

Immunization Status of Children in Abbottabad, Pakistan: A Cross-Sectional Study

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ABSTRACT

Objective: Recent studies and surveys are detecting an ambiguous trend of routine immunization coverage and fully immunized children in KPK. Pakistan. A cross-sectional survey was conducted to access immunization status among children of age group 12-23 months visiting fixed EPI centers in primary, secondary and tertiary health facilities in rural and urban areas. **Methods:** The study covered 436 children in five health facilities. Five fixed EPI centers are visited as per office order: BBS teaching hospital Abbottabad. (DHQ), Women and children hospital Abbottabad. (THQ), Type D hospital Havelain, Basic Health Unit (BHU) Mangal and Ayub teaching hospital Abbottabad (AMI). A pretested structured questionnaire was used to collect information. Analysis was performed on SPSS version 23 for frequencies, cross tabulation and percentages. **Results:** Estimation recorded fully immunized children as 275 (63.1%), partially immunized as 155 (35.6%), and unimmunized as 6 (1.3%). Only 157 (36.1%) children in rural area were fully immunized compared to 118 (27.1%) in urban. Primary respondents were mothers 320 (73.4%) whereas, father and other respondents are almost 13%. Vaccination cards were available with 386 (88.5%) respondents. High proportion of partially immunized children 77% in BHU. However, unimmunized 1.96% and 4.4% children in AMI and Type D hospital were present. Moreover 67% partially immunized are from rural origin. The coverage of various vaccines was BCG 421 (96.6%), Pentavalent 403 (96.6%): Penta-1 60 (13.8%), Penta-2 38 (8.7%), Penta-3 305 (70.0%), and Measles 375 (86.0%): Measles-1 127 (29.1%), Measles-2 248 (56.9%), and Polio 430 (98.6%): Oral Polio Vaccine (OPV-0) 51 (11.7%), OPV-1 32 (7.3%), OPV-2 44 (10.1%), OPV-3 165 (37.8%), Injectable polio vaccine (IPV) 138 (31.7%), Pneumococcal 409 (93.8%): Pneumo-1 75 (17.2%), Pneumo-2 46 (10.1%), Pneumo-3 288 (66.1%). No Sex-wise discrimination was found. **Conclusion:** Hard work in policy making is needed to strengthen routine immunization programme in marginalized areas like rural areas (83.12% of KPK and 62.5% of Pakistan) with special emphasis on BHUs and groups such as those living in mountainous terrain. Inaccessibility, inconvenience and unavailability of timely EPI services at BHUs are among various reasons of unimmunized and partially immunized children. Targeted intervention are needed with special emphasis on people in slum and rural areas with low educational and socioeconomic status.

Keywords: children, immunization, rural health, vaccination, Pakistan.

INTRODUCTION

Astutely said about Vaccine “With the exception of safe water, no other modality, not even antibiotics, has had such a major effect on mortality reduction”¹. In public health one of the greatest achievement in twentieth century². In Pakistan Expanded programme on immunization (EPI) was introduced against six vaccine preventable diseases (VPDs) polio, tuberculosis, diphtheria, measles, whooping cough and tetanus. Now in Pakistan National immunization programme includes vaccination against ten VPDs including polio, tuberculosis, measles, pneumonia, rotavirus and Pentavalent vaccine which is five individual vaccines conjugated in one intended to protect children from five deadly diseases: Haemophilus influenza type B (bacteria causing meningitis, otitis and pneumonia), whooping cough (pertussis), tetanus, hepatitis B and diphtheria however Rota vaccine has not been introduced

in Abbottabad until now. The vaccine that are included in EPI National immunization programs are provided free of cost at health centers under Ministry of health. United Nations Children’s Fund and World Health Organization (WHO) played pivotal role in expanding EPI programme country wide in 1978³. Since significant performance in polio eradication can be observed, yet routine immunization was not given needed attention as a result Pakistan has not achieved Millennium Development Goal four (MDG-4) related to childhood immunization. Hence, number of deaths of children under one year of age, per 1000 live births is 69 which is against target of 40⁴. In contrast to other developing countries in South Asia like Nepal, Sri Lanka, Bangladesh and Maldives who have accomplished MDG-4 related to childhood immunization. Particularly in Pakistan reason behind suspension in achieving MDG-4 is that supply side (logistic support) of

immunization services increases significantly, however demand side (education programme for masses) was not given due consideration⁵. In Pakistan two out of three causes of infant death were due to VPDs⁶. According to Bureau of Statistics KPK population was 28,327,000 and Abbottabad population was 1204000 (Estimated) in 2014-2015 and KPK, population is 13.5% of Pakistan total population. Whereas, urban population was 16.88% and rural population was 83.12% in KPK. Infant Mortality Rate per thousand live birth (IMR/1000LB) in Pakistan is 74, whereas in KPK is 58⁷. Among twenty-six districts, IMR in district Abbottabad is fourth highest in province, after Battagram (52), Haripur (41), and Shangla (37)⁸.

In region of South Asian Nations Pakistan and Afghanistan are only two countries with highest under five mortality rate (U5MR) of 81 and 94 deaths per 1000 live births (LB) in 2015⁹. Whereas, U5MR/1000LB is 70 in KPK⁷. Globally three out of ten under five year age children death occur in South Asia. Since, between 2000 and 2015, 21 Sub-Saharan African developing nations have either tripled their progress rate or reversed increasing mortality trend. If current U5MR trend continues, Pakistan will achieve its targets in 2050⁹. A report of World Bank in 2012, recommended that additional resources and stringent efforts need to be made to educate public about benefits of routine immunization. Moreover, Pakistan would improve performance of EPI if suggestions were implemented over next five years; 2017, which would not only result in higher level of immunization coverage yet reduction in illness episodes and death rates will also occur¹⁰. In this context Government of Pakistan has started "Reach Every District / Reach Every Community" (RED/REC) approach by evidence-based research to meet targets of ninety percent fully immunized children by 2017 with support of UNICEF. In this effort ignored and hard to reach twenty three districts have been selected across four provinces with better service delivery and reach, strategic planning, supervision and monitoring¹¹. To date large part of immunization services have been delivered from outreach EPI centers (extending from fixed site), minimal services by fixed sites, and in far-flung areas services are delivered through mobile teams. Whereas, research done in this context signifies that, if benefactors shift their services more towards fixed centers it will improve immunization status by preventing absentees and stock outs¹². Meanwhile eighteen amendment (devolution of provincial Government from Federal Government), stock outs and delay in supply because of transport cost from 1-3 months have been noticed in Balochistan and KPK¹⁰.

Hamid stated that 65% children in KPK are fully immunized¹³, however UNICEF reported contrary immunization status of 77 % in same year¹⁴ this report is in consistent with 2015 reports of KPK Government⁸. A report was presented in 2013 which reveals KPK province tragically bears burden of VPDs observed in 2012 in Pakistan; 62.5% measles and diphtheria, 62.1% TB, 63.7% tetanus due to weak health policies. According to estimates of WHO and Maternal and Child Epidemiology Estimation Group approximately six million deaths in children that occur in 2015, around half were caused by measles, HIV,

tetanus, meningitis, malaria, diarrhea and pneumonia. In order to achieve SDGs target 2030: "U5MR of $\leq 25/1,000/LB$ ", out of total of forty seven countries Pakistan is among eleven countries which need to triple the pace to meet target. If all these countries will meet their goal lives of thirty-eight million children under age five years can be saved^{9,15}. Childhood immunization status at twenty-four months of age in a region is a very particular indicator that forecasts future vaccination coverage rates in herd immunity and preschools at population level in long-term¹⁶.

Therefore a study was conducted in Abbottabad, KPK Pakistan to determine current immunization status of children aged 12-23 to determine bottleneck areas in routine immunization coverage that need to be addressed. A number of studies have been published to determine immunization status at health facilities¹⁷⁻¹⁹ but none has been carried out to find out at which level of health facilities parents are facing problems to immunize their children. Hence, this study was carried to determine status of immunization coverage of children aged 12-23 months at Primary, Secondary and Tertiary health facilities.

MATERIALS AND METHODS

Government of KPK Abbottabad is providing routine immunization services in district through 73 fixed EPI centers among them 54 BHUs, 8 Dispensaries, 1 Mother and Child Health Center (MCH), 3 Type D, 5 Civil hospital and 2 Rural Health Center (RHC) as per District Health Officer (DHO) office details. These fixed centers are located in rural and urban areas. There are 2 Tehsils (Abbottabad and Havelain), 51 Union Councils (UCs), (among these UCs; 35 in Abbottabad and 16 in Havelain). A total of five immunization centers were permitted to visit because these centers have concentrated flow of parents to immunize children, as to cover maximum children in district by convenient sampling. Study was conducted after receiving NOC from District Police Officer (DPO), Abbottabad from January to March, 2017.

A pilot study was performed on a sample of 45 parents and the questionnaire was edited accordingly, since IPV was introduced in Abbottabad EPI programme in mid of 2016. Data was collected from relatives and parents of 12-23 months aged children in particular mothers attending fixed EPI centers after taking verbal consent. Children who were not permanent residents for last one year were not included in study. Furthermore sick, adopted and twin children were also excluded. The data was analyzed with respect to area, health facility, sex, immunization coverage for each vaccine given to children under EPI programme. Children were considered fully immunized as per WHO guidelines if they had received one dose of BCG, three doses of pentavalent, at least three doses of polio and one dose of measles before completing first year of life^{18,20}. Studies conducted in health facilities are less affected by recall bias compared to community-based household surveys, therefore we consider exit interviews reinforced by health center record with minimal bias in determining immunization status²¹.

RESULTS

The study sample of 436 children was collected in period of three months from Primary, Secondary and Tertiary health facilities in rural and urban areas of Abbottabad. The male-female children distribution was 60.8% and 39.2%. Moreover there was not much difference in complete immunization status of male and female (Table 1).

Hospital wise representation was AMI, DHQ, THQ, Type D, and BHU 23.4%, 18.8%, 25%, 20.9%, 11.9% respectively. As AMI and THQ are teaching hospitals with state of art facilities, hence visited by most parents from rural and urban area (Table 2).

If we look at alarming figures of partially immunized children in each health facility it was highest 77% in BHU. However, 22% in THQ, 47.5% in DHQ, 50.9% in AMI and no case of partially immunized children was observed in Type D hospital. It can be seen in Table 3 that few cases of unimmunized children 1.96% and 4.4% in AMI and Type D hospital were noticed. Generally among our study sample of partially immunized children are 67% who are from rural origin (Table 4). The best figures were observed in THQ and Type D hospital with fully immunized children 78% and 95.6% respectively.

It can be observed that coverage by area was almost similar in urban and rural area. In addition it is evident that partially immunized and unimmunized children are double in rural area as compared to rural area shown (Table 4). Moreover people living in rural and urban areas receive almost 90% and higher vaccination coverage for all EPI vaccines except measles vaccine with coverage is 84.6% and 88.2% in rural and urban area. Whereas 88.8% coverage of pentavalent in urban area, consequently 11.2% have not received pentavalent vaccine in even once in life. Tragically, people living in rural and urban area not receiving maximum coverage for measles vaccine. As a result 15.4% children in rural area and 11.8% children in urban area missed opportunity of being immunized with measles vaccine (Table 5).

In general coverage of all vaccines included in EPI programme was BCG 96.6%, Polio 98.6%, Pentavalent 96.6%, Pneumococcal 93.8% and Measles 86% in (Table 6). A dramatic decline in pentavalent second dose is observed therefore, only 8.7% people were administered penta-2. However, only 29.1% children received first dose of measles vaccine and 14% have never been immunized with measles vaccine. If we see at endemic polio figures six children have not yet immunized against polio among them four cases were at Type D and two cases at AMI were seen. Administration of pneumococcal second vaccine decreases sharply to only 10.6% of children being immunized.

Immunization coverage was markedly different at Primary, Secondary and Tertiary level hospitals (Table 7). Just 30.8% children in BHU received penta-3 and pneumo-3 doses which is far less than THQ and Type D coverage of more or less 90%. On the other hand, AMI and DHQ has approximately 50% children who received penta-3 and pneumo-3 doses. Results for polio vaccine are noteworthy where only 7.7% children in BHU receive all four doses of

OPV. THQ and Type D again performing well with nearly 50% children receiving fourth dose of OPV. It is important to note here that 25.2% and 36.5% children visiting AMI and DHQ have received OPV-3 with only two cases (1.96%) in AMI who has not received even a single polio vaccine. Worst figures of measles missed opportunity are seen at AMI where 33.3% children having not yet being immunized against measles disease.

On discussion with health authorities, key persons, vaccinators and parents it was observed that lower vaccination coverage was entitled to:

Migration of refugees from war hit areas of FATA and Afghanistan to Abbottabad district.

Lack of planning at BHUs level for slum and mountainous areas.

Parents have to visit city or Tertiary health facility due to lack of immunization service at hometown area.

Parents complain lack of immunization service for BCG and Measles vaccine. There are only two days designated for BCG and Measles in all EPI vaccination centers in whole week.

Missed opportunities resulted in partial immunization due to incorrectly applied contraindications (i.e., child was not immunized due to mild fever), children receiving curative service only (i.e., immunization status of child was not accessed), not having vaccination card at time of visit to hospital and at scheduled time unavailability of vaccinator. Due to lack of knowledge health worker disseminate incorrect or insensitive information.

DISCUSSION

The study was performed to find immunization status among children aged 12-23 months. Convenient sampling was done as this was convenient and cost-effective method with maximum number of responses. Although Abbottabad has highest literacy rate in KPK and second highest in Pakistan, yet the overall immunization status of fully immunized children in present study was 63.1% which was in line with immunization status of studie²² less than that in,²³⁻²⁴ but better than that in other studies conducted in Pakistan and other low and middle income countries^{24,25}. Conversely, 81% fully immunized children under twelve month age were observed in District Health Information System third quarterly report 2015⁸. However if we look at National level immunization status between and within provinces shows marked variations. For instance, the figures for fully immunized children from 1990 to 2012 in Punjab was 26%-91%, Sindh 5%-75%, KPK 0%-77% and Baluchistan 0%-60%¹¹ almost similar figures were presented by Pakistan Institute of Legislative Development and Transparency²⁶. Coverage at National level for year 2014 were; BCG 95%, pentavalent 90%, OPV3 90%, polio, pneumococcal 86%, measles first dose 91%²⁷.

The coverage was lower in Abbottabad despite of high literacy, excellent health infrastructure and shorter distances to health facilities because of poor performance of Basic health units (BHUs), it is evident from present study that only 23% children are fully immunized in BHU Mangal, in a country where 70% of population is living in

Table 1: Immunization status with respect to gender.

Gender (number of cases) (%), Male (265) (60.8%)			Gender (number of cases) (%), Female (171) (39.2%)		
Unimmunized	Partially immunized	Completely immunized	Unimmunized	Partially immunized	Completely immunized
4(66.6%)	105(67.7%)	156(56.7%)	2(33.4%)	50(32.3%)	119(43.3%)

Table 2: Representation from each health facility and Parents from different origin.

Name of hospital	Rural	Urban	Total
ATI	45(44.1%)	57(55.9%)	102(23.4%)
DHQ	42(51.2%)	40(48.7%)	82(18.8%)
THQ	70(64.2%)	39(35.8%)	109(25%)
BHU	52(100%)	No case	52(11.9%)
Type D	57(62.6%)	34(37.4%)	91(20.9%)

Table 3: Immunization status with respect to health facility.

Health facility	Immunization status		
	Unimmunized	Partially immunized	Completely immunized
AMI	2(1.96%)	52(51%)	48(47.04%)
DHQ	No case	39(47.6%)	43(52.4%)
THQ	No case	24(22%)	85(78%)
Type D	4(4.4%)	No case	87(95.6%)
BHU	No case	40(77%)	12(23%)

rural area²⁸. In particular 83.12% population in KPK belong to rural area. This problem can be addressed by training intervention for primary health care workers, which will not only improve immunization knowledge but also increase rate of immunization coverage as evident from study conducted in Turkey²⁹. Parents have to suffer and travel towards tertiary and secondary health centers rather primary health facilities due to lack of timely EPI services at hometowns, as apparent from this study 44.1%, 51.2% and 64.2% parents from rural origin have to travel urban health facilities of tertiary (AMI) and secondary (DHQ and THQ) level of health care. Although performance of ATI and Type D was better yet only cases of unimmunized children are also noticed there with 1.96% and 4.4 % respectively due to vaccinator unavailability^{23,30} inaccessibility to service which are similar to reasons described in Rainey et al. systematic review and other studies that signifies and concluded that completely unimmunized children in low and middle income countries result from 32% immunization system related problems like unequal delivery of resources and adequate number of vaccinators^{22,31}. Pathetically total partially immunized children were 35.6%. Although status was higher compared to other study but again reason is poor performance of immunization system which is responsible approximately 45% of partial immunized children in low and middle income countries (Rainey et al., 2011)³¹. This study also observe there was no significant difference in coverage of urban and rural area of completely immunized children i.e. 42.9% and 57.1% respectively, results are similar to study conducted in India where rural areas are in close vicinity of urban areas and basic health centers are at

short distance throughout district³². Immunization cards were present with 88.5% of respondents among them 60.9% were fully immunized, whereas 38.9% were partially immunized, therefore it clarifies importance of record keeping in immunization campaigns findings are almost similar to other studies^{23,33}.

Overall coverage of all nine vaccines in EPI programme was 96.6% for both BCG and pentavalent which is almost similar to study conducted by Bhatia et al.³² 86% for measles which is slightly higher compared to study conducted in other country, whereas Nationally highest coverage rate of 95% was observed in survey conducted by Civil Societies Organization (CSOs) in Jhelum district in 2014²⁷ with Tharparkar having least coverage of 57% only. In present study 98.6% coverage for polio but still hard work is needed because Pakistan and Afghanistan are still polio endemic countries with five cases of wild polio each so far³⁴. Injectable polio vaccine (IPV) has been introduced in Abbottabad district on mid-year 2016 as per DHO office. Better immunization coverage of 98.3% for pneumococcal was observed, in country where 4% cases of death are due to pneumonia (GOP.2017) However mild decline in coverage was noticed in third dose of pentavalent vaccine to 70% which is against target of WHO which was $\geq 90\%$ in 2010 for all member states, whereas overall target coverage of $\geq 80\%$ for pentavalent has been achieved³¹. A sharp descending trend of 29.1% was also observed in coverage of measles first dose which is far away from targets set for 2017 according to report submitted to Global Alliance for Vaccination and Immunization GAVI²⁷. Moreover, results of first measles vaccine coverage in our study are not consistent with third quarterly report of DHIS (86%), It is alarming situation for district administration since every nine out of ten people who are not immune against measles if share living space with infected person can catch this deadly disease⁸.

All health facilities showed excellent performance in case of BCG vaccine having almost 90% of children receiving one dose immediately after birth achieving targets set at National level of 89% as per GAVI progress report 2014. CSOs conducted survey from May to June 2014 in selected UCs of nineteen districts across Pakistan which also depicts similar results in case of BCG coverage with lowest coverage in Sanghar 58% and highest in Jhelum and Skardu which was 96% in both. However BHU has poor performance in case of pentavalent vaccine as a result just 30.8% children receive all three doses and unable to achieve targets of 79%²⁷. Due to poor availability of services as clear from 30.8% children received penta-3 dose, people in rural areas travel towards urban areas and result in dilution of pentavalent vaccine coverage. Consequently, AMI and DHQ has only 58.9% and 52.5% children to whom three doses of pentavalent vaccine were administered these rates are not alike 90% coverage of

Table 4: Immunization status with respect to area of residence.

Area (number of residents) (%), Rural (266) (61%)			Area (number of residents) (%), Urban (170) (39%)		
Unimmunized	Partially immunized	Completely immunized	Unimmunized	Partially immunized	Completely immunized
4(66.6%)	105(67%)	157(57.1%)	2(33.4%)	50(32.3%)	118(42.9%)

Table 5: Area of residence and overall coverage of each vaccine.

Name of vaccine	Status of vaccination	Rural	Urban
BCG	Yes	262(98.5%)	159(93.5%)
	No	4(1.5%)	11(6.5%)
Pentavalent	Yes	252(94.7%)	151(88.8%)
	No	14(5.3%)	19(11.2%)
Pneumococcal	Yes	244(91.7%)	165(97.1%)
	No	22(8.3%)	5(2.9%)
Polio	Yes	262(98.5%)	168(98.8%)
	No	4(1.5%)	2(1.2%)
Measles	Yes	225(84.6%)	150(88.2%)
	No	41(15.4%)	20(11.8%)

Table 6: Overall immunization status.

Name of vaccine	Status	Frequency	Percentage
BCG vaccination	Yes	421	96.6
	No	15	3.4
Pentavalent vaccination	Yes	403	96.6
	No	33	7.6
How many times pentavalent vaccine	Penta-1	60	13.3
	Penta-2	38	8.7
	Penta-3	305	70.0
	No dose	33	7.6
Measles vaccination	Yes	375	86.0
	No	61	14.0
How many times measles vaccine	Measles-1	127	29.1
	Measles-2	248	56.9
	No dose	61	14.0
Polio vaccination	Yes	430	98.6
	No	6	1.4
How many times polio vaccine	OPV-0	51	11.7
	OPV-1	32	7.3
	OPV-2	44	10.1
	OPV-3	165	37.8
	IPV	138	31.7
	No dose	6	1.4
Pneumococcal vaccination	Yes	409	93.8
	No	27	6.2
How many times pneumococcal vaccine	Pneumo-1	75	17.2
	Pneumo-2	46	10.6
	Pneumo-3	288	66.1
	No dose	27	6.2

penta-3 mentioned in DHIS report 2015. Moreover, it is worth mentioning here that other districts in province have better penta-3 coverage rates of: Swabi (89%), Swat(91%), Charsada (90%),⁸ however THQ and Type D has satisfactory performance of 90.7% and 95.6% respectively, yet overall coverage from present study of penta-3 vaccine in district Abbottabad is 70%. In case of pneumococcal BHU, DHQ, and AMI only delivered all three doses to 30.8%, 41.5% and 55.9% respectively which are far away from National targets of 79% children receiving third dose of pneumococcal, these results are

similar to studies conducted by CSOs with least 8% coverage in Sanghar and most 88% coverage in Jhelum which depicts that remote rural population is particularly disadvantaged in Pakistan. However THQ and Type D hospital have better figures 89% and 92.3% respectively. Those children who received three doses of OPV are least in BHU 7.7% with slightly higher rates in AMI, DHQ, THQ, and Type D as 25.2%, 36.5%, 54.2% and 50.5% respectively. Pathetically there were 1.96% cases in AMI and 4.4% cases in Type D hospital who had not received even single vaccine CSOs survey also shows similar data

Table 7: Coverage of all vaccines in different health facilities.

Vaccine name	Doses delivered	AMI(102)	DHQ(82)	THQ(109)	Type D(91)	BHU(52)
BCG	One dose-at birth	100(98%)	73(89%)	109(100%)	87(96%)	52(100%)
	No dose	2(2%)	9(11%)	No case	4(4%)	No case
Pentavalent	Penta-1	19(18.8%)	25(30.5%)	2(1.9%)	No case	14(27%)
	Penta-2	12(11.8%)	No case	8(7.4%)	No case	18(34.6%)
	Penta-3	60(58.9%)	43(52.5%)	99(90.7%)	87(95.6%)	16(30.8%)
	No dose	11(10.8%)	14(17.1%)	No case	4(4.4%)	4(7.6%)
Pneumococcal	Pneumo-1	15(14.7%)	34(41.5%)	4(3.7%)	No case	22(42.2%)
	Pneumo-2	12(11.7%)	9(11%)	8(7.4%)	3(3.3%)	14(27%)
	Pneumo-3	57(55.9%)	34(41.5%)	97(89%)	84(92.3%)	16(30.8%)
	No dose	18(17.7%)	5(6%)	No case	4(4.4%)	No case
Polio (OPV)	OPV-0 at birth	17(17%)	24(29.2%)	No case	No case	(19.2%)
	OPV-1	5(5%)	5(6.2%)	8(7.3%)	No case	(27%)
	OPV-2	14(14.2%)	10(12.3%)	8(7.3%)	No case	(23.1%)
	OPV-3	26(25.2%)	30(36.5%)	59(54.2%)	46(50.5%)	(7.7%)
	IPV	38(37%)	13(15.8%)	34(31.2%)	41(45.1%)	(23%)
	NO dose	2(1.96%)	No case	No case	4(4.4%)	No case
Measles	Measles-1	37(36.2%)	34(41.4%)	8(7.3%)	34(37.3%)	14(26.9%)
	Measles-2	31(30.4%)	43(52.5%)	87(80%)	53(58.2%)	34(65.3%)
	No dose	34(33.3%)	5(6%)	14(12.8%)	4(4.4%)	4(7.7%)

in Jhelum (4%) and Skardu (2%) with highest rates of unimmunized children in Muzaffarabad (30%)²⁷. High rates of missed opportunities as observed in this study are alike other studies³⁵ (Shahab et al., 2013, Nath et al., 2008) where reasons for partially immunized and unimmunized children are in line with study conducted in Calcutta, India^{32,36}. Every effort by District Government must be made to upgrade EPI services at basic level. Special campaigns need to be initiated because VPDs has to be addressed stringently to achieve SDGs for health sector. Finally core reasons for lower coverage in Abbottabad district, are poor health facilities at BHUs, rush hours and increase work load at tertiary hospitals like AMI and lack of monitoring. Beneficiaries have not much problem as fixed immunization centers are present at shorter distance but with ghost staff and services. We have example of twenty four out of eighty one low and middle income countries who have achieved MDG-4 of childhood immunization. As a result, forty eight million children have been saved from being dead is living example of global will and commitment. Hence, despite of limited infrastructure and resources Pakistan can also achieve it: with timely communication of information to parents and staff, intensive effort to monitor primary health sector. Indeed study area we selected is not easily accessible as a result it is representative of underprivileged population.

CONCLUSION

Multi-factorial reasons are responsible for unimmunized and partially immunized children, and while some problems can be more easily resolved than others in low and middle income countries like Pakistan. Many factors are associated with immunization system and access to services, and can be addressed by immunization programme managers and coordinators through known intervention: missed opportunities can be reduced by training of health workers, enhancing fixed EPI center rather outreach services in BHUs. MDGs now (Sustainable

Development Goals) SDGs should be part of health policies.

REFERENCES

- Plotkin S, Offit P. 2008. Vaccines, Saunders.
- CDC. 1999. Ten great achievements in public health 1900–1999. Centers for Disease Control and Prevention.
- Hasan Q, Bosan A, Bile K. 2010. A review of EPI progress in Pakistan towards achieving coverage targets: present situation and the way forward. *EMHJ*; 2010;16:S31-S40.
- UNDP. 2015. Reduce child mortality" Where we are?. UNITED NATION. Available: <http://www.pk.undp.org/content/pakistan/en/home/pos-t-2015/mdgoverview/overview/mdg4/> [Accessed 15.november.2016 2016].
- UNICEF 2014. "A study to identify drivers of inequities and barriers to access and utilization of immunization services for improved immunization coverage and outcomes in Pakistan". Pakistan: Oasis Insights (Private) Limited.
- Ahmad N, Akhtar T, Roghani MT, Ilyas H, Ahmad M. Immunization coverage in three districts of North West Frontier Province. *J Pakistan Med Asso.* 1999;49:301-304.
- GOV. 2015. Khyber Pakhtunkhwa In Figure 2015, Planing and Developement Department. KPK Pakistan.
- DHIS 2015. 3rd Quater Report 2015. *In: HEALTH* (ed.). KPK Pakistan.
- You D, Hug L, Ejdemyr S, Beise J. Levels & Trends in Child Mortality. USA: United Nations Children's Fund, 2015.
- Navaratne TMKV. 2012. The Expanded Program on Immunization in Pakistan, Recommendations for improving performance. Pakistan: World Bank.

11. UNICEF 2015. UNICEF Pprogress Report 2013-2015. Decrease Child Deaths. Results for children in Pakistan. *In*: NAM, S. (ed.). UNICEF Pakistan.
12. Mangrio NK, Alam MM, Shaikh BT. Is Expanded Programme on Immunization doing enough? Viewpoint of health workers and managers in Sindh, Pakistan. *JPMA. J Pakistan Med Asso.* 2008;58:64.
13. Hamid S. Immunization of Children in a Rural Area of North Kashmir, India: A KAP Study. *J Health Allied Sci.*2012;11(4):1-4.
14. WHO 2006-20015. Department of immunization, Vaccines, and Biologicals, UNICEF Programme Division, Health Section. Global Immunization Vision and Strategy. updated June 2011 ed.
15. WHO, U. 2016. Committing to child survival: A promise renewed. USA: UNICEF.
16. Elam-Evans L, Yankey D, Singleton J, Kolasa M. National, state, and selected local area vaccination coverage among children aged 19-35 months. Centers for Disease Control and Prevention. United States: *MMWR Morbidity and Mortality Weekly Report.*2014.
17. Naeem M, Khan M, 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.
18. Sanou A, Simboro S, Kouyate B, Dugas M, Graham J, Bibeau G. Assessment of factors associated with complete immunization coverage in children aged 12-23 months: a cross-sectional study in Nouna district, Burkina Faso. *BMC Int Healt Human Rights.* 2009;9:S10.
19. Etana B, Deressa W. Factors associated with complete immunization coverage in children aged 12–23 months in Ambo Woreda, Central Ethiopia. *BMC Public Health* 2012;12:566.
20. Bugvi AS, Rahat R, Zakar R, Zakar MZ, Fischer F, Nasrullah M et al., Factors associated with non-utilization of child immunization in Pakistan: Evidence from the Demographic and Health Survey 2006-07. *BMC Public Health* 2014;14:232.
21. Sridhar S, Maleq N, Guillerment E, Colombini A, Gessner BD. A systematic literature review of missed opportunities for immunization in low-and middle-income countries. *Vaccine.* 2014;32:6870-6879.
22. Abdullah A, Anwar M. Immunization Barriers in Kyber Pukhtunkhwa (KPK), Pakistan. *Int J Sci Res.* 2014;3(9):67-70.
23. Sheikh A, Iqbal B, Ehtamam A, Rahim M, Shaikh HA, Usmani HA et al., Reasons for non-vaccination in pediatric patients visiting tertiary care centers in a polio-prone country. *Arch Public Health* 2013;71:19.
24. Torun SD, Bakirci N. Vaccination coverage and reasons for non-vaccination in a district of Istanbul. *BMC Public Health* 2006;6:125.
25. Siddiqi N, Khan A, Nisar N, Siddiqi AE. Assessment of EPI (expanded program of immunization) vaccine coverage in a peri-urban area. *J Pakistan Med Association.* 2007;57:391-5.
26. PILDAT 2010. Immunization in Pakistan. Islamabad.
27. GAVI. 2015. Annual Progress Report. Pakistan.
28. Bhutta ZA, Ali S, Cousens S, Ali TM, Haider BA, Rizvi A., et al Alma-Ata: Rebirth and Revision 6 Interventions to address maternal, newborn, and child survival: what difference can integrated primary health care strategies make? *Lancet* 2008; 372:972-89.
29. Uskun E, Uskun SB, Uysalgenc M, Yagiz M. Effectiveness of a training intervention on immunization to increase knowledge of primary healthcare workers and vaccination coverage rates. *Public Health.* 2008;122: 949-958.
30. Mustaq MU, Majrooh MA, Ullah MZS, Akram J, Siddiqui AM, Shad MA et al., Are we doing enough? Evaluation of the Polio Eradication Initiative in a district of Pakistan's Punjab province: a LQAS study. *BMC Public Health* 2010;10:60.
31. Rainey JJ, Watkins M, Ryman TK, Sandhu P, BO A, Banerjee K. Reasons related to non-vaccination and under-vaccination of children in low and middle income countries: findings from a systematic review of the published literature, 1999-2009. *Vaccine*2011; 29:8215-21.
32. Bhatia V, Swami H, Rai S, Gulati S, Verma A, Parashar A et al., Immunization status in children. *Indian J Pediatrics,*2004; 71:313-315.
33. Saxena P, Prakash D, Saxena V, Kansal S. Assessment of routine immunization in urban slums of Agra district. *Indian J Preventive Social Med.* 2008; 39:60-62.
34. WHO 2017. Polio Eradication Initiative. Pakistan: Regional Office for the Eastern Mediterranean.
35. Shahab F, Hussain H, Gul H. Vaccination status and causes of under vaccination in paediatric patients admitted at Khyber teaching hospital Peshawar. *J Postgrad Med Institute.* 2013;27(4):439-4.
36. Biswas A, Mitra N, Nandy S, Sinha S, Kumar S. Missed opportunities for immunisation in children. *Indian J Public Healt* 1999; 44:23-27.