

Chapter 10

Supply Chain Resilience During Pandemic Disruption: Evidence from the Healthcare Sector of Pakistan



Evaluating Demand and Supply Chain Resilience

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Abstract The research aims to investigate the impact of supply chain resilience in the healthcare supply chain of Pakistan when experiencing the COVID-19 pandemic disruption. The study uses a qualitative approach. The interview method is selected for data collection. Population of the research is the healthcare sector of Pakistan. A sample of three participants is chosen for this study. Findings: The study finds six different themes as the key strategies of supply chain resilience in COVID-19 disruption namely, cost-effectiveness, collaboration, flexible supply chain strategies, conflict management, future planning, and self-medication. Implications: The research implies focusing on these factors in order to strengthen the supply chain network so that organizations do not have to face risks and disruptions during a crisis or pandemic period.

Keywords Supply chain resilience · Supply chain disruption · COVID-19 pandemic · Pandemic disruption · Healthcare sector · Pakistan · Evaluating demand

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10.1 Introduction

10.1.1 Book Chapter Overview

The COVID-19 epidemic has painfully brought to light the need to reevaluate supply chain management as well as the practices followed in healthcare sectors, corporate structures, and the lifestyles of individuals (Mubarik et al. 2021). The year 2020 saw the common prevalent themes in the media, public policy debates, and daily conversation: limitations in the supply of various items (Khan et al. 2023b). Demand patterns significantly altered due to the sudden outbreak of COVID-19 (Ferdous et al. 2022). Lockdowns and bare shop shelves were seen on the supply side (Miao et al. 2022). Prior to the epidemic, the main focus was on creating supply chains that were flexible, lean, sustainable, environmentally friendly, optimized, and effective Al-Odeh et al. 2021; Badar et al. 2013). These issues have not been neglected throughout the epidemic, but the main concern have significantly shifted.

According to Toba et al. (2008), the process of supply chain is very important as it enables the provision of healthcare treatments and other services to the patients. In order to bring products and services to the patient, who actually avails the services of the healthcare industry, supply chain is a vital and life-saving component (Rakovska and Velinova 2018). In contrast to a business setting where SC interruption might result in lost money, healthcare is significantly more important since lives are at danger (Getele et al. 2019). Supply chain management in the healthcare industry is often a very complicated and disjointed process (Saviano et al. 2014; Mubarik et al. 2021). Regardless of how severe the disruption events are, companies must adopt groundbreaking precautions to avoid or lessen the damage they pose (Mubarik et al. 2022). Hence, the study focuses on the supply chain resilience in the healthcare sector Pakistan during the pandemic disruption (Khan and Zaman 2023).

Supply chain disruptions are considered as a combination of unforeseen circumstances and their effects, which significantly endanger the movement of materials and regular company operations (Khan et al. 2022c). As a technique to guard against a number of threats and disruptions occurred in supply chain, supply chain resilience has emerged as a central concept in the literature on supply chain management (Miao et al. 2022). Pandemic disruption generates specific SC issues that are challenging to defend (Ivanov 2020; Govindan et al. 2020). Pandemics expose the weaknesses of supply chain practices followed in the world because to factors like China's focus of PPE manufacture and unparalleled requirement of the world (Bradsher 2020; Khan et al. 2022b).

It is important to note that pandemics are acknowledged in the book chapter on supply chain risks in a number of studies (for instance, Calnan et al. 2017), less focus was placed on the way resilience might lessen disruption from pandemics (Rubbio et al. 2019; Zaman et al. 2023b), particularly in the healthcare sector (Syahrir et al. 2015). Since the COVID-19 pandemic was the first of its kind encountered and was not anticipated by the general public, no comparable studies can be found and the majority of the studies in this area is still in its early stages. Numerous scholars

studying various issues that are affected by the pandemic right now, and there will be a lot of papers in upcoming years to come that will also be a significant contribution in describing supply chain resilience especially in healthcare sector. The literature assessment is obviously preliminary and selective due to the extremely dynamic growth at the time this study was produced (Zaman et al. 2023a).

Hence, there is a room to investigate the important topic of supply chain resilience during the ongoing COVID-19 epidemic. Also, there is no study found in a literature that has focused on supply chain resilience in health sector in the context of Pakistan, hence, the study is filling the gap in literature by answering the following questions:

1. How is Supply chain resilience revealed in healthcare supply chain of Pakistan when experienced the COVID-19 pandemic disruption?
2. What are the lessons learned from the tests on resilience as a result of the COVID-19 pandemic?

From the above details, the objectives of this chapter is to:

- Explore supply chain resilience in healthcare supply chain of Pakistan during the COVID-19 pandemic disruption.

10.2 Theoretical Background

10.2.1 *Supply Chain Resilience*

According to Brandon-Jones et al. (2014), supply chain resilience can be defined as the capacity of the system to get back to the original condition, in a satisfactory duration of time, after facing disruption. Resilience helps identify the most vulnerable links in the network and strengthen them so that, in the case of a future disruption, the system do not have to experience the same and handle it with ease (Khan et al. 2021). The supply chain is kept moving with supplies and information thanks to the supply chains' resilience (Mubarik et al. 2021). Even the smallest material holdup in any supply chain of the company has a significant time and financial impact (Miao et al. 2022).

Since both notions pertain to an organization's or supply chain's capacity to respond to unforeseen events and environmental changes, many scholars contend that resilience and flexibility are connected (Khan et al. 2022c). Resilience is connected to the range of planned or spontaneous organizational responses to shocks, much like flexibility (Mubarik et al. 2021). One aspect of supply chain resilience is its capacity to accommodate fluctuations in delivery as well as fluctuations in volume, fast product design alterations, and a range of marketing activities (Miao et al. 2022). Market sensitivity is an important element in supply chain's resilience to comprehend and respond to customer demand while lowering the likelihood of supply deficiencies or interruptions (Kopanaki et al. 2018; Jiang et al. 2019).

Scholars, professionals, and policymakers are paying close attention understand the impact of COVID-19 epidemic in an effort to strengthen the supply chain resilience (Mubarik et al. 2022). Transportation networks and related supply chain operations are seen as having high resilience (Aydin et al. 2018; Ilbeigi 2019). More than ever before, academics are researching many facts of the supply chain resiliency (Khan et al. 2023b). The most widely read essay by Ivanov (2020) sought to foresee the outcome impact of a pandemic on supply chain efficiency. The article investigated the duration of supply chain disruption through the perspective of resilience the supply chain may endure as well as the duration of recovery process. It was discovered that several crucial elements, such the opening and closure of facilities, the influence of time, interruption propagation time, and lead time on the supply chain resilience was substantial.

According to Govindan et al. (2020), in the healthcare setting, the requirement to provide critical care skyrockets when the world was experience COVID-19, and effective hospital demand management might lessen the COVID effects. The book chapter suggested a strategy for prioritizing patients in order to maximize hospitalization and intensive care provision. In order to increase the supply chain resilience, Remko (2020) split the pandemic supply chain risks by categorizing into three different groups, which are control, demand, and supply risks.

10.2.2 Strategies to Overcome Supply Chain Resilience

COVID-19 pandemic played a significant role in causing major disruptions in supply chain management (Ivanov 2020) and has been regarded as the biggest risk factor in breaking numerous global supply chains (Araz et al. 2020; Queiroz et al. 2020). However, the COVID-19 was not the only crisis that was experienced by the industries. A number of instances are available in the history that caused a major supply chain disruption, for instance, Tsunami in Japan in the year 2011 that had a global impact of supply chain. Other outbreaks such as Ebola virus, acute respiratory syndrome (SARS), etc. (Green 2012) were also worth mentioning that instigated a number of authors to conduct the study (Dasaklis et al. 2012; Calnan et al. 2017; Mubarik et al. 2023).

For instance, the study of Tan and Enderwick (2006) provided recommendation for the organizations to reevaluate their supply chain practices in order to understand the major issues and bottlenecks and enable slack that can dodge the delays as well as the possible issues expected to happen. In order to avoid risk and uncertainties, organizations can also try to keep buffer stock or safety inventory (Khan et al. 2023a).

Following a thorough study of the literature on the effects of COVID-19 epidemic on supply chain, Queiroz et al. (2020) suggested a supply chain framework that can be followed at the time of COVID-19 pandemic based on their results. According to Queiroz et al. (2020), the primary book chapter topics for supply chain management during disease pandemic is sustainability. In addition to emphasizing sustainability, it is crucial to leverage technological and digital methods, such as data analytics or

digital manufacturing, to enhance processes and supply chain management during such epidemics or pandemics (Miao et al. 2022). Different components of supply chain resilience, such as recovery, ripple effect control, readiness, and adaptation, make up the majority of the recommended study purpose (Khan et al. 2021).

According to the study of KPMG (2022), since COVID-19 significantly disrupted the supply chain, executives must now right-size their operations and embrace digital capabilities that shield supply networks from further disturbances as we move into the post-COVID-19 world companies across all sectors are increasing their investments in cutting-edge innovation, which have shown to be the driving force for the company (Khan et al. 2022b). These technologies range from block-chain to artificial intelligence (AI), machine learning, and intelligent automation (Khan et al. 2022c).

Majumdar et al. (2021) carried out a study with the goal of prioritizing risk reduction tactics for supply chains in sustainable apparel. A number of risk mitigation techniques and different risk types were examined. The most crucial method for disruption risk reduction was discovered to be supply chains' increased agility. Numerous green sourcing options, adaptable capacities, adoption of green practices, coordination, and teamwork were also shown to be effective tactics.

In context of healthcare industry, Rowan and Laffey (2020) provided three different strategies to overcome supply chain resilience caused by COVID-19 disruption. These strategies include enhancing lines of communication by familiarizing websites, the usage of mobile applications to facilitate inventory management and personalized manufacturing of PPEs. Govindan et al. (2020) in their book chapter presented an analysis and framework to show how to make the weakest and vulnerable patients the hospitals' priority, for instance, high blood pressure patients, diabetic patients, those who need restricted care and those needing home care during COVID-19. The major solution proposed for the resilience was to ramp up the production. Iyengar et al. (2020) proposed openly sourcing of ventilator production, in which businesses not manufacturing ventilators may assist the manufacturing firms of ventilators.

10.2.3 Theoretical Perspective—Resource Based View

In terms of the theoretical view of the book chapter, the study uses a resource-based approach to the book chapter. Finding the origins of achieving competitive edge is a key study area in strategic management (Porter 1985). Considering the perspective of a resource-based approach, a firm's ability to use particular resources and competencies that it either possesses or has the potential to acquire will provide it a competitive edge. By examining these assets and skills, it becomes clearer how businesses outperform rival businesses (Nandi et al. 2020). The important assets or belongings of a company that can be accessed to or owned by are the resources. Such resources can discriminate between intangible resources like information exchange and concrete resources like infrastructure. Furthermore, unless they are combined

with other resources to create capabilities, individual resources may not result in a competitive edge (Brandon-Jones et al. 2014; Zaman et al.).

The Resource based view is useful for comprehending, framing the way supply chain resilience may be utilized, and disruption risks can be decreased (Cheng and Lu 2017). For example, resource buffering and bridging minimize risk and lessen the effect of disruptions, while resource reconfiguration can take advantage of supply chain resilience (Ambulkar et al. 2015; Jiang et al. 2023). Additionally, a number of authors link resources and skills to supply chain resilience measurements that have a favorable influence on supply chain resilience and provide competitors an edge (Rajesh 2019). In order to determine when and in what ways supply chain organizations produce supply chain resilience, the present study use Resource based view.

10.3 Methodology

The two main choices of book chapter that are often most frequently employed for data collecting are quantitative and qualitative approaches. In order to understand the impact of supply chain resilience in healthcare supply chain, the study will use qualitative method. Qualitative techniques emphasis on comprehension, meaning, nature observations, and proximity to data from an internal perspective hence, this method is more convenient and suitable for the study.

The major advantage of using a qualitative method in a book chapter is that it includes all those information and facts that are often overlooked in quantitative approach. Given that the present book chapter examines the supply chain resilience focusing on the perceptions, views, ideas, and opinions of the supply chain managements, it seems challenging to quantify the perception and views, hence, a qualitative method seems more effective in achieving the goals of this book chapter. Using qualitative approaches, the author can comprehensively examine views, dynamics, and challenges of supply chain resilience in order to grasp perspectives and opinions of the issues.

10.3.1 Data Collection

The aim of the book chapter will be achieved by collecting the data with the help of interviews. The supply chain managers will be the participants of the book chapter and they will provide a detailed information regarding the supply chain resilience.

10.3.2 Sampling and Sample Size

The population of the book chapter is the health care sector of Pakistan. A sample size of three participants is chosen for this study. In addition, purpose sampling method is used which is one of the types of non-probability sampling method.

10.3.3 Thematic Analysis

In order to analyze the data, the author will use thematic analysis. The versatility of thematic analysis is one of its distinctive characteristics, which may be utilized within a number of theoretical structure and epistemological frameworks and used to a different type of book chapter topics, strategies, and sample sizes. When thematic analysis is utilized, the topic must “explain the bulk of the data” in order to provide content. To put it another way, a lot of material, or data, is needed. This is so because, despite the fact that a single sentence might be important, it may not accurately capture the entire narrative. This is particularly true when the goal of the study is to understand and identify connections among the various data coming from various student groups. As a result, the author must present and explain a substantial number of data.

To locate, comprehend, characterize, and express the experiences of satellite nursing academics as they encounter them, as well as to identify emerging themes and their intertwined linkages, the author employed Valley and King (1978) technique of data analysis, which is also known as a challenging and robust qualitative approach.

10.4 Data Analysis

The data analysis for the book chapter was conducted after completing a series of steps. After completing all interviews, the author overviewed the transcripts numerous times to comprehend the context of the episodes for every respondent, but also avoided developing any notions, structures, or theories as a result of reviewing the data initially in the process. In the second step, the author took out around 97 significant statements regarding the supply chain resilience as seen in Table 10.1.

In the next step of analysis, the principal author retrieved and developed the meanings of each major remark, and verified and debated each one. The author made an effort to design the meanings to allow them to encompass respondents’ statements with various profiles and modes of expression in light of the multiplicity of contexts. While maintaining conformity to the original descriptions, this necessitated a certain amount of abstraction. Nearly 97 defined meanings are shown by instances in Table 10.2.

Table 10.1 Key indicators, *source* Author

S. No.	Significant statement	Address
1	Price are fluctuating every second but we must have to buy them as it belongs to the patient end not to the user end	Transcript 1 P40
2	Our sub store, nursing staff, support services staff are user end but the patient end is immediate on which particular things applied	Transcript 1 P40
3	We scratch-up, dig-up number of vendors of that particular product. We visited market and also follow COVID protocols and line-up all the things	Transcript 1 P40
4	We realized that our strategies must have to substitute the suppliers of particular items	Transcript 1 P40
5	We are basically in basement	Transcript 1 P40
6	For ventilation we go at first floor and where at the same time COVID patients are moving for treatment's	Transcript 1 P40
7	Our family is getting disturbed from that activities because we are all time surrounded by COVID patient's	Transcript 1 P40
8	Trying to build ourselves in that environment which is very difficult and very important	Transcript 1 P41
9	We were not ready for such kind of loss and neither economically nor professionally	Transcript 1 P41
10	Those companies whose supply chain was not strong were closed down and people became unemployed	Transcript 1 P41
11	Its impact is so dangerous	Transcript 1 P41
12	There are many health care centers like Tabba heart institute, South city, Liaquat national, Agha Khan. They are ready for every kind of disaster which going to hit the country	Transcript 1 P41
13	They have planned for the next 30th years or not only planned but in the next 30 years, the things that have happened will happen again	Transcript 1 P41
14	The supply chain is a very strong, wide, diversified field and every department plays its role	Transcript 1 P41
15	Supply chain plays various and vital role to accommodate good feedback	Transcript 1 P41
16	Due to pandemic many supply chain matters line up and dead procedures, problems were re-awaked	Transcript 1 P41
17	Housekeeping, our nursing staff. In addition, our COVID staff are very important	Transcript 1 P41
18	We have to face many problems during covid	Transcript 1 P42
19	It made us very cost-effective	Transcript 1 P42
20	Items are important but items are not available	Transcript 1 P42

(continued)

Table 10.1 (continued)

S. No.	Significant statement	Address
21	There were very serious patients of COVID including both male and female, if we only talk about our nursing staff they gave it over all, they were with the COVID patients day and night	Transcript 1 P42
22	Our housekeeping staff performed very well and stay resilient among all covid duration	Transcript 1 P42
23	I want to say that not everything is perfect, everything thing needs perfection in coming days but the things we have learned after COVID hit Pakistan is that humanity cannot defeat the nature	Transcript 1 P42
24	Many companies were switched themselves to online in result many expenses were cut down economically	Transcript 1 P42
25	Many companies and their departments which were not at sustainable position were collapsed and their people became unemployed	Transcript 1 P42
26	Many good companies went through unemployment, the main reason behind that is their organizational structure was not good enough	Transcript 1 P42
27	When your organizational structure is not good, you have to face such kind of problems in your companies	Transcript 1 P42
28	It means this is our key lesson that our first priority is to make our organizational structure strong	Transcript 1 P42
29	If we study history we will find that if there is no movement of supply chain then it will be pretty sure that company will completely destroy in coming two to three years	Transcript 1 P42
30	The main lesson in that is we should not be afraid from these kind of situations and just try to follow rules like we know what the safety principals are	Transcript 1 P42
31	If we feel any kind of symptoms we should immediately contact to the doctor not rely ourselves on self-medication	Transcript 1 P42
32	We should keep ourselves self-medicated but at certain level when we feel now there is no advantage of self-medication you should immediately concern to the doctors	Transcript 1 P43
33	This pandemic shone a bright light on the weakness and cracks of supply chain with in the health care sector	Transcript 2 P43
34	COVID left the health care sector in trouble. Hospital's overloaded and overflowed	Transcript 2 P43
35	Critical items also interrupted and basic elements getting shortage in the market (i.e. PPE's and testing kits)	Transcript 2 P43
36	Prices get boom double to triple	Transcript 2 P43
37	There are two kinds of relationship i.e. user end and patient end. The user end which is staff need to use that PPE but that usage is important for patient i.e. costumer end	Transcript 2 P43
38	In this event level of uncertainty is high, length of the disruptions is too long which also hits area geographically	Transcript 2 P44

(continued)

Table 10.1 (continued)

S. No.	Significant statement	Address
39	Supply chain is not only about supply it also about demand	Transcript 2 P44
40	To strengthen or stabilized our supply chain for future disruptions. First of all to identification of challenge	Transcript 2 P44
41	If we talk about Pakistan the conditions is quite much worse as compare to other countries because of weak healthcare system and strategies	Transcript 2 P44
42	In Pakistan this pandemic become a reason to re-awake the dead practices and weak healthcare structure	Transcript 2 P45
43	As well as our organization is concern, we built fully ERP system before arrival of this pandemic	Transcript 2 P45
44	This pandemic specially made us cost effective because required equipment's are needed but not available	Transcript 2 P45
45	We scratch-up multiple clients and found the most suitable price	Transcript 2 P45

The second stage of abstraction in Colaizzi's technique occurs as themes are created from the defined meanings. Here, the author organized the linked formed meanings into groups, allowing each meaning to belong to just single group. Hence, the initial theme for formulated themes are emerged in Table 10.3.

Below table provides an illustration of how combining earlier concepts might lead to different emerging themes regarding supply chain resilience, and total five emergent themes can be found in Table 10.4.

10.4.1 Discussion

According to the analysis above, six different themes were found that are identified as the key strategies of supply chain resilience in COVID-19 disruption. To strengthen or stabilized the supply chain for future disruptions, it is important to understand cost effectiveness, collaboration, flexible supply chain strategies, conflict management, future planning and self-medication.

Resilience of an economic system without respect for cost is inadequate. Resilient supply networks may not always be those with the lowest prices (Jamil et al. 2022). Disruptions to the supply chain should be reduced as much as possible. Cost effectiveness has been noted as a characteristic of robust systems, and resilient supply chains must prioritize cost reduction through quick and efficient coordination. Additionally, supply chain resilience should necessarily be seen as the capacity to not only a risk management factor but it should be the method to respond to the rivals in cost effective ways, giving the company a competitive edge (Yao and Meurier 2012; Khan et al.). The findings of the study match the result of Yang and Xu (2015) who

Table 10.2 Significant statement, *source* Author

S. No.	Significant statements	Formulated meanings
1	Price are fluctuating every second but we must have to buy them as it belongs to the patient end not to the user end	1. Price factor involve in order to fulfill the requirement 2. That events make us cost effective 3. Shortage of supply occurs whenever disruption comes 4. We need to involve always in search of multiple suppliers
2	We scratch-up, dig-up number of vendors of that particular product. We visited market and also follow COVID protocols and line-up all the things	
3	It made us very cost-effective	
4	Critical items also interrupted and basic elements getting shortage in the market (i.e. PPE's and testing kits)	
5	Prices get boom double to triple	
6	This pandemic specially made us cost effective because required equipment's are needed but not available	
7	We scratch-up multiple clients and found the most suitable price	
8	The prices are also getting high due to dramatic increase in demand	
9	We faced the high cost on some items especially on PPE's	
10	We are basically in basement	
11	For ventilation we go at first floor and where at the same time COVID patients are moving for treatment's	
12	Our family is getting disturbed from that activities because we are all time surrounded by COVID patient's	
13	There were very serious patients of COVID including both male and female, if we only talk about our nursing staff they gave it over all, they were with the COVID patients day and night	
14	During this disruption many people become unemployed, robberies also increased due to these unemployment's	
15	There are many health care centers like Tabba heart institute, South city, Liaqat national, Agha Khan. They are ready for every kind of disaster which going to hit the country	1. Every healthcare sector need good future forecasting

(continued)

Table 10.2 (continued)

S. No.	Significant statements	Formulated meanings
16	They have planned for the next 30th years or not only planned but in the next 30 years these things that have happened will happen again	
17	The main lesson in that is we should not be afraid from these kind of situations and just try to follow rules like we know what the safety principals are	<ol style="list-style-type: none"> 1. Don't need to be afraid of natural disruptions 2. Always follow the safety precautions 3. Good organizational structure is very important for long time stability
18	If we feel any kind of symptoms we should immediately contact to the doctor not rely ourselves on self-medication	
19	We should keep ourselves self-medicated but at certain level when we feel now there is no advantage of self-medication you should immediately concern to the doctors	
20	In the initial stages we don't have medical and diagnosis facilities. Until government takes the responsibility of this work	
21	We must need to understand that no one in the world able to defeat the nature	
22	We need to follow proper precautions and act accordingly	
23	Firstly, I see many companies collapse in this pandemic because of weak organizational structure	
24	Some of them were start work from home specially HR department, supply chain department, admin department and other management departments	
25	Same as for COVID we must have to strictly follow the safety precautions	
26	We learn that in this scenario some organization moved towards employment rather than un-employment	

stated that when choosing the best ways to construct grain supply chain resilience against calamities, recovery cost is the crucial factor.

10.4.2 Findings

The findings also suggested that the collaboration and support are highly important in order to overcome disruption in supply chain operations and to be supply chain resilience. The support services department and procurement department performed well or resilient in this disruption, according to the result. The hospitals worked on inventory forecasting or planning and built strong housekeeping team in order to counter the existing condition. The findings related to the collaboration and support within organization compliments the theoretical premise that greater coordination along the supply chain enables businesses to respond swiftly to shifting supply and

Table 10.3 Formulated meanings, *source* Author

Formulated meanings	Initial theme
<ol style="list-style-type: none"> 1. Price factor involve in order to fulfill the requirement 2. That events make us cost effective. 3. Shortage of supply occur whenever disruption comes 4. We need to involve always in search of multiple suppliers 	<p>Interviewee try to explain the cost factor involving either shortage of items or prices boom dramatically. Which shows that if any disruption will occur we have to face these issues (i.e. shortage of important items either PPE's or machines, price fluctuation)</p>
<ol style="list-style-type: none"> 1. Trained staff is the basic need in order to perform resilient against disruptions 2. In these disruptions we need to stay positive and built ourselves in according to the situation 3. After-effects of any disruption is remain at 30th years 4. It will repeat itself after some interval of time 5. Housekeeping and support service department are the key department to remain resilient 	<p>Interviewee try to elaborate that there were always some supporting departments which are very important. There are two main key department defined i.e. support services department and housekeeping department</p>
<ol style="list-style-type: none"> 1. Supply chain is the backbone of any industry 2. Improvement chance is always there 3. Good practices need to be adopted 4. Supply chain dead practices need to be re-evaluate 5. Must need to understand the difference between customer end and user end 	<p>Interviewee reveals the facts that organizational structure is very important for any organization to stay resilient. Good supply chain strategies are also important i.e. multiple suppliers, good feedback, try to identify the cracks and weakness of process, implementation of ERP system and at last good future prediction, which we called inventory forecasting in term of supply chain</p>
<ol style="list-style-type: none"> 1. We must have to face some personal issues when faced that kind of disruptions 	<p>Interviewee try to explain their personal issues when facing disruption</p>
<ol style="list-style-type: none"> 1. Every healthcare sector need good future forecasting 	<p>In these statements they are trying to explain their future planning tenure or the way healthcare sector prepared themselves for the future disruptions</p>
<ol style="list-style-type: none"> 1. Don't need to be afraid of natural disruptions 2. Always follow the safety precautions 3. Good organizational structure is very important for long time stability 	<p>In this part the keys lessons interviewees try to explain us we must have to follow the precautions related to any disruption, Self-medication is good at certain level</p>

demand situations (Polyviou et al. 2020). The findings also suggest that these teams need to have widespread support throughout the supply chain in order to succeed. The whole business as well as the entire supply chain needs to support the teams, according to Scholten et al. (2014). Teams lose influence and ability to make decisions without assistance from managers and workers (Chen et al. 2019).

Table 10.4 Initial theme, *source* Author

Initial theme	Theme cluster	Emergent theme
Interviewee try to explain the cost factor involving either shortage of items or prices boom dramatically. Which shows that if any disruption will occur we have to face these issues (i.e. shortage of important items either PPE's or machines, price fluctuation)	Shortage of Items	Cost effectiveness
	Price Fluctuation	
Interviewee try to elaborate that there were always some supporting departments which are very important. There are two main key department defined i.e. support services department and housekeeping department	Support departments	Collaboration
Interviewee reveals the facts that organizational structure is very important for any organization to stay resilient. Good supply chain strategies are also important i.e. multiple suppliers, good feedback, try to identify the cracks and weakness of process, implementation of ERP system and at last good future prediction which we called inventory forecasting in term of supply chain	Multiple suppliers	Flexible supply chain strategies
	ERP system	
	Inventory forecasting	
Interviewee try to explain their personal issues when facing disruption	Departmental conflicts	Conflict management
Future planning tenure or the way healthcare sector prepared themselves for the future disruptions	Preparation for future disruption	Future planning
We must have to follow the precautions related to any disruption, Self-medication is good at certain level	Precautions	Self-medication
	Safety measures	

10.4.3 Flexible Supply Chain Strategies

The results showed that flexible supply chain strategies are highly important for supply chain resilience. The findings are in line with Tang and Tomlin (2008) who suggested that inter-organizational initiatives should take flexibility into account and it has to be prevalent across the whole supply chain. Additionally, it gives businesses the flexibility to develop a wider range of solutions, which implies that they may be able to fend off a wider variety of disruptive occurrences. Jüttner and Maklan (2011) go on to say that flexibility may be a useful skill for developing answers to erratic demand and locating alternative supply sources to cut costs and meet irrationally escalating demand. This implies that adaptability may be utilised to combat both the outcomes' highly volatile supply and demand situations (Mubarik et al. 2021).

10.4.4 Conflict Management

Conflict management emerged as one of the enablers of supply chain resilience. During the time of COVID-19, supply chain disruption and conflicts occur in the workplace causing issues and distress in the working environment as well as the operations. The personal issues and conflict are the reasons of disruption in work which are caused by the pandemic. As stated by Hamid, support culture and conflict management are the major internal strategies that are important to enable supply chain resilience (Ali et al. 2023).

10.4.5 Future Planning

Future planning emerged as one of the themes for supply chain resilience. After COVID hit Pakistan, the major learning is that humanity cannot defeat the nature, if we have some natural disasters so we have to prepare ourselves for them and try to defend them. If we fail to do so we will must be bearing loss in future. This stresses upon the necessity of future planning in organization to avoid disruptions. This is in line with Scholten et al. (2014) who suggested that preparation and training regarding the whole supply chain enables the workforce to be more prepared to deal with supply chain disruptions (Scholten et al. 2014).

10.4.6 Self-medication

According to the responses, symptoms we should immediately contact to the doctor not rely ourselves on self-medication, we should keep ourselves self-medicated but at certain level when we feel now there is no advantage of self-medication you should immediately concern to the doctors because COVID is an epidemic and it will remain now for our life time, it will come from different names like wave one wave two but it will always be there so we should prepare ourselves for it.

10.5 Conclusion

Academics and practitioners aiming to focus on supply chain's performance in all circumstances frequently discuss the idea of supply chain resilience. Many previous studies on supply chain resilience have focused on defining the term or have only studied the social or technical facets of the topic (Hohenstein et al. 2015). A SEM-based approach towards the Utilization of Technology and its Relationship to the performance of private business education institutions. However, while being

sociotechnical systems (Wieland and Wallenburg 2013), supply chains are fundamentally a reflection of human behavior (Sweeney 2013; Miao et al. 2023). Academics and practitioners must comprehend the interaction between the human and technological components of supply chains in order to increase their resilience (Arif et al. 2023). The study found different enablers of supply chain resilience in healthcare sector. This includes cost effectiveness, collaboration, flexible supply chain strategies, conflict management, future planning and self-medication. The book chapter implies to focus on these factors in order to strengthen the supply chain network so that the organizations do not have to face risks and disruptions during crisis or pandemic period.

When taken as a whole, this book chapter offers more proof that, in order to build resilience within a supply chain and advance the knowledge of supply chain behavior, the social and technological elements of supply networks need to be investigated simultaneously. These pieces provide small but gradual advances in our comprehension of resilience and supply chain behavior. The book chapter also sheds light on support and conflict management as the key tools to avoid disruptions and uncertainties in supply chain.

Although the objective of the study was achieved, several limitations are important to address. Firstly, the study took a limited number of supply chain professionals working in healthcare sectors. This questions the generalizability of the study. For more generalized result, it is important to identify a specific factor and conduct a survey with as many hospitals as possible. Furthermore, the paper makes no mention of which supply chain resilience recovery techniques work. Even if this has nothing to do with the study's objectives, it is nonetheless interesting to know when assessing the applicability of the investigated supply chain resilience reactive techniques.

10.5.1 Insights and Implications Post-Covid Practice

The healthcare industry in Pakistan has been hit hard by the global disruption caused by the COVID-19 epidemic. Here are some takeaways and implications for bolstering supply chain resilience in the wake of the COVID pandemic:

- ***Digitalization:*** The epidemic has stressed the need for more visibility and openness in the supply chain in real time. By using digital technology, Pakistani healthcare facilities may increase supply chain transparency, cut down on human error, and offer real-time information on inventory, demand, and availability. Better choices, optimized resources, and lessened supply chain interruptions can all result from this for healthcare firms (Khan et al. 2022a). Healthcare businesses in Pakistan can better plan for the inevitable disruptions to their operations by creating a risk management strategy. Part of this process is thinking ahead about what may go wrong and making preparations for it. Establishing alternative sources, storing essentials, and planning for swift action are all examples of risk management strategies. The epidemic highlighted the need to diversify supply

sources, especially in the healthcare industry. This has led to an increase in the importance of sourcing from several locations and producing goods domestically. By obtaining supplies from a variety of sources, Pakistani healthcare facilities will be less reliant on any one vendor or geographical area. This can lessen the duration of downtime caused by disturbances (Ishizaka et al. 2023).

- **Boost Cooperation and Coordination:** Supply chain resilience relies on the cooperation and coordination of all parties involved. To better coordinate and align with their suppliers, regulators, and patients, healthcare companies in Pakistan should set up lines of communication and methods for collaboration. Data, expertise, and best practices may be shared, and coordinated reaction plans can be made. Healthcare has a huge influence on the environment, especially in terms of waste production, power usage, and GHG emissions. Thus, healthcare institutions in Pakistan may lessen their supply chain's carbon footprint by adopting sustainable practices like recycling and employing renewable energy. Supply chain resilience amid pandemic disruption in Pakistan's healthcare industry after COVID calls for a multi-stakeholder strategy that puts an emphasis on transparency, risk management, teamwork, and long-term viability. Healthcare firms in Pakistan can benefit from increased supply chain resilience, efficiency, and effectiveness by using these strategies (Jamil et al. 2023).

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