**An Ethical Appraisal of the Choice of Vaccine against Poliomyelitis**

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**Background**

Medical ethics is applied in healthcare and in research involving human subjects (1). In both situations, interaction takes place between a healthcare professional and patient or a researcher and subject recruited for research. The transaction is one on one, both persons identified by each other. The application of and adherence to ethical principles are crucial to guide such inter-personal transactions where one is more influential than, or has power over, the other (2).

In Public Health, usually, there is no personal one on one transaction. The focus of public health is on the community and the patient as an individual is no longer relevant - community consists of  ill and well individuals. There may be involvement of human subjects, collectively, during investigations or interventions relevant to an outbreak and in health promotion or disease prevention settings. For example, to stop domestic mosquito breeding, all houses may be visited and residents asked to prove the absence of breeding in any water receptacle. All residents are treated alike. Here intrusion into the privacy of residence is for common good and no human right is violated. However the conflict that emerges between the individual good and the common good is greatly heightened when it comes to a public health intervention like vaccination, thereby raising an intense ethical debate.

Sound ethical principles are crucial to justify any immunisation programme . Biomedical ethics, framed in 1970s by Beauchamp and Childress, has the following four elements: non-malficence, beneficence, autonomy and justice (1, 3). Ethics in public health evolved in the early 2000s . It largely addresses the issues of interdependence, autonomy, justice and human rights . Most of the philosophers of public health ethics have outlined a 2 step approach, the first step is to frame principles in a similar way as bioethics and the second step involves proposal of justificatory conditions to help combat the ethical dilemmas(4). In 2004, seven ethical principles were proposed by Verweij M and Dawson for design of collective immunisation, which were further developed by David Isaacs in 2012 as i)Benefits of the program to the individual and community, ii)Risk monitoring for adverse effects, iii)Monitoring of effectiveness of the program,iv) Cost effectiveness and justice for the vulnerable and disadvantaged groups, v)Autonomy and informed decisions for vaccine recepients/care providers of children, vi)Reciprocity including no –fault compensation schemesfor those who suffer serious consequences of vaccination and lastly, vii)Mutual trust and decision making by public consultation(5).The above principles were designed in view of the rising concerns regarding the emergence of new and future vaccines.

WHO’s Strategic Advisory Group of Experts (SAGE) on Immunization developed a framework for decision-makers on use of life saving vaccines during emergencies(6). It advised to consider the urgency and need of vaccination, targeting the most susceptible population with high rate of transmission, using a tool that can give maximum speed of coverage, while overruling parental objection to the child’s vaccination if disease risk is high. But ethical ambuigity continues for regular vaccination policies on several issues pertaining to communication, mandatory implementation, safety, and compensation for adverse effects and is largely dependent on the local rules and regulations. In United States alone, some states have mandatory vaccination at school level. Apart from exemptions due to medical contraindications, the decisions to exempt based on religious views and philosophical beliefs vary from state to state. There is a perceived increase in vaccine hesitancy among parents from 9.1 to 16.7 % over 7 years (7). US witnessed biggest measles outbreak in 2014 since its elimination in 2000. Measles outbreak continue to occur in many parts of Europe. In 2010 Lancet retracted 12 year old article by Andrew Wakefield which linked vaccines and autism, but parental anxiety and hesitancy continue to persist. The American Academy of Pediatricians (AAP) has recently agreed to offer pediatricians an option of dismissal of families who refuse vaccination despite multiple attempts to convince them to vaccinate. However this option is to be used as last resort respecting the state laws prohibiting abandonment of patient care (7).

In this paper, we travel back in time and narrow our discussion on an important topic -the ethics behind the selection of vaccine for the vaccination against poliomyelitis (polio) in the Universal Immunisation Programme (UIP) of the Government of India (GOI). This debate is carried out in light of traditional ethical principles of non-malficence, beneficence, autonomy and justice. We present in this paper our assessment of the choice against each element and argue that the choice was vitiated due to the non-application of ethics.

In UIP, a trained health worker vaccinates all children eligible by age and place of residence. The worker implements a job assigned by the Government under national policy and there is little or no personal choice. While a paediatrician immunising a child in the clinic, under healthcare setting, is involved in one to one transaction with the vaccine recipient and most often the caretaker of the minor vaccine recipient. The paediatrician may be called to justify the choice of a vaccine in case of a dispute, the health worker immunising children is protected from such disputes as the worker is fulfilling national policy. In case of injury to the child due to a vaccine, the parent apparently has no recourse to compensation under UIP. Parents have to accept Government policy under UIP with regards to the choice of vaccines. Since parents bring children to the worker, consent for giving immunisation is taken for granted. When the worker is instructed to go into houses and immunise children, non-refusal of parent is taken as consent.

Citizens assume that the Government would have carefully chosen the vaccines to be included in UIP based on epidemiological need, safety and efficacy of the vaccine and economic feasibility. All expenses on vaccine delivery side are covered by public funds at the disposal of the Government. Best practices are defined and ensured by staff-training and by supervision. There is a general perception/belief that the programme is in the best interests of society and ethics is either not relevant, or, if relevant implicit in the transaction.

For many diseases like tuberculosis, diphtheria, tetanus, pertussis and measles there is one globally accepted vaccine against each and for that reason there was little need for choice between products when policy was enunciated. In the case of polio, two vaccines with highly contrasting properties were available since the 1960s. In 1978 when the National Immunisation Programme as a Public Health intervention was launched, the GOI chose one for exclusive use and the other disallowed by non-licensure.

**The two polio vaccines**

The inactivated polio vaccine (IPV) and live attenuated oral polio vaccine (OPV) were both created in the USA during mid-1950s and early 1960s. The Expanded Programme on Immunisation (EPI) was launched by the World Health Organisation (WHO) in 1974, in which OPV was recommended. India established EPI in 1978 and introduced OPV in 1979-80 (8). EPI was revised as the UIP in 1985(9).

In the USA and in Europe, OPV was highly efficacious with no vaccine failure documented. However, OPV was shown not to be totally safe, with children developing polio caused by vaccine viruses, called vaccine-associated paralytic poliomyelitis (VAPP), of which the frequency varied from country to country (10,11). In 1982 the WHO strongly recommended that all countries using OPV should establish surveillance to monitor the frequency of VAPP, so that further decisions could be made on its frequency (11). The EPI in India did not comply.

Before India established EPI, data from within the country had showed sub-optimal vaccine efficacy of OPV (12-15). The Government of India had access to information from many sources, on the comparative parameters of both vaccines. Thus, India faced problems with both efficacy and safety of OPV. On the other hand, studies on IPV in India, limited because IPV was not licensed and not available to the public, had shown very high vaccine efficacy, on par with experience in other countries (16).

Experience from other countries using IPV had shown complete safety, unparalleled by almost any other vaccine (11).

**Application of ethical principles**

**Non-malficence:** The first ethical principle is to do no harm. OPV carried a small but definite risk of VAPP (10,11). When comparing one completely safe vaccine (IPV) and the other not completely safe (OPV), choosing the latter fails the test of non-malficence, unless there was any over-riding reason to choose the former. There was no such over-riding reason. USA had also chosen to use OPV exclusively, but there every child with VAPP was identified and monetarily compensated (10). India had ignored the problem of VAPP until their numbers were counted; 181, 129 and 109 VAPP cases were reported in 1999, 2000 and 2001, respectively (17).

Moreover, with OPV, many children with primary immunodeficiency developed polio (18). Others became chronically infected with vaccine viruses and shed them for long periods of time (18). With such chronic shedding of vaccine viruses there existed the potential threat of polio in contacts as the viruses became increasingly neurovirulent with time (18).

Although per dose cost of OPV was lower than that of IPV, both vaccine safety and vaccine efficacy of OPV were not as good as those of IPV. A health economics evaluation was not apparently done; there was no need as only one was licensed. Hence the cost issue could not be considered a reason to over-rule non-malficence.

From 1984 a new generation IPV was available; its production cost was substantially lower than that of older IPV. Considering that less number of IPV was sufficient than OPV, probably cost would have been lower per protected child using IPV, than OPV (16).

**Beneficence:** On the face, both vaccines appeared to satisfy beneficence, as both prevented paralytic polio. However, there was reason to question if OPV satisfied fully the test of beneficence.

OPV given under national policy of 3 doses protected only about two-thirds of vaccinated children in India; consequently many children developed polio in spite of the EPI-stipulated number of doses, 3-4 in the first year of life (12-15). USA had also chosen a policy of exclusive use of OPV, but had one supportive argument that OPV was completely effective in preventing polio, while IPV, available then was not according to the original IPV efficacy trial (19). However, that was only a matter of the number of doses – 3 doses of the original IPV was not 100% efficacious (19). The old IPV contained thimerosal as preservative; the mercury-containing preservative reduces polio antigencity and when IPV was made without preservative, it was 100% efficacious (19). Globally, 3 doses of the old IPV without preservative and 2 doses of modern IPV, given at appropriate age and interval, are completely efficacious. No child is recorded having had polio after the recommended number of doses in the first year of life.

EPI did not evaluate either vaccine for efficacy, but the sub-optimal efficacy of OPV and consequent vaccine-failure cases of polio had been recognised and were widely known when EPI was launched (12-15). By mid-1980s about half number of cases of polio was in children given all the EPI-recommended doses of OPV (15).

**Autonomy:** There is a common belief that autonomy principle applies only when the patient or research subject has a choice. The Government had choice – to include or exclude a vaccine from UIP and the choice could be applied autonomously or made according to recommendations made by international organisation(s). There is no evidence, direct or circumstantial, that autonomy was applied in the choice of OPV to be used exclusively. On the other hand many member countries in WHO autonomously chose IPV over OPV – mainly for safety from the risk of VAPP. India did not monitor the frequency of VAPP in spite of recommendation by the WHO in 1982. Eventually investigators from the US CDC counted 181 VAPP cases in 1999 in India (20). One can only imagine and lament over the enormous numbers of children who were paralysed by VAPP, for want of ethical choice between OPV and IPV.

By national policy, parents of children were not given choice between the two vaccines – thus autonomy for choice was denied. They were obliged to accept OPV – and face the consequences of VAPP as well as vaccine-failure polio.

Sweden autonomously chose to use IPV exclusively and OPV was never allowed in the country (21). Norway began with IPV and switched to OPV and when faced with VAPP (at the rate of one case per 100,000 children), switched back to IPV (21). France gave the freedom to choose between OPV and IPV to parents and their paediatricians. As they increasingly chose IPV over OPV; when only a small minority of children were getting OPV, in 1987, France discontinued OPV altogether (22). Thereafter there was no polio in France, due either to vaccine virus or wild virus importation from North Africa.

Countries like USA and UK had autonomously chosen OPV – Information on VAPP was available in the public domain in the US but victims were monetarily compensated. In UK the information was not in public domain (19). Eventually, both countries abandoned the use of OPV and used exclusively IPV since 2000 (USA) and 2004 (UK).

**Justice:** There was a global inequity in the choice of vaccine with OPV promoted in the low income countries where its efficacy was low while the rich countries chose IPV to control polio.

Moreover, for the period that OPV was in used in USA and Japan, families of children with VAPP were monetarily compensated, for fulfilling the ethical principle of justice. On the other hand, no compensation was offered to affected families in India.

**Discussion**

In the past, ethical issues in the choice of OPV to the exclusion of IPV in our national immunisation programme had been only rarely discussed in any forum, to the best of our knowledge. Clearly, there was the need to make an informed choice if the policy-makers had wanted only one vaccine licensed in India. It would have been better if a policy of the exclusive use of one was not made, but instead both vaccines were licensed so that the experts could gain experience and insights from using both of them.

On the counts of ethical principles, we argue that the choice of the exclusive use of OPV was faulty. Ultimately, in 2006, India licensed IPV, when it became obvious that it had safety and efficacy superiority over OPV. Gradually it became apparent that global polio eradication can be achieved when only IPV is used universally to the exclusion of OPV. India had an opportunity to lead the rest of the low and middle income countries, which was forfeited for want of application of ethics in the choice between two products for use in Public Health.

Two moral principles are possible in Public Health, utilitarian and deontological (23).The former accepts an intervention if it benefits the majority, while harm may occur in a minority. The latter on the other hand does not accept an intervention if it harms the individual. There could be situations where choice between utilitarian and deontological principles may be impossible but in the choice of one vaccine from the two available was clearly unethical – the utilitarian principle that was apparently applied, was inappropriate.

We draw an important lesson from this historical national experience. Ethical principles must be applied in all Public Health policies. Just because the persons on whom Public Health interventions are applied are not clients of any transaction, they are human beings and from their side, ethics is essential. India’s policy leaders must review every national health programme from an ethics assessment.

As action under national policy may be non-judiciable, ethics and human rights are to be ensured and seen to be ensured in all such policies.

While we cannot retrace past steps, we must learn from the past and consider the value of applying ethics in vaccine choice. Traditionally epidemiology and economics guide vaccine choice, but we recommend ethics should also be a critical element.

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