Modern Imperatives of Organ Donation: Ensuring Survival at the Edge of Life – A Narrative Review

Organ donation is the legal process by which a person allows their own or their kin's organs to be removed and transplanted into another person, this can happen while the donor is still alive or after death with the donor's next of kin's consent.[1] There are two forms of organ donor: (i) Living Organ Donor: A person may donate one kidney, a portion of the pancreas, or a portion of the liver etc. during his or her lifetime. In India the age limit for living organ donation is equal or more than 18 years age. (ii) Deceased Organ Donor (Cadaveric organ donation): A person may donate multiple organs and tissues after brain-stem/cardiac death after the consent of first-degree relatives.[1] The brain death is irreversible and permanent end of all the brain functions; such persons are kept on artificial support (ventilation) to maintain oxygenation of organs so that organs are in healthy condition until they are removed. whereas when a person suffers a cardiac death, the heart stops beating and due to lack of circulation of blood the vital organs quickly become unstable for transplantation; however, if person is on ventilators and if it is medically clear that the person could not survive; then family can consider organ donation for certain vital organs.

For organ donation, there are two main methods to determine voluntary consent: (i) Opt-in (Explicit Consent): One would have to sign up to be an organ donor, or rather, it is assumed that nobody is an organ donor unless they voluntarily do so. This system is followed in India. (ii) Opt-out (Presumed Consent): It means that, hospitals would be permitted to remove people's organs unless they choose to opt out of the donor registration or their relatives objected. But this consent structure and process is based on sociological fears. This system is existed in Argentina, Chile, Colombia, Spain, Austria, Belgium, Scotland, England, Wale.[2]

To pledge for organ donation, a person has to fill an online form to register on www.notto.gov.in. website or an offline form at any nearby organ donation organization then can recieve donor card and the organ recipient has to be registered by concerned hospital though online registration form on www.notto.gov.in. website

under THOTA (Transplantation of Human Organ and Tissue Act). Allocation of organs will be done first based on state waiting list, if no recipient is available in state waiting list then allocation will be done in same Regional Organ and Tissue Transplantation Organizations wise then to nearby state and then other Regional Organ and Tissue Transplantation Organizations nationally. Donated Organs of Pediatric donor (<16 years) first will go to pediatric patients, if any pediatric patients are not available then to it is allocated to adult patients. Organs from donors with blood group 'O' will be allocated to recipients with blood group 'O', then to any other group, other than 'O' blood group.[2]

Global organ donation rate in 2021 was 4.77 per million population. Which was decreased from 5.78 per million population in 2020 and 6.97 per million population in 2019. Organ donation rate of South East Asia was 0.44 per million population in 2021, 0.47 per million population in 2020 and 0.63 per million population in 2019.[3] Although India has been performed the third largest number of transplants in the world in 2019 (after United States and China), still it lags far behind the western nations like Spain (49 pmp), United States (36.88 pmp) in national organ donation rate of only 0.52 per million population in 2019, 0.25 per million population in 2020 and 0.4 per million population in 2021 due to lack of awareness and so many reasons.[4] According to the World Health Organization, only around 0.01 percent of people in India donate their organs after death in comparison of 70-80% people in western countries.[5,6] Some of the reasons behind such poor performance are lack of public awareness,[7] religious or superstitious beliefs among people, and strict laws. 'World Organ Donation Day' is observed annually on August 13 to promote organ donation and motivate others to do the same. The day has been set aside to raise awareness of the importance of organ donation. In 1954, Ronald Lee Herrick donated his twin brother a kidney in the first-ever organ donation. The treatment was carried out by Dr Joseph Murray, who also received the 1990 Nobel Prize in Physiology or Medicine for his contributions to the field of organ transplantation. Recently it was celebrated in 2022 with the theme - 'let's pledge to donate organs and save lives'.[8]

Organ donation in India:

Organ donation is very helpful for the grieving process. Furthermore, many donor families take relief and consolation due to organ donation. Initially the

organ donation transplantation was unregulated and organ trafficking was rampant so the primary legislation related to organ donation and transplantation in India was passed in 1994 named as Transplantation of Human Organs and Tissues Act (THOTA 1994) and was amended in 2011 and rules were notified in 2014[9] except in Andhra Pradesh and Jammu and Kashmir, as these States have their own laws.[10] This Act is aimed at regulation of removal, storage and transplantation of human organs for therapeutic purposes and for prevention of commercial dealing in human organs. Even after amendment in Act, there was no authority for handling organ transplantation processes in States and no any dedicated staff for registry, surveillance, awareness or training for organ donation and transplantation and in India, according to a non-profit, non-government organization-'MOHAN Foundation' (Multi Organ Harvesting Aid Network Foundation, established in 1997 in Tamil Nadu); a total of only 530 organs were retrieved from 196 multi-organ donors in 2012 and 852 organs from 388 multi-organ donors in 2013 resulting in national organ donation rate of 0.16 per million population in 2012 and 0.26 per million population in 2013. In 2014, 1150 organs were retrieved from 411 multi-organ donor (0.34 per million population)[11]. Due to such low Organ donation rates, almost 90% people in India die despite their name on waiting list. So to bridge the gap between demand and supply of organs/Tissues of transplantation, to improve access for needy citizens and to organize and monitor an efficient mechanism and system, Government of India has implemented National Organ Transplant Programme (NOTP), which carry out the activities as per amendment Act for training of manpower and promotion of organ donation from deceased persons. Under this programme, in 2014, an apex level organization, National Organ & Tissue Transplant Organization (NOTTO) was established at 4th Floor, National Institute of Pathology, NIOP Building, Safdarjung Hospital Campus, New Delhi under Directorate General of Health Science, which has components of National networking, National Registry, National level Biomaterial center and facility of cadaver organ and tissue retrieval Operation theatre. There are 5 Regional Organ and Tissue Transplantation Organizations (ROTTO) and 12 State Organ and Tissue Transplantation Organizations (SOTTO) in India. NOTTO has announced July as organ donation month in 2022 to commemorate 8 July 1994, when Transplantation of Human Organs and Tissues Act was sanctioned and 3 August as 'Indian Organ Donation Day' to commemorate India's first Deceased Heart transplant in India on 3 august 1994.[12]

In various situations even the organs are available, organ wastage is also a factor due to very short and critical time interval between harvesting and transplantation of the organ. Studies have suggested that the chances of the transplantation being successful are enhanced by reducing this time delay.[13] The time between recovering and transplanting is 72 hours for kidney, 24 hours for pancreas and liver, 4 hour for heart, 4-6 hour for lung, 14 days for cornea, 5 years for bone and skin and 10 years for heart valves. Due to such very short range of time, creating a tissue bank (heart valves, skin, bones, cornea, etc.) is possible but creating an organ bank is not.[14]

Therefore, transportation of the organ is also a critical factor. For this purpose, "green corridors" have been created in many parts of India, which refers to a route that is cleared out for an ambulance carrying the harvested organs to ensure its delivery at the destination in the shortest time possible. Green corridors are generally used for transporting heart and liver, which have the shortest preservation times of 4 to 6 hours and 12 to 15 hours, respectively.[15] The hospitals involved in a transplantation, city traffic authorities, and in certain cases, airport authorities collaborate to transport an organ from one hospital to the next.[16] The formal name of "Green Corridor" was given in July 2014 when a hospital and police in Chennai coordinated to transport a heart from one hospital to another in half the regular time. This system has been used effectively in cities such as Mumbai, Gurgaon, Hyderabad, Bangalore, Kolkata, and Indore.[17]

Organ Donation in States of India:

The number of deceased organ donations in India grew gradually from 2012. The total number of multi-organ deceased donors in 2012 throughout India was 196 (0.16 pmp), which was doubled in 2014 to 411 (0.34 pmp)[11] and further increased to 552 (0.4 pmp) in 2021.[3]

In Rajasthan, The Department of Medical Education has taken up the task of promoting deceased organ donation and transplantation in the state to overcome the organ shortage problem. The State Organ and Tissue Transplantation Organization was established in 2nd floor of academic block of Sawai Man Singh (SMS) Medical college in 2019. The first deceased organ donor in the state was a 7yearold boy Mohit

Kumar who became brain dead following an accidental head injury. On 6th February 2015, his both the kidneys were transplanted into a 50-year-old man Mahatma Gandhi Hospital, Jaipur and the liver was transplanted into a 10year old boy at the Institute of Liver and Biliary Sciences in Delhi. The second deceased organ donor was a 14-year-old girl Radha Rani. She was brought to, Sawai Man Singh (SMS) Hospital, Jaipur on 22nd February 2015, in a critical condition. She was declared brain dead on 24th February, her kidneys were transplanted into two patients at SMS Hospital while her liver was sent to the Army Research & Referral Hospital in Delhi through a special Indian Air Force helicopter, where it was transplanted into a patient who was the wife of a soldier.[17] In Rajasthan, first heart transplant was conducted in August 2015 at Mahatma Gandhi Medical College & Hospital, Jaipur, when 18 year old road accident victim was declared brain death, his heart was transplanted to 32 year old patient of hanumangarh after consent of family.[18] SMS Hospital conducted its first liver transplant in February 2017 with support from experts of Delhi's Institute of Liver and biliary science (ILBS) and first heart transplant in February 2020.[19]

In Rajasthan, to release patients form expenses, Organ donation also has been included to the Chief Minister Chiranjeevi Health Insurance Scheme (Mukhyamantri Chiranjeevi Swasthya Bima Yojana). The yearly medical coverage sum has also increased from Rs 5 lakh to Rs 10 lakh, with an additional accident cover worth Rs 5 lakh. Packages of this scheme includes five packages of cochlear implant, nine of bone marrow transplant, eight of liver transplant and seven of heart and kidney transplant. This would allow people to receive expensive treatment of such diseases free of cost.[20]

To keep encouraging people for organ donation, India's first 'Organ Donor Memorial' (Angdata Smarak) was inaugurated in Jaipur, Rajasthan by the Honourable Chief Minister of Rajasthan Mr. Ashok Gehlot on 27 November 2020 (National Organ Donation Day) through the efforts of Navjeevan-MFJCF (MOHAN Foundation – Jaipur Citizen Forum) with the theme of 'ek khamoshi-anekmuskaan, aaokarein angdaan'.[21,22]

This memorial is an epitome of love and compassion towards mankind and its design is inspired from the famous sculpture of Jaipur, the Jantar Mantar.

Despite of continuous efforts, in Rajasthan there is huge difference in demand and supply for organ transplant, As only 22 organs were transplanted in 2015, 35 in 2016 and 34 in 2017, which was declined to only 18 in 2020,[23] while 430 patients were on waiting list for kidney, 140 for liver, 44 for heart transplantation.[24]

In the Tamil Nadu, Organ transplantation is regulated by 'India's Transplantation of Human Organs Act, 1994' and is facilitated by the Transplant Authority of Tamil Nadu (TRANSTAN) of the Government of Tamil Nadu and several NGOs. Tamil Nadu made brain death certification mandatory in 2008, becoming the first Indian state to do so. Between 2008 and 2013, more than 2,000 transplants were recorded in Tamil Nadu, the highest in the country at the time.[15] The state of Tamil Nadu had the most deceased organ donations in the country until 2018. It ranks first in deceased organ donation rate at 1.8 pmp as of 2018,[25] which was seven times higher than the national average.[14] From 2016 to 2018, the state transplanted 4,938 organs from 887 donors.[6] By 2019, this number went up to 7,783 organs. The state suffered a dip in number of organ donations received in 2018, reportedly due to a controversy over preference given to foreign patients. Organ donations dropped from 185 in 2016 to 160 in 2017 and 140 in 2018.[26] In 2019, the state recorded 128 deceased donors.[27] In 2021, only 60 donors were registered and

378 transplantation surgeries were done,[28] which is declined form 128 organ donations in 2019 and 768 transplantation surgeries. In 2022, a wide waiting list was of 6,483 for kidney, 380 for liver, 43 for heart, 42 for lungs, 18 for heart and lungs, two for pancreas and 23 for hand.[29,30]

The Government of Andhra Pradesh has its own law to regulate organ donation in the state. The Andhra Pradesh Transplantation of Human Organs Act, 1995, was enacted by the government shortly after the central act.[10] The deceased donor program functions under the banner of 'Jeevandan' since January 2013 in the state.[11] In 2022, total 191 donors had donated their organs as compared to 162 in 2021, which was increased from 51 in 2014 (organ donation rate: 0.6 pmp)[31] but still as of June 2022, about 2,400 patients were on the waiting list with 1,688 patients requiring kidney transplantation alone.[32]

The Zonal Coordination Committee of Karnataka (ZCCK) is the government body that oversees the transplantation process in the state of Karnataka. Between 2007 and 2012, Karnataka has recorded 58 deceased organ donations only. However, there was a huge gap between the number of organs donated and the number of recipients waiting for a transplant.[33] In 2018, the state had registered only 90 organ donations and over 3,000 patients were waiting for organs in Karnataka and have registered with Jeevasarthakathe.[34] Subsequently, the pace picked up further, Jeevasarthakathe, the State Organ and Tissue Transplant Organization (SOTTO), which is the nodal agency that facilitates cadaver organ donations, recorded 105 cadaveric donations were facilitated through Jeevasarthakathe (wherein 511 organs and tissues were retrieved) in 2019. In 2020, only 35 donations were recorded (retrieving 167 organs and tissues) and in 2021, only 70 cadaveric donations and retrieval of 284 organs and tissues (including corneas and heart valves) were recorded while as of August 2021, there were 5,056 patients were listed for organs transplantation. Out of which, 3,756 patients require kidneys, and this was followed by 1,084 patients who need liver transplantation. There was a requirement for 113 heart transplants, 48 lung transplants and there were 22 patients who require both heart and lungs. In 2022, still the number of organ donations were very less as 151.[35] Although there has been a steady rise in the number of donations, the number of patients in need of organ transplantation in Karnataka is also increasing, as of July

2022, 5,542 patients are waiting for various single-organ transplants (including 4,304 for kidneys and 1,113 for liver), 66 are waiting for multi-organ transplants. The demand is high among patients with O blood group, out of the total 5,542 patients in the wait list of single organ requirement, as many as 2,265 and patients with O blood group. This is followed by those with B group with as many as 1,620 waiting for organs. The lowest requirement is among those with AB blood group with 345 enrolled with SOTTO (jeevasarthakathe).[36]

The Zonal Transplant Coordination Center (ZTCC) oversees organ transplantation activities in Maharashtra.[11] Between 2012 and 2014, the state recorded 116 organ transplants.[11] In 2018, 135 donations were recorded.[37] In Mumbai, 70 kidneys were donated and transplanted, 40 donors donated liver, 26 heart and 10 lungs were transplanted, 3 pancreas and intestine transplantation were done In 2022.[38] According to ZTCC, out of 2561 patients on waiting list for organ transplantation,[39] among them over 1,600 individuals are on the waiting list for kidney donation in the Pune region alone (Pune, Solapur, Satara, Kolhapur, Sangli, Karad, Nashik, Dhule, Jalgaon and Ahemad nagar), while around 700 are in the line for liver, 55 for heart and around 80 for multi visceral transplantation till may 2022.[40]

India is struggling from acute shortage of organs for transplantation. Though the number of transplants performed in India are steadily increasing, there is wide gap between need and availability of organs in India. The rate of organ donation is majorly affected by the knowledge, sociocultural views, and awareness about organ donation among various population groups in society. The major restrictions for organ donation among general population are lack of awareness about organ donation, various myths about donation of organs, sociocultural and religious concerns, denial towards the concepts of brain death and deceased organ donation, inability to know about the process, lack of knowledge about institutional structures, organizational support, and legal and ethical terms, which can be eliminated by appropriate education and counselling so that eventually goals for higher donation rates could be achieved. Since medical students are the ones who work in close proximity to the community, they are the one who are in direct contact with potential organ donors. By improving knowledge and awareness of medical students can enhance the odds of

positive effect of their counselling on potential donors and their families and can affect their accessibility and willingness to donate their organs.

According to a study conducted in Kerala among 194 final year MBBS students (third and fourth year), 61% of students were unaware that the "National Network for Organ Sharing" exists in their area, and 48.5 percent of students did not know how to register as an organ donor.[41]

Since medical students are the country's future doctors, and they are the first to form relationships with potential donor's families, their positive attitude and high level of knowledge will help to create a positive environment and encourage organ donation. The medical curriculum has also recently included formal education on the subject. Hence, this study aims to assess the knowledge and attitude towards organ donation among medical students; both undergraduate and postgraduate, as well as to identify the areas of missing knowledge and their possible associated factors, so as to recommend measures to improve upon those areas.

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