ORIGINAL ARTICLE

Assessment of the Level of Immunological Protection Against Poliomyelitis in Health Care Students

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ABSTRACT

Aims: To assess the protective titers of polio antibodies in medical and Allied Health Sciences students and compare vaccination status of students with their protection level.

Study design: The study was of Descriptive type with simple random sampling.

Place and Duration of study: Microbiology Laboratory of FPGMI, ShaikhZayed Hospital, Lahore. The duration of the study was two years from 1st Feb 2018 to 31st January 2020.

Material and Methods: 384 individuals participated in this study. All the students were adult. They posed questions to get basic details from respondents. Students with serious psychiatric condition were not included in the report. ELISA kits were used to assess the antibody titres of the samples.

Results: Out of 384 samples, 290 (75.5%) were vaccinated in which 16 (5.5%) were protected, 245 (84.4%) were in grey zone while 29 (10%) were non-protected. In remaining 94 (24.5%) non vaccinated students 10 (10.6%) were protected, 80 (85.1%) were in grey zone while 4 (4.3%) were non-protected.

Conclusions: This study concluded that the protective titres are same in both vaccinated and non-vaccinated students showing a low immunity level either due to waning immunity in case of vaccinated students and failed vaccination campaign in non-vaccinated students.

Key words: Poliomyelitis, protective titers, infantile paralysis, OPV. IPV

INTRODUCTION

In 2016, after declaration of Nigeria polio free by WHO; Pakistan and Afghanistan were the only reservoirs of polio virus. Poliomyelitis, still endemic in Pakistan generated an alarming situation in the country.[1]

Poliomyelitis also known as infantile paralysis is a vaccine avertable viral disease. Nerve damage is common leading to complete or partial paralysis. The family of polio virus is *Picornaviridae* and genus is *Enteroviruses*.[1]

Poliovirus is an icosahedral virus with no envelope. RNA virus with positive polarity. The RNA genome is composed of 7,500 nucleotides and has a diameter of 30 nanometers.[2]

Polio is known as a naturally occurring and a vaccine derived poliovirus. Poliovirus 3 is further split into Poliovirus 2 and Poliovirus 1. Vaccine related poliovirus was classified as CVDVs, iVDVs and aVDVs in the order of transmissibility.[3]

Alternatives such as OPV and IPV are both used to remove polio from nations.[4]The potential of OPV to become a transmissible wild form vaccine virus has contributed to deadly diseases across the world. It takes 750,000 doses of tOPV to keep one case of VAPP from arising as opposed to 1 in 100,000 cases being triggered by wild infection.

Other primates and humans are reservoirs for poliovirus. The average incubation time for this virus is from 35 days depending on the environment.[5]Not suitable for use below 40% relative humidity. Eradication relies heavily on mass anti-polio vaccination programmes which take place in the colder months. The communicability of the virus is unclear, but the virus will theoretically be transmitted after incubation time.[6]

Poliovirus spreads by the fecal-oral route. It will infiltrate the throat and lower intestines in hopes to reach the bloodstream and spread through the entire body.[7]Accumulating itself in the central nervous system leads to more significant effects. Polio may have either asymptomatic or flu-like effects with headaches, malaise, fever, pain in the neck/back, As manifest by non-paralytic polio, the signs of the nervous system are apparent. Besides, this is a typical symptom of sore neck and back. Negative kerning and Brudzinski shapes are here, too. Paralysis more commonly affects the lower limbs than the upper limbs. The typical side effects of prolonged ingestion of opiates include extreme muscle pain and spasm, flaccid muscle tone, constant coarse fasciculation, reflexes initially brisk and then absent, and paresthesia. Extreme paralysis is expected to occur for days or weeks. Recovery is sluggish over the years. In the case of bulbar paralysis, the medulla is seriously affected.[3]

After the start of 2015, the polio initiative in Pakistan has been doing quite well. The number of human carriers has fallen from 306 to 54 in 2014, from 20 to 3 in 2015, and 12 from 2017 in 2018.[8, 9]

The health care professional acts as a proxy for the general public. If they do not get their vaccines, can themselves catch the disease or be a risk of illness to others.[10] Thus, their immunisation status should be reviewed and recommendations should be given accordingly about the vaccine schedule and booster dosage. There is no evidence that shows that adults gain

lifetime immunity from poliovirus, it is proposed that adults undergo full childhood vaccine and a single dose of oral IPV vaccination.[11]

MATERIALS AND METHODS

The study was of Descriptive type with simple random sampling. Students not ready to give consent and those having polio or other medical illnesses were excluded. The duration of the study was two years from 1st Feb 2018 to 31st January 2020. With number of male and female students properly adjusted, a sample size of 384 was estimated with expected 50% (conservative approach) of students having required titres of IgG for polio having 5% margin of error and 95% confidence level, Variables of the study were protective titers, vaccination status and age. The required particulars of the students were recorded on proforma sheet with all their basic information, history of polio and vaccination status. At SKZMDC, blood samples of the students were collected and then were tested at Microbiology Laboratory of FPGMI, ShaikhZayedHospital,Lahore. After affirmative assent and under sterile protocols, 5ml whole blood was drawn from the donors using three-person-sized syringes. All the samples were transferred to the laboratory for analysis immediately. When the blood coagulated, samples were covered in plastic and stored in inexpensive plastic cases. The serum was removed from the tube and placed in conical Eppendorff tubes at -20oC. The samples were put into an oven and 384 were picked randomly. According to manufacturer's guidance, quantitation assay was carried out using CE labelled ELISA Kit (Demeditec Diagnostics GmbH Lise-Meitner-StraBe2 D-24145 Kie) (Germany). Centered on the surveys of producers, who were examined on a collection of From the results of our data, we concluded that ROC curve was drawn and we extracted our optimum cutoffs (90 percent sensitivity and specificity). 10 U/ml (kit cut off) is taken as sero-negative and 86.5 U/ml is taken as sero-positive. In order to analyse the results, SPSS version 20 was used. The variables of the analysis were analysed and correlated to figure out patterns (percent).Chi- square was used for comparative analysis of protection level with vaccination status. P-value less than 0.05 was significant and P-value equal to or greater than 0.05 was considered insignificant.

RESULTS

Samples of 395 students having age 18 or above were collected from a fixed population of 605 students enrolled in SKZMDC in MBBS and Allied Sciences group. Due to incomplete history, 11 samples were lost to the study and anti-polio IgG test and statistical analysis was performed on the remaining 384 samples (which fulfill the criteria of our sample size). On proforma sheet vaccination status of every student was recorded. Out of 384 students 290 were vaccinated and 94 students were not vaccinated, Out of 290(75.5%) vaccinated students, 230 (79.3%) students had a complete course of vaccination while 60 (20.7%) students were incompletely vaccination. In general completely and incompletely vaccinated students were 59.89% and 15.6% respectively. However non-vaccinated students were 94 (24.5%). (Table. 1)

Table1: Vaccination status of students and doses

	Vaccinated(n = 290)		Non Vaccinated(n = 94)		Total(n = 384)	
	N	%	N	%	N	%
Incomplete Doses	60	20.7	0	0.0	60	15.6
Complete Doses	230	79.3	0	0.0	230	59.9
None	0	0.0	94	100.0	94	24.5
Total	290	100.0	94	100.0	384	100.0

Table2: Protection level on basis of cut off

Cutoff			Total	
			N	%
Kit	Sero-positive	≥10.0	351	91.4
	Sero-negative	< 10.0	33	8.6
		Total	384	100.0
ROC curve	Protected	> 86.5	26	6.7
	Grey zone	10-86.5	325	84.6
	Non Protected	<10	33	8.6
		Total	384	100.0

Standard cut off of the kit is taken as 10 U/ml showing sero-positivity with a neutralization titres≥ 1:8. Then based on titres observed in our studies, ROC curve was drawn and on the basis of ordinates our optimum cutoffs were decided with 90% sensitivity and specificity. 10 U/ml (kit cut off) is taken as sero-negative, 86.5 U/ml as sero-positive and 10-86.5 U/ml as grey zone (Table. 2)

Vaccination status and doses has no significant association with protection level according to cut off calculated on ROC curve. (Table 3)

Table. 3. Significant association of Cut off with Vaccination and doses

		ROC curve Cut off							
		Protected		Grey Zone		Unprotected		Total	
		N	%	N	%	N	%	N	%
Vaccination	Total	26	6.8	325	84.6	33	8.6	384	100.0
	Yes	16	5.5	245	84.5	29	10.0	290	100.0
	No	10	10.6	80	85.1	4	4.3	94	100.0
	P value = 0.065				Chi square = 5.48				
Doses	Total	26	6.8	325	84.6	33	8.6	384	100.0
	Complete	12	5.2	194	84.3	24	10.4	230	100.0
	Incomplete	4	6.7	51	85.0	5	8.3	60	100.0
	None	10	10.6	80	85.1	4	4.3	94	100.0
	P value = 0.195				Chi square = 6.05				

DISCUSSION

While an infectious illness, Polio has become a national emergency in Pakistan. Vaccination is also important despite having wide-range vaccination campaigns in Pakistan. Pakistan is the only location where polio "endemic" variants still exist in the world.[12]The most distressing truth about India is that, in 2012 it was proclaimed the polio free nation of the world. Besides, this is something commendable in Islam and according to the legal ruling of Islam, " prevention is better than cure" and "there should be no damage or injury to each other.". In 2013, there were 34 cases and in 2014, it was 82.[13]

In our analysis, a total of 395 samples of students having 18 years or above were obtained from a fixed population of 605 students at a medical college. 11 samples were to be analysed but they all were misplaced. All the students were aged about 18 or above having a male-female ratio of 1:2. General variables like vaccination status and security level of students were considered while performing our research. A full medical history was taken regarding the people infected by the polio.

We find no substantial variation in protective titres of the vaccinated and the non-vaccinated in our study. We may infer that 10.6% of non vaccinated population have either subclinical infection or polio virus based on immune status of the topics.[14]

In a research run from 2009 to 2013, out of 352 samples analysed, 34.6 percent have titers of less than 1:8 for at least one serotype and 1.3 percent has titers of less than 1:8 for all three serotypes.[15]

The major factors of poor protective standard are poorly administered vaccines, inadequate immunisation or waning immunity. Many surveys indicate that older people are less sensible than their children. All should be vaccinated.[16]

In this research, a clear connection of student's immunisation status and doses of vaccine taken was found. Only 6.7% showed protection against Polio viruses, 20% were Sero-Negative and 84.6% showed strong immune response to polioviruses.

CONCLUSIONS

Polio is one of the deadly nightmare for Pakistan. Circumcision only occurred in two countries in the world until recently. Currently, type 1 polio virus is circulating in the natural world and poses a threat to countries without Polio. For the most part, Pakistani are naturally prone to polio and this is obvious in the province of Punjab. It may be that this is due to vaccines or a subclinical infection of wild poliovirus. It is fair to say that immunization standards in healthcare workers do not confer immunity against the disease. It is remarkable that exceptional steps will be required for eradication of poliovirus within the sense of global scope for immunization against polio.

Recommendations: As routine testing is expensive, it is not recommended. Students having documented vaccination record are advised a booster dose of polio vaccine while other students are advised a complete course of vaccination as well as a booster dose.

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