16</td>
<td>25%</td>
<td>0.0008</td>
</tr>
</tbody>
</table>

**Table 2: Knowledge of parents’ regarding vaccination schedule in 2006 and 2010**

<table>
<thead>
<tr>
<th>Knowledge</th>
<th>2006</th>
<th>2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>No Knowledge</td>
<td>26 (32%)</td>
<td>28 (35%)</td>
</tr>
<tr>
<td>Know the schedule</td>
<td>18 (22%)</td>
<td>20 (24%)</td>
</tr>
<tr>
<td>According to Card</td>
<td>37 (46%)</td>
<td>33 (41%)</td>
</tr>
</tbody>
</table>
The demographic distribution of patients in 2006 and 2010 is given in Figure 2. It can be very well appreciated that in 2006, the non-immunized patients were mostly from main city or sub-urban areas of Peshawar and Bannu while in 2010, the non-immunized patients were from the tribal areas or areas where there was ongoing conflict.

The parents were asked regarding participation in polio campaigns that are held regularly. In 2006, 79 patients (97.5%) received polio drops while 71 patients (87.6%) in 2010 received polio drops. The two patients who did not receive polio drops in 2006 were both from Afghanistan.

There was no significant difference (p-value = 0.81) in terms of knowledge regarding vaccination schedule as majority of parents immunized according to card.

DISCUSSION

Our research pointed out an alarmingly high rate of under/non-vaccination in the admitted pediatric population in KTH Peshawar and no improvement on vaccination profile in the selected population was seen even after 4 years interval.

The immunization coverage of fully immunized admitted children in this study was 37.03% (41% (2006) and 33% (2010)). The partial/non-immunized children accounted for 59% (2006) and 67% (2010) with a mean of 62.9%. The results are consistent with other similar studies that have been performed previously. A hospital based study conducted in a different hospital in same city, reported 37.6% children to be completely immunized and 62.4% to be partial/non-immunized. In another study, on 2000 children in Karachi, the reported percentage of patients vaccinated was 26.5% at 2 years of age. They also reported a relative risk of 2.2 for complete immunization in children delivered at hospital compared with delivery at home and a relative risk of 1.4 for vaccination with a higher educational level of mother.

Majority of data regarding immunization status is based on studies conducted in hospitals. Ahmad et al., conducted a community survey in North West Frontier Province (currently, Khyber Pukhtunkhwa) and showed that 65% children were fully immunized. There was a discrepancy that only half of them were verified by immunization.

There is a difference in the findings of the studies conducted in related to the EPI program itself in Pakistan. Pakistan Demographic and Health Survey reported immunization coverage of different provinces of Pakistan. Punjab had the highest immunization coverage of 53%, followed by NWFP (KPK) of 47%; Sindh had 37% while Balochistan was last in list with 35%. Few studies have cited improved immunization coverage, as high as 89% in Pakistan.

In this study, though we did not look for individual vaccines except polio. Polio vaccination in oral polio campaigns, on national immunization days and routine vaccination coverage, taking all into account, the percentage of the sample population vaccinated against polio was 97.5% (2006) and 87.5% (2010) with a mean of 93%. In a study conducted in Hyderabad, Pakistan, Shaikh et al. reported the vaccinations for different vaccines (100% polio, 71.6% BCG, 64.8% DPT and 40.8% measles). Amongst all EPI vaccines, polio has the highest rate of immunization and it has been reported in many studies. Iram et al. reported 99% immunization against polio in a study conducted on 50 children visiting outpatient department in a tertiary care hospital in Punjab province of Pakistan. The increased coverage for polio can be attributed to media campaigns, regular polio campaigns and polio workers going door-to-door to provide vaccines.

In this study, the main reasons cited by parents for non-immunization were lack of awareness regarding benefits of immunization, conflicts in their resident localities leading to internal displacement which precluded access to vaccination centre, unwell condition of child, not considering immunization as important, services not present in area and yielding to peer pressure and not immunizing their child. All these barriers except conflicts in their resident localities leading to internal displacement have been cited previously by other studies. In addition to these, parents literacy, malnourished child, family income, rural area, place of delivery, age of parents have been reported as other causes of non/under immunization.

Majority of parents did not know the schedule of vaccination. The most common response amongst parents of immunized children was according to immunization card. The use of immunization card is associated with improved immunization coverage. Very few parents knew about the names of various diseases against which immunization is done. All parents were able to recall name of Polio and the polio drops which shows effectiveness of media and polio campaigns. Other studies have also shown low level of knowledge regarding names of diseases.

The most important reason contributing towards under-non vaccination in our study in 2010 was the re-emergence of conflicts in various resident localities leading to internal displacement of the patients. This has affected the vaccination in many regions of Khyber Pukhtunkhwa. This has precluded the access of the patients to the vaccination/hospital centres.
In such a scenario the EPI teams cannot also launch a door to door campaign.

This study was aimed as a pilot study to identify the need for any large-scale study on the vaccination in the province of Khyber Pukhtunkhwa focusing on vaccination statistics, the reasons of under-immunization and methods that should be employed to raise the vaccination coverage in the population of Khyber Pukhtunkhwa.

**COMPETING INTERESTS**

The authors declare that they have no competing interests.

**ACKNOWLEDGEMENT**

The authors would like to thank Prof. Nadeem Khan for allowing us permission to collect data from Paediatrics ward.

**REFERENCES**


CONTRIBUTORS
FS conceived and designed the study. FS and HG collected and analyzed the data. FS and HH interpreted the data and wrote the manuscript. All authors have approved the final manuscript that was submitted to the journal.