

## Past, Present and Future of Urology in Pakistan

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### Abstract

There is very little published literature on urologic diseases prior to 1947 from areas now constituting Pakistan. From inception of the country to 1970s, urology was part of surgery practiced by general surgeons except for two urology units established in 1960s. The real take off of urology began with introduction of transurethral resection of prostate (TURP) in 1980s, ushering the era of endourology; the second era of which began with ureteroscopy along with extracorporeal shockwave lithotripsy (ESWL) in 1987-1989, percutaneous nephrolithotomy in 1992 and introduction of percutaneous nephrostomy in 1997. Renal transplantation was started in 1979 from living-related donors and currently, there are 19 renal transplant centres. At present, there are 11 specialized kidney centers in the country. Urology has undergone marked metamorphosis during the new millennium. It has given rise to many sub-specialties. Over the past few decades, the classical surgical training has shifted towards adaptation of surgical simulation labs. We foresee more specialized urology centers and strengthening of sub-specialty practices in the country.

**Keywords:** Urology, endourology, transplantation, teaching and training, Pakistan.

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### Introduction

Urology is defined as the evaluation, therapy, prevention and rehabilitation of diseases, malformations and injuries of the male urogenital system and the female urinary system. It also includes metabolic and endocrine disorders related to these systems. A Urologist is the physician who takes care of all aspects of disease affecting the urinary tract in both sexes.<sup>1</sup>

Broadly speaking as a urologist, we have to perform three functions: To restore the continuity of the urinary tract, relieve the obstruction to save nephrons and must respect the male urethra. Pakistan is situated in South Asia extending from the Himalayas in the north to the Arabian Sea in the south with a population of about 207.8 million (2.8% of the total world population) as per 2017 population census.<sup>2</sup>

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The history of stone disease is as old as the human being itself. Vesical stones were found in Egyptian mummies approximately seven thousand years old. Circumcision, on the other hand, is one of the oldest urological procedures that was however, practiced by barbers, technicians and nursing assistants in around 90 – 95% of cases in Pakistan.<sup>3</sup> Oldest Urologic operations also included catheterization, dilatation and diagnostic uroscopy. On the other hand, most of the sexually transmitted diseases like gonorrhoea, syphilis and infertility and erectile dysfunction were treated by homeopaths, hakims and faith healers. In the old history books of urology, there is no mention about Pakistan because it was created in 1947. The only mentions dating back to the period can be found in papers published on stone disease during the British rule in the Sub-continent. This has made it difficult to trace the original contributions of the ancient pioneers of our own motherland. Archaeological excavations in Harappa (Punjab) and Mohen-Jo-Daro (Sindh) revealed ample evidence of urban culture, but there is no trace of famous urologists from Pakistan like Sushrita Samhita from the Indian sub-continent<sup>4</sup> and Hippocrates from the Greek civilization.<sup>5</sup>

The oldest paper on the causation of stone in India was published by Robert Mac Carrison in the British medical Journal in 1931. In this paper, he showed the highest incidence of stone disease in patients hailing from Dera Ghazi Khan, Sukkur and Hyderabad districts – now in Pakistan – in the entire subcontinent.<sup>6</sup> There is no other trace of any article on urologic disease prior to 1947 which shows that mainly Urology in this part was bladder calculus removed by cystolithotomy with ratio of bladder: renal calculi as 18.6: 1.<sup>7</sup> Removal of bladder calculus as an elective operation in Sindh shows that we worked in the older surgical specialty in early 20th century.

From creation of Pakistan to 1970s, urology was mainly considered as a part of General Surgery and was mainly performed on the general surgeons' operation lists, and comprised mostly of open surgeries for stones and prostate. Reconstructive Urology was mainly practiced by plastic Surgeons and consisted primarily of hypospadias, exostrophy, epispadias, phalloplasty and first rib insertion under penile skin as a treatment of erectile dysfunction (substitute for penile implants) (Personal communication).

There were two Urology units working from the late fifties to the early sixties in the country. One of them was in Civil

Hospital, Karachi, with the name of department of genitourinary surgery, which was headed by Prof. Sher Mohammad Shaikh, while the other was in King Edward Medical College Hospital, Lahore. The other units where Urology was being practiced was Liaquat National Hospital by Dr. Hussaini and Dr. Khalid Nizami and Dr. J. Talati in Holy Family Hospital, Karachi, and one urology unit was established in Rawalpindi Medical College Hospital in 1970s. Major Amin General Surgeon was performing Urology in Bahawalpur. In Peshawar, the urology unit was established in Lady Reading Hospital in 1976; later on, fresh Urology unit was established in Khyber Teaching Hospital, which was headed by Dr. Hazrat Bilal. Prof. Altaf Hussain Rathore writes in his memoirs that 25% of his surgery workload was urology, although he was a general and thoracic surgeon at Jinnah Postgraduate Medical Centre in Karachi.<sup>8</sup>

During the period of 1947–1970, urology mainly comprised of Catheterization, Urethral dilatation, Open Surgery for Stones and Open Prostatectomy. Cystoscopy was used by General surgeons in Karachi, especially by Prof. Col. Saeed Ahmed. The actual rise of Urology began with the introduction of Trans-urethral resection of Prostrate (T.U.R.P) in the country, which made a clear distinction between general surgeons and urologists in early 1980's. This was the beginning of endourology. Use of Cystoscopy, retrograde ureteropyelography and later use of trans urethral resection of bladder tumour (T.U.R.B.T/T.U.R.P) made the separation of Urology from its parent specialty of General Surgery. On the diagnostic side, X-Ray intravenous pyelogram (I.V.P) has been the mainstay in the diagnosis of urologic diseases since 1960s in the country. Ultrasonography was started in late 1975-1976 (personal communication).

From 1947 to 2000, there were five books written on specialty of Urology by Pakistani authors. The oldest one, 'Etiology of Urinary Calculi' (1966), was probably written before 1947 by Dr. Joshi. He collected data in 1939 from Hyderabad, Sindh, where he was posted as a surgeon. Dr. Joshi's data shows 115 cases of stones from Jharuk (Thatta) in 1932 and 164 similar cases from Sukkur during the year, 1939. The second and third books were written by Prof. Farrukh Ahmad Khan from Lahore on 'Calculus Renal Failure' in 1981 and Practical Guide to Urology in 1999. The fourth book, 'Manual of endoscopic urinary tract stone surgery in urology' was written by Dr. Munim Khan in 1997 and was revised in 2015, while the fifth one, 'Stone disease in Pakistan' was by Prof. Jamsheer Talati in 2012.

The real pioneers of modern Urology in Pakistan are, Prof. Syed Adibul Hasan Rizvi, Prof Syed Ali Anwar Naqvi, Prof. Farrukh Ahmed Khan, Prof. Fateh Khan Akhter, Prof. Hazrat

Bilal, Prof. Saidat Khan, Professor Khursheed Anwar, Prof. Ali Bux Jatoi, Prof. Sajjad Hussain, Prof. Noor Mohammad Baloch, Major General Arshad Mahmood, Prof Brig Mohammad Sadiq, Prof Rauf Iftikhar, Prof Masood Shaikh, Prof Jamsheer Talati, Prof. Afzal Farooqi and Prof. Saeed Akhter. The present younger generation of urologists were trained by the above mentioned professors of urology.

The second real era of modern endourology began with the introduction of percutaneous nephrostomy in the year, 1997, and ureteroscopy along with extracorporeal shockwave lithotripsy (E.S.W.L) in August, 1987 – 1989. In the year 1997, Percutaneous nephrolithotomy (PCNL) was started in Karachi<sup>9</sup> and in 1992 in Sadiqabad by Dr. Munim Khan, probably the first centre to start PCNL in the country. We must mention the name of Prof. Khursheed Anwar of Pakistan Institute of Medical Sciences (PIMS), Islamabad, being one of the pioneers of PCNL in Pakistan and an eminent medical educationist. Today, about 80-90% of stones are managed by E.S.W.L, P.C.N.L and Ureteroscopy (URS) in the country. Now PCNL is being done as a minimally invasive procedure for managing renal calculi at 21 urology units spread in tertiary care teaching hospitals in the country. ESWL centres are 25 in number, but in most of the centres, there is lack of interest because of newer machines with poor results, and lack of maintenance funds especially in public sector hospitals.

In 1998, Pakistan association of urologic surgeons (PAUS) was founded in a national meeting of urologists from all over Pakistan in Lahore. Prof. Farrukh Ahmed Khan was elected the first President and Prof. Riaz Tasneem as the general secretary. Now, there are 700 qualified members of the national association of urologists, some of them are working in overseas countries.

Renal Transplantation in Pakistan started in 1979 in Rawalpindi at Armed Forces Institute of Urology (AFIU) from living related donors and by the end of 1985, they had performed 100 renal transplants. 'The Transplantation of Human Tissues and Organs Ordinance 2007' was passed by the Government of Pakistan in November, 2007, in compliance with W.H.O and International Transplantation Society guidelines and findings. The 'Transplant Law 2010' was passed by Parliament and signed by President of Pakistan to enable ethical transplantation and to curb illegal trade of organs into the country. Now, there are approximately 18-19 centres in the country in public and private sectors where renal transplantation is being performed.<sup>10</sup> The largest public sector centre for renal transplantation is Sindh Institute of Urology and Transplantation (SIUT) – founded by Prof. S. A. H Rizvi in Karachi, where more than 6200 renal transplants have been performed after November 1986 inclusive of four cadaveric

kidney transplants harvested locally from Pakistan.

### Specialized Kidney and Urology Centres in the Country

- 1) Sindh Institute of Urology and Transplantation (SIUT), Karachi – was upgraded as an institute of Urology and Transplantation in 1991 through an act of the Sindh assembly. In 2009, it was granted an independent degree-awarding status by Higher Education Commission of Pakistan.
- 2) S.I.U.T Sukkur – a satellite centre of S.I.U.T, Karachi, was established in 2009 for treatment of urology and nephrology patients. In the near future, SIUT, Sukkur, new block will be ready with a 350 bedded hospital.
- 3) Balochistan Institute of Nephro-Urology, Quetta with 13 – 14 Urologists – was established in the year 2015. It is providing facilities for endourology such as PCNL, TURP, TURBT and URS, and open surgery for large renal tumours.
- 4) Institute of Kidney Diseases (IKDC), Peshawar – was established in 2007 under the leadership of Prof. Nasir Orakzai with his tremendous contributions in the field of research, practice and education in the specialty of Urology. IKDC was initially 3-bedded, which increased to 65 and now has 220 beds. There are currently 13 other Urology Units in Khyber Pukhtoonkhwa (KPK) province.
- 5) The Kidney Centre, Karachi: Provides Urology and nephrology services in private sectors.
- 6) Armed Forces Institute of Urology (A.F.I.U), Rawalpindi: Provides Urology, nephrology & transplantation facilities.
- 7) Pakistan Kidney and Liver Institute (P.K.L.I), Lahore was established by Government of Punjab under the leadership of Prof. Saeed Akhter, who is one of the main supporters of ethical transplantation programme in Pakistan.
- 8) Institute of Kidney Diseases, Multan
- 9) Rawalpindi Institute of Urology and Transplantation (R.I.U.T): yet to be started in the near future.
- 10) Tayab Urudgan Hospital (Urology+Nephrology), Muzaffar Garh; Punjab managed by Indus Hospital with the help of Punjab Government.

- 11) Benazir Institute of Urology and transplantation, Nawabshah, Sindh.

### Urology in New Millennium: 2000 – 2020

In Pakistan, there are around 700 qualified urologists for more than 207 million population. Presently, there are 58 Urology departments in the country for the treatment of Urologic diseases in public and private sectors. Renal transplantation centres in public and private sector are 18 – 19 in number. There are about 50 fellowship (FCPS) recognised centres by College of Physicians and Surgeons in the country. FCPS is 2 + 3 or 2 + 4 year programme and M.S Urology is a 5-year programme in most of the universities. There is Masters in Surgery (M.S) Urology programme at university level currently being held in 9 reputed universities in Pakistan including Karachi University, Ziauddin University, Liaquat University of Medical Health Sciences (Jamshoro) P.I.M.S and Shaheed Zulfiqar Bhutto University (Islamabad), S.I.U.T (Karachi), Punjab University of Health Sciences, People's University of Health Sciences (Nawabshah), Shaheed Mohtarma Benazir Bhutto University (Larkana). MS urology is an older degree than FCPS, was started in University of Punjab and University of Karachi in 1970s before FCPS urology was started in early 1990s by College of Physicians and Surgeons, Pakistan.

Urology has undergone a dramatic change during the new millennium. There have been sub-specialties in Urology like Paediatric Urology (3 centres including S.I.U.T in Karachi, and in Lahore and Peshawar), Renal Transplant Urology, EndoUrology, Reconstructive/Urodynamics Urology, Andrology and male Infertility, Uro-Oncology and female urology.

There are about 6 – 7 centres that are offering Laparoscopy in Urology and only one centre currently, S.I.U.T Karachi, where Robotic Surgery is being performed free of cost. Laparoscopic donor nephrectomy is performed in only one centre in public sector, that is, in S.I.U.T (Karachi).<sup>11</sup> A specialized stone clinic has been established for follow-up, metabolic workup and prevention programme of stone disease which is seen by urologists, nephrologists, radiologists, dieticians, laboratory unit and social workers in S.I.U.T (Karachi).<sup>12</sup>

Special Clinic for urethral reconstruction and functional urology have been opened in S.I.U.T, Karachi.<sup>13</sup> Female Urology (Uro-Gynaecology) programme as a sub-specialty is functioning in Aga Khan University Hospital, Karachi, Indus Hospital, Liaquat National Hospital Karachi, Shaheed Mohatarma Bhutto University Larkana, S.I.U.T, Karachi, People's University Nawabshah, L.U.M.H.S, Jamshoro, Koochi Goth medical centre, Malir, Karachi. There are a few centres

in Punjab where special clinics are run for female urology and V.V.F repair along with a VVF centre in Quetta, Balochistan.

In Endourology, T.U.R.P, T.U.R.B.T, PCNL, and URS is being done in almost all CPSP recognized teaching centres in urology in Pakistan. Male Infertility and andrology is not much practiced in public sector urology centres in the country. Testicular biopsy, vasography, varicocele ligation, archeopexy, hormone therapy for hypogonadism, Phosphodiesterase inhibitors, intracorporal injections for erectile dysfunction are in practice in some public sector hospitals. Penile Prosthesis and assisted reproductive technique (A.R.T) are not offered in public sector hospitals. These interventions are however, offered in private sectors in Karachi (Australian Concept Centre) and in Lahore (Fatima memorial hospital) where one-year fellowship programme is offered. To the best of our knowledge, there is no centre to offer transgender surgery for transgender males or transgender females in the country.

Lasers in prostatic surgery are in use in 1-2 units in Karachi and high-intensity focused ultrasound (HIFU) in 1-2 centers in the country.

### Present Urology Work Load

If we exclude catheterization and dilatation which are frequently done as common procedures in public sector hospitals, we might find that Stone disease constitutes 50% of Urologic workload in any tertiary care hospital. This includes ESWL, PCNL, URS and Open Surgery – but flexible Ureteroscopy and Laser fragmentation of upper tract stones is rarely performed in not more than few centres.

This is followed by Uro-Oncology (6.1%) which includes radical cystectomy, diversions, radical prostatectomy, partial nephrectomy, excision of retroperitoneal masses, adrenalectomy and TURBTs. Additional diagnostic cystoscopies +/- bladder biopsies are done in 8.5% of all urologic procedures. Laparoscopic radical nephrectomy is performed in few centres while robotic surgery is restricted to only one centre, S.I.U.T, Karachi. This is followed by Stricture Urethra which includes urethroplasty, Direct vision internal urethrotomy (D.V.I.U), lasers, meatotomy and Perineal urethrostomy. All stricture work constitutes 4.6% of Urology workload as of 2019 data.<sup>14</sup> Neurogenic bladders and small capacity bladders needing augmentation cystoplasty and Vesicovaginal fistula (V.V.F) repair constitutes around 1% of workload. Benign Prostatic Hyperplasia (B.P.H) work includes Transurethral resection of the prostate (TURP), Transurethral incision of the prostate (TUIP), Open Prostatectomy and robotic Prostatectomy in 3.6% of cases, and Urodynamic Studies (U.D.S) constituted 7.1% (Total 1119 cases) as a diagnostic procedure in adult

**Table-2:** Present Adult Urologic Disease Pattern in Pakistan (n=15,578) (Year 2019).

Disease	n (%)
Stone Disease	7809 (50)
Uro-Oncology	951 (6.1%)
B.P.H/ Prostatic disease	565 (3.6)
Stricture Urethra	731 (4.6)
Neurogenic Bladder	59 (0.37)
V.V.F	30 (0.19)
Congenital Anomalies: P.U.J.O, Hypospadias, Epispadias Extrophy Complex	105 (0.67)
Andrology/Infertility	51 (0.32)
Urogenital Trauma	118 (0.75)
Renal Transplantation	434 (2.78)
Urodynamic Studies U.D.S (Adults and Paediatric Patients)	1119
<b>Infections</b>	
Drainage of Renal Abscesses	88 (56)
Aspiration of Infected Cysts	50 (32)
Emphysematous Pyelonephritis	15 (0.09)
Fournier's Gangrene	24 (0.15)
Pyonephrosis/Obstructed Kidney who needed PCN	1931 (12.3)
Prostatic Abscess	3 (0.0190)
Gonococcal Urethritis/Prostatitis	53 (0.35)
Cystoscopies(Diagnostic/Biopsies)	1326 (8.5)
DJ Stents (Used for ESWL, Calculus, anuria and obstructed Kidneys)	1203 (7.7)
Circumcision (Adult) for Phimosis	7 (0.04)
Drainage of Haematoma	13 (0.08)
Penile Constricting Rings	3 (0.019)

Data acquired from operation theatre records of S.I.U.T, Karachi 2019.

VVF: Vesico vaginal fistula PUJO: Pelviureteric junction obstruction PCN: Percutaneous nephrostomy; ESWL: Extracorporeal shockwave lithotripsy.

and paediatric patients and pre-transplant patients with abnormal bladders. Congenital anomalies as Pelviureteric junction obstruction (P.U.J.O), ureteroceles, hypospadias, extrophy epispadias complex in 105 (0.65%) cases, Urologic trauma in 118 (0.75%), Andrology and male Infertility factor in 51 (0.3%), Urogenital Infections (Renal abscesses, Fournier's Gangrene, Prostate abscess, emphysematous Pyelonephritis, Infected and Obstructed Kidneys needing Percutaneous nephrostomy (PCN) in 1931 (12.3%) and Double J-stent (DJ) in 1203 (7.7%) and others as aforementioned in Table.

**Future of Urology:** We will look into the future according to the disease pattern which we have discussed in the previous section.

### Urolithiasis

If we review the Urology workload, we find that 50% of Urology comprises of Stone surgery. After PCNL & ESWL, Open Surgery has reduced to 8.8% of all cases. What we foresee in the future is the introduction of retrograde intrarenal surgery (R.I.R.S); using flexible ureteroscopy with laser fragmentation which will increase and will be a part of every tertiary care urology centre in Pakistan. Single use ureteroscopy and digital technology is likely to reduce operation time, improve vision and increase success rates.<sup>14</sup>

Moreover, the cost of flexible ureteroscopy will likely be reduced in the future and it will be a routine in the management of upper tract renal calculi. Although standard PCNL is being done in almost all urology centres in Pakistan, use of mini PCNL with sheath size less than 20 FR reported stone free rates in the range of 99% of renal stones measuring 1 – 2 cms in size. It is better than ESWL and cheaper in cost. Micro PCNL using 'All seeing needle'; and tract size of 4.5 FR and 200 micron laser fiber will further reduce the morbidity of large size tract in stones measuring 1 cm in size and concurrently, ESWL resistance.<sup>15</sup> Role of ESWL for management of stone disease is decreasing because of its cost and less efficacy than endourologic procedures. Same is being observed in Pakistan as most of the ESWL machines in Urology Centres in the public sector are out of order due to a high maintenance cost and lack of funds.

As stone disease is highly prevalent in Pakistan, we need to open new specialized 'Stone Clinics' in the future in every teaching Urology unit. This clinic should consist of urologists, nephrologists, dieticians and metabolic laboratory specialists equipped also with genetic analysis of Primary hyperoxaluria, cystinuria and urolithiasis. These clinics can play a pivotal role in the prevention of Urolithiasis in the country.<sup>12</sup>

**Uro-Oncology:** The second most common sub-specialty is Uro-Oncology. There are only a few centres in the country having this sub-specialty as a separate department. One such centre is in S.I.U.T, Karachi, which is equipped with Uro-Oncology Surgery, chemotherapy and radiotherapy with separate outpatient clinics and indoor admissions.

Another centre is Shaukat Khanum memorial cancer hospital and research centre, Lahore, where 2-year fellowship is also offered in Uro-oncology. In other centres, Uro-oncology is a part of general urology services, although tumour board meetings on Uro-Oncology are a regular feature in some centres like Aga Khan Hospital, Karachi. In the management of testicular cancers, the progress and survival has improved and mortality has decreased significantly. However, a lot needs to be done in the management of prostate cancer, renal cell carcinoma and bladder cancer, especially early diagnosis, use of minimally invasive surgery (Robotics and Laparoscopy) and use of multi-modality treatment in the form of targeted chemotherapy and radiotherapy. There is only one Robotic Surgery Centre in Pakistan – (S.I.U.T) – where more than 489 procedures have been performed for Uro-Oncology patients. Laparoscopy for Uro-oncology patients is performed in 4 – 5 centres in the country.

What we foresee in the future is more Laparoscopy for uro-

oncology patients and more robotic centres in the country performing more urologic procedures as radical prostatectomy, radical cystectomy and intracorporeal neobladders, radical and partial nephrectomy for renal cell carcinoma. Laparoscopic and robotic surgery will be part of F.C.PS and M.S (Urology) programmes' curriculum in the future.

**Reconstructive Urology and Urodynamics:** This is a highly specialized field of urology that restores both structure and function to the genitourinary tract. There are some fields that fall under the genitourinary reconstruction umbrella including urethral reconstructive surgery, neurogenic bladder, incontinence and surgery for extrophy, epispadias and other congenital anomalies.<sup>16</sup> There are a few centres in Pakistan that are dedicated for surgeries as urethral stricture, extrophy, epispadias complex and functional urology. Anti-incontinence surgery is mainly done in private sector and one or two centres in the public sector. Road traffic accidents are rising in Pakistan and so are traumatic urethral strictures. Results of Urethroplasty are improving with the rise in the volume of cases,<sup>16</sup> so there is a need to open new urethral reconstructive centres and functional urology clinics and centres to improve the outcomes. There is also a need to start a 1-year fellowship programme in Reconstructive Urology and Urodynamics in the country after doing FCPS or MS degree on the pattern of Genitourinary reconstructive surgery (G.U.R.S), USA.<sup>15</sup> Although artificial bladders and urethra using regenerative medicine in urology seem to be far away from clinical practice in near future in Pakistan, but use of Laparoscopy and Robotic Surgery in V.V.F repair and augmentation cystoplasty with Mitrofanoff are likely to be used in the near future.

**Andrology and Male Infertility:** Approximately 15% of couples are affected by infertility. Male infertility factor accounts for up to 50% of all infertility cases; hence, the demand for male fertility services have increased. In public sector hospitals, very little facilities are available in this subspecialty. It includes medical therapy as well as Intracorporeal injections (I.C.I) for erectile dysfunction (ED), but facility for penile implants for E.D are not available except at few centres in the private sector. Phalloplasty is mainly done by plastic surgeons in 1 – 2 centres in the country but none to the best of our knowledge not by urologists. One such centre is currently in Shifa International Hospital, Islamabad.

There is a large number of population that needs treatment regarding erectile dysfunction surgery for male infertility. It is likely that facilities will be available in the near future and some centres may make a 1-year fellowship programme to train the young urologists in this field.

Hopefully, more urology centres will integrate reproductive urologists within fertility centres in collaboration with gynaecologists and reproductive endocrinologists. It is also hoped that erectile dysfunction will be recognized as a disease in the near future and patients will be offered free treatment in public sector urology centres. To the best of our knowledge, there is no centre offering surgery for male and female transgender surgery in the country. Nevertheless, there is a need for it.

### **Renal Transplant and Vascular Access for Haemodialysis**

A total of 6,202 renal transplants have been done in S.I.U.T since 1986. As end stage renal disease is caused by urologic diseases, approximately 10% is the result of stone disease<sup>17</sup> and 40% of cases in children are due to structural anomalies. In Pakistan, renal transplantation is done by urologists in collaboration with nephrology units that are attached with Urology units. Therefore, it is important to train our urologists in renal transplant programmes as a part of fellowship or masters, so that they can deal with surgical complications of renal transplantation, if needed. As most of the dialysis units are attached with urology, there is a need for training in dialysis-related angioaccess so that patients can be managed safely and properly. What we can see in the future is an increase in transplant activity in Pakistan with the use of Laparoscopic donor nephrectomy in live related programmes and deceased organ donation programmes yet to take off. There is a need for starting specialized fellowship programmes in renal transplantation, dialysis angioaccess and laparoscopic donor nephrectomy, and dealing with surgical complications with minimally invasive surgical methods. S.I.U.T is currently one centre that has been recognized by C.P.S.P in this field.

### **Uro-Radiology**

Urologic imaging at present is dominated by plain X-Ray KUB, I.V.P, C.T Scan and ultrasound but it is likely to see a rise in the use of Magnetic Resonance Imaging (M.R.I) and more ultrasound in the future. Multi-parametric M.R.I and the 3-Tesla M.R.I allow better spatial resolution and it increased signal-noise ratio enables better detection, localization and staging of prostate cancer. The development of M.R.I – U.S Fusion prostate biopsies also hold potential. The anatomic visualization using M.R.I. allows better targeting of biopsies.<sup>16</sup> Percutaneous nephrostomy, renal biopsies, PCNL tract formation and placement of drain under ultrasound guidance, Transrectal ultrasound (TRUS) guided prostate biopsies will also increase the role of interventional radiologists in urology. Use of ultrasound urethrogram is increasing for diagnosis of anterior urethral strictures and diagnosis of

spongiofibrosis. So, there is a need for development of this sub-specialty within urology in the near future and also Uro-radiology will be made a part of all urology units in the country.

### **Paediatric Urology**

There are only three paediatric urology centres in the country (Karachi, Lahore and Peshawar). In the rest of the country, Paediatric Urology patients are being treated by adult urologists or paediatric surgeons as a whole. What we see in the near future is the ability to diagnose antenatal congenital anomalies by gynaecologists and ultrasonologists with referrals to Paediatric Urology units. We also anticipate the opening of new Paediatric Urology centres and the start of fellowship programmes in this field. We see more progress in the genetic basis of disease diagnosis, progress in reconstructive urology for complex diseases like extrophy epispadias complex (E.E.C) and increase in mini and micro Perc and flexible ureteroscopy and laser for stone disease in children as it constitutes 60% of urology workload in Pakistan.<sup>18</sup> A dedicated hospital for paediatric urology, nephrology and transplantation is in the process of completion at S.I.U.T, Karachi. This will facilitate better care for these children in the near future. Hopefully, this new hospital in Karachi will open new avenues for global co-operations in Paediatric Urology in Pakistan.<sup>19</sup>

**Academic Urology and Research:** This is not a well-developed sub-specialty in Pakistan, most of the urologists do not seek academic and research programmes because of their busy schedules in clinical practice and no financial benefits. There is a need to conduct population-based epidemiologic studies on prevalence, incidence, and prevention of stone disease, urologic oncology, congenital anomalies, reconstructive urology etc. There is no urology journal in Pakistan that can provide a platform for publications for young urologists, in this regard, Pakistan association of urologic surgeons (P.A.U.S) can play an important role in this regard.

### **Organizational Issues**

One of the most important features in the new millennium (2000 – 2020) is the large influx of urology patients in tertiary care centres for medical and diagnostic workup. In one large urology, nephrology and transplant centre in Karachi (SIUT), around 3 million patients visited for diagnostic, medical, urologic, nephrologic and transplant care in one year (Personal Communication). This is because primary care centres are not well-equipped with physicians, surgeons and diagnostics in the country. So, if we appoint consultant urologist for diagnostic and medical purposes in primary care centres, then we might be able to conserve more time for Urology surgeons to perform complex

surgeries in tertiary care centres.

In Pakistan, there are more female doctors graduating from state owned medical colleges with the ratio of 80% females and 20% males. This has resulted in shortage of male urologists. We should encourage female doctors to pursue their careers as urologists by making conducive atmosphere and more security as well as more facilities for female residents<sup>20</sup> as there is almost equal ratio of females to males in Pakistani population.

During the COVID-19 pandemic in Pakistan, we also witnessed that most of the scientific meetings were held online through webinars, thanks to the internet. This will probably be the 'new normal' and will replace physical urology conferences in the near future. This practice will also be made mandatory for doctors to learn about information technology as a part of their training. There has been some increase in online consultation between doctors and their patients. The negative side, however, of this will be decrease in patient and doctor relationships. Rise in knowledge provided by information technology to the patients will increase the likelihood of medicolegal cases against doctors if any negligence occurs. We can counter this problem by good counselling skills, complete documentation by doctors and insurance of medical practitioners in the future. Ethical medical practices and good knowledge of urologic procedures are other factors which can help overcoming these issues.

### **Urological Training and Education**

The classical surgical training follows the apprenticeship model as described by the Halstead model at John Hopkins Hospital in 1904. It consists of "See one, do one, and teach one". This needed long working hours and staying in wards, attending emergencies, wards and O.R based training by supervisors and mentors.<sup>21</sup> However, over the past few decades, there is a rise in minimally invasive surgery and concurrent rise in medicolegal concerns and patient safety, there is shift toward adaptation of surgical simulation labs.<sup>22</sup> There are around 3-4 skill labs in tertiary care centres in Pakistan which are offering training in endourology and dry labs in training basic laparoscopy in urology. But, in vast majority of urology centres, training is being given in operation rooms on real patients. We expect to see more such skill labs for training and also training in classical ways to retain open surgical skills in stone disease for large staghorn renal calculi, large renal tumours and difficult nephrectomies for large pyonephrotic kidneys, adult polycystic kidneys, urological trauma and renal transplantation.

In view of above facts, we can see a paradigm shift in training and teaching in urology from old Halstead model

to simulations to dry and wet lab based training. We foresee an increasing number of urologic consultants and shifting simple urologic operations to primary care setting rather than large tertiary care hospitals.<sup>23</sup>

### **Future of Urology in Pakistan**

The future of urology is exciting and more technology will be acquired in Pakistan like minimally invasive surgery will rise in the future for stone disease and uro-oncology in the form of Laparoscopy and robotics, retrograde intrarenal surgery and lasers for stone, prostate or stricture urethra.<sup>11,24</sup>

The number of urology patients is increasing and will increase more in future. We need to increase the number of tertiary care centres in the future in Pakistan in public sector because private sector treatment is expensive and beyond the reach of 80% of disfranchised population. We feel that S.I.U.T. model will be replicated in the form of a beacon for free healthcare in Pakistan<sup>25</sup> and we should also train more consultants for rural areas at each district level hospital so that patients can be provided urology facility at their doorstep.

There is shortage of organs for transplantation due to discrepancy in the supply and demand and no commercial kidney transplant could be done after passage of transplant law in 2010 by National Assembly of Pakistan. There is a need to open more ICUs and trauma centers in the country and appointment of transplant coordinators in ICUs. The government, PAUS and transplant coordinators can play a vital role in promoting the cause of deceased organ donation. This will open new avenues not only for renal transplantation but also transplantation of other organs, as has been seen in Ukraine and Spain.<sup>26</sup>

As medical urology is becoming a new emerging subspecialty in urology, we expect more medical treatment options for incontinence, lower urinary tract symptoms, erectile dysfunction, stone prevention and targeted therapy in uro-oncology in future in Pakistan. We need to introduce medical urology as a new subspecialty inside Urology.

There is expected to be a rise in computer-based technology to transmit new ideas and research within Urology, as has been witnessed during COVID-19 pandemic.<sup>27</sup> Adaptation of telehealth and computer-based technology during this period is likely to change our practice in future. There are also chances that COVID-19 can hamper the urology practice in future. Throughout history, crises have forced improvements that have ultimately improved society.

The increasing role of PAUS in teaching, training and

medical education in the near future with more global co-operation through webinars and telehealth programmes must be stressed and also many females in urology will affect our future practices in Pakistan and we expect more specialised centres for 'Female Urology' and functional urology clinics run by female urologists in the near future.

## Conclusion

To the best of our knowledge, this is the first article on this topic and this will help young urologists in the future who will be interested in writing on this subject. Some facts and information may have been missed by the author because of non-availability of data in literature.

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