

## CHALLENGES IN THE IMPLEMENTATION OF BIG DATA ANALYTICS (BDA) IN MEDICAL INSTITUTE LIBRARIES OF PAKISTAN

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### ABSTRACT

**Purpose:** The core purpose of this study is to pinpoint the challenges (Technological, Knowledge & Skills, Legal & Ethical, and Organizational) faced by the library professionals of medical institutes and attached teaching hospitals of Pakistan during the implementation of Big Data Analytics (BDA). **Design/Methodology/Approach:** Quantitative Survey design was adopted for the collection of data. The targeted audience was the library practitioners of medical institutes and attached teaching hospitals of Pakistan. The questionnaire was distributed among the respondents through personal visits, social media, emails and google docs. Out of total 369 institutions, 256 responses from these library professionals were received for the analysis. After data cleansing and filling missing values the data was analyzed through SPSS 26th version. The descriptive statistics was used, the data was analyzed for Mean and Standard deviation. **Findings:** The finding of the study indicated that in the category of Technological Challenges the library professionals faced the problem of "Lack of storage devices followed by Data Recovery and Variation in data types (structured, un-structured and semi-structured). Furthermore, in the category of Knowledge & Skills Challenges, the Lack of data management skills followed by Lack of data retrieval and Data cleansing faced by these practitioners. Similarly in the category of "Legal & Ethical Challenges the Personal Data privacy & Confidentiality followed by the Fair Use are the big challenges. In the category of "Organizational Challenges", Lack of Big Data management Policy followed by Administrative barriers are the main challenges faced by the library practitioners of these medical institutes and attached teaching hospitals. **Originality/value:** The current study is significant because it fills a huge gap in the literature related to the implementation of BDA technology in the medical institute libraries and challenges faced by these medical librarians.

**Key Words:** Big Data Analytics (BDA), Challenges, Medical Institutes, library practitioners

### INTRODUCTION

Development in the Information Communication Technology (ICT) , Internet of things and cloud computing caused the creation of huge data almost in every field of life (Liu, Yang, Sun, Jiang, & Wang, 2018). Ahmad, JianMing, and Rafi (2019b) Stated that the beginning of Information Communication Technology (ICT) and digital emergence has

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enhanced the world data on huge numbers of digital objects. There is an information flood and explosion in this digital era (Rialti, Zollo, Ferraris, & Alon, 2019). Giannakis, Spanaki, and Dubey (2019) Rightly reported that, due to the advancement in internet, mobile technology, sensors and cloud computing data is being produced at exponential rate. Big data has been extensively discussed in various fields of life for the last two decades. The big data has been defined as “The growth of data on such a large scale is called “big data” (Djafri, Bensaber, & Adjoudj, 2018). As Cuzzocrea (2014) rightly reported that nowadays, the Big Data is an emerging topic of discussion in various fields of life including , education, healthcare, commerce , business sports and government agencies: many studies have been conducted to overcome the challenges and paved ways for the implementation of BDA. Nonetheless, the expert did not agree on a single definition of the big data up till now. Few definitions of big data are quoted in the following lines: According to Manyika (2011) “Big Data refers to such datasets whose volume is outside the capacity of traditional software. Garcia (2013) Explained that Big Data comprises of those data sets which are so large and complex that commonly used software are incapable of dealing with them”. According to Weerasinghe (2017), with the advent and development of emerging technologies, the job nature and responsibilities of the library managers, practitioners and professionals have been changed. Ahmad et al. (2019b) opined that now this is the sole responsibility of the library practitioners and Library managers to store and analyze the prevailing data of information centers for the informed decisions and future predictions which will ultimately helpful for the fulfilling of the organizational goals. Furthermore, Big Data Analytics can be utilized to enhance the effectiveness and efficiency of process (Venkatesh & Davis, 2000). Big data analytics can be defined as “BDA encompasses the technologies and techniques to hunt, store, transmit, analyze and visualize voluminous amount of unstructured and structured data (Erevelles, Fukawa, & Swayne, 2016). As per the study of Read et al. (2015), the library professionals will always face the challenges whenever they will use new information system in their libraries. In other words, the challenges are always associated with the implementation of new technologies in the information centers. When the challenges and opportunities of an organization is known then it is easy to overcome it during the implementation of BDA (El-Seoud, El-Sofany, Abdelfattah, & Mohamed, 2017).

### **Libraries and Big Data Analytics (BDA)**

Library data and Big Data are interconnected with each other, for example increasing in library materials/items means big data (Teets & Goldner, 2013). Due to the importance of Big Data analytics, the library professionals also recognize its significance in the library operations and service (Zhan & Tan, 2020). Likewise, Ilesanmi (2013) is of the opinion that libraries are the units which are being used to acquire the information, organize the information and disseminate the information in order to quench the knowledge thirst of the

society. It is reported that big data is restructuring the shape and functions of libraries for execution their duties(Goins, 2015). Currently, BD is bringing changes in the simple way of data provision into valuable insights using methods of BDA (Ambigavathi & Sridharan, 2018). Libraries have been affected by BDA in two aspects: first, because of big volume, speed of the concerned materials & selection, the capacity and operational needs of the system is overwhelming. Secondly, BDA techniques & algorithms are complicated process, due to which BDA is totally an IT based task(Kamupunga & Chunting, 2019). It is of high importance to manage the organizational resources through BDA initiatives(Braganza, Brooks, Nepelski, Ali, & Moro, 2017). Affelt (2015) Articulated that the emergence of Big Data analytics concept become a challenge for the current library professionals to change their mode of services and operations for the provision of best services to their users. To adopt these unavoidable changes in the current libraries, it should be converted into library 4.0, which means a vigilant library that can evaluate an enormous amount of data and present the required information in minimal time to its users. Library 4.0 means that kind of libraries which have the ability to handle Big Data for better use(Noh, 2015).

### **Medical Institutes and Attached Teaching Hospitals in Pakistan.**

In this study, Medical institute means all those institutions which offer medical programs like MBBS, BDS, Nursing, DPT and Homeopathic etc. and have affiliation with a Medical University, recognized by the then Pakistan Medical and Dentil Council (PMDC) and now Pakistan Medical Commission (PMC). The medical libraries means the libraries in medical institutions and attached teaching hospitals of Pakistan(Ullah & Anwar, 2013). Moreover, all the below mentioned medical institutions are affiliated with the concern Medical Universities and recognized by Pakistan Medical and Dentil Council (PMDC). Due to the exponential growth in digital innovation, emerging technologies and rapid enhancement in the use of digital materials, the application of data analytics in educational institution's libraries is now an important feature (A. A. Islam, Ahmad, Rafi, & JianMing, 2020).

There are around 369 medical institutes and attached teaching hospitals in the country (PMDC, 2019). Out of 369, there are 118 medical Institutions affiliated with Khyber Medical University Peshawar, Khyber Pakhtunkhwa. These institutions offer various types of Medical Programs, like , MBBS, BDS, BS Paramedics, BSc. Nursing, Master in Public Health, Doctor of Physical Therapy (DPT), BSc. Post RN ( 2years) and BHMS (University, 2020, Septembe, 11). Punjab has 156, Sindh has 76 whereas Baluchistan and AJ&K have 07 and 12 medical institutes with attached teaching hospitals respectively (See the details at Appendix- I).

**TABLE NO. 1. PROVINCE WISE NUMBERS OF RECOGNIZED MEDICAL COLLEGES AND ATTACHED TEACHING HOSPITALS.**

Province	Public	Private	Attached Teaching Hospitals	Total
Punjab	19	43	94	156
Sindh	11	15	50	76
K.P	23	30	65	118
Baluchistan	01	01	05	07
AJ&K	03	01	08	12
Total	57	90	222	369

### STATEMENT OF THE PROBLEM

Medical library users are life savers. They need latest, accurate and relevant data for the fulfillment of their daily information needs. With the help of Big Data analytics one can provide information to concerned users according to their requirements in a very organized form. It can also act as a tool to serve the medical practitioners, teachers, students, researchers and paramedical staff in a more effective manner. The major focus of this study is to determine the level of understandability, usability, applicability of BDA in Pakistani medical libraries. Efforts were made to dig out the current practices, the required big data analytics infrastructure, required skills, capabilities and challenges confronted by Medical librarians of these institutions. The tendency of library professionals towards “concept of Big Data” and “different forms of data in libraries is very low (Ahmad, JianMing, & Rafi, 2019a). A. A. Islam et al. (2020) Articulated that Big Data analytics help the librarians to find out the required information of library clients by utilizing the existing data resources. Moreover, it also supports the organization in context of consumption financial resources and library materials.

### PURPOSE OF THE STUDY

Purpose of the current study is to know about the challenges and hurdles faced by the library practitioners of these medical institutes during the implementation and practices of Big Data analytics technology. As the role of library professionals have been changed many fold. They are no more the custodians or watchers of the information materials, rather they involve in data management, data science, storage and retrieval of information. Moreover, it is the need of the time to employed BDA systems in the medical libraries for informed decisions, future predictions and usefulness of library operations. The study in hand will pin point most of the challenges faced by the library professionals of these medical institutes and attached teaching hospitals during the use of this new information system.

### RESEARCH OBJECTIVES

Overall objective of the current study is;

To know about the various challenges confronted by medical librarians in the

implementation of BDA including;

1. Technological Challenges
2. Knowledge and Skills Challenges
3. Legal & Ethical challenges
4. Organizational challenges

## REVIEW OF LITERATURE

This part of the study will review the relevant literature about the challenges faced by the library professionals of these medical institutes during the adoption of this new information system.

### Big Data

It is an open query to determine that at which level the data will be considered as big one, however, some of the data scientists have suggested that BD contains data at the measure of Exabyte, while some others debate for zettabytes/ yottabyte (Anna & Mannan, 2020). Various experts have explained the same concept according to their own point of views on the basis of some evidences. Zhang, Wang, Li, Zhao, and Zhan (2018) have defined the big data as "high-Volume, high-velocity and /or high variety information assets that demand costs effective and innovative forms of information processing that enable enhanced insight, decision making and automation process." There are different views that who coined the word "Big Data" for the first time? The Diebold and Cheng reported that the word "Big data" was coined by John Mashey, during a table talk at Silicon Graphic In-charge (SGI) in the mid 90's (Diebold et al., 2012). On the other hand, the Wang, Kung, and Byrd (2018) claimed that Michael Cox and David Ellsworth used the word Big Data for the first time at an IEEE conference in 1997. Gandomi and Haider (2015) Explained that the three Vs.: volume, velocity and variety are the main outlines for intellectualizing big data. Schaeffer and Olson (2014) Elaborated that BD is also known a mean for value creation. Therefore, the research elucidated big data as data with high value, volume, velocity and variety. Furthermore, the utilization of big data can generate its value. Thus, term veracity has been added to the definition of BD as data quality (White, 2012). In a report, presented by International Data Corporation (IDC) in 2011, said that the yearly data size has enlarged around nine times within a period of five years attaining up to 1.8ZB. Moreover, they projected about the data volume growth to be twofold in every two years till 2020 (Gantz & Reinsel, 2011).

### Big Data Analytics (BDA)

Big Data Analytics (BDA) encompasses the technologies and techniques to hunt, store, transmit, analyze and visualize voluminous amount of unstructured

and structured data(Erevelles et al., 2016). Big Data analytics has the capability to improve the world economy by its active use in various field of life(Manyika, 2011). Similarly , Chen, Chiang, and Storey (2012) abstracted that BDA is a set of data management and analytical techniques & skills for managing enormous (from terabytes and Exabyte) and multifaceted (from sensor to social media) data. Moreover, the Big Data Analytics framework needs advanced data storage, data management, data analysis & visualized advance technologies. After facing many challenges like data capturing its management, storage, analysis and visualizing, BDA has brought a paradigm shift in the world of data scientific retrieval(Tebboune, Nudurupati, Daley, & Hardman, 2016). A best example in this regard is Cricket. During any international cricket tournament the matches are analyzed very easily on the basis of past data available. Moreover, due to past organized data, full record of a batsman or bowler's performances is evaluated even during the match (Dhyani & Barthwal, 2014). Data provider may face many problems in the acquisition of information its storage and process, but as interest increase in Big Data analytics (BDA) such problems will decrease or will be resolved in minimal time(Özköse, Arı, & Gencer, 2015).

### **Challenges in the Implementation of BDA**

On one hand, the implementation of Big Data Analytics paved ways for smooth functioning of organizations & institutes and make the tasks easy for its employees, on other hand there are some challenges which are confronted and faced by these employees.

- **Technological Challenges**

As far as the Technological challenges are concerned, it includes, the availability of all modern gadgets, technological tools , software and hardware etc. (Sivarajah, Kamal, Irani, & Weerakkody, 2017). Furthermore, variation in data, which data is to be stored and which is not, to find out that which data points are important to be stored is also a big challenge(Lee & Yoon, 2017). Cuzzocrea (2014) Said that the BDA requires a specific technological skills to manage and store. Furthermore, in context of the technical challenges, cost & complexity of the big data storage is of high importance(Halamka, 2014). . The following are some challenges which need to be addressed by the future researchers.

- **Analytics Architecture.**

Dealing with currents and historic data by an optimal architecture analytical system is a huge challenge confronted by analytical systems(Marz & Warren, 2013).

- **Statistical significance.**

Accomplishing significant goals is yet another challenge to be addressed. The Efron (2012) rightly says in his book about the large scale statistical

inferences that “it is easy to go wrong with huge data sets and thousands of questions to answer at once.”

- Time evolving data.

The BDA system must be capable of acquainting the evolving data. As in some cases the data may evolved over time. In such a case the data streaming techniques is very useful one (Gama, 2010).

- Compression:

There are two main approaches in respect of big data storage and management, the first one is compression and the second one is sampling. As far as the compression is concerned, in this approach the data does not lost rather the whole data is compressed for saving the space. This methodology takes more time and less space.

Unlike the compression, in case of sampling only the most representative data is stored. This approach takes less time and space(Feldman, Schmidt, & Sohler, 2020).

- Visualization.

It is one of the big challenges for any data analytics system to visualize the end result of the store data. As in any big data analytical system the data is so voluminous, that's why it is very difficult to retrieve the required information need of the client. To fulfill the said task, new framework and techniques will be required(Fan & Bifet, 2013).

- Hidden Big Data.

As all online available data is not properly tagged and analyzed, due to which a big quantity of important data are lost. The IDC reported in 2012 that in the period of 2012 only 23% (643 Exabyte) of data on cloud would be useful if properly tagged and analyzed. Although, only 3% of the possibly useful data is tagged (Gantz & Reinsel, 2011).

- **Knowledge and Skills Challenges**

The most important issues which are affecting the development of a profession is capacity building. Many of the library professionals do not know about the modern IT based environment. Furthermore, they don't have up-to-date IT skill by not attending proper trainings due to lack of funds. Yet another big challenge in the application of Big Data analytics (BDA) is the methodological one. Moreover, Gordon-Murnane (2012) reported that in current circumstances, two big challenges for libraries are data handling and lack of required skills of librarians. Yet another big challenge in the implementation of BDA is the automatic generation of right metadata for the purpose to label the data(Labrinidis & Jagadish, 2012). In the process of BDA, there are so many future vital challenges particularly in its organization & analytics, which appear due to the

various types of data: enormous, variation, and evolving(Gopalkrishnan, Steier, Lewis, & Guszcza, 2012).

- **Legal & Ethical Challenges**

It encompasses the legal and ethical issues(Lee & Yoon, 2017).Similarly, Sivarajah et al. (2017) elucidated that Privacy & Security are of the two important challenges and issues with big data which are of delicate nature and consists of legal, technical as well as conceptual importance. Some people do not want to share their personal data or disclose their privacy, as sometimes big data use personal information of the people when the private information of a particular person is combining with the large data sets which leads to new facts about the personal information of the people(Grady, Underwood, Roy, & Chang, 2014). Most of the companies and organization are using personal information of the people for the purpose of trade and business, this data sharing needs insight information of the people which the people will never want to disclose(Nambiar, Bhardwaj, Sethi, & Vargheese, 2013).

Furthermore, yet another challenge which will be arose due to big data analytics is the social stratification. Through big data analytics, an educated person would take maximum benefit through predictive analysis and on other hand the illiterate person will be identified and will be treated in bad way(Ilesanmi, 2013). During the process of analytics the data become part of large system therefore, sharing personal data about own clients and processes threatens the culture of privacy & competitiveness.

- **Organizational Challenges**

Ilesanmi (2013) Opined that lack of infrastructural facilities keep the employees away from taking interest in their jobs. Furthermore, the important elements which affect the smooth implementation of Big Data Analytics including leadership Support, financial Support, industrial development, perceived Usefulness, data resources ,technical abilities and data talent etc. (L. Wang et al., 2018). Shuijing (2016) elaborated that on resource based view, the factors which affect the application of Big Data analytics are namely, technical capacity, expected earnings, environmental pressure, data quality and data resources. As the available space for data storage is not sufficient to store such enormous data produced by so many sources including Social Media and different other data bases. There is big demand of storage devices for the purpose to store this huge data(Lee & Yoon, 2017). The researchers and IT expert have given its solution in the shape of cloud computing. On the other hand uploading big data on cloud needs more efforts and time. The solution of

this problem is to only upload the metadata of this big data on clouds and networks(Cuzzocrea, 2014).

## RESEARCH METHODOLOGY

The current study has adopted the Positivist research paradigm, which applies quantitative research design. Where the subjective approach is discouraged and fully based on objective approach.

- **Data Collection and Instrumentation**

There were total 369 Medical institutes and attached teaching hospitals in Pakistan(PMDC, 2019). The data has been collected from the library professionals of these medical institutes and attached teaching hospitals through a data collection tool. The questionnaire has designed on the basis of the current literature in the relevant areas. The same has sent to two big data analytics experts for validity. The reliability of the instrument was also checked through SPSS 26<sup>th</sup> which results showed excellent reliability. The cronbatch's Alpha test was applied for the reliability which value was .942, which showed an excellent reliability. The questions were asked from the respondents about the Technological challenges, Knowledge & Skills challenges, Legal & Ethical Challenges, and Organizational challenges. The questionnaire was based on 5 likert scale, starting (1) strongly disagree to (5) strongly agree. Items for the measured variables have adapted from the relevant literature. The data collection tool has distributed among the respondents via social media, personal visits, through post and google Docs. Out of the total population 256 responses were received from the respondents.

## DATA ANALYSIS AND RESULTS

The data collected on questionnaire survey has analyzed through SPSS 26<sup>th</sup> version. The collected data was analyzed for the mean, and standard deviation. Table 2 shows the demographic information of the respondents. . Frequency, and percentage were used for the analysis of the demographic information as shown in the said table. Due to limited population, census base data was collected. Total 256 (69.37 %) responses from 369 respondents were received for the data analysis. There were 74 (28.90%) female and 182 (71.09%) male respondents. Qualification analysis showed that, there were 8 (3.1%) PhD's, 56 MS/MPhil (21.9%), 189 (73.8%) MLIS/BSLIS and 3 (1.2%) BLIS respondents. As far as the respondents' location was concerned, there were 103 (40.2%) respondents from Punjab, 39 (15.2%) were from Sindh, 6 (2.3%) were from Baluchistan, 92 (35.9%) were from Khyber Pakhtunkhwa and 16 (6.3%) were from Federal Capital & A.J. Kashmir. The highest number of respondents 147 (57.4%) were from Private sector medical institutions while 109 (42.6 %) were from Public sector medical institutions and attached teaching hospitals. The highest number 85 (33.2%) were from the experience range 1-5 years, similarly 78(30.5%) were from 6-10 years and stood second. 53

(20.7%) from range 11-15 years, 17 respondents fall in the range of 16-20 years of experience and 23 (9.0%) had more than 20 years of professional experience.

**TABLE NO. 2. DEMOGRAPHIC INFORMATION**

		Frequency	Percentage %
Gender	Male	182	71.09%
	Female	74	28.90%
Qualification	PhD	8	3.1%
	MS/MPhil	56	21.9%
	MLIS/BS-LIS	189	73.8%
	BLIS	3	1.2%
Location of Institution	Punjab	103	40.2%
	Sindh	39	15.2%
	Baluchistan	6	2.3%
	Khyber Pakhtunkhwa	92	35.9%
	Federal Capital & Kashmir	16	6.3%
Type of Institution	Public	109	42.6%
	Private	147	57.4%
Experience	1- 5 Years	85	33.2%
	6-10 Years	78	30.5%
	11-15 Years	53	20.7%
	16-20 Years	17	6.6%
	More than 20 Years	23	9.0%

## ANALYSIS OF VARIOUS CHALLENGES

The data was collected from the respondents on the basis of four areas of challenges;

1. Technological Challenges
2. Knowledge & Skills Challenges
3. Legal & Ethical Challenges
4. Organizational Challenges

- **Technological Challenges**

As far as the technological challenges are concerned most of the library professionals confronted the challenge of “*Lack of storage devices*” with (central tendency) mean value (3.7461), and standard deviation SD (1.06365) followed by “*Data Recovery*” with the mean value (3.742) and standard deviation SD (0.98016). In technological challenges, the “*Variation in data types (structured, un-structured and semi-structured)*” has a parallel position with “*Data Recovery*” with means value (3.742) and

standard deviation SD (0.99997). Table 3 depicts that the library professionals of these medical institutes and attached teaching hospitals largely face the challenge of " *Lack of storage devices*" followed by " *Data Recover and variation in data types*" in the context of technological challenges.

**TABLE NO.3: TECHNOLOGICAL CHALLENGES**

	N	Mean	Std. Deviation
Lack of proper software and hardware	256	3.7266	1.10411
Lack of storage devices	256	3.7461	1.06365
Data Recovery	256	3.7422	.98016
Variation in data types( structured, un-structured and semi-structured)	256	3.7422	.99997

- **Knowledge & Skills Challenges**

The second category in challenges was " *Knowledge & Skills*". Table 4 shows that " *Data cleansing*" with mean value (3.6094) and Std. Deviation (1.04588) is the most faced challenge in the context of knowledge and skills confronted by these library professionals. " *Lack of data management skills*" with mean value (3.5625) and Std. Deviation (1.01942) stood second followed by " *Lake of data retrieval*" with mean value (3.4922) and Std. deviation (1.13411).

**TABLE NO. 4: KNOWLEDGE & SKILLS CHALLENGES**

	N	Mean	Std. Deviation
Lack of data management skills	256	3.5625	1.01942
Lake of data retrieval	256	3.4922	1.13411
Data cleansing	256	3.6094	1.04588
LIS professionals don't have the interest in learning and utilizing the big data tools	256	3.2070	1.26805

- **Legal & Ethical Challenges**

Table 5 indicates that in the context of "Legal & Ethical Challenges"

*“Personal Data privacy and Confidentiality”* with mean value (3.8359) and Std. Deviation (.97238) has grabbed the top position followed by *“Fair Use”* with mean value (3.8047) and Std. Deviation (.97465). *“Issues of data security”* with mean value (3.7969) and Std. Deviation (.98506) came at third position to be mostly faced by the library practitioners of these medical institutes and attached teaching hospitals.

**TABLE NO. 5: LEGAL & ETHICAL CHALLENGES**

	N	Mean	Std. Deviation
Copyright laws	256	3.7500	1.07740
Personal Data privacy and Confidentiality	256	3.8359	.97238
Issues of data security	256	3.7969	.98506
Fair Use	256	3.8047	.97465

- **Organizational Challenges**

Table 6 presents that the challenge *“Lack of Big Data management Policy”* with mean value (3.8633) and Std. Deviation (1.02558) is the most confronted challenge in the category of organization challenges. The *“Administrative barriers”* with mean value (3.7969) and Std. Deviation (1.07272) stood second followed by *“Inadequate funding for the data warehouse or project”* with mean value (3.7617) and Std. Deviation (1.00677). The above discussion reveals that the library professionals of these institutions are severely faced the problem of big data management policy. They also faced the challenges of “administrative berries and inadequate funds from the parent or upper management.

**TABLE NO.6: ORGANIZATIONAL CHALLENGES**

	N	Mean	Std. Deviation
Inadequate funding for the data warehouse or project	256	3.7617	1.00677
There is no provision of training opportunities for LIS professionals.	256	3.7266	1.07896
Lack of Big Data management Policy.	256	3.8633	1.02558
Administrative barriers	256	3.7969	1.07272

## FINDINGS AND RECOMMENDATION

The whole challenges were classified into four broad categories having four items in each.

1. The findings depicted that in the category of technological challenges, these library professionals primarily faced the issue of “Lack of storage devices” followed by “Data recovery”.
2. The administration of these medical institutes and attached teaching hospitals should provide all the necessary storage devices and data recovery software. They must also arranged proper infrastructure for the better environment to implement the BDA technologies in the libraries of these medical institutes and teaching hospitals.
3. The findings also indicates that in the category of “Knowledge and Skills” the library practitioners of these institutions faced the issue of “*Data cleansing*” on the top followed by “*Lack of data management skills and Lake of data retrieval*”. Data cleansing means data cleaning. As the library professionals of these institutions lacking the required skills of data cleansing that’s why they are not in a position to smoothly adopt the BDA system. Furthermore, they don’t have data management skills which is a basic requirement in the implementation of BDA technology. They also don’t have the skills to retrieve the stored data.
4. The health departments and high ups of these medical institution in collaboration with other training institutes should arrange training , seminars and refresher courses to enhance the IT and BDA skills of these librarians.
5. Moreover, the analysis says that in the category of “*Legal and Ethical Challenges*” the library practitioners of these medical institutes confronted the issue of “*Personal Data privacy and Confidentiality*. It means that the practitioners of these institutes cannot take risk of collecting the personal data of their clients due to the fear of leakage. Due to this problem they hesitate to adopt the BDA information system in their libraries. Similarly “*Issues of data security and Fair Use*” are also the two challenges which hindering them to implement BDA system in their concerned information centers.
6. The Government in consultation with the health department and legal experts should make legislation in this regard to protect the personal data of the clients. Similarly, they should also provide training to their library professionals regarding the data security and information ethics. Furthermore, lectures on legal rights and data usage ethics must be organized by the Management of these medical institutes and teaching hospitals.
7. Finally, in the category of “Organizational Challenges” most the librarians of these institutes faced the challenge of “*Lack of Big Data management Policy*”. It

is a fact that there is no big data management policy in these medical institutes and teaching hospitals (Labrinidis & Jagadish, 2012). The absence of such policy caused the non-implementation and abstention of BDA practices in these medical libraries. Moreover, the *“Inadequate funding for the data warehouse or project and Administrative barriers”* are also some more challenges in this category. As Pakistan is a developing country and financial constraint is everywhere in the educational departments. Some of the institutions deliberately do not want to start the BDA practices due to weak financial health of the institute.

8. The government should provide adequate fund to the Public as well as the private sector for the implementation of BDA information system in these medical institutes which will resultantly shape a happy and prosper society. These institutes should also fulfil the fundamental needs of these libraries in context of BDA. Furthermore, the administration must ensure all possible and encourage their library practitioners to adopt BDA analytics which will earn good name to their institutions.

## CONCLUSION

Big Data analytics is a modern information system which performs a vital role in the informed decisions, future predication, make the process easy, useful, expedite and economical (Ambigavathi & Sridharan, 2018). BDA implementation and practices in the medical institutes and teaching hospitals is indispensable and need of the day. The library users of medical institutes are life savers (M. S. Islam et al., 2019). They need information in minimal time for the quick and informed decisions. It will only be possible if these medical libraries start using this modern information system.

El-Seoud et al. (2017) rightly said that during the adoption of this new technology, the libraries faced too much challenges. These challenges have been classified into four categories namely, Technological Challenges, Knowledge and Skills Challenges, Legal & Ethical Challenges and Organizational challenges. Medical librarians of these institutes faced all or some of the mentioned challenges which do not permit them for the smooth adoption of this emerging technology in their libraries (Katal, Wazid, & Goudar, 2013). The government departments, high ups of these medical institutes and teaching hospitals should play their vital role to assist these medical librarians to overcome these challenges and applied BDA information system in these medical institutes and teaching hospitals.

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