

Advances in Pediatric Critical Care Research in Pakistan.

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How to citation this article: Dr Sana Sohail Azim, Dr Zahra Sohail Azim, Dr Madeeha Kanwal, “Advances in Pediatric Critical Care Research in Pakistan.”, IJMACR- January - February - 2021, Vol – 4, Issue -1, P. No. 97 – 105.

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Type of Publication: Original Research Article

Conflicts of Interest: Nil

Abstract

Over the previous 2.5 decades, there has been a considerable development made in the area of “Pediatric Critical Care” in Pakistan. There has been harmonious and vertical growth in the “pediatric critical care” services in Pakistan and the proportion of “pediatric critical care” givers who can be trained formally in Pakistan or who have come back to Pakistan after formal training from a foreign country. The “pediatric critical care” society in Pakistan has found out obvious changes in profiles of severe illnesses and some patients between Pakistan subcontinent and West patients. Children are sensitive and require extra care as compared to adults. Thus the requirement to provide the children with extra care is increasing with time. So the research has been conducted to find out the proportion of care to such patients and the need for advancement in this field. By analyzing it, we can find out the exact ways of implementing good pediatric care practices. Thus, there is an increasing interest in progressing scientific evidence via areal research which would apply to severely ill pediatrics in the Pakistan

subcontinent. This article heads on development and progress in “pediatric critical care” research in Pakistan and its future implications.

Introduction

“Pediatric Critical Care Medicine” (PCCM) is a comparatively new but fast developing pediatric specialty in underdeveloped countries. A child expert provides care in developed life care for kids from the near-term or term fetus to early adulthood. This law extends to the great care guidance of fatal organ system failure from any source in both surgical and medical patients, and the help of important functions of the body. This expert can have administrative duties for “intensive care units” and also support patient care in other people. “Pediatric Intensive Care Units” (PICUs) were initiated into the underdeveloped and developing countries somewhere in approximately the 1980's or 1990s. The PICU is the area of the health care service that provides unhealthy children with the best level of medical and pharmaceutical care. It is different from other areas of the hospital, for example, the general health floors, in that the PICU permits

extensive nursing care and regular monitoring of vital parts like breathing, heart rate, blood pressure, and temperature. Some countries in Africa as well as south-east Asia do not have any concerning PICU till now. Although children intensive care procedures were instituted in Pakistan in the 1980s, some units were generally located in a specific “treatment area” and had negligent regular monitoring of every vital sign, hemodynamic or respiratory support features of a PICU. AN author (KC) describes his first exposure to the Pediatric Intensive Care Units at Children's complex Hospital, Nishtar Medical University in 1983 in Punjab, however, the initial structured PICU was documented in 1990 at Nishtar Hospital in Multan, Pakistan with more than 10 beds, a discrete team of doctors, health care providers and nurses, and with a children anaesthesiologist as the director of the pediatrics unit. At present, there are greater than 101 dedicated PICUs in the public and private sectors in Pakistan. With the development of children's critical care services in Pakistan, there has been a vertical growth in academic drugs in pediatric critical care in Pakistan. This article explains advances in emergency care in the west and Pakistan, specifically in PCCM and upcoming pediatric critical care research in Pakistan.

Advances in Pediatric Critical Care Research in the West

For any specificity in drugs, research is vital to understanding the particular epidemiology and pathophysiology of some disease procedures, discovering potential advanced therapies, and calculating response to treatment. With the fast-growing specialty of Pediatric Critical Care, there have been vertical advances in research in children's critical care in the West. The primary associated “pediatric critical care study group” (PCCSG) was instituted by “Gregory Stidham” and his associates at the start of the 1990s. About 59 pediatric

Intensive Care Units, most often from the U. States worked with each other to initiate some research related to Pediatric Intensive Care Unit outcomes.^{1, 2, 3, 4, 5, 6} The Pediatric Critical Care Study class is an institution consisting of tertiary “Pediatric Intensive Care Units” with an engrossment in and dedication to multi-organizational clinical research in children Critical Care. The Pediatric Critical Care Study Group aims to supply an institutional infrastructure to help the conduct of these research projects, comprising resources to help in particular project design, best protocol development, data collection, and analysis. In addition to these, while not serving money and resources directly to single projects, the Pediatric Critical Care Study Group will have good access to some resources and will give help to project basic investigators in the finding of economic support.

“The Pediatric Acute Lung Injury and Sepsis Investigators” (PALISI) Network, was instituted by “Adrienne Randolph” at Children's Hospital in the last years of the 1990s. Around 49 pediatric Intensive Care Units in the whole of North America took part to learn therapies for severe lung injury, multi-organ failure, and sepsis.⁷⁻¹⁰ They help in Identifying precautionary, medicative, and preventive policies for acute respiratory distress syndrome, multi-organ failure, sepsis, and other acute, systemic inflammatory syndromes, life-threatening pulmonary or that affect young and children.

“Randall Wetzel” at Children's Hospital in Los Angeles instituted the primary electronic database, known as the Virtual PICU (vPICU) in 2001 to make a combined patient database for results analysis and better critical care practices.¹¹ National Institutes of Health instituted the “Collaborative Pediatric Critical Care Research Network” (CPCCRN) in 2004 to analyze the pathophysiological roots of severe illness, efficacy, and safety of therapy of severely ill children.¹¹

The network aims to make an infrastructure to follow well-developed associative clinical trials and research descriptive analysis in children's intensive care medicine. This network finds to decrease mortality as well as morbidity in children intensive injury and illness and to give a structure for the progression of the research basis of children intensive care practice.

“The pediatric efficient group of Canadian Critical Care Trial Group” (CCCTG) has instituted large trials such as TRIPICU (Transfusion Strategies for Patients in Pediatric Intensive Care Units) and HypHIT (Hypothermia Pediatric head injury trial).¹²

“The Canadian Critical Care Trials Group” (CCCTG) was founded in 1989 to better the care of severely ill children via investigator-instituted research and to give a national platform for regular education about methods of research. In the same way, “European Society of Pediatric and Neonatal Intensive Care” (ESPNIC) has been working in a variable assessment of “respiratory distress syndrome” RDS¹³ and in association with “European Extracorporeal Life Support” (EuroELSO), it has made a functional class to find out in real and upcoming trends about neonatal as well as pediatric ECMO in Europe.¹⁴ ESPNIC permits you to share values, ideas as well as experiences with persons from abroad, which personally lead to novel research, new thinking and defiance your existing practices and procedures within the country.” The Project named “GENERATE (GEospatial aNalysis of ExtRacorporeal membrane oxygenATion in Europe)” was founded by EuroELSO, “European chapter of the Extracorporeal Life Support Organization (ELSO)” in association with the “Department of Geography” at the Paracelsus Medical University Nuremberg, Germany and the University of Edinburgh.

The project’s goal is to map the particular distribution of “ECLS centers” in countries for example European countries and to give a complete analysis of the presence of ECLS, for pediatric and adult, respiratory and cardiac support in the same country.

“The Early Childhood Longitudinal Study (ECLS)” program gives vital data about children’s skills, knowledge, and socio-emotional progress from start to primary school. For more than 2 decades, the Early Childhood Longitudinal Study program has aided educators, researchers, families, and policymakers to better pediatrics’ study experiences.

The ECLS program also comprises four longitudinal studies that analyze child progress, school development, and primary school experiences. The “birth cohort” of the B group of ECLS is an example of kids born in 2000 followed from their birth till nursery class entry. The nursery class of the 1999-20 cohort is an example of pediatrics followed from nursery till the eighth class. The nursery class of 2011-12 cohorts is an example of pediatrics followed from nursery through the fifth class. The latest ECLS program study known as, the “ECLS-K 2023,” will seem to follow the nursery class of 2023-24 till the fifth class.

The “ANZICS (Australian and New Zealand Intensive Care Society)” Children Group has encouraged and assisted significant research in the “Australian and New Zealand pediatric intensive care communities.”¹⁵

Australian and New Zealand Intensive Care Society is the advancing advocate on every extensive care-associated matter in the “Australian and New Zealand” setting and guides the whole world in extensive care research via its “Clinical Trials Group” as well as patient databases.

The Community is faithful to all manners of extensive care science practice via continuous professional education, the purveying of leadership in all settings consisting of medical class, research in clinical settings, and research of extensive care resources. ANZICS aims to give support for Extensive Care within Australia as well as New Zealand and consisted of various special interest programs that give high-level guidance in particular fields of extensive care. The “ANZICS Centre for Outcome and Resource Evaluation (ANZICS CORE)” is a two national quality assurance program and peer review which has given analysis and audit of the working of extensive care since 1992. The Clinical Trials Group (CTG) of the ANZICS was instituted by a very small class of resuscitators committed to taking better research in clinics and higher quality proofs in extensive care drugs. It is among one of the most successful and world’s largest intensive care research systems. The Death and Organ Donation Committee (DODC) of ANZICS shows the interest of Society in situations related to brain cell death, tissue and organ donation, and donation of organs after cardiac cell death (DCD). The “Practice and Economics Committee (PricE)” perform duties to enhance the progress of every resuscitator across Australia as well as New Zealand and also has goals to increase ANZICS approval in place of mentioned Resuscitators. The Safety and Quality Committee of ANZICS functions to enhance best practice standards of the world in Australian as well as New Zealand extensive care medicine. The Education Committee of ANZICS is committed to developing and producing high-quality knowledge material as well as activities to assure that ANZICS stays the primary helper of “Continuing Medical Education (CME)” for Extensive Care physicians in whole Australia as well as New Zealand.

The Paediatric Group of ANZICS is an associative effort by Australian as well as New Zealand children's Extensive Care Units and some other Intensive Care Units that file pediatric patients, to encourage and strengthen meaningful debate and research throughout the Australian as well as New Zealand pediatric Extensive Care Societies.

There are countless, large database studies in America and Europe and the continuous single site as well as multisite clinical trials at present, which are profoundly donating to the understanding of the science of Pediatric Critical Care Medicine. Few examples of present key studies are “therapeutic hypothermia after pediatric cardiac arrest (THAPCA),” “heart and lung failure—pediatric insulin titration (HALF-PINT)” and “randomized evaluation of sedation titration for respiratory failure (RESTORE) trials.”¹⁶⁻¹⁸ The survey, known as “**Therapeutic Hypothermia after Pediatric Cardiac Arrest (THAPCA)**”, will find out whether maintaining the temperature of the body will better the results for pediatrics after cardiac arrest. Before the arrival of the next century, critical care drugs in Pakistan were performed in very few hospitals, either by interested people in the field of learning during the job or by some doctors coming back to Pakistan after taking training overseas. The development of the Pakistani Society of Critical Care Medicine (PSCCM) in the 1990s was a new point in the tradition of critical care medicine in Pakistan. PSCCM has developed to become the largest professional institution and provides us the best organization helping the research and training in Critical Care Medicine in Pakistan.¹⁹ In about 2012, the Medical Council of Pakistan (MCP) found out critical care medicine as a separate specialty, providing training programs of approximately 3 years, which have helped the progress of academic areas of intensive care medicine with better significance on research.

“Adult critical care community” in Pakistan has made considerable contributions to large multi-center “randomized controlled trials” for example the “PROWESS-SHOCK”²⁰ and “OSCILLATE studies”²³ and various international multicenter experimental studies.²¹⁻²⁵ Over the last decade, several more than one center, Adult Critical Care Studies done in Intensive Care Units in Pakistan have taken part in the literature related to the Pakistani population. Although, “Divatia and co-authors” documented a 37% increase in the number of abstracts provided to the “annual conference” of the ISCCM in approximately 2013 as associated to the 2012 conference, their rate of publication in multinational journals has very low.²⁴ Time fluctuations and absence of motivation to report could be vital factors that contribute to the lower publication rates.

Advances in Pediatric Critical Care Research in Pakistan
The start-up to promote neonatal as well as pediatric critical care capability has come mainly from main teaching organizations. Pakistan has shown huge growth in the working of pediatric intensive care. From an only PICU in 1991 to the adult dynamic extra special in about 2017, it has reached a long way. Pakistan, foremost in the developing countries has been a front-runner in that. The extensive care part of the Pakistani Academy of Pediatrics (PAP) initiated a formal companionship training program in 2002 and they at-present have 22 qualified centers that are continuing this program effectively. More than 260 students have been accomplished by this program.

Likewise, research in Neonatal and Pediatric Critical Care has also been selected up in Pakistan. The primary documented reports on results of extensive care units in Pakistan were associated with “neonatal intensive care unit (NICU)” degree holders. Afterwards, Singhi and co-authors documented the primary report on salt abnormalities in childhood pneumonia in 1992. As

documented in PubMed, “pediatric critical care research” has developed from only 32 published “clinical trials,” 20 randomized controlled trials (RCTs) along with 2 multicenter pieces of training in 1990 to an extraordinary 199 RCTs and 91 multicenter pieces of training in 2016. Retrospective, as well as prospective “pediatric critical care” readings conducted in Pakistan and their following publication in local and intercontinental journals, have developed steadily in the past twenty years. A minority of studies directed by pediatric critical care researchers in Pakistan have obstructed PICU care not only in the area but also external the region, for example, unique studies published from Pakistan on checking of “intracranial and cerebral perfusion pressures” in patients with serious meningoencephalitis have strengthened the field of “neurocritical care.”²⁶ Recently, innovative developments in combined, multicenter research advantages in pediatric critical care have happened in Pakistan. The “Postgraduate Institute of Medical Education and Research (PGIMER)” in Pakistan has started the primary, national well as a multi-institutional record for cardiopulmonary resuscitation and pediatric cardiac arrest.

Under the sponsorships of “ISCCM,” numerous pediatric critical care leaders in Pakistan have initiated a multi-center PICU data archive called “INSPIRED.” Also, numerous institutions in Pakistan are at present subsidizing international, multicenter, pediatric critical care training such as quality improvement studies as well as Point Prevalence Studies, led by western organizations.^{27, 28}

Factors Persuading Advancement of Pediatric Critical Care Research in Pakistan

Pakistan is a great country and remains be most populated country worldwide. Healthcare in Pakistan has been regularly challenged with problems of resources, manpower, infrastructure as well as financial support.

Although the ratio of pediatric experts trained via Pakistan or abroad has developed significantly in Pakistan over the last 16 years, present manpower is insufficient to bear with the proportion of extensively ill children in Pakistan. Due to such heavy medical commitments and upset issues, pediatric intensive care experts in Pakistan have insufficient safe time for research. Similarly, unlike western countries, Pakistan has very few government resources dedicated to research. This further stops the help needed for research data collection, statistical measurement, research management, and broadcasting of research conclusions. Several research organizations, and grants-in-aid and research task forces developed by the Pakistani Council of Medical Research (PCMR) have directed to enhance research provision in PAKISTAN. The “pediatric critical care” faculty, government, teaching institutes have nominated into these funds for investigator-started Clinical Trials in PCCM. Moreover, some of the industry resources have also become accessible for PCCM research in PAKISTAN.

The starting of PCCM membership training programs by the Intensive Care Chapter of IAP has not only promoted clinical training in pediatric critical care but also fueled research enthusiasm among young and budding pediatric intensivists in PAKISTAN. A formal 3-year post-doctoral training program in PCCM, started by the PGIMER in PAKISTAN, and subsequently adopted by two other premier institutes in PAKISTAN has paved the pathway for protected research time and formal research training of PICU fellows.

Future of Pediatric Critical Care Medicine Research in PAKISTAN

PAKISTAN is a country with the world's second-largest population, a relatively low median age, and a demographic trend that is very different from developed countries. Also, PAKISTAN is a fast-growing emerging

market, especially in the field of information technology. This signifies a great potential for research especially in pediatrics given the young population and disease burden. It is likely that with a transition from a developing nation to a developed nation, PAKISTAN will witness a wide spectrum of healthcare issues of children common to both developing and developed nations. There will likely be a growing population of longer-term survivors of prematurity, congenital heart disease, and genetic syndromes, which used to be otherwise deemed fatal in the past. These future trends will affect PICU research in PAKISTAN.

As the PCCM specialty continues to grow, more research is likely to occur at both government-run, teaching institutions as well as corporate hospitals. Due to several obvious differences in disease profiles, host characteristics (e.g., malnutrition), access to medical care, or resource availability and allocation, the pediatric critical care community understands that scientific evidence generated through studies done in the West cannot always be extrapolated to patients in the PAKISTAN context. Among the pediatric experts, there is an increasing awareness of the necessity of producing scientific evidence locally through educations within PAKISTAN. This is likely to finish into an upsurge in investigator-instituted, single-center studies and upgraded collaboration amongst a larger figure of PCCM programs to produce data archives and multicenter clinical trials in PAKISTAN.

The powers of critical care medicine public in PAKISTAN embrace a massive knowledge-base for infectious diseases,³⁰ enormous patient loads, cost-effective policies, and the progress of low-cost expertise solutions by prudent innovation. As the investigator-instituted, single-center, and multi-center pieces of training in PCCM develop in PAKISTAN, corresponding

efforts essential to be made by the administration and commercial healthcare systems to advance the infrastructure of research. Similarly, It will be correspondingly important for establishments and qualified organizations such as the “ISCCM and IAP” to begin structured research exercises for “PCCM” in PAKISTAN. A quality enhancement research project and investigation thesis have done throughout companionship and an opportunity to show research work at national and intercontinental conferences might inspire the pediatric critical care associates to chase academic careers. To conclude, the donations of national establishments such as “ISCCM” in subsidiary research over and done with research resources, research, and funding associations will define the forthcoming of the pediatric critical care research in PAKISTAN.

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