Library services and facilities in higher education institutions during coronavirus disease (COVID-19) in Pakistan

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Abstract
This article attempts to evaluate the library services and facilities during the pandemic situations in Pakistan. This study is fashioned in positivistic tradition of quantitative research design, and a cross-sectional research method was employed. The objective of the study was to examine the library services available to students and faculty members in two public sector academic libraries in Pakistan. A complete list of students and faculty members was collected from the concerned offices along with their WhatsApp numbers and email address. A total of 1736 students and faculty members sampled through proportionate random sampling technique and filled the questionnaire out of 7835. The inclusion criteria to participate was based on enrolled students of public and private sector university, passed at least one semester of BS (4 years) and MA/MSc (2 years) programme in Pakistan, and faculty members using library resources. A structured questionnaire to measure the response of library patrons and consisted of exogenous and endogenous variables and pretested. The study findings showed that COVID-19 pandemic situations affected educational institutions at a large scale. The social distancing rule was opted to minimise the risk of infection and university libraries were also closed down. However, due to online learning transformation, library materials were digitalized and online library services were provided to students and faculty members.

1. Introduction

The COVID-19 pandemic started in China, Wuhan, in December 2019 [1]. It spread rapidly to rest of the world by affecting both developed and developing countries [2]. Sooner, World Health Organization (WHO) imposed public health emergency across the world. There was neither treatment nor any drug available to cure the patients. To curtail the spread of pandemic, lockdowns were imposed and people were restrained to homes and make use of personal protective equipment (PPE) [3,4]. This pandemic posed severe challenges to the health system [5]. Similarly, it also threatened the

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education system across the countries. Thus, the universities were closed down and teaching was shifted to online mode [6]. By the same token, the academic libraries were also transformed into online mode [5,6].

Due to pandemics, recent year witnessed a dramatic shift of academic libraries from traditional to modern resources and services in developing and developed countries [7,8]. It was a response to the pandemic lockdowns in the higher educational institutions (HEIs) including universities. It is noted that pandemic affected both direct regulation of teaching and restrictions to the working activities. Therefore, on campus learning was replaced with an online mode to maintain the pandemic guidelines and to curtail the spread of disease and risk infection [1,2]. It is pertinent to mention here that it was not possible to suspend academic and research activities for long. Thus, HEIs took initiatives to shift the academic and research activities online. By the same token, academic libraries were also transformed into online mode [9,10] due to closure of HEIs [11]. Research shows that the closure of academic libraries resulted into digitalization of library materials in developed and developing countries [12,13]. The studies revealed that it was an easy task for the developed countries because of modern technology and infrastructure [14–16]. However, due to a lack of infrastructure and technology, developing countries faced difficulties in shifting academic libraries online [5,17]. It is noted that academic services and facilities in libraries were also suspended. A few of these had limited online services in the libraries [16,18]. However, these services do not fulfil the need of students and research scholars. Furthermore, HEIs managed digitalized library materials and services to facilitate faculty members and students for academic teaching and learning activities [19–21]. The digitalized library materials include e-books, e-journals, e-periodicals, e-study materials, e-reports, electronic thesis, and audio/video material [19,22,23]. Similarly, these services also consisted of online clearance, online orientation, virtual meetings, virtual references, chat rooms, online seminar and workshop facilitation, provision of the online database including books and articles. Research shows that faculty members, students and research scholars benefitted from these online library services during the lockdown [14,24]. This study was conducted from June 2020 to November 2020 in two public sector universities of Pakistan. This study provides insights in terms of the digitalization of online academic library material and services during the pandemic.

1.1. Problem statement

The pandemic affected HEIs including academic library services across the globe [23,25–27]. Several studies have been conducted in developed countries on digitalization of online academic activities [8,27–30]. However, the academic environment of developed countries is different from that of the developing countries [5,6,27,28,31–33]. Moreover, the academic libraries services and digitalization has never been concern of the researchers in developing countries. Like developing countries, Pakistan being deficient in technology had traditional mode of academic libraries in majority of HEIs. Thus, it was not an easy task to digitalize the academic library services and facilities in a very short period. To smoothen online academic activities, a few measures were taken to digitalize library materials, and online library services were provided to the students and faculty members. We did not find even a single research conducted on the digital academic libraries, during pandemic, in Pakistan. Hence, this study attempted to evaluate the online academic library services and facilities during COVID-19 in public sector libraries of Pakistan.

2. Review of literature

Digital transformation is not a new phenomenon. For the last few decades, digitalized library services in developed and developing countries have been utilised. The digital transformation of libraries has not been a concern of HEIs in developed world, as developed countries have already transfigured knowledge and data by creating different online databases by means of modern technology [5,6,34–37]. Similarly, online libraries are also established. Worldwide, these databases and online libraries are important sources of stock of knowledge [32,38,39] where knowledge is accumulated through multiple sources of journals, books, periodicals, and newspapers [40,41]. These digital services are primarily utilised by researchers, scholars, and faculty members in HEIs [5] in public and private spheres across the world [42,43]. Moreover, the digital library is of great significance in the provision of services to HEIs [33,44]. Research showed that academic libraries are established for faculty, students, and research scholars to get benefitted [45]. However, unlike libraries, digital libraries provide easy and online access to the stock of data in a very short time period. These services and facilities are also provided free of cost to the faculty and research scholars by HEIs. In this way, faculty and students get benefitted from institutional access to the stock of data [14]. It is also noted that online academic libraries support research and academic activities even from home [21]. Therefore, developed countries digitalized libraries into e-libraries to facilitate the readers away from home [27,46]. Previously, physical appearance was observed in academic libraries to get benefitted from the stock of knowledge [28,47]. However, developed nations have introduced use of digital libraries in a more efficient way [8,26,45].

The importance of digital libraries can be gauged during pandemics [5,17]. The students and teachers worked from home and benefitted from digital library services [48–50]. Research showed the electronic use of accessing data was opted [48–52] to avoid the severe consequences of pandemics in humans gathering [1,2]. Research also unpacked that HEIs adopted the online mode of education coupled with digital libraries [32,47,53]. Researchers, faculty and students were provided and facilitated the digital library services at homes [45]. Therefore, massive measures and precautions were adopted [1] at national, local, and institutional level including the guidelines [1,2,4] WHO [54–57].

Research revealed that students and scholars were benefitted from electronic services and facilities of digitalized libraries in the developed countries [19,58]. All the HEIs are already either using or providing access to digital libraries [14,15]. After shifting educational activities to online mode [18], students from rural and urban areas equally benefitted from the online libraries [50,59,60]. It is also revealed that electronic modes are equally available to the students, readers and scholars [61]. These adequate provision of services and facilities were due to modern technology in the times of pandemic [12,13,62].

In developing countries, normally students, faculty and research scholars do not have access to modern digital library services [63–65]. The majority of HEIs still use traditional mode of academic libraries. Thus, it was difficult for the HEIs to transfrom these into digital libraries. However, a few online databases are available for students [66,67]. Moreover, due to lack of technology, digital library services are not available in public HEIs in the mjaority of developing countries. Therefore, students, faculty members and research scholars from urban and rural areas remain disadvantegoeus to the digital libraries [68,69]. Research showed multiple factors of inaccessibility to digital services and facilities in developing countries [48,70,71]. Besides technology, these factors include infrastructure and provision of related facilities in HEIs. In addition, students do not even have access to the available online databases due to different issues, that is, Internet issues and subscription issues, and partical aceess to databases [72–74]. Research also showed that students, readers, scholars, and faculty from both rural and urban areas do not have access to these databases [75,76]. Therefore, in most of the developing countries, students from rural areas were not able to get benefitted from digital libraries, while students from urban areas although benefitted however suffered to the great extent [77–79]. Hence, based on the review of literature, we articulated the following conceptual framework for the current study.

Based on the conceptual model, we have formulated the following hypotheses(see Figure 1):
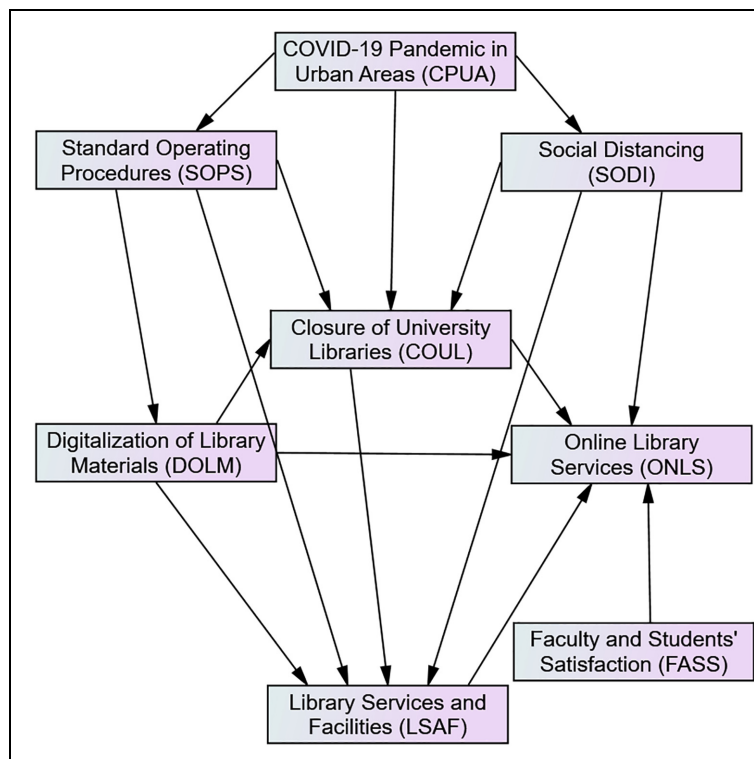
Figure 1. Conceptual framework.

Hypothesis 1. COVID-19 pandemic in urban areas has a direct effect on standard operating procedures, social distancing and closure of university libraries.

Hypothesis 2. Standard operating procedures of COVID-19 have direct effects on digitalization of library material, closure of university libraries, and library services & facilities.

Hypothesis 3. Digitalization of library materials has a direct effect on the closure of university libraries, library services & facilities, and online library services.

Hypothesis 4. Social distancing has a direct effect on the closure of university libraries, library services & facilities.

Hypothesis 5. Closure of university libraries has a direct effect on library services & facilities, and online library services.

Hypothesis 6. There is a direct effect of library services & facilities, social distancing, and faculty & student satisfaction on online library services.

3. The data and methods

3. 1. The study design and unit of analysis

This study used a quantitative design and a cross-sectional survey was conducted. The unit of analysis was based on the university students and faculty members using university library services for their study and research purposes.

3.2. Sampling procedures and sample

The sample was based on the academic library users of enrolled students of two Public Sector Universities of Pakistan, that is, University of Gujrat, Gujrat and Mirpur University of Science and Technology (MUST), Mirpur. Students passed at least one semester of BS (4 years) and MA/MSc (2 years) programme. In addition, faculty members using library resources were also included in the study. A total of 1736 users including students and faculty members were sampled through proportionate random sampling technique. A sampling frame was consisted on a complete list (attendance sheet) of students and faculty members (attendance list) was collected from the concerned departments along with their WhatsApp numbers and email address. The use of WhatsApp and email was opted due to the pandemic situations. It was impossible to get the data personally from each respondent due to closure of the universities. All the library users were sent a survey form either through email or WhatsApp. A total of 1736 students and faculty members participated to fill the questionnaire out of 7835.

3.3. The technique of data collection

An online survey was opted to collect information from the respondents. The rationale to conduct an online survey was based on minimising the spread of the current pandemic outbreak by maintaining social distancing rules. The procedure was also opted to minimise the risk of infection.

3.4. Tool of data collection

A structured questionnaire was constructed based on different variables and their statements. The main variables include COVID-19 pandemic, standard operating procedures, social distancing, closure of university library, digitalization of library material, online library services, faculty and students' satisfaction, and library services and facilities. An attitudinal scale of (dis)agreement (Strongly Agree to Strongly Disagree) consisting of six-point scale had been used to measure the response of the respondents. It is pertinent to mention here that the variables along with relevant statements had been extracted from different sources including several studies, available review of literature, and also consulted with subject experts. Total eight variables and 64 items had been used in the questionnaire. The consent for the respondents was included in the front page of the survey questionnaire.

3.5. Ethical approval

Before collecting data, an ethical approval was taken from the ethical institutional review board (IRB) of both universities to conduct this research.

3.6. Scale reliability test

Cronbach's alpha statistical test was employed to test the reliability of the measurement instrument. The results of pretesting indicated the significance of alpha value ranging from .738 to .898 and overall was .938. The sample size for pre-testing was taken as 30. Furthermore, exploratory factor analysis (EFA) was employed to identify the items of the constructs, and confirmatory factor analysis (CFA) was employed to confirm the factors. The structural equation modelling (SEM) technique was employed to measure the direct and indirect effects [80] of the proposed model. The rationale to use this statistical technique was based to measure the direct and indirect effects of the path variables. Similarly, this method had the assumption that the sample size should be more than 400 and data should be parametric. Hence, the SEM technique was more appropriate as compared with other statistical techniques including regression analysis. It is pertinent to mention here that regression analysis only predicts the effects of more than one independent variable on only one dependent variable. It also did not provide the path diagram. Therefore, the SEM technique had been employed after completing all the pre-assumptions of the statistical test.

4. Results and discussion

This study shows respondents' mixed geographical locations, that is, 76% belonged to rural area and 24% belong to urban area. The distribution of respondents according to gender is: male were 38% and female were 62%. All the participants are literate (students studying at BS & MA/MSc educational level and faculty members working in different departments) and their ages ranged from 20 to 42 years. It is noteworthy to mention that fathers of the respondents are working in different capacities of life such as government and private jobs, business, farming, driving, and labour. The educational level of their father is ranging from illiterate to above master level. Moreover, family size ranged up to seven brothers and nine sisters. In addition to the demographic characteristics of the participants, descriptive statistics of the study has also been provided in Table 1. It includes range, minimum (Min.), maximum (Max.), mean, standard deviation and variance of the variables used in the research.

Table 2 describes the correlation statistical test of the variables. The results reveal that there was a significant positive correlation among all variables. It is worth mentioning to show that standard operating procedures have a significant correlation with social distancing (.590), digitalization of library materials (.544), and library services & facilities (.435). Contrary to it, the lowest significant correlation (.127) has been reported between faculty & students' satisfaction and COVID-19 pandemic outbreak in urban areas. Moreover, it revealed that the results showed in the table presented the significance of the variables selected for this study.

4.1. Direct effects of the model

4. 1.1. Hypothesis 1: COVID-19 pandemic in urban areas has a direct effect on standard operating procedures, social distancing, and closure of university libraries. The study asserts that there is a direct effect of COVID-19 pandemic outbreak in urban areas on standard operating procedure (β = .285), social distancing (β = .256), and closure of university libraries (β = .237). The results are in support of hypothesis 1 that the COVID-19 outbreak affected that urban area that results in social distancing and other standard operating procedures. Furthermore, university libraries are closed to minimise the spread of the current pandemic [81]. As it affected the whole world and all educational institutions are closed temporarily [82–84], after few months, all the academic activities are shifted online [14,76,85]. It is important to mention here that students and faculty members are not allowed to visit university libraries [86]. Hence, the current epidemic affected the education sector at a large level [18,87]. Currently, the third wave of COVID-19 is also very dangerous, and the number of positive cases and death has also been increasing day by day in developing countries, including India, Pakistan, and similar to other developing settings [88–90].

4.1.2. Hypothesis 2: Standard operating procedures of COVID-19 have direct effects on digitalization of library material, closure of university libraries, and library services & facilities. The results in Table 3 reveal that there is a direct effect of standard operating procedures of COVID-19 on digitalization of library material (β = .506), closure of university libraries (β = .320) and library services & facilities (β = .077). The survey results showed the confirmation of hypothesis 2 that standard operating procedures of COVID-19 have been directly affecting the digitalization of library material. As the lockdown has been started and university libraries were closed [76,91,92], all the study-related materials were digitalized by the academic libraries to facilitate the students and faculty members [93,94]. This process was essential to enhance the learning as academic activities were shifted to online [12,47,95]. The study findings are also aligned with the findings of library services and facilities to the faculty and students during current pandemic situations [96,97].

Table 1. Descriptive statistics (*n* = 1736).

Variables	Range	Min.	Max.	Mean	SD	Variance
Social Distancing (SODI)	13	7	20	17.68	2.259	5.104
COVID-19 Pandemic in Urban Areas (CPUA)	12	8	20	15.00	2.333	5.445
Standard Operating Procedures (SOPS)	14	10	24	20.83	3.094	9.572
Closure of University Libraries (COUL)	11	9	20	17.83	2.358	5.558
Digitalization of Library Materials (DOLM)	12	8	20	17.48	2.420	5.856
Online Library Services (ONLS)	9	7	16	14.21	1.838	3.379
Faculty and Students' Satisfaction (FASS)	15	5	20	15.93	3.624	13.132
Library Services and Facilities (LSAF)	9	11	20	17.64	2.270	5.154

Table 2. Correlation statistical test (*n* = 1736).

Variables	SODI	CPUA	SOPS	COUL	DOLM	ONLS	FASS	LSAF
SODI	1	.256	.590	.302	.544	.250	.259	.435
CPUA		1	.285	.377	.249	.150	.127	.237
SOPS			1	.474	.506	.326	.333	.457
COUL				1	.439	.459	.296	.586
DOLM					1	.212	.496	.456
ONLS						1	.085	.425
FASS							1	.303
LSAF								1

**Correlation is significant at the 0.01 level (2-tailed).

4.1.3. Hypothesis 3: Digitalization of library materials has a direct effect on the closure of university libraries, library services & facilities, and online library services. The calculated data indicate that there is a direct effect of digitalization of library materials on the closure of university libraries (β = .260), library services & facilities (β = .126) and online library services (β = .055). The analysis confirmed hypothesis 3 that digitalization of library materials was started and had direct effects on the closure of university libraries during COVID-19. Furthermore, the university library started online services to patron including students and faculty members to facilitate online academic activities [85,98,99]. Similarly, library services and facilities were started during a current pandemic to facilitate online materials to the users [100–102]. At the starting time of lockdown, it was difficult for students and faculty members to shift online academic activities [49,103], as it was reported in developing countries that most of the material was in hard form and it takes time to be shifted online [104,105]. Hence, the digitalization of library materials and online library services had been started after the closure of higher education institutions [59,61,106]. Furthermore, the study findings are similar to the findings of Jin [25], Perkins [107] and Weyant [79].

4.1.4. Hypothesis 4: Social distancing has a direct effect on the closure of university libraries and library services & facilities. The statistical data in the table point out that there is a direct effect of social distancing on the closure of university libraries (β = .096), library services & facilities (β = .200). The analysis supported and confirmed hypothesis 4 that social distancing during COVID-19 has direct effects on the closure of universities and library services. It is note-taking here to mention that the current pandemic affected educational institutions at a large level all over the world including developing and developed countries [60,104,108,109]. It is important to mention here that social distancing was opted to minimise the spread of infection and university libraries were closed to avoid the risk [48,110]. These university libraries were temporarily closed along with higher education institutions [5]. Hence, the library staff tried to facilitate and provide online services to faculty and students during online academic activities [7,26]. The study finding is aligned with the study finding reported in several countries [13,18,110,111].

4.1.5. Hypothesis 5: Closure of university libraries has a direct effect on library services & facilities, and online library services. The analysis shows that there is a direct effect of the closure of university libraries on library services & facilities (β = .468), and online library services (β = .351). The study findings confirmed hypothesis 5 that university libraries were closed and the services were also postponed till the further decision of higher education institutions. The services and

Table 3. Regression weights, covariances, and variances (*n* = 1736).

Variables			Standardised regression weights	Estimate	*SE*	C.R.	*P*
CPUA	—>	SOPS	.285	.378	.031	12.398	***
SOPS	—>	DOLM	.506	.396	.016	24.452	***
CPUA	—>	SODI	.256	.248	.022	11.050	***
CPUA	—>	COUL	.237	.245	.021	11.486	***
DOLM	—>	COUL	.260	.259	.022	11.685	***
SOPS	—>	COUL	.320	.250	.018	13.966	***
SODI	—>	COUL	.096	.102	.021	4.820	***
DOLM	—>	LSAF	.126	.113	.020	5.552	***
SOPS	—>	LSAF	.077	.054	.017	3.253	.001
COUL	—>	LSAF	.468	.424	.021	20.549	***
SODI	—>	LSAF	.200	.193	.018	10.579	***
LSAF	—>	ONLS	.223	.188	.022	8.528	***
COUL	—>	ONLS	.351	.268	.020	13.229	***
SODI	—>	ONLS	.097	.079	.017	4.545	***
DOLM	—>	ONLS	.055	.042	.018	2.346	.019
FASS	—>	ONLS	.085	.043	.010	4.101	***
Variances							
CPUA				5.442	.185	29.453	***
FASS				13.125	.446	29.453	***
e1				8.788	.298	29.453	***
e2				4.766	.162	29.453	***
e4				4.352	.148	29.453	***
e3				3.702	.126	29.453	***
e6				2.936	.100	29.453	***
e5				2.493	.085	29.453	***

Chi-square = 1447.598, *df* = 12, *P*-value = .000. Model fit summary = GFI = .906, AGFI .909, CFI = .903, RMSEA = .072. Total number of observations = 1736.

facilitation were provided to the patrons [16]. It is worth mentioning that university libraries provided digital resources to their users during the current pandemic situation [39,87]. The current study findings are supported by several study findings conducted by researchers in the developing world [112].

4.1.6. Hypothesis 6: There is a direct effect of library services & facilities, social distancing, and faculty & student satisfaction on online library services. The study findings depict that there is a direct effect of library services & facilities (β = .223), social dissecting (β = .097), and faculty & student satisfaction (β = .085) on online library services. The results were confirmed to support hypothesis 6 that library services were provided to faculty and students during COVID-19. Although the infrastructure and the Internet service was not properly available in the developing world. University libraries tried their best efforts to facilitate the library patrons. The online library services to library users were provided as per the availability of existing resources [113]. However, the social distancing rules were also implemented to prevent the spread of the pandemic outbreak [1,2,5]. Furthermore, the finding of the current study have been aligned with the results of several researchers reported in the global north and global south on the subject under discussion [16,20,111].

4.2. Indirect effects of the model

4.2.1. Hypothesis 7: COVID-19 pandemic in urban areas has an indirect effect on digitalization of library materials, closure of university libraries, and library services & facilities through the mediation of standing operating procedures. The study findings show that there is an indirect effect of COVID-19 pandemic in urban areas on digitalization of library materials (*SE* = 0.144***), closure of university libraries (*SE* = 0.091***), and library services & facilities (*SE* = 0.022*) through the mediation of standing operating procedures (see Table 4).

Table 4. Indirect effects of the model (*n* = 1736).

Indirect path	Unstandardized estimate	Lower	Upper	*P*-value	Standardised estimate
CPUA –> SOPS –> DOLM	0.150	0.126	0.173	0.001	0.144***
CPUA –> SOPS –> COUL	0.094	0.078	0.115	0.001	0.091***
CPUA –> SOPS –> LSAF	0.020	0.008	0.034	0.011	0.022*
CPUA –> SODI –> COUL	0.025	0.038	0.013	0.003	0.025**
CPUA –> SODI –> LSAF	0.048	0.034	0.064	0.001	0.051***
CPUA –> SODI –> ONLS	0.020	0.012	0.029	0.001	0.025***
CPUA –> COUL –> LSAF	0.104	0.087	0.123	0.001	0.111***
CPUA –> COUL –> ONLS	0.066	0.054	0.077	0.001	0.083***
SOPS –> DOLM –> COUL	0.102	0.084	0.121	0.001	0.131***
SOPS –> DOLM –> LSAF	0.045	0.030	0.061	0.001	0.064***
SOPS –> DOLM –> ONLS	0.017	0.034	0.000	0.101	0.028
SOPS –> COUL –> LSAF	0.106	0.086	0.127	0.001	0.150**
SOPS –> COUL –> ONLS	0.067	0.052	0.084	0.001	0.112***
SOPS –> LSAF –> ONLS	0.010	0.004	0.018	0.012	0.017*
SODI –> COUL –> LSAF	0.043	0.064	0.022	0.003	0.045**
SODI –> COUL –> ONLS	0.027	0.040	0.014	0.003	0.034**
SODI –> LSAF –> ONLS	0.036	0.027	0.049	0.001	0.045***
DOLM –> COUL –> LSAF	0.110	0.086	0.137	0.001	0.121***
DOLM –> COUL –> ONLS	0.069	0.056	0.087	0.001	0.091***
DOLM –> LSAF –> ONLS	0.021	0.013	0.031	0.001	0.028***
COUL –> LSAF –> ONLS	0.080	0.062	0.098	0.001	0.104***

Significance of estimates: *** $p < 0.001$, ** $p < 0.010$, * $p < 0.050$, † $p < 0.100$.

4.2.2. Hypothesis 8: COVID-19 pandemic in urban areas has an indirect effect on online library services, closure of university libraries, and library services & facilities through the mediation of social distancing. The results of the cross-sectional survey indicate that there is an indirect effect of COVID-19 pandemic in urban areas has indirect effect on online library services (*SE* = 0.025***), closure of university libraries (*SE* = 0.025**), and library services & facilities (*SE* = 0.051***) through the mediation of social distancing.

4.2.3. Hypothesis 9: COVID-19 pandemic in urban areas has an indirect effect on library services & facilities and online library services through the mediation of closure of university libraries. The tabulated data of indirect effects of the model reveal that there is an indirect effect of COVID-19 pandemic in urban areas on library services & facilities (*SE* = 0.111***) and online library services (*SE* = 0.083***) through the mediation of closure of university libraries.

4.2.4. Hypothesis 10: Standard operating procedure of outbreak has an indirect effect on the closure of university libraries, library services & facilities, and online library services through the mediation of digitisation of library materials. The statistical analysis describes that there is an indirect effect of standard operating procedures of the outbreak on the closure of university libraries (*SE* = 0.131***), library services & facilities (*SE* = 0.064***), and online library services (*SE* = 0.028) through the mediation of digitisation of library materials.

4.2.5. Hypothesis 11: Standard operating procedures have indirect effects on library services & facilities and online library services through the mediation of closure of university libraries. The survey results present that there is an indirect effect of standard operating procedures on library services & facilities (*SE* = 0.150**) and online library services (*SE* = 0.112***) through the mediation of closure of university libraries.

4.2.6. Hypothesis 12: Standard operating procedure has an indirect effect on online library services through the medication of library services & facilities. The data show that there is an indirect effect of the standard operating procedure on online library services (*SE* = 0.017*) through the mediation of library services & facilities.

4.2.7. Hypothesis 13: Social distancing has an indirect effect on library services & facilities through the mediation of closure of university libraries. The study found to show that there is an indirect effect of social distancing on library services & facilities (*SE* = 0.045**) through the mediation of closure of university libraries.

4.2.8. Hypothesis 14: Social distancing has an indirect effect on online library services through the mediation of closure of university libraries and library services & facilities. The survey results indicated that social distancing has an indirect effect on online library services through the mediation of closure of university libraries (*SE* = 0.034**) and library services & facilities (*SE* = 0.045***).

4.2.9. Hypothesis 15: Digitalization of library materials has an indirect effect on library services & facilities and online library service through the mediation of closure of university libraries. The indirect effect of the model describes that there is an indirect effect on digitalization of library materials on library services & facilities (*SE* = 0.121***) and online library service (*SE* = 0.091***) through the mediation of closure of university libraries.

4.2.10. Hypothesis 16: Digitisation of library materials and closure of university libraries have an indirect effect on online library services through the mediation of library services & facilities. The statistical data reveal that there is an indirect effect on digitisation of library materials (*SE* = 0.128***) and closure of university libraries (*SE* = 0.104***) on online library services through the mediation of library services & facilities.
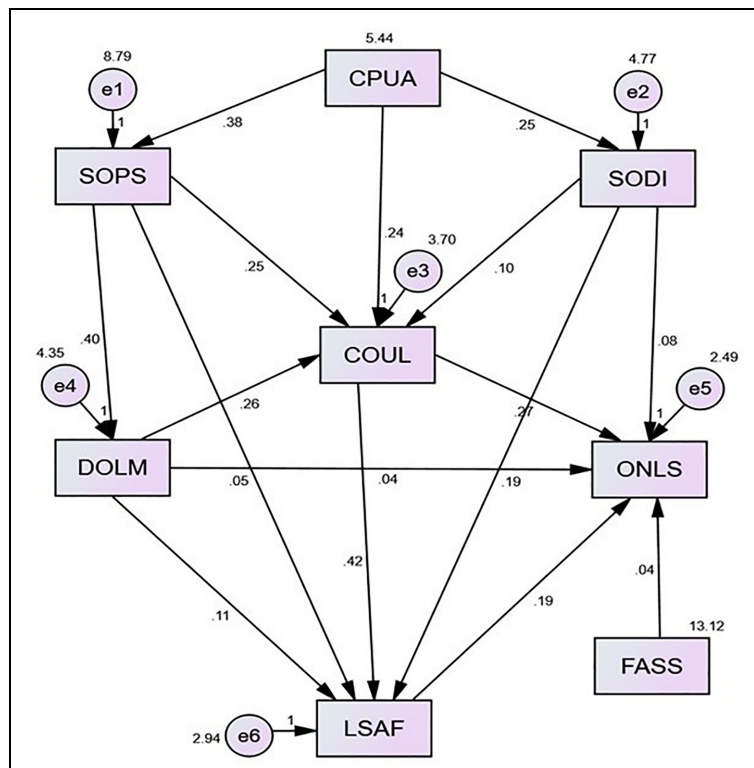

Figure 2. Model fit diagram.

5. Conclusion

The overall conclusion we reached in this article is based on model employed in the study. It is worth mentioning that outbreak affected HEIs worldwide. Consequently, academic libraries were closed to avoid the spread of pandemics. We concluded that COVID-19 pandemic affected HEIs of Pakistan at large level. The traditional academic libraries were

closed down for students, researchers and faculty members. Owing to the urgency of online education, library materials were digitalized and online library services were provided to students and faculty members. Similarly, these libraries provided the required academic material to the users online. It is important to mention that university faculty members and students were satisfied with the provision of digital library materials and online library services to complete the academic tasks. The study recommended that the developed countries should also support developing nations in terms of technology. In this way, developing countries may develop their own online library resources and digitalized academic materials to facilitate students and faculty members in any such crisis.

5.1. Future research

5.1.1. Study design. Mixed Method Research (MMR) may be employed to conduct the studies in the future on the similar nature of the topic of library services and digitalization of library material.

5.1.2. Population and unit of analysis. Future research may be conducted in special libraries, public libraries, and national libraries. Similarly, a unit of analysis may also be used as library patrons.

5.1.3. Statistical analysis. Statistical techniques of Artificial Neural Network (ANN) may also be employed to test the data and draw a conclusion.

5.2. Limitation of the study

The research had been limited to quantitative study design and SEM technique. Similarly, it only focused on the academic library at higher education institutions in Pakistan.

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References

[1] Shoaib M and Abdullah F. COVID-19 backlash: psycho-social impacts of outbreak in Pakistan. *Health Educ* 2021; 121: 265–274.
[2] Shoaib M and Abdullah F. Risk reduction of COVID-19 pandemic in Pakistan. *Soc Work Public Health* 2020; 35: 557–568.
[3] Ahmad A, Shoaib M and Abdullah F. COVID-19 black swan and personal protective equipment (PPE) in Pakistan. *Health Educ* 2021; 122: 1–9.
[4] Abdullah F and Shoaib M. Psychosocial impacts of COVID-19 pandemic: a cross-sectional study of Mirpur, Pakistan. *Int Rev Sociol* 2021; 31: 1–17.
[5] Shoaib M, Rasool D and Anwar D. Evaluating research support facilities to university students during COVID-19. *Libr Philos Pract* 2021; 4953: 1–18.
[6] Shoaib M, Iqbal S and Tahira G. Digitalization of academic libraries in higher education institutions during COVID-19 pandemic. *Libr Philos Pract* 2021; 2021: 6376.
[7] Fraser-Arnott M. Academic library COVID-19 subject guides. *Ref Libr* 2020; 61: 165–184.
[8] Ma LFH. Academic library services during COVID-19: the experience of CUHK library. *Int Inform Libr Rev* 2020; 52: 321–324.
[9] Vitella F. Comics, the library has those: how public libraries can use graphic novels to foster reading communities. *J Graph Novel Comics* 2022; 13: 72–92.
[10] Rafiq S, Ashiq M, Ur-Rehman S et al. A content analysis of the websites of the world's top 50 universities in medicine. *Sci Technol Libr* 2021; 40: 1–22.
[11] Xie X, Siau K and Nah FFH. COVID-19 pandemic – online education in the new normal and the next normal. *J Inform Technol Case Appl Res* 2020; 22: 175–187.

[12] Adedoyin OB and Soykan E. Covid-19 pandemic and online learning: the challenges and opportunities. *Interact Learn Environ* 2020; 2020: 1–13.

[13] Warren GW, Lofstedt R and Wardman JK. COVID-19: the winter lockdown strategy in five European nations. *J Risk Res* 2021; 24: 267–293.

[14] Adams AL. Online teaching resources. *Publ Serv Quart* 2020; 16: 172–178.

[15] Alajmi BM and Albudaiwi D. Response to COVID-19 pandemic: where do public libraries stand? *Publ Libr Quart* 2021; 40: 550–556.

[16] O'Donnell P and Anderson L. The university library: places for possibility. *New Rev Acad Libr* 2022; 28: 232–255.

[17] Ullah H and Shoaib M. Trend of research visualization of sociology of education from 2001 to 2020: a bibliometric analysis. *Libr Philos Pract* 2021; 5172: 1–24.

[18] Regehr C and Goel V. Managing COVID-19 in a large urban research-intensive university. *J Loss Traum* 2020; 25: 523–539.

[19] Ćirić J and Ćirić A. The impact of the COVID-19 pandemic on digital library usage: a public library case study. *J Web Libr* 2021; 15: 1–16.

[20] Sangster A, Stoner G and Flood B. Insights into accounting education in a COVID-19 world. *Account Educ* 2020; 29: 431–562.

[21] Coghill JG and Sewell KA. Librarians' response during COVID-19. *J Electron Resour Med Libr* 2020; 17: 92–100.

[22] Alajmi MA and Alotaibi JH. Reconceptualization of system use in the context of the digital library: what are the roles of UTAUT and IS success models? *J Electron Resour Libr* 2020; 32: 151–181.

[23] Srivastava R and Babel P. Role of open access after emergence of COVID-19: special reference to national digital library and repository. *New Rev Child Lit Libr* 2020; 26: 131–140.

[24] Jung J, Horta H and Postiglione GA. Living in uncertainty: the COVID-19 pandemic and higher education in Hong Kong. *Stud High Educ* 2021; 46: 107–120.

[25] Jin Q. Enhanced discovery with linked open data for library digital collections. *Tech Serv Quart* 2021; 38: 17–32.

[26] Howes L, Ferrell L, Pettys G et al. Adapting to remote library services during COVID-19. *Med Ref Serv Quart* 2021; 40: 35–47.

[27] Decker EN. Reaching academic library users during the COVID-19 pandemic: new and adapted approaches in access services. *J Access Serv* 2021; 18: 1–22.

[28] Condic K. Examination of academic library websites regarding COVID-19 responsiveness. *J Web Libr* 2021; 15: 32–45.

[29] Weeks A, Houk KM, Nugent RL et al. UNLV Health Sciences Library's initial response to the COVID-19 pandemic: how a versatile environment, online technologies, and liaison expertise prepared library faculty in supporting its user communities. *Med Ref Serv Quart* 2020; 39: 344–358.

[30] Jæger MM and Blaabæk EH. Inequality in learning opportunities during COVID-19: evidence from library takeout. *Res Soc Stratif Mob* 2020; 68: 1–5.

[31] Craft AR. Remote work in library technical services: connecting historical perspectives to realities of the developing COVID-19 pandemic. *Ser Rev* 2020; 46: 227–231.

[32] Garner J, Hider P, Jamali HR et al. 'Steady ships' in the COVID-19 crisis: Australian public library responses to the pandemic. *J Aust Libr Inform Assoc* 2021; 70: 102–124.

[33] Koos JA, Scheinfeld L and Larson C. Pandemic-proofing your library: disaster response and lessons learned from COVID-19. *Med Ref Serv Quart* 2021; 40: 67–78.

[34] Shoaib M and Ullah H. Classroom environment, teacher, and girl students' learning skills. *Educ Urban Soc* 2021; 53: 1–25.

[35] Shoaib M and Ullah H. Teachers' perspectives on factors of female students' outperformance and male students' underperformance in higher education. *Int J Educ Manage* 2021; 35: 684–699.

[36] Shoaib M, Ali N and Naseer A. Plotting the literature on precautionary measures of COVID-19: a scientometric analysis of web of science. *Libr Philos Pract* 2021; 5899: 1–20.

[37] Shoaib M, Ali N, Anwar B et al. Plotting the literature on learning outcomes and academic performance in higher education from 2001 to 2020: a scientometric analysis. *Libr Philos Pract* 2021; 5919: 1–24.

[38] Scott MC and Vogus B. Through the eyes of an academic library: understanding the significance of the strategic planning process. *Publ Serv Quart* 2021; 17: 40–45.

[39] Metcalfe AS. Visualizing the COVID-19 pandemic response in Canadian higher education: an extended photo essay. *Stud High Educ* 2021; 46: 5–18.

[40] Lee AP and Springer K. Socially engaged oral history pedagogy amid the COVID-19 pandemic. *Oral Hist Rev* 2020; 47: 227–239.

[41] Nowicki R. Starting from (sort of) scratch: strategies for developing a long-term and sustainable online library instruction plan. *J Libr Inform Serv Dist Learn* 2021; 14: 240–252.

[42] Nelson RJ. Podcasting services in academic libraries: a case study. *Coll Undergrad Libr* 2020; 27: 117–132.

[43] Quattrone F, Borghini A, Emdin M et al. Protecting higher education institutions from COVID-19: insights from an Italian experience. *J Am Coll Health* 2022; 70: 1354–1355.

[44] Saran S, Gurjar M, Baronia AK et al. Personal protective equipment during COVID-19 pandemic: a narrative review on technical aspects. *Exp Rev Med Devices* 2020; 17: 1265–1276.

[45] Jones S. Optimizing public library resources in a post COVID-19 world. *J Libr Admin* 2020; 60: 951–957.

[46] Hashemi S and Shahrabi Farahani R. How accessible is our collection? National Library of Iran's strategies for grey literature. *Ser Libr* 2020; 79: 307–315.

[47] Maluleke S, Ngoepe M and Marutha NS. A framework for document delivery services in an open distance e-learning environment library. *J Interlibr Loan Doc Deliv Electron Res* 2020; 29: 29–43.

[48] Tammaro AM. COVID 19 and libraries in Italy. *Int Inform Libr Rev* 2020; 52: 216–220.

[49] Bao W. COVID-19 and online teaching in higher education: a case study of Peking University. *Hum Behav Emerg Technol* 2020; 2: 113–115.

[50] Vogus B. Ebooks in academic libraries. *Publ Serv Quart* 2020; 16: 182–185.

[51] Toquero CM. Challenges and opportunities for higher education amid the COVID-19 pandemic: the Philippine context. *Pedag Res* 2020; 5: 1–5.

[52] Saragossi J, Stevens GA, Scheinfeld L et al. Leveraging survey results in support of a library renovation: a case study. *Med Ref Serv Quart* 2020; 39: 238–253.

[53] Oxborrow-Cowan E. Digital scholarship at the Library of Congress: user demand, current practices and options for expanded services. *Arch Records* 2020; 41: 328–330.

[54] World Health Organization (WHO). Coronavirus disease (COVID-19): situation report - 151, 2020, https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200619-covid-19-sitrep-151.pdf

[55] Shoaib M, Ali N, Anwar B et al. Research visualization on teaching, language, learning of English and higher education institutions from 2011 to 2020: a bibliometric evidences. *Libr Philos Pract* 2021; 5677: 1–27.

[56] Shoaib M, Ahmad A, Ali N et al. Trend of research visualization of learning, classroom, and class participation in higher education institutions: a bibliometric analysis from 2001 to 2020. *Libr Philos Pract* 2021; 5743: 1–26.

[57] Shoaib M, Abdullah F and Ali N. A research visualization of academic learning skills among students in higher education institutions: a bibliometric evidence from 1981 to 2020. *Libr Philos Pract* 2021; 5579: 1–34.

[58] Kee CE. The impact of COVID-19: graduate students' emotional and psychological experiences. *J Hum Behav Soc Environ* 2021; 31: 476–488.

[59] Crawford J, Butler-Henderson K, Rudolph J et al. COVID-19: 20 countries' higher education intra-period digital pedagogy responses. *J Appl Learn Teach* 2020; 3: 1–20.

[60] Reimers FM and Schleicher A. A framework to guide an education response to the COVID-19 pandemic of 2020, 2020, https://www.oecd-ilibrary.org/docserver/6ae21003-en.pdf?expires=1668974255&id=id&accname=guest&checksum=86A1F557F2FFB6F7E8B482DECF66A4AF

[61] Robinson K, Saddler A, Kerr-Campbell M et al. Digital accessibility: overcoming the challenges of managing grey literature in Jamaica: the case of the University of the West Indies Mona Library. *Ser Libr* 2020; 79: 326–348.

[62] Ali MY, Naeem SB and Bhatti R. Digital technologies applications in the provision of library and information services in health crises. *J Hosp Libr* 2020; 20: 342–351.

[63] Mojapelo SM. The internet access and use in public libraries in Limpopo Province, South Africa. *Publ Libr Quart* 2020; 39: 265–282.

[64] Atta-Obeng L and Dadzie PS. Promoting sustainable development goal 4: the role of academic libraries in Ghana. *Int Inform Libr Rev* 2020; 52: 177–192.

[65] Adeoye AA, Oladokun TA and Opalere E. Readiness for digital reference services: a survey of libraries in Ibadan Metropolis, Nigeria. *Int Inform Libr Rev* 2021; 53: 306–314.

[66] Ledwaba LS. Regulatory frameworks impacting on the South African public libraries internet access. *Publ Libr Quart* 2020; 40: 203–220.

[67] Chidi Nuel-Jean O and Okoye MO. Relevance of libraries and librarians in distance education programs of universities in Nigeria. *J Libr Inform Serv Dist Learn* 2020; 14: 141–159.

[68] Azonobi IN, Uwaifo SO and Tella A. Determinants of postgraduates' use of electronic information resources in federal universities in southern Nigeria. *Int Inform Libr Rev* 2020; 52: 202–215.

[69] Odunola OA and Tella A. Perceived usefulness as correlate of undergraduate students' patronage of online public access catalog in South-West Nigeria. *Catalog Classif Quart* 2020; 58: 520–532.

[70] Zawacki-Richter O. The current state and impact of COVID-19 on digital higher education in Germany. *Hum Behav Emerg Technol* 2021; 3: 218–226.

[71] Mahmut Ö. Educational policy actions by the Ministry of National Education in the times of COVID-19 pandemic in Turkey. *Kastamonu Eğit Derg* 2020; 28: 1124–1129.

[72] Rapanta C, Botturi L, Goodyear P et al. Online university teaching during and after the COVID-19 crisis: refocusing teacher presence and learning activity. *Postdigit Sci Educ* 2020; 2: 923–945.

[73] Hoogland MA. Options for accessing online electronic resources in difficult fiscal times. *J Electron Resour Med Libr* 2021; 18: 1–19.

[74] Desmarais B and Louderback P. Planning and assessing patron experience and needs for an academic library website. *J Libr Admin* 2020; 60: 966–977.

[75] Rodriguez M. Negotiating accessibility for electronic resources. *Ser Rev* 2020; 46: 150–156.

[76] Mishra L, Gupta T and Shree A. Online teaching-learning in higher education during lockdown period of COVID-19 pandemic. *Int J Educ Res Open* 2020; 1: 100012.

[77] O'Donnell R, Maloney K, Masters K et al. Library-faculty referencing and plagiarism pilot using technology-mediated feedback for change. *J Aust Libr Inform Assoc* 2020; 69: 523–539.

[78] Naciri A, Baba MA, Achbani A et al. Mobile learning in higher education: unavoidable alternative during COVID-19. *Aquademia* 2020; 4: 1–2.

[79] Weyant E. Multilingual access and services for digital collections. *J Electron Resour Med Libr* 2020; 17: 125–126.

[80] Gaskin J and Lim J. Indirect effects (AMOS plugin: Gaskination's StatWiki), 2018, http://statwikikolobkreationscom/indexphp

[81] Latif A and Sajid I. *Pakistan closed schools and universities over coronavirus*. Ankara, Turkey: Anadolu Agency, 2020.

[82] Yang H, Bin P and He AJ. Opinions from the epicenter: an online survey of university students in Wuhan amidst the COVID-19 outbreak. *J Chin Govern* 2020; 5: 234–248.

[83] Salman M, Asif N, Mustafa ZU et al. Psychological impact of COVID-19 on Pakistani university students and how they are coping, 2020, https://www.medrxiv.org/content/10.1101/2020.05.21.20108647v2

[84] Omar NAM, Jusoh Z and Kasuma SAA. Malaysian university undergraduates' perceptions towards comprehensive online instructions amidst COVID-19. *Univ J Educ Res* 2020; 8: 7131–7140.

[85] König J, Jäger-Biela DJ and Glutsch N. Adapting to online teaching during COVID-19 school closure: teacher education and teacher competence effects among early career teachers in Germany. *Eur J Teach Educ* 2020; 43: 608–622.

[86] Vegas E. *What can COVID-19 teach us about strengthening education systems?* Washington, DC: Brookings Institution, 2020.

[87] Nasri N, Mohd Rahimi N, Mohamad Nasri N et al. Longitudinal impact of COVID-19 pandemic on university researchers' psychosocial trajectories. *J Loss Traum* 2022; 27: 63–73.

[88] World Health Organization (WHO). *World Health Organization coronavirus disease (COVID-19)*. Geneva: World Health Organization, 2020.

[89] World Health Organization (WHO). *World Health Organization coronavirus disease (COVID-19): situation report - 207*. Geneva: World Health Organization, 2020.

[90] World Health Organization (WHO). *World Health Organization coronavirus disease 2019 (COVID-19): situation report - 88*. Geneva: World Health Organization, 2020.

[91] Odriozola-González P, Planchuelo-GómezÁ, Irurtia MJ et al. Psychological effects of the COVID-19 outbreak and lockdown among students and workers of a Spanish university. *Psychiatr Res* 2020; 290: 113108.

[92] Kang M, Choi Y, Kim J et al. COVID-19 impact on city and region: what's next after lockdown? *Int J Urban Sci* 2020; 24: 297–315.

[93] Tejedor S, Cervi L, Pérez-Escoda A et al. Digital literacy and higher education during COVID-19 lockdown: Spain, Italy, and Ecuador. *Publications* 2020; 8: 48.

[94] Samaroudi M, Echavarria KR and Perry L. Heritage in lockdown: digital provision of memory institutions in the UK and US of America during the COVID-19 pandemic. *Mus Manage Curator* 2020; 35: 337–361.

[95] Day T, Chang ICC, Chung CKL et al. The immediate impact of COVID-19 on postsecondary teaching and learning. *Profess Geograph* 2021; 73: 1–13.

[96] Hover A and Wise T. Exploring ways to create 21st century digital learning experiences. *Education 3-13* 2022; 50: 40–53.

[97] Aduba DE and Mayowa-Adebara O. Online platforms used for teaching and learning during the COVID-19 era: the case of LIS students in Delta State University, Abraka. *Int Inform Libr Rev* 2022; 54: 17–31.

[98] Murphy JA and Shelley A. Textbook affordability in the time of COVID-19. *Ser Rev* 2020; 46: 232–237.

[99] Ladan A, Haruna B and Madu AU. COVID-19 pandemic and social media news in Nigeria: the role of libraries and library associations in information dissemination. *Int J Innov Res Educ Sci* 2020; 7: 2349–5219.

[100] Ifijeh G and Yusuf F. COVID–19 pandemic and the future of Nigeria's university system: the quest for libraries' relevance. *J Acad Libr* 2020; 46: 102226.

[101] Gonzalez T, De La Rubia M, Hincz KP et al. Influence of COVID-19 confinement on students' performance in higher education. *PLoS ONE* 2020; 15: 1–23.

[102] Dwivedi YK, Hughes DL, Coombs C et al. Impact of COVID-19 pandemic on information management research and practice: transforming education, work and life. *Int J Inform Manage* 2020; 55: 102211.

[103] Burki TK. COVID-19: consequences for higher education. *Lancet Oncol* 2020; 21: 758.

[104] Rafiq M, Batool SH, Ali AF et al. University libraries response to COVID-19 pandemic: a developing country perspective. *J Acad Libr* 2021; 47: 1–10.

[105] Asamoah MK. Reflections and refractions on Sakai/Moodle learning management system in developing countries: a case of Ghanaian universities' demand and supply perspective analyses. *Afr J Sci Technol Innov Develop* 2020; 12: 243–259.

[106] Colahan E and Perske S. Bringing digital in from the cold: collecting and preserving music downloads. *Mus Ref Serv Quart* 2021; 24: 59–91.

[107] Perkins CR. From South Asian print to the digital archive: the quest for access and sustainability. *J South Asia Stud* 2020; 43: 554–570.

[108]   Paudel P. Online education: Benefits, challenges and strategies during and after COVID-19 in higher education. *Int J Stud Educ* 2021; 3: 70–85.

[109]   Okike BI. Information dissemination in an era of a pandemic (COVID-19): librarians' role. *Libr Hi Tech News* 2020; 37: 1–4.

[110]   Smith J. Information in crisis: analysing the future roles of public libraries during and post-COVID-19. *J Aust Libr Inform Assoc* 2020; 69: 422–429.

[111]   Ribeiro L and Diniz AMA. The Brazilian penitentiary system under the threat of COVID-19. *Vict Offend* 2020; 15: 1019–1043.

[112]   Ali N and Naveed MA. Research support resources and services in university libraries of Pakistan: a situational analysis. *Pak Libr Inform Sci J* 2020; 51: 57–63.

[113]   Shaukat R, Ali N and Naveed MA. Mapping the literature on health literacy related to COVID-19 pandemic: a scientometric analysis. *Libr Philos Pract* 2021; 5042: 1–15.