Using School-based Tele Consultation Services (TCS) to Make Community Health Services Accessible in Semi-Rural Settings of Pakistan: Mixed Method Study

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Abstract

Background: Remote areas of Pakistan do not have access to quality healthcare and experienced healthcare professionals within their communities. Telehealth increases the accessibility of healthcare services, using innovative solutions such as teleconsultation and school settings can be utilized as a powerful healthcare platform.

Objective: This study aims to explore the effectiveness of introducing school-based Tele-Consultation Services (TCS) in strengthening community health in a semi-rural area of Karachi, Pakistan

Methods: This study employed a mixed-method design to address the objectives. The total number of students who were enrolled for the quantitative component was 393 while 35 parents, teachers, and stakeholders of the community participated in the qualitative arm (focused group discussion) study. Proportional computation was done for the quantitative data using SPSS version 24, while qualitative data underwent thematic analysis guided by Creswell 2013.

Results: A total of 1046 successful teleconsultations were provided over 28 months, Only 1.24% (13) cases required referrals. The qualitative analysis yielded three themes.
i) transformation of the healthcare experience, ii) escalating demands for teleconsultation, and iii) the psychological aspect of care.

Conclusions: This study shows that TCS has made healthcare services strong and accessible to the community and has effectively addressed a significant number of health issues of children at the government school in semi-rural Karachi, Pakistan TCS is an effective solution to provide healthcare services to school-going children in remote low-resourced communities with nurses being primary care providers. This model school approach can be utilized to enhance the accessibility of healthcare services to a larger scale addressing health issues to minimize morbidity and the overall burden on the healthcare system of the country in the longer run.

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Using School-based Tele Consultation Services (TCS) to Make Community Health Services Accessible in Semi-Rural Settings of Pakistan: Mixed Method Study.

Introduction:

Healthcare inaccessibility remains a persistent concern in developing regions, even in the 21st century [1,2]. Pakistan is one of the countries in Asia where remote areas lack access to experienced health professionals who could provide quality healthcare services and information [3]. The lack of quality healthcare compels people from remote areas to seek help from unqualified practitioners [4] which can lead to further complications. Firstly, there is an unavailability of safe and quality healthcare services in remote urban and rural areas as physicians and nursing cadres are unwilling to live in these areas due to poor health facilities and limited lucrative opportunities. Secondly, since patients live at considerable distances from major cities, they spend excessive amounts of money to reach hospitals and clinics for both serious and non-serious ailments [1,2,3,4]. Also, in many cases, a male family member skips work to take someone for medical consultation, hence losing that day's earnings. Lastly, the lack of an organized public healthcare system in Pakistan puts the entire burden on the few available public hospitals [1-5]. The global community has committed to certain benchmarks, formerly as Millennium Development Goals (MDGs) and recently as Sustainable Development Goals (SDGs), for eradicating poverty, protecting the environment, empowering communities, and ensuring healthy lives and well-being for all ages. To meet the SDG goals, it is critical to provide healthcare services and information to people in their own communities. Digital Health can play a major role in supporting conventional health services to fulfill this demand in distant semi-urban and rural areas of Pakistan.

Digital Health is a rapidly growing field, and the adoption of telehealth services is becoming increasingly common [1,6]. While Digital Health is widely used in developed countries, it is not readily available to the masses in Pakistan. It is a convenient and helpful service that can help reach more secluded areas of Pakistan. Its wider adoption would benefit society by allowing access to healthcare regardless of distance and economic status. Digital Health solves logistical barriers, supports weak health systems, and helps establish worldwide networks of healthcare professionals [6].

Digital health is defined as “the cost-effective and secure use of Information and Communication Technology (ICT) to support health and health-related fields, including healthcare services, health surveillance, health literature, health knowledge, and research” [7]. It has emerged as an important source for enhancing access to health and information, and improving response time to matters impacting personal or community health [8]. Digital Health enhances the delivery of healthcare services where treatment cost and distance are critical factors [8]. Considering digital health solutions, telehealth through Tele Consultation Services (TCS) is a viable option for making healthcare accessible [9]. The current study was undertaken to bring healthcare services to the community's doorstep and address the health needs of school-aged children through TCS in a poor semi-urban settlement in Karachi, Pakistan. This project was tied with the school health program at a local government school using a nurse-led model to facilitate teleconsultation of school children with

a physician available virtually.

Developing a teleconsultation service as a school health program was an innovative idea to make healthcare accessible to people living in far-flung semi-urban communities where healthcare facilities are not easily available. [10] The school health program became the first step to explore the feasibility of bringing healthcare to such communities through TCS [10]. The uniqueness of this project was that the selected school, which was initially nonfunctional, was adapted to convert it into a model educational institution where education and school health go hand in hand. The teleconsultation services added value to this innovation. From the beginning, the detailed educational, health, and IT needs of the potential students attending this school were assessed by a team of experts. The findings of the needs assessment helped the research team develop a plan to build a school health room with IT capabilities to initiate telehealth services, addressing the health needs of school-going children—one of the vulnerable populations. This initiative served as a prototype school health service catering to the target population and other areas where access to health is difficult or nearly impossible. Once the feasibility of TCS at this school is proven, the project could be scaled up for a wider community and more health conditions.

Utilizing technology in school health services is essential for improving efficiency, communication, and student well-being [10, 11] . It streamlines administrative tasks, improves communication among health professionals, students, and their parents, and ensures accurate record-keeping. Real-time health monitoring and telehealth services enhance timely interventions, especially in remote areas. Technology enables data analysis for health trends, supports health education, and fosters active parental involvement [11]. This study will be a steppingstone for scaling up the same for the community at large and to other parts of Pakistan. Therefore, the aim of the study is to explore the feasibility of introducing school-based Tele-Consultation Services (TCS) in strengthening community health in a semi-urban area of Karachi, Pakistan. We hypothesized that the accessibility of students and their parents to health services and information would increase through the implementation of school-based Tele-Consultation Services. In addition, the qualitative arm of the study would provide the insight about usefulness and feasibility of TCS implemented through School health setting.

Methods

Study Design:

A Sequential Explanatory Mixed-Method was used to assess the feasibility of teleconsultation services (TCS) at the local government school in the semi-urban setting of Karachi, Pakistan. The rational of selecting Mixed Method approach was to provide the holistic perspective of the TCS initiative undertaken.

Study Setting:

The study was conducted at a government school in a semi-urban community in Karachi, serving 34 villages within a 10 km range. The total number of households in these villages was 2,052 with approximately 10,750 inhabitants. The commonly spoken languages of the community were Balochi and Sindhi. Male members of the community contributed to household income by working as

laborers and farmers. Some were also involved in military and protective services. The majority of married females were stay-at-home spouses, with a few working in the health and education sectors. The catchment population opted for private sector services due to the lack of public sector facilities in the area, which added financial and time burdens for the local community.

A nonfunctional public school in the aforementioned semi-urban setting of Karachi, Pakistan, was adopted by an NGO in partnership with the government, aiming to turn it into a model school with all the necessary components of an ideal educational institution. The school health service, being a mandatory element of any ideal school, was brought to this model school through the current project to provide health services to children attending the school.
The reason for selecting this particular school was twofold: firstly, it was situated in a semi-urban setting with almost no access to healthcare; secondly, the school was in a growing phase with a lot of potential for adapting new initiatives. The partnership between the government and an NGO helped the project team introduce and execute a nurse-led school health project with the innovation of telehealth services. As the school grew, it offered education from ECD to grade eight by a team of 7-8 teachers, including one male and six female teachers, all from the same community. The student body of the selected school predominantly consisted of males, with a male-to-female ratio of 60:40.

The population served by this project was school students from a semi-urban settlement in Karachi. The service was open to all students attending the school and falling sick during school hours.

Tele consultation service:

For this study, a ‘Hub and Spoke’ model [12] was used in one of the local government schools with 393 enrolled students. The school served as a spoke, connected to the Pediatric Department of a Private University Hospital in Karachi, which acted as the hub for providing TCS for the children studying at the school.

For this study, the utilization of TCS was limited to students attending the selected school during official hours (0900-1200) for health issues related to children aged 5-14 years. All students feeling unwell were allowed to avail themselves of the TCS. The average turnout was 3-4 students per day. The services provided during TCS included:

1. Recording the demographic data of the students (name, age, gender, grade, presenting complaint, height, and weight).
2. Conducting a complete initial assessment of the student, including history, vital signs, and physical assessment related to the presenting complaint, by the school health nurse using digital equipment (stethoscope and derma scope).

This information was reviewed by the pediatrician, who provided appropriate advice for diagnosis and treatment using TCS.

The TCS at the school operated in two ways:

1. *Live Synchronous Consultations*: These occurred twice a week when the pediatrician was available online for three hours. During this time, the pediatrician attended to students for their initial visits and all follow-up visits. The entire assessment and consultation were recorded in the system by the nurse.

2. *Store-and-Forward Consultations*: These took place on the days when the pediatrician was not available live. In this mode, the nurse uploaded the student's assessment into the system and sent an alert to the pediatrician. The pediatrician would review the initial assessment on the system. If additional information or further assessment was needed, the pediatrician would consult the nurse. The nurse would then upload images and data from digital equipment such as a stethoscope, ophthalmoscope, and dermascope. Once the complete assessment was reviewed, the pediatrician proposed the treatment, which the school health nurse then uploaded to the system.

   After each consultation (live or store-and-forward), the school health nurse conveyed all the medical advice suggested by the pediatrician to the parents of the children seeking TCS and maintained regular follow-ups on all cases as per the pediatrician's comments and advice.

   The privacy of all students availing TCS was ensured by uploading all data onto a password-secured online system, accessible only by the school health nurse, the pediatrician, and the principal investigator. Snapshots or assessments were taken using digital equipment connected to the online system and were directly uploaded.

   The duration of each consultation varied depending on the presenting complaint and the nature of the visit (initial or follow-up). An average initial visit took approximately 30 minutes, while an average follow-up visit took about 15 minutes. The pediatrician received a minimal token payment of Rs 8,000 per month (approximately US$30) for participating in the TCS program.

Teams & Infrastructure:

An infrastructure for TCS was established at the target school by developing a health assessment room, with a school health nurse available physically and a pediatrician joining remotely. Various partners actively participated in executing the project, including members from a private School of Nursing and Midwifery, the administration and IT staff of the local school, telehealth specialists from a private digital health firm in Karachi along with their support staff, a school health nurse who was a trained Lady Health Visitor (LHV), and a trained pediatrician.

Recruitment of Study Participants:

The study participants for the quantitative arm were recruited through total/universal sampling, including students of all ages and grades, from ECD to grade eight, attending the school (n=393).

For the qualitative arm, 35 participants were recruited through purposive sampling. These included

community stakeholders, teachers, and parents of students who utilized the TCS at the school during the study period and were willing to participate.

A formal launch of the TCS was executed in 2017 at the target school through a ceremony in which all relevant community and school stakeholders, parents, teachers, and related government officials were invited. The entire process of live teleconsultations was demonstrated at the launch, with the school health nurse presenting a case to the pediatrician attending the consultation online. Through this event, the community and parents were mobilized, and services were formally initiated for the school.

Parents who attended the event were informed about the research project and asked for their consent. The day after the event, the school health nurse visited each class to explain the project, the role of the teleconsultation service, the online physician, and the nurse in managing minor ailments of the students. A meeting was also held with the school teachers to explain the project and instruct them to direct students who fell ill during school hours to the health room for immediate teleconsultation services.

Data Collection and Analysis:

Data was collected during April 2017 and January 2020. This exclude summer and winter vacation, weekends and public holidays. Hence the total time duration in which TCS was provided was17 months.

Quantitative Data:

Quantitative data included demographic information such as the age and sex of the participants, as well as monthly data on the number of successful teleconsultations, referrals, follow-ups, complaints for which TCS was sought, and types of treatment received. This data was retrieved from the monthly logbooks maintained by the school health nurse and analyzed using descriptive statistics with SPSS version 24.

Qualitative Data:

Qualitative data were collected through focus group discussions (FGDs) using a semi-structured interview guide. Three separate FGDs were conducted at the school with 12 parents, 6 teachers, and 4 community stakeholders. The FGDs were audio recorded with the participants' permission and later transcribed for analysis. Each FGD lasted approximately 45-60 minutes. The community stakeholders included community leaders who made themselves available for the discussions.

The broad topics considered during the discussions included the need for TCS services, the benefits of TCS services, challenges, and ways to improve TCS at the school. The recordings

were transcribed immediately after the discussions to ensure trustworthiness. The data underwent manual content analysis, with each meaningful sentence taken as the unit of analysis. Through this process, codes were identified and similar codes were clumped together to generate subthemes, from which unique themes were extracted [13]. Data collection continued until saturation was achieved.

The study employed the following steps for analyzing the qualitative data:
Data analysis commenced by transcribing audio taped interviews verbatim and translating them into English. These transcripts and translations were assigned unique code numbers and formatted uniformly in a word document with five columns: transcription, translation, code, categories, and themes. They were meticulously organized in both ring binders and electronic folders.
Thorough immersion in the data was achieved through multiple readings of the transcripts to attain a profound understanding and description of the phenomenon. During this phase, each paragraph of every transcript was systematically coded. Similar ideas within each transcript were consolidated under corresponding codes. These codes, with similar meanings, were subsequently amalgamated to form categories.
Common themes were derived by scrutinizing all categories for connections and similarities. To substantiate each theme, pertinent quotes from participants were extracted from the transcripts and linked to each theme, accompanied by the participant's code.
These methodical steps ensured a comprehensive and systematic analysis of the qualitative data collected.

The identified themes were interpreted as the study's findings and underwent verification for integrity and reliability by research team members. Furthermore, these themes were compared with existing literature to discern similarities and differences in the ideas uncovered by the study.

Ethical Consideration:

The study received approval from the Ethical Review Committee of Aga Khan University (AKU-ERC 4410-SON-ERC-16) in November 2016 and was conducted from January 2017 through December 2020.

Informed Consent: Written informed consent was obtained from all parents, and verbal consent was obtained from all children who participated in teleconsultations. Participants were informed about the study's purpose, process, and benefits, and were given the option to participate voluntarily and withdraw at any stage.

Privacy and Confidentiality: Privacy and confidentiality were strictly maintained by assigning unique code numbers to each participant using teleconsultation services (TCS). Participant information was password-protected, and access was restricted to the core research team, which included student nurses and physicians.

Compensation: No monetary compensation was provided to the students, as teleconsultations were conducted within the same schools where the students were enrolled.

Health Issues treated	Number of each health issue reported in total consultations (n=393)	Percentage
Upper Respiratory		
	117	29.8%
Dermatology		
	81	20.6%
Musculoskeletal		
	75	19.1%
Ear Nose and Throat		
	55	14.0%
Gastrointestinal		
	26	6.6%
Oral Health		
	20	5.1%
Eye		
	16	4.1%
Hematology		

Results

Quantitative:

Over a span of 17 months, a total of 1,046 teleconsultations were conducted, serving 393 students. Among these consultations, 37.57% (393) were initial visits, and 62.42% (653) were follow-ups. The majority of disease-related complaints were effectively managed through teleconsultation services (TCS), with only 1.24% (13) necessitating referrals to specialized services. [Table 1].

The demographic data revealed that students utilizing teleconsultation services (TCS) had a mean age of 9.24 years (± 3.25 SD), with a majority being male (59.5%, 113 students).
:

	Number	Percentage
Initial visit		
	393	37.5%
Follow up		
	653	62.42%
Referral		
	13	1.24%

Table 1. Number and proportions of initial visits, follow up and referral out of the total 1046 TCS offered to n=393 students

The health issues for which teleconsultation services (TCS) were provided were categorized into the following eight subgroups: dermatology, eye, ear, nose and throat (ENT), gastrointestinal, hematology, musculoskeletal, oral health, and upper respiratory tract. Among these subgroups, the majority of cases were related to the upper respiratory tract (29.8%, 117 cases), followed by dermatology (20.6%, 81 cases), and musculoskeletal issues (19.1%, 75 cases). [Table 2].

Table 2. Count and Proportion of Reported Health Issues during Initial (393) Tele-Consultation

There was a distinct pattern of disease distribution according to the age and sex groups of the participants. The most frequently reported health issues among children of all ages and genders were related to the upper respiratory tract and musculoskeletal system, followed by dermatology and ENT issues. The distribution of diseases across age and sex groups is illustrated in [Figure I].

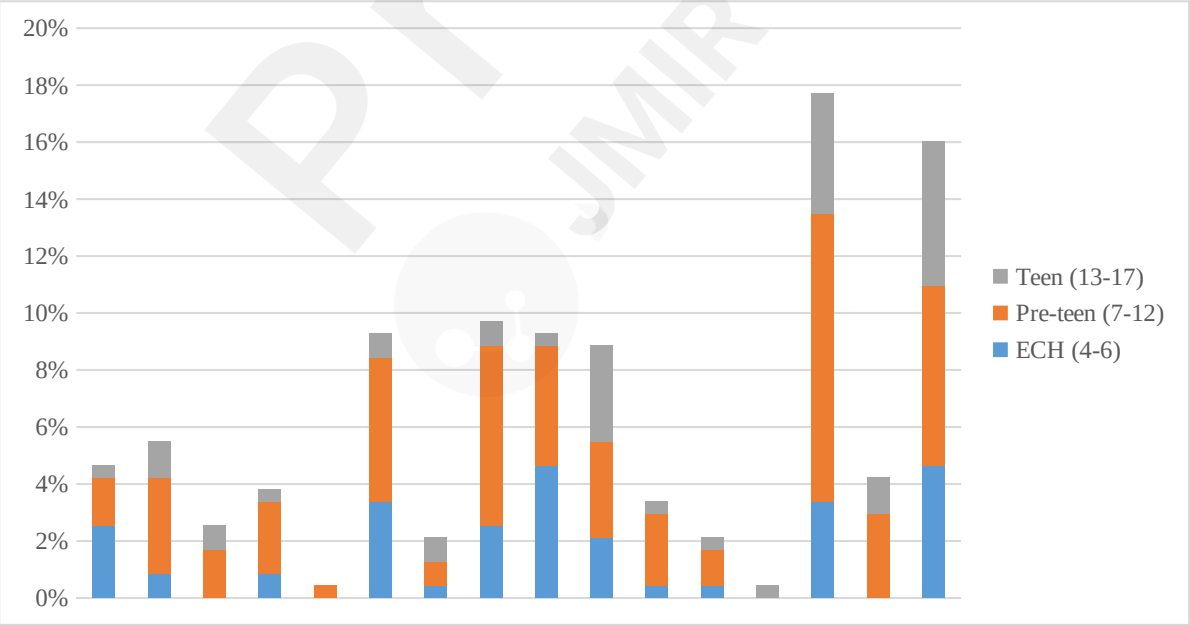

Figure II. "Disease Distribution as per Age and Sex Groups" illustrates the distribution of diseases among participants categorized by age and sex groups. The age groups include Early Childhood (ECH) aged 4-6 years, Pre-teens aged 7-12 years, and Teens aged 13-17 years. The sex groups are

categorized as male and female.

Additionally, the treatment provided during teleconsultations revealed that the majority of students received topical medications (32%, 335 cases), followed by oral antibiotics (20%, 209 cases), and other medications (48%, 502 cases) such as antipyretics and antihistamines. Essential medications were readily available either with the school health nurse or within the school vicinity.

Qualitative:

Three themes emerged from the analysis of focused group discussions: i) the transformation of the healthcare experience, ii) escalating demands for teleconsultation, and iii) the psychological aspects of care.

Transformation of Healthcare Experience

Parents/caregivers of students, as well as teachers, exhibited a fundamental understanding of TCS. The community began to view TCS as a convenient, cost-effective, and reliable healthcare service accessible right at their doorstep. TCS played a pivotal role in transforming healthcare experiences. Primarily, TCS provided the semi-urban community with access to essential healthcare services.

One parent stated,

> *"We live in a village where healthcare facilities are not readily available, and it used to take hours or even a day to reach a doctor. Now, having online doctors available here is so convenient for us."*

Another parent mentioned,

> *"In our community, there are no doctors nearby. When our children get sick, the mother has to wait for the father to come from work to take them to a healthcare service that is located far away."*

TCS also streamlined healthcare to be cost-effective and time-efficient. A caregiver expressed satisfaction with TCS, highlighting its affordability in terms of both money and time. They emphasized that these services enabled timely consultations with doctors, ensuring prompt management of their children's health. Reflecting on the challenges the community faced before TCS, one parent shared,

> *"Public transportation operates on a fixed schedule, and if someone falls ill afterwards, arranging private transport becomes very difficult or unaffordable due to high rental charges."*

Another participant added,

> *"Previously, it took us hours to transport our sick children to healthcare services, but teleconsultation has made it much more feasible for us. A remote consultation used to cost us a minimum of two thousand rupees (approximately US$7)."*

Participants expressed satisfaction with TCS for alleviating their challenges of seeking expensive and

distant healthcare consultations for their sick children. One participant shared their contentment, stating,

> *"This saves us time and money. When we travel for doctor visits, it wastes both time and money. This service also prevents our children from missing school; it's much better and convenient."*

Furthermore, community members began to trust TCS for its quality, accessibility, and affordability. A parent highlighted their satisfaction, saying,

> *"We are pleased that our child can receive medical treatment online at school. Now they can stay healthy and continue their education under one roof. We are very satisfied with this service. Once, my child had a high fever; the nurse examined him and the doctor prescribed medicine. By the grace of God, he recovered in three days."*

Escalating Demands for Teleconsultation

The feasibility of TCS was widely acknowledged by members of the community. However, there were suggestions for enhancing these services, as caregivers and community leaders perceived the source as highly trustworthy and reliable. Participants expressed a desire for 24/7 TCS availability in their community to alleviate nighttime difficulties when children fall ill. One community leader voiced support for the service, stating:

> "*It is a great initiative, however, there is a need for a 24/7 consultation service with an extended pharmacy service available also. The community leaders will arrange the financial resource and will pay for someone who is not able to afford the medicines*."

Furthermore, participants expressed a desire for the expansion of TCS to include adults and other members of the community beyond just school-going children. They suggested broadening the scope to cover additional medical conditions such as delivery, maternal and child healthcare, aiming to benefit the entire population.

One participant emphasized,

> *"The facility should grow to encompass resources like injections, drips, nebulizers, oxygen, and basic lab tests. It should offer treatment for a wide range of conditions. There should be doctors available on-site. While the current consultation rooms are adequate, there should also be facilities for delivery, CT scans, and X-rays."*

The Psychological Aspect of Care

During the analysis, several intriguing insights surfaced regarding the community's perception of healthcare. The semi-urban population primarily consisted of illiterate individuals who were unable to read, write, or communicate in any language other than the local Balochi or Sindhi. These individuals believed it was crucial to have a physician physically present to conduct a comprehensive assessment of sick patients and prescribe treatment accordingly.One community leader expressed dissatisfaction, stating:

> ***"Physical presence of the doctor will give us better satisfaction. We all are ill-literate here, some of us may understand about the online consultation but most of the community individuals will take this for granted."***

Another participant shared that,

> ***"We cannot openly speak to the doctor online as we do face to face, which allows us to discuss health problems openly with experts."***

One aspect that emerged from the FGD was people's mindset and perception regarding the cost associated with healthcare and the preference for a physical examination by a doctor rather than teleconsultations. Study participants discussed the possibility of implementing a fee-for-service model for consultation services. They expressed that offering consultations free of cost might lead to them being undervalued and taken for granted. Given the challenges related to transportation and time loss in accessing healthcare, participants emphasized the importance of recognizing and appreciating TCS, which provides accessible and safe healthcare.
Caregivers suggested charging a nominal fee of one to two hundred rupees for these services, while some still preferred free consultations. One nurse remarked,

> "*Nobody values free services. When they spend money, they care. Free-of-cost facilities are cared for by none. I think a small fee must be charged so that parents take some responsibility for the treatment of their children*."

The same sentiment was echoed by another parent, who emphasized that

> *"Previously, when the child felt low, we had to take off from work and the child had to miss school to take the child to the doctor. But now, the facility is available here. So, parents send the child to the school nurse or when we meet the nurse during the break, we tell her to call the child from class and see the child. For these many facilities here, the fees are moderate, and we have to give at least half of the fees."*

Discussion

Principal Findings:

Through this study, a total of 1,046 teleconsultations were provided to 393 students over a span of 17 months. Among all the initial consultations, 62% (648 consultations) involved follow-up visits which were continue till students availing TCS attained complete recovery.
Most of the cases involved respiratory infections, followed by skin problems, minor injuries, and ENT issues. During consultations, the process included assessing the child's anthropometric measures, gathering details of the presenting complaint, and prescribing effective treatments regimen along with health education to the parents. The findings of health education have been published elsewhere.[14]

Qualitative analysis revealed that participants had developed a basic understanding of TCS, finding it cost-effective and timesaving. They had begun to trust TCS for its quality, accessibility, and affordability. Suggestions for improving TCS emerged from the data, including providing 24/7 availability, expanding services to include adults and other medical conditions to benefit a larger

population. Participants also proposed a reimbursement model for TCS provided within the community.

Our study addresses the gap in healthcare accessibility by establishing Tele Consultation infrastructure within the school platform. Digital health services represent a clear solution to enhance healthcare access in remote areas [8-11].

The current study exemplifies offering a solution through Tele Consultation Services (TCS) to a remote semi-urban community in Karachi. It assesses the community's health needs and evaluates the feasibility and experience of TCS in this context. Similar to other developing regions, Pakistan encounters challenges in ensuring equitable and accessible healthcare distribution to its expanding population, particularly those residing in villages and remote areas [3,4]. Our study demonstrated that Tele Consultation Services (TCS) effectively meets the healthcare needs in underprivileged and resource challenged countries such as Pakistan. The quantitative arm of the current study revealed that children of varying ages and with diverse health issues benefited significantly from this service. However, the qualitative arm of the study informed that the same services shall be expanded to adult population with various health speciality. Having TCS available within school premises prevented children from missing school days to visit doctors located far from their homes for health issues. This increased their attendance and improved their overall attitude toward education and learning.

Furthermore, TCS minimized the costs associated with high consultation fees and transportation to visit a doctor in person. Caregivers were able to remain on campus, reducing lost wages. Literature also supports the role of school-based digital health solutions in reducing school absenteeism and saving costs related to external healthcare visits [15]. Moreover, literature suggests significant time and cost savings for patients receiving care for chronic and infectious diseases through Digital Health solutions in remote regions of Low- and Middle-Income Countries (LMICs) [16]. The current study not only documented the use of Tele Consultation Services (TCS) for initial visits but also highlighted its utilization for follow-up visits until students fully recovered. During the data collection period, the majority of cases were successfully managed using TCS, with only a few requiring referrals to hospital services. This approach minimized the costs traditionally incurred by caregivers for travel to healthcare facilities in urban areas. Furthermore, timely referral is critical in predicting the outcome of severe illnesses.

Comparison with Prior Work:

One of the crucial aspects of this project is the integration of Tele Consultation Services (TCS) within the school system. Numerous studies in literature strongly support this integration [17]. Community stakeholders appreciated the integration of Tele Consultation Services (TCS) within the school system for several reasons, including timely consultations, access to expert opinions, effective illness management, improvement in children's health status, and cost-saving benefits.

Regarding the TCS fee model, our proposed solution remained significantly more affordable compared to visiting a local GP. A similar example of low-cost TCS can be found in the literature, where the weekly costs for eye-related issues during COVID–19 were 56 times lower. This illustrates the cost-saving aspect of TCS while ensuring the safety of all individuals involved, thanks to its digital healthcare services [18]. Further exploration of the fee structure model for teleconsultation is

necessary to ensure it is appropriately contextualized for different settings and populations.

This prototype model for teleconsultation initiative has opened avenues to explore the scope of proactive Digital Health Solution in resource-constrained settings, including preparation for future epidemics. The impact of this project is twofold; firstly this TCS school health model has been now owned and taken over by the provincial government for its sustainability. Secondly, the role of school health nurse has been enhanced as student counsellor to cater students' psychosocial issues.

Implications and Suggestions for Further Studies:

Healthcare access remains a significant but often overlooked issue, and it is crucial for policymakers to acknowledge the pivotal role of healthcare workers and community health nurses as frontline personnel in achieving health-related goals in underprivileged areas. [1,2,3] Digital health modalities for delivering virtual health services have garnered significant attention from primary care practices during this unprecedented pandemic. [8] The Center for Medicare and Medicaid Services in the USA approved teleconsultation services in 1997. However, widespread implementation by primary healthcare systems occurred during recent pandemics and major natural disasters worldwide, when physical access to healthcare became challenging. [19].

Telehealth through Tele Consultation Services (TCS) is a vast platform with immense scope for innovation. It utilizes technology to deliver health services, including awareness sessions, assessments, monitoring, and educational sessions for home healthcare, all under the guidance of medical experts. This approach addresses significant concerns related to healthcare access in underserved populations. [14,16]

The implementation of Tele Consultation Services (TCS) will reduce travel costs for patients and healthcare seekers. Furthermore, it will alleviate the burden on the healthcare system by ensuring equitable allocation of resources. TCS will also decrease unnecessary hospital visits, allowing healthcare costs to be redirected toward the delivery of high-quality care [20]. Tele Consultation Services (TCS) can implement a multidisciplinary team model involving nurse practitioners, physicians, psychologists, and other healthcare workers, provided that human resources management is effectively handled. TCS enhances the role of the school health nurse as a crucial member of this interdisciplinary team. The nurse's role includes independent practice in identifying issues, triaging and referring patients, and effectively applying clinical judgment, skills, and evidence-based nursing practice to assess, plan, implement, and evaluate treatment outcomes.

Literature supports the pivotal role of registered nurses in the community who contribute significantly to building team-based partnerships aimed at addressing health issues within their community [21].

In this digital era of technology, including smartphones, nurse-led Tele Consultation Services (TCS) should be encouraged to support population health. Nurses can play a critical role in coordinating care, facilitating communication, promoting disease self-management, performing appropriate triage, and engaging in health promotion for families and communities. The accessibility and widespread use of smartphones further enhance the reach and effectiveness of nurse-led TCS, making healthcare more accessible and responsive to the needs of diverse populations [22]. Evidence globally has demonstrated promising outcomes of Tele Consultation Services (TCS) in effectively managing diseases through virtual consultations. These consultations utilize audio, visual, graphics, and other electronic formats to deliver healthcare remotely, showcasing positive results in disease management across various regions [23]. Pakistan stands to benefit significantly from implementing Tele Consultation Services (TCS), which can help address challenges posed by unpredictable health and weather changes in the healthcare system. Policymakers and legislators can play an active role in allocating resources and developing policies to promote telehealth across various healthcare settings, including schools. This proactive approach can enhance healthcare accessibility, efficiency, and resilience in the face of evolving health and environmental conditions in Pakistan.

Strengths and Limitations:

The study's greatest strength lies in the trust that Tele Consultation Services (TCS) garnered from the community and stakeholders, leading to the establishment of a pioneering prototype model school offering TCS as a healthcare service in Pakistan. This model now has the potential to be replicated and scaled up in other community schools, with contextual adaptations based on the study's findings. A cost-effective TCS infrastructure integrated into the school health room, along with a practical TCS model and networking with community stakeholders and school health experts, will significantly enhance healthcare access for the community and serve as a valuable asset for both the school and its surrounding community.

The use of a mixed-method study design not only helped identify consultation patterns but also captured caregiver preferences and experiences regarding this service, providing comprehensive insights.

However, the study's limitation lies in its narrow generalizability, as it was conducted in only one government school in a semi-urban setting, catering to children from Early Childhood Development (ECD) to Grade 8. This limits the broader applicability of the findings. Additionally, the study's small scale makes it challenging to assess the teleconsultation service's overall impact on population health and community behavior change. Technical issues such as internet connectivity, technology maintenance, and sustaining a high-tech school health room also pose potential limitations for the ongoing viability of this model at the school.

Conclusion

The current study addresses the critical gap in healthcare accessibility by implementing Tele-Consultation Services (TCS) within the school platform. This initiative significantly influenced the perspectives of students and parents regarding the overall health of school children. Our findings underscored the effectiveness of integrating TCS, emphasizing its cost-effectiveness, time efficiency,

and quality of service delivery. TCS integrated into schools reduced school absenteeism due to illness and alleviated financial burdens on families, aligning with global literature supporting digital health interventions.
Community feedback highlighted strong support for TCS, advocating for 24/7 availability, expansion to adult populations, and the implementation of a reimbursement model. Active involvement from policymakers and legislative support for resource allocation and policy development are crucial for the successful integration and sustainability of TCS. Policymakers should recognize TCS's pivotal role in bridging healthcare gaps, particularly in underserved areas.

Led by school health nurses, TCS enhances health outcomes through improved coordination, disease management, and health promotion. With adequate resources and training, the prototype for TCS in school settings offers an innovative, scalable solution to healthcare access challenges, with significant potential to enhance health outcomes for school-going children not only in Pakistan but also in other resource-challenged settings, including Low- and Middle-Income Countries (LMICs).

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Conflicts of Interest

“none declared”.

List of Abbreviations

ECH: early childhood
ERC: Ethical Review Committee
FGD: Focused Group Discussion
ICT: Information and Communication Technology
IT: information technology
MDG: Millennium Development Goal
SDG: Sustainable Development Goal
TCS: Teleconsultation Services
URT: upper respiratory tract

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Supplementary Files

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Figures

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