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Digital Divide and Educational Inequality: A Post-Pandemic Study of Online Learning in Rural and Urban Pakistan

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ABSTRACT

Background: The COVID-19 pandemic has accelerated the shift to online education worldwide, exposing and amplifying existing disparities in access to digital technology and educational resources.

Objective: This study explores the digital divide and its impact on educational inequality between rural and urban students in Pakistan during the post-pandemic era.

Methods: Using a mixed-methods approach, data were collected from 400 students through surveys and interviews to assess differences in digital device access, internet connectivity, online learning participation, academic performance, and psychological well-being.

Results: Results indicate a significant gap, with urban students having greater access to technology and experiencing better academic engagement and motivation compared to rural students, who face infrastructural challenges and social barriers. Additionally, rural students reported higher levels of stress and educational disruption.

Conclusion: The findings highlight the need for targeted interventions including infrastructural improvements, inclusive digital policies, and gender-sensitive approaches to bridge the divide. The study concludes that overcoming the digital divide is essential for achieving equitable educational outcomes and ensuring resilience in Pakistan's education system against future disruptions.

INTRODUCTION

COVID-19 has changed almost all aspects of the human life, and one of the most significant shifts became manifest in the sphere of education (Bozkurt et al., 2022; Ashour, 2024). With schools and universities all over the world closing their doors to limit the spread of the virus, online education became the main and, in most cases, the only means of delivering education (Tilak & Kumar, 2022; Adedoyin and Soykan, 2023). Although such a shift made it possible to continue education in cities that had already developed digital infrastructure, it also revealed and exacerbated the inequalities that had already been experienced, most prominently, the digital divide, particularly in developing countries such as Pakistan. The sudden transition to online education introduced an additional tier of educational inequality, which overrepresented rural students, low-income families, and marginalized groups (Tate and Warschauer, 2022; Mathrani, Umer, Sarvesh, and Adhikari, 2023).

The digital divide in Pakistan made the existing inequities in education systems based on gender, socioeconomic status, and geography even more deeply rooted (Raza et al., 2023; Zamir and Wang, 2023). Pakistan Bureau of Statistics and UNICEF note that more than 22 million children were not in school even before the pandemic. The pandemic worsened this crisis because online learning, although potentially possible in urban and densely populated cities, was mostly unavailable in rural and underserved regions (Nepal, Khadka, Guragain, and Ghimire, 2024; Faturoti, 2022). Many students and teachers lacked the equipment and facilities needed, access to the internet, digital literacy, or favourable learning conditions, and this gap in training in urban areas and rural regions expanded.

The digital divide is not only the difference in access to digital technology but the unequal access to and use of digital technology (Afzal, Khan, Daud, Ahmad, & Butt, 2023). It includes the problem of affordability, internet penetration, device availability, electricity, digital literacy, and access to technical support. In Pakistan, such urban areas as Lahore, Karachi, and Islamabad enjoy relatively well-developed technological facilities, whereas the small rural areas of such provinces as Balochistan, interior Sindh, and Khyber Pakhtunkhwa remain at the bottom with the basics. This gap led to an unequal learning experience under the pandemic with urban students more likely to keep learning, engaging with instructors, and finishing their academic demands and rural students experiencing more time of disrupted learning.

In addition, there was a wide disparity in the quality of online education along socio-geographic boundaries. In fact, in urban families, overcrowded living conditions, the presence of shared equipment among the siblings, and insufficient parental assistance owing to digital illiteracy contributed to the development of unequal learning opportunities (Fu, Zeng, and Kang, 2024; Thilakasiri et al., 2023). In rural homes, the lack of these issues were amplified by the near lack of infrastructure, the use of old-fashioned educational techniques, and the fact that teachers were not trained or prepared to teach in digital formats since they were not trained or equipped to do so.

A number of governmental and non-state programs were launched in order to alleviate this crisis. It involved the opening of the TeleSchool channel, broadcasting digital content on radio and

HIGHLIGHTS	
Research insights	The study reveals a persistent digital divide between rural and urban students, highlighting significant disparities in technological access, academic engagement, and psychological well-being post-pandemic.
Practical insights	Improving digital infrastructure, training teachers, and providing affordable internet access in rural areas can reduce educational inequality and enhance learning continuity during future crises.
Industry insights	EdTech companies can leverage these findings to design inclusive, low-cost digital learning platforms tailored to rural communities, ensuring broader access and sustainable educational innovation.

television, and the implementation of Learning Management Systems (LMS) in some universities (Thangavel, 2023; Zubairi et al., 2022). Nevertheless, these interventions were not regular and sometimes did not penetrate the most vulnerable groups. It was not only the question of the availability of the internet but the entire ecosystem of educational delivery, including curriculum change, teacher training, student involvement, and monitoring and evaluation (Moore and Piety, 2022).

The digital divide conceptualization of the post-COVID situation in Pakistan is critical to not only discover the harm but also inform future policies to support educational resilience and equity (Iacovidou and Sharma, 2022; Shahzad, 2024). The pandemic was a stress test and showed the frailty of the Pakistani education system. It highlighted the pressing necessity to close the digital divide in order to stop the further marginalization of rural and underserved communities. Otherwise, the digital divide threatens to entrench educational and economic inequalities over the long run, especially among students who are already peripheral to the society.

The proposed study, therefore, aims to examine the scope and effects of digital divide on education inequality in rural and urban Pakistan during and after the COVID-19 pandemic. It is expected to investigate the impacts of variations in access to digital tools and infrastructure on the experiences of students, their performances, and well-being in general. The study will also examine how socio-economic background, gender, geography and institutional response influence these outcomes.

The comparative method, the rural and urban setting would be found as the sources of bringing out the problems, and the coping strategies employed by students, teachers, and the learning institutions. It will provide evidence based details about the socio-political and economic dimension of the digital divide, as opposed to a technological one. It will also propose policy interventions that will help bridging the gap and building a more inclusive, equitable, and future-ready system of education in Pakistan.

On the whole, the issue of the digital divide has ceased to be a fringe question, but a major concern of educational equity. The concept of digital inclusion must become a key pillar of education change, as part of post-pandemic recovery. The digital divide is not only an issue of whether or not one has access to technology, but an issue of whether or not one can avail the fundamental right of a child being educated regardless of where they may be, or what resources they possess.

METHODOLOGY

This study employed the mixed-method study research design to be in a position to comprehensively explore the impact of the digital divide on educational inequality in both rural and urban Pakistan throughout and following the COVID-19 pandemic. Its quantitative nature involved a survey that was designed and administered on 400 students (200 rural and urban) and the students were selected using stratified random sampling to represent geographically and gender. The survey has found some information about the access to digital devices, internet connection, regularity of online classes, and self-reported academic performance among students during the pandemic. The qualitative element involved in-depth interviews with 20 participants, who were students, teachers and parents in both contexts, to get a better understanding of the lived experiences, challenges, and coping strategies in regard to online learning. The three months of data collection were done through the use of Google Forms, Telephonic interviews, and face-to-face visits where there was no access to digital means. The SPSS was also utilized in quantitative analysis (descriptive and inferential) of the quantitative data and thematic analysis (a qualitative type of analysis) was employed to establish the general tendencies and differences between rural and urban experiences. During the research, the ethical issues of the research, such as informed consent, anonymity, and voluntary involvement were observed in detail.

RESULTS

1. Access to Digital Devices and Internet

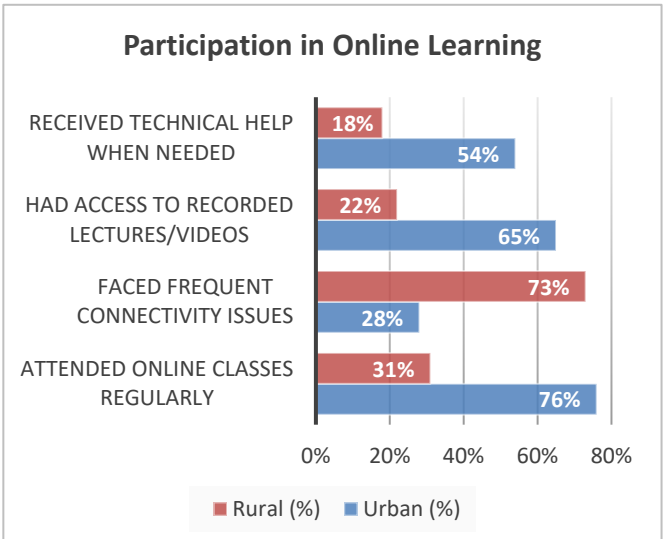
Variable	Urban (n = 200)	Rural (n = 200)	p-value
Access to personal smartphone	82%	39%	<0.001
Access to laptop/computer	60%	21%	<0.001
Reliable internet connection	74%	28%	<0.001
Daily electricity availability (>8 hrs)	91%	47%	<0.001

A statistically significant difference was observed in terms of access to devices and internet connectivity. Urban students were far more likely to possess personal devices and reliable internet than their rural counterparts.

2. Participation in Online Learning

Online Participation	Urban (%)	Rural (%)
Attended online classes regularly	76%	31%
Faced frequent connectivity issues	28%	73%
Had access to recorded lectures/videos	65%	22%
Received technical help when needed	54%	18%

These findings reflect that rural student not only participated less but also faced more obstacles such as poor connectivity and lack of support during online sessions.

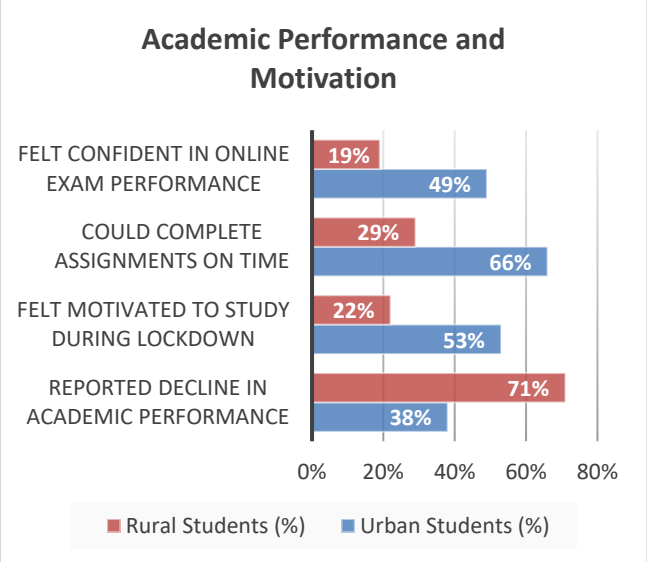


3. Academic Performance and Motivation

Indicators	Urban Students (%)	Rural Students (%)
Reported decline in academic performance	38%	71%
Felt motivated to study during lockdown	53%	22%
Could complete assignments on time	66%	29%

Felt confident in online exam performance	49%	19%

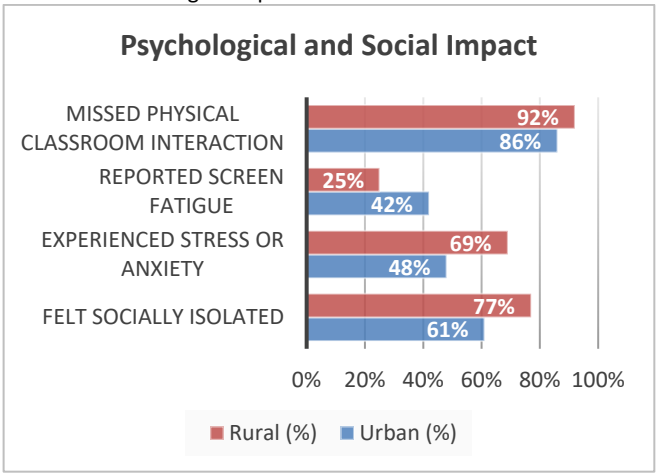
The data indicate that rural students experienced a much sharper decline in academic performance and motivation compared to their urban peers.



4. Psychological and Social Impact

Mental Health Indicator	Urban (%)	Rural (%)
Felt socially isolated	61%	77%
Experienced stress or anxiety	48%	69%
Reported screen fatigue	42%	25%
Missed physical classroom interaction	86%	92%

Rural students reported higher levels of stress and isolation, although urban students experienced slightly more screen fatigue due to extended digital exposure.



The analysis of the interviews as applied to qualitative analysis uncovered several important themes that help us understand better the difficulties of students in rural and urban Pakistan at the beginning of the transition to online learning. To begin with, the Digital Exclusion and Frustration appeared to be one of the key topics, with the students in rural areas complaining about their learning being constantly interrupted and the absence of proper support services. Secondly, the theme of Double Burden on Female Students was used to show that girls in rural families were commonly expected to take care of the home and study which further weakened their education. Thirdly, the comparison of Urban Adaptability vs. Rural Resistance revealed that smooth transition of urban students to the requirements of the online environment was observed over time, whereas rural students still experienced significant challenges during the online learning process. Inaccessibility of teachers was another important problem, in which both rural and urban students said that there was a lack of teachers, but responsiveness and delays were extremely worse in the rural regions. Finally, the theme of Hoped Future Blended was a shared desire among the students in both settings to have a blend of education that integrates real-life and online learning to create a more sustainable and inclusive education platform. In sum, these results prove the existence of a perceived digital divide that exists between rural and urban environments and which directly relates to the difference in educational access and academic performance and involvement. Rural students were overrepresented not only academically but also psychologically. However, the decision in support of the blended learning approach proved to be a shared point, as a marker of a general wish to enjoy a more flexible and egalitarian future of education.

DISCUSSION

The findings of this article reveal that an immense and deep digital divide between the rural and urban Pakistani students exists, and that has increased disparities in education in the post-pandemic world. Even though the COVID-19 pandemic caused an unexpected transition to online learning a few months ago, it unveiled the infrastructural and socioeconomic imbalance that had previously gone unnoticed in the educational setting.

The availability of smartphones and laptops, stable internet connectivity, and an endless power source enabled urban students to be more actively involved in online classes and showed greater resistance to academic difficulties. On the other hand, the students in the rural area had no access to these basic materials and thus were able to hardly access online activities frequently. This out of touch is not a mere technological symptom, but also systemic- in reference to socioeconomic status, gender roles, and infrastructural negligence in rural conditions.

This inequality is also expressed in the academic performance and self-reported levels of motivation. A significant percentage of rural students reported a drop in academic results and low levels of motivation, in many cases, caused by recurring connection problems, technical assistance shortage, and insufficient teacher assistance. Interestingly, although access to some form of digital learning was available to rural students, the quality of the given instruction and the degree of interaction was lower, meaning that the accessibility is not enough, quality, involvement, and the relevance of the given context are essential elements as well.

There was also a significant difference in the psychological effect of online learning between the two groups. Although both urban and rural students indicated that they felt isolated, rural students were more stressed because of academic insecurity, domestic burden, and the feeling of being left behind. This particularly affected female students in rural areas because they were usually distracted by other cultural demands instead of academics due to lockdowns. This brings out the interplay between gender and geography in influencing educational outcomes. The additional information presented in qualitative interviews allowed seeing beyond the practice-level difficulties and was filled with emotional accounts of students struggling to keep up with the fast-moving digitizing world. The respondents in the rural setting most often spoke of their feeling of being excluded and powerless, though better equipped, urban students nevertheless lacked the physical classroom setting and had screen fatigue. Even with these obstacles, students in both locations expressed the desire to have a hybrid approach to education- implying that the future of learning in Pakistan should be to incorporate the benefits of face-to-face learning with the advantages of e-learning.

CONCLUSION

This paper concludes that the digital divide in Pakistan is one of the significant influences on educational equality, particularly during a crisis like the COVID-19 pandemic. The digital divide between urban and rural students directly influences their ability to engage in online education not just with regard to academic performance, but also in regard to their mental well-being and future educational aspirations. A complicated solution is needed to solve this issue. The investment in digital infrastructure and rural areas in particular is a matter of urgent concern. Moreover, the policy of education needs to respond to the local solutions, such as low-tech learning platforms (radio, TV), community-based digital centers, and teacher training programs intended to train in remote locations. Furthermore, we ought to put gender sensitive measures to ensure that the girls in rural settings do not fall even further.

Digital divide is not, after all, a technology issue but an equity and inclusion issue and ultimately a right to an education issue. As long as Pakistan desires to create a system of education that would not collapse in instance of any disruption in the future, then closing this gap should be a national agenda. Then only we can have an opportunity to build a more inclusive, equal, and more digitally empowered educational future of all Pakistani students regardless of their area of residence.

Ethical Considerations

The study was conducted in accordance with ethical guidelines, with informed consent obtained from all participants and confidentiality strictly maintained.

Data Availability

Available from corresponding author on request.

Author Contributions

Dr. Aisha Sami: Conceptualization, Methodology, Data Curation, Formal Analysis, Writing – Original Draft Preparation, Visualization, and write up.

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Conflict of Interest

None.

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