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Polio still a Threat in Pakistan: Possible role of stability of polio vaccine

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ABSTRACT

Objective: Vaccination is considered very important for proper health and development of child. It helps in keeping a child disease free. Although most of the developing countries are considered polio free, Pakistan is not one of them. The study is designed to evaluate whether storage conditions and stability effect polio vaccine leading to its inefficacy. **Methodology:** It is a cross sectional survey based study consisting of N=200 (both males and females) age group 20-55 years from medical field and polio workers. The study was conducted for 2 month. Data was collected from the participants by directly contacting with them and the answers were recorded as open ended. **Results and discussion:** From our study we came to know that 87% of population was aware about polio vaccine, 55% was aware that it is stored in cool place but 41% had no idea that at what temperature it is stored. 67% population thought its efficacy is maintained if kept in ice box for prolonged time. **Conclusion:** From our study we came to conclude that polio vaccine should be stored at standard temperature in refrigerators, not kept in ice boxes for prolonged time. Awareness should be created regarding this and it would be better option to dispense it from Community Pharmacy to avoid stability issues.

Keywords: Polio Vaccines, Refrigerator, Storage, Stability, Community Pharmacy.

Introduction

Poliovirus (PV), an enterovirus belonging to the Picornaviridae family is the etiological agent of poliomyelitis, an acute paralytic disease. [1] It is a small RNA virus, just 30 nm across and with a complete genome of only approximately 7500 nucleotides. [2] It is shed in enormous quantities in the throat and intestines of infected individuals such that a gram of stool can contain several million virus particles[2] This disease results from lower motor neuron damage and is characterized by asymmetric persisting weakness (flaccid paralysis). [1] Poliomyelitis is caused by any one of the three serotypes of poliovirus (type 1, type 2 or type 3) that can be prevented through vaccination. [3]Poliomyelitis disease may attack nerve cells of the brain and spinal cord. Symptoms include fever, headache, sore throat, and vomiting. Some victims develop neurological complications, including stiffness of the neck and back, weak muscles, pain in the joints, and paralysis of one or more limbs or respiratory muscles. In severe cases it may be fatal, due to respiratory paralysis. [4]The propagation of the PV **in vitro** led to the development of the vaccines against poliomyelitis: the formalin-inactivated vaccine (IPV) by Jonas Salk (1953) and the live-attenuated vaccines (OPV) by Albert Sabin (1956). [5]Immunization is the most precious gift that a health care worker can give a child [6] Vaccination is a crucial tool for preventing and controlling disease, but its use has been plagued by controversies worldwide [7-12] Vaccines are sensitive biological substances that gradually lose their potency with time [13] and this loss of potency can be accelerated when stored out of the recommended range of temperature [13, 14, 15] Any loss of potency in a vaccine is permanent and irreversible. Consequently, a proper storage of vaccines at the recommended temperature conditions is vital so that vaccine's potency is retained up to the moment of administration [13].Timely vaccination is important to obtain adequate disease protection. [16-19]The first

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vaccination is at birth where the BCG [Bacillus Calmette–Guérin] (birth to 8 weeks) and oral polio (birth to 4 weeks) vaccines are given. The first dose is given at 6 weeks (4 weeks to 2 months), then again at 10 weeks (8 weeks to 4 months), and at 14 weeks (12 weeks to 6 months).). [20] Two vaccines, live attenuated oral poliovirus vaccine (OPV) and inactivated poliovirus vaccine (IPV) are used throughout the world to protect against polio. [21]OPV is used instead of IPV for several reasons. [21] OPV is more cost effective than IPV [22]; primary immunization with OPV induces superior intestinal immunity than IPV.OPV thus has the potential to better prevent transmission of wild viruses; OPV confers contact immunity through passive immunization of unvaccinated persons from viruses shed by vaccines. OPV is administered in oral drops, which are easy to store and transport. The United States Center for Disease Control recommends polio vaccination boosters for travelers and those who live in countries where the disease is occurring.[23] Once infected there is no specific treatment. The objective of the study is to evaluate awareness regarding storage conditions of polio vaccine whether stability of polio vaccine is effected due to improper storage leading to inefficacy of polio vaccine which might be one of the possible reasons polio is still not eradicated from Pakistan and what measures can be adopted for proper storage and dispensing.

Materials and method

It is a cross sectional survey based study comprising of N= 200 individuals. The study was carried out in various public and private sector hospitals of Karachi and Retail Drug seller stores. The sample population consisted of Physicians, Nurses, Drug Sellers and polio workers. The data was collected by directly contacting with persons and the answers were recorded as open ended.

Sample selection

Inclusion Criteria

- Must be registered physicians from PMDC
- Must be registered Nurse from PNC
- Must be working in any public and private sector tertiary care hospital of Karachi
- Must be authentic Polio worker
- Must be able to speak and understand local language Urdu and English

Exclusion Criteria

Interns and trainees

Ethical consideration

The participation of every healthcare practitioner was voluntarily. All the participants had complete right to withdraw from study without any prior notice.

Results and discussion

The data was analyzed by SPSS version 19 and by using Binomial testing and Chi square test the results were evaluated. P value of 0.05 (5%) or less was considered statistically significant. The results have been presented as follows:

Table 1: Binomial Test

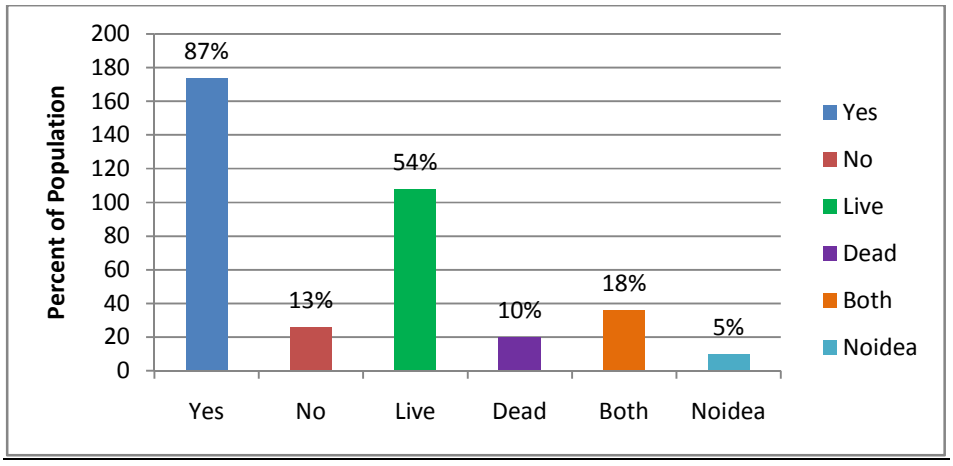
		Category	N	Observed Prop.	Test Prop.	Exact Sig. (2-tailed)
Awareness regarding Polio Vaccine	Group 1	No	26	.13	.50	.000
	Group 2	yes	174	.87		
	Total		200	1.00		
Awareness regarding storage of polio vaccine	Group 1	yes	110	.55	.50	.179
	Group 2	no	90	.45		
	Total		200	1.00		

Stable in ice box for prolonged time	Group 1	yes	106	.53	.50	.437
	Group 2	no	94	.47		
	Total		200	1.00		
Awareness regarding community Pharmacy	Group 1	yes	76	.38	.50	.001
	Group 2	no	124	.62		
	Total		200	1.00		
Community pharmacy better option for dispensing polio vaccine	Group 1	yes	24	.12	.50	.000
	Group 2	no	176	.88		
	Total		200	1.00		

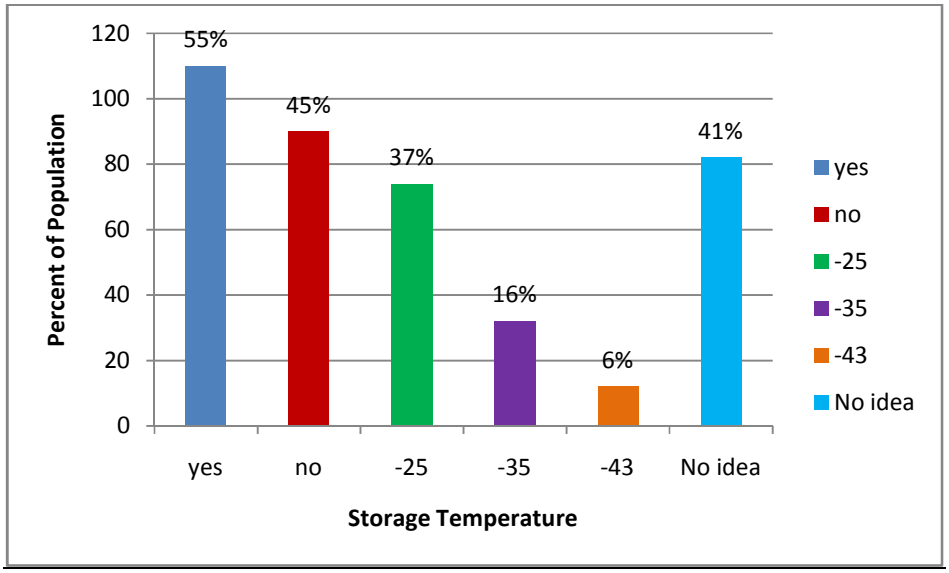
Table 2: Chi-Square Test

	Awareness regarding Polio Vaccine type	**Awareness regarding temperature**	**Efficacy maintained in ice box**
Chi-Square	195.040	71.160	130.690
df	3	3	2
Asymp. Sig.	.000	.000	.000

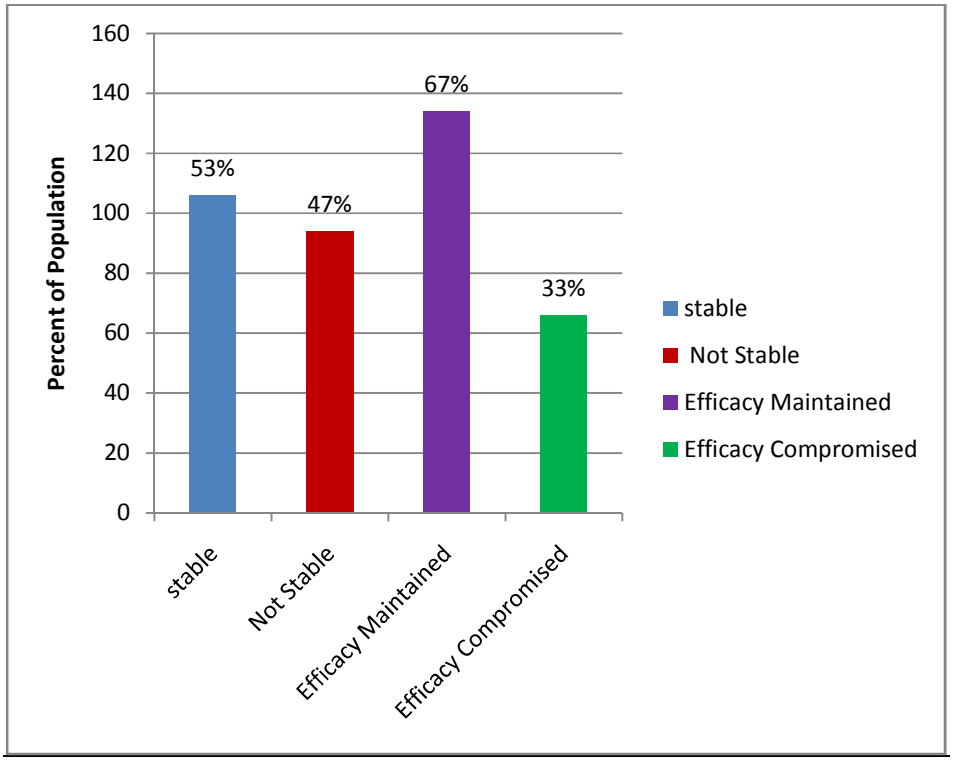
Graph 1: Awareness regarding Polio Vaccine



Graph 2: Awareness regarding storage of Oral Polio Vaccine



Graph 3: Oral Polio Vaccines Efficacy and Stability in Ice box for prolonged period



Graph 4: Awareness Regarding Community Pharmacy and it being a better option for Dispensing Polio Vaccine

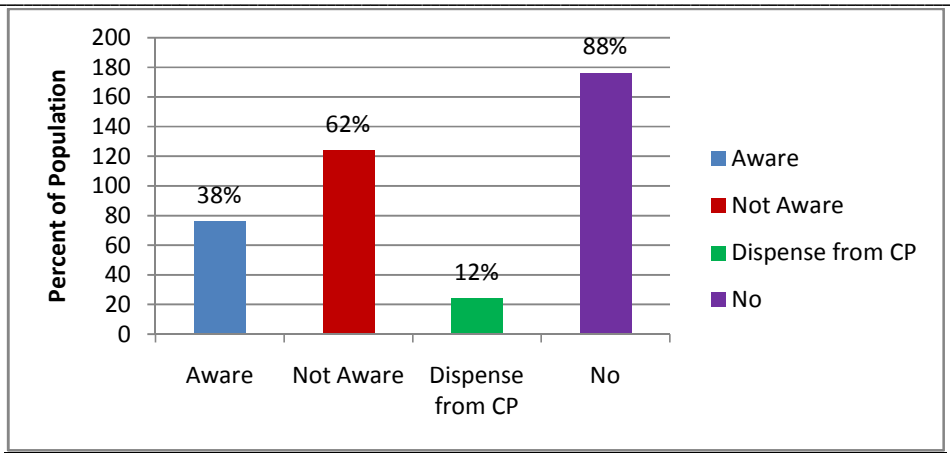


Table 1 shows that awareness regarding polio vaccine was highly significant i.e p<0.000 however results regarding storage conditions of polio vaccine and stability for prolonged periods in ice box were insignificant. The results showed awareness regarding community pharmacy was moderately significant as majority of people were not aware about it p<0.001 where as dispensing of polio vaccine from community pharmacy also had highly significant results i.e p<0.000 majority of people did not agree about importance of community pharmacy in dispensing polio vaccine.Table 2 shows that when chi-square was applied we found that highly significant population was unaware of the temperature at which polio is stored, about whether it is live or dead vaccine and regarding effect on efficacy if it it kept in ice box for prolonged time period i.e p in all situations was P<0.000

Graph 1 shows Awareness regarding Polio Vaccine. Our results show that majority (87%) of the population is aware about Polio Vaccines and only a minority (13%) is unaware about it. It also shows that 54% of population considered Polio vaccine as a live vaccine while only a minority considered it dead. 18% population knew that Polio vaccine is both Live and Dead vaccine. Since the 1950s there have been two safe and effective vaccines against poliomyelitis: Inactivated (killed) polio vaccine – known as IPV or Salk – which is made from wild strains and administered by injection; live attenuated (weakened) oral polio vaccine – OPV or Sabin – which is given by mouth. [24]OPV has been used in the Global Polio Eradication Initiative to reduce polio cases by more than 99% and to restrict poliovirus circulation to a handful of countries.

Graph 2 shows Awareness regarding storage of Oral Polio Vaccines. Our results show that 55% of the population is aware about the storage of Oral Polio Vaccines while 45% is unaware about it. It also shows that majority of the population had no idea about the storage temperature at which polio vaccine should be maintained while 37% thought that it is stored at -25°C. According to World Health Organization (WHO) recommendations OPV must be kept frozen between -15°C and -25°C. [25]Proper vaccine storage and handling practices play a very important role in protecting individuals and communities from vaccine-preventable diseases. [6]

Graph 3 shows Oral polio Vaccine Efficacy and Stability in Ice box for prolonged period. Our results show that majority of the population believed that the Polio Vaccine remain stable when kept in ice box for prolong period of time. It also shows that 67% of population thought that the efficacy was maintained when placed in ice box for prolonged period of time only 47% of the population had an idea that vaccine does not remain stable when kept in ice box for prolonged time period and 33% thought that efficacy gets compromised if kept for prolonged periods in icebox. WHO recommendation states thatOPV should not be kept atrefrigerator temperatures (0C to 8C) at health centres for more than one month, nor transported at these temperatures for more than one week. [26] The system used for keeping and distributing vaccines in good condition is called the “cold chain.” This consists of a series of storage and transport links, all of which are designed to keep the vaccine at the correct temperature until it reaches the recipient. [27] Researchers reported defects in the cold chain and the need to strengthen this mechanism to achieve successful polio eradication.[28] Use of magnesium chloride as preservative would help to increase the stability of OPV and to minimize reliance on the cold chain system [29]

Graph 4 shows Awareness regarding Community Pharmacy and it being a better option for Dispensing Polio Vaccine. Our results show that majority of the population is unaware about Community Pharmacy and did not think it could play a role in correct dispensing of polio vaccine. Community pharmacy in the UK is established as a very well known pharmacy profession. [30] Buying medicine from a community pharmacy would be very beneficial for people as they would be correctly councelled about its use too.

Conclusion

From our study we came to conclude that there is a need to create awareness in Health care professional and Polio workers regarding storage of oral polio vaccine as loss in its stability could be one of the causes of its inefficacy. A better option would be to dispense it from a community pharmacy so that proper supervision would be carried out during dispensing.

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