



Effect of Supply Chain Disruption in Dental Practice During Covid-19 Pandemic: An Indian Perspective

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ABSTRACT

Disruption during Covid-19 pandemic highlighted the need of healthcare supply chain management in order to achieve effective delivery of health services. Though, considerable efforts have been undertaken on managing the healthcare supply chain disruptions in India but there is paucity of literature which documented the effect of supply chain disruptions in dental practices during covid-19 pandemic. During pandemic, the disruptions in production and distribution of dental products were seen in India. Indian dental market is largely dependent on imports and there is scarcity of local production units. The main dental companies reported significant decline in production during the first wave of Covid-19. The increase in demand for dental supplies was seen with shutdown, shortage of labour and scarcity of raw materials. Disruption rippled through the supply chain and this was caused by large distortion in demand. This phenomenon led to bullwhip effect. This bullwhip effect crisis led to increased cost in dental practices. Covid19 has shown significant lack of resilience in Indian dental healthcare supply chain. This study identified few loopholes in dental supply chain and suggested the way forward for managing the supply chain disruptions. It seems that there is need of more comprehensive research on dental supply chain resilience from Indian perspective to prevent disruptions particularly in emergent situations.

Keywords: Covid-19, bullwhip, dental, cost, supply chain

INTRODUCTION

In general, the supply chain is a network of processes that involves the production, distribution and delivery of products to the consumers or beneficiaries¹. The healthcare supply system is a significant sector among all industries as they deal with health and wellbeing². The healthcare supply chain requires a sequence of resources that could provide cost-effective services to health care providers or patients adequately. The healthcare supply chain involves several stakeholders that could be grouped into four categories: Manufacturers, purchasers, distributors and providers³. This supply chain becomes more complex and fragmented due to the involvement of multiple stakeholders, insurance companies, and regulatory agencies⁴. Hence, it is a challenge to maintain the constant flow of materials from manufacturers to consumers efficiently.

Despite rapid growth in the Indian health industry, the sector has faced many challenges like inadequate infrastructure, lack of advanced technologies to forecast demand and supply, varying regulatory policies that have potential to affect the efficiency of the supply chain in healthcare⁵. The pandemic impacted the health care services including dentistry worldwide and has brought light on issues or vulnerabilities that exist in the supply chain system⁶. Sudden increase in demand and shortages in the supply of protective tools, medications and other medical needs were evident during this pandemic⁷. The disruptions in supply chain were caused due to reason like lack of transportation, efficient and trained workforces, distribution of warehouses and different regulatory agencies at district, state and national level⁷.

Initially, the routine dental care services were restricted due to the outbreak of covid-19 in most of

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the countries considering the risk of developing infections in dental settings⁸. In India, during late March 2020, the dental practices were restricted and were mostly limited to emergency treatment^{8,9}. Gradually, dental services resumed along with persistence of pandemic and strict protocols for infection control¹⁰. Dental professionals were at more risk of developing covid-19 infections as they have direct contact with the saliva and oral cavity. The use of Personal Protective Equipment (PPE) and other protective measures were made mandatory in dental settings to protect dental personnel and patients from the infections¹¹. These requirements for personal protection in dental settings were considered responsible for the sudden increase in demand for preventive tools like facemasks, gloves, face shields and PPE¹². The shortage of dental tools or equipment or material was observed due to the sudden lockdown in this pandemic^{12,13,14}. This sudden need and shortage of supplies provoked the disruptions in the supply chain and further led to economic repercussions on dental services^{6,14}.

The disruption during Covid-19 pandemic highlighted the need of healthcare supply chain management in order to achieve effective delivery of health services. Though, considerable efforts have been undertaken on managing the healthcare supply chain disruptions but there is a paucity of literature which documented the effect of these disruptions on dental practices during Covid-19 pandemic^{7,15}.

DENTAL SUPPLY CHAIN IN INDIA

Market of dental products in India is dynamic and estimated to be of USD 0.260 billion¹⁶. In India, the dental products are supplied by number of multinational companies including 3M, Dentsply and M-Tech Innovation¹⁶. The large number of dental supplies is imported from the countries like Germany, US, Italy, Japan. Although, the Indian dental industry expanding its manufacturing units and supplying dental materials to developing countries¹⁷. But, still, the dental market is largely dependent on imports and there is scarcity of local production for dental products^{17,18}.

The dental product passes through various manufacturers, local distributors or vendors before finally reaching to the consumers. The dental supply lifecycle consists of a series of procedures that involves finding, negotiating, and contracting the dental products from the suppliers¹⁹. Due to the complex structure of the supply system; the dental supply chain requires efficient supply chain management.

DISRUPTION IN THE DENTAL SUPPLY CHAIN

International trade or imports got interrupted due to a sudden lockdown across the globe during the pandemic. This crisis created disruptions in the production and distribution of dental materials or products as many types of dental equipment, materials, consumables and non-consumables are majorly dependent on imports¹⁸.

Before Covid-19 pandemic, the use of surgical masks and PPE was generally in emergency/critical situation but Covid-19 enhanced the use of surgical masks and PPE kits in dental practice¹¹. During this pandemic, these measures were compulsory to use in routine practice to protect against infections^{11,20}.

Moreover, during this Covid-19 pandemic, the demand for PPE has also increased among the general population other than in healthcare settings and the use of surgical masks and other preventive measures become mandatory²¹. The sudden surge in demand for PPE disrupted the whole global supply chain system. PPE availability also got hampered during this pandemic due to sudden closure, transportation, and trade bans^{21,22}. Because of trade restrictions, the production and distribution of PPE kits was affected due to a shortage of raw materials²³. This disruption in the supply chain caused a six-times increase in the price of surgical masks²⁰. The price of surgical gowns were doubled in this crisis as well²⁰.

Mostly the surgical gloves are supplied from the countries Malaysia and Thailand²¹. India has faced a shortage in supply of gloves in this crisis despite having the capacity for manufacturing their raw materials^{21,24}. It was observed that surgical gloves became costlier due to hoarding, misuse and black marketing of surgical gloves^{23,25}. Similarly, there were reports that stated about the limited availability of surgical gloves, masks and other preventive tools at very high prices in India^{24,25,26,27}. This could be due to sudden shutdowns globally, trade bans and limited production capacity of India^{21,24}.

The purchase of dental products was also affected during the Covid-19 pandemic. Before the pandemic, the dental professionals were procuring the dental supplies and products from small vendors or distributors of their choice to save money and time. The purchasing trend of dentists from their choice of distributor became difficult during the pandemic as the small distributors were not able to obtain the dental products adequately²⁸. This shortage faced by distributors and beneficiaries was attributed due to interruption in the supply chain of dental products globally²⁸.

The main dental companies reported significant decline in production during the first wave of Covid-19. The sudden decrease in demand for glass-ionomers restorative materials was also observed during this pandemic²⁹. During lockdown, dental industry faced challenges in production dedicated to lack of staff, pandemic-related costs, and slackened demand²⁹.

Along with the disruption in the supply chain, the pandemic also induced panic buying¹². These factors together caused a rippling effect in the supply chain that leads to rise in prices of the dental materials¹⁴. The dental professionals struggled to secure these materials in optimum quantity due to their increased demand and availability at high prices during this public health crisis¹⁴. The adaptation in the

dental setting based on covid-19 guidelines increased the financial burden on dentists.

THE WAY FORWARD

Many challenges aroused in a supply chain that caused disruptions in the healthcare system during the pandemic. The challenges that were observed in this crisis were difficulty in the transport of preventive supplies like PPE and other medical equipment, lack of workers and export bans³⁰. These disruptions emphasized the need for a resilient or sustainable healthcare supply chain, particularly in emergent situations^{1,30}.

During pandemics, increase in demand for dental supplies was seen in addition to shut down, shortage of labour and scarcity of raw materials which caused disruption at every link of supply chain¹⁴. The disruption that rippled through the supply chain and this was caused by large distortion in demand. This phenomenon led to bullwhip effect³¹. High level of dental inventory was ordered at all levels of supply chain due to fear of delay and not able to meet the demand^{14,31}. This bullwhip effect crisis in supply chain led to increased cost in dental practices^{14,31}.

The covid-19 pandemic has shown a significant lack of resilience in Indian healthcare supply chain^{7,32}. Supply chain resilience refers to the capability of the supply chain to adapt or transform in response to the unpredicted disruption caused by unnatural events or disasters¹. Supply chains resiliency becomes important in healthcare as it deals with the health and well-being of human beings¹. Due to the lack of a resilient supply chain, the pandemic has caused a high amount of pressure on the healthcare supply system and resulted in inefficient delivery of services to patients^{1,7}. There is need of performance measures for a resilient supply chain including resilience, responsiveness and re-configurability⁷.

Most of the companies for essential commodities have relied on a single source of suppliers. This dependence on a single source was one of the reasons that caused the supply-side risks. This pandemic emphasized on the decision-makers to realize the need of multiple sources to deal with the shortage of suppliers^{7,33}. The alternative mode of suppliers needs to be identified that deals with supply-related shocks during emergent situations⁷. The strategies of diversifications and vertical integration in the building of resilient supply chains needed for future^{33, 34, 35}.

This situation has taught us that responsiveness is an essential aspect of a robust supply chain. Responsiveness is a process that requires a complete flow of information and coordination between the stakeholders involved in the supply chain³⁶. Primarily, it focuses on the fulfilment of the needs of patients on time at an affordable cost³⁶. Black marketing was also observed as channels for the supply of essential products were not properly identified. This might be due to inefficient coordination between the stake-

holders³⁷. So, it is important to develop effective responsiveness in the supply chain by enhancing the logistics and managing the operations in a supply chain network efficiently³⁶.

However, India has made efforts for disruptions related to the supply chain system. The Indian government has undertaken an initiative named "Aarogya path" to address the bottlenecks in the supply chain. This is a web-based solution that provides a platform for essential healthcare supplies including dentistry to all stakeholders of the supply chain including manufacturers, suppliers, and consumers³⁸. It deals with challenges like dependence on single sources, lack of accessibility to suppliers, and difficulty in identification of good quality services. This also makes the public aware of the new technological advancements in healthcare³⁸.

CONCLUSION

This study identified few loopholes in dental supply chain that were amplified during Covid-19 pandemic and suggested the way forward for managing the supply chain disruptions. It seems that there is need of more comprehensive research on dental supply chain resilience from Indian perspective to prevent supply chain disruptions particularly in emergent situations like pandemics.

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