An Assessment Of The Strategies For Mitigating Pharmaceutical Supply Chain Disruption During COVID-19 At The Central Medical Stores Namibia

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Received: Feb 22, 2023; Revised: Mar 09, 2023; Accepted: Mar 11, 2023; Published: Mar 13, 2023

CITATION: Ekandjo J, Adenuga BA. An Assessment Of The Strategies For Mitigating Pharmaceutical Supply Chain Disruption During COVID-19 At The Central Medical Stores Namibia. *Recent Adv. Biol. Med*. 2023; 9(1): 9800029. https://doi.org/10.18639/RABM.2023.9800029

ABSTRACT
The COVID-19 pandemic has negatively impacted Namibia's public sector pharmaceutical supply chain. This study aimed to investigate the strategies for mitigating pharmaceutical supply chain disruption during COVID-19 using Central Medical Stores Namibia as a case study. The study employed a case study design to explore the research area intensively. Unstructured interviews were conducted with seven pharmacists from Central Medical Stores who were purposively selected. Data were analyzed using thematic analysis with the aid of ATLAS.ti software. Seven (7) pharmacists working at Central Medical Stores were included in this study. The participants highlighted various thematic issues reflecting the impact of COVID-19 on medicines procurement, access and distribution within the healthcare system. These themes included managing the supply chain during the COVID-19 pandemic; COVID-19 pandemic-induced supply chain challenges; Approaching supply chain challenges; medicines shortages; and looking into the future. The study found that there needs to be government intervention to encourage local manufacturing, international intervention to prevent the hoarding of pharmaceuticals by rich nations, adoption of long-term procurement contracts, establishing of good communication with suppliers, having a sufficient budget for pharmaceuticals, training employees in supply chain management and adequate storage space in order to mitigate pharmaceutical supply chain challenges at the Central Medical Stores during COVID-19.

KEYWORDS: Supply Chain, Disruption, Pharmaceutical, Central Medical Stores, Namibia.

ABBREVIATIONS
COVID-19: Corona Virus Disease of 2019, CMS: Central Medical Stores, WHO: World Health Organization, UNICEF: United Nations International Children's Emergency Fund, Nampost: Namibia Post Office, USA: United States of America.

1.0 INTRODUCTION

The COVID-19 pandemic has caused major global disruptions in various supply chains [1]. The pharmaceutical supply chain is one of the hardest-hit sectors [2]. According to Chowdhury *et al.* [3], the supply chain areas negatively impacted by the COVID-19 pandemic include demand management, supply management, production management and logistics management. Consistent with this, Friday *et al.* [4] have argued that the COVID-19 pandemic has caused a negative impact on the availability, access and affordability of pharmaceutical items resulting in panic buying and stock holding of pharmaceutical items. This has created demand shocks, stockouts and systemic disruptions in the pharmaceutical supply chain [4]. These negative impacts call for firms to explore strategies to mitigate supply chain disruptions during COVID-19.

The aim of this study was to investigate the strategies for mitigating pharmaceutical supply chain disruption during COVID-19 at the Central Medical Stores (CMS) in Namibia.

2.0 RESEARCH METHODOLOGY

2.1. RESEARCH DESIGN AND SETTING

The study employed a case study design to explore the research area intensively. Unstructured interviews were conducted with seven pharmacists from Central Medical Stores who were purposively selected. Data were analyzed using thematic analysis

with the aid of ATLAS.ti software. Participants were invited via email to partake in the study. Upon agreeing to participate in the study, appointments were made with participants. Before starting with the interviews, the researcher explained the purpose of the study to the participants. Participants were then requested to sign consent forms. After that, a Zoom link was sent to participants via email. Interviews were conducted via Zoom over an average of 20 minutes for each participant. The researcher minimized interview question bias and participant bias by keeping the questions neutral to avoid the questions being misunderstood by the participants and by building trust and keeping neutral during the interviews.

2.2. POPULATION

The research population of this study comprised 22 pharmacists at the CMS; out of these, 7 pharmacists were included in the study.

2.3. ETHICAL CONSIDERATIONS

Permission to conduct this study was obtained from the Namibia Business School and Ministry of Health and Social Services.

3.0 RESULTS

Data were analyzed using a thematic analysis technique. Thematic analysis is a strategy for analyzing qualitative data and entails coding data to identify themes across a data set [5]. The researcher used the following steps for undertaking thematic analysis as outlined by Saunders *et al.* [5]: familiarisation with the data, coding the data, creating and assigning codes to describe the content, searching for patterns to generate themes, reviewing the themes, defining and naming themes [5]. Furthermore, ATLAS.ti software was used to analyze the data.

Seven interviews were conducted with all the selected pharmacists at the CMS (Table 1). Therefore, the response rate was 100%. Interviews were conducted until saturation was attained.

Table 1: Demographics.

	N	Range	Mean (Std. Deviation)
Age (Years)	7	(30-50)	37.7 (7.2)
Number of years of experience	7	(4-20)	10.1 (5.5)
Gender			Frequency (%)
	Female		4 (57.1)
	Male		3 (42.9)

Five themes and nine subthemes were derived from the responses. These were (a) Managing the supply chain during the COVID-19 pandemic; (b) COVID-19-induced supply chain challenges; (c) Approaching supply chain challenges; (d) Medicine shortages; and (e) Looking into the future.

4.0 DISCUSSION

According to this study, CMS managed the supply chain by adopting various strategies and collaborating with its key stakeholders to manage the supply chain. The findings of this study are supported by several studies which focused on how firms are managing the impact of the COVID-19 pandemic on the pharmaceutical supply chain [6-10]. The results suggested that CMS employed efficient distribution of pharmaceuticals to help expedite the supply. For instance, CMS used the seaport as an alternate distribution channel to bring supplies from other countries. Flights were banned during the pandemic, making air routes challenging. Similar findings were obtained by Butt [11], who argued that evaluating alternate routes such as rail routes, seaports, or a combination depending on the restrictions in place is vital during the pandemic. Results further highlighted that CMS worked closely with key stakeholders such as Nampost, Chemonics and Namibia Defence Force to distribute pharmaceuticals to health facilities efficiently. These findings are supported by recent literature, arguing that collaboration with key stakeholders is a critical resilience strategy for the pharmaceutical supply chain in the public sector during the COVID-19 pandemic [12,13]. Results also found that in terms of the distribution of pharmaceuticals to health facilities, CMS prioritized hard-hit regions such as Khomas and Erongo. These findings agree with recent studies suggesting that prioritization of stock distribution mitigates pharmaceutical supply chain disruption during COVID-19 [10].

Table 2: Thematic analyses.

Themes	Subthemes	Respondents' quotes
Managing the supply chain during the Covid-19 pandemic	Innovative mode of transportation	*"In terms of distribution, one thing that we have done is that we had a private company to deliver pharmaceuticals to facilities as soon as possible. This was necessary because CMS only had that six-week delivery period, so we used that private company to send items to the regions in need (delivery period). However, stock distribution was prioritized according to hard-hit regions like Khomas and Erongo. On vaccines, we dedicated a person to deal with COVID-19 vaccine distribution. Luckily we were also given transport by Chemonics to transport vaccines to any region that needed them."* *"In terms of distribution of pharmaceuticals to facilities, there were times when we had to use Namibia Defence Force to assist us in delivering items."* *"For distribution, CMS was assisted by NamPost courier to deliver stock to health facilities."* *"Transportation of pharmaceuticals from abroad was managed with alternative routes such as sea as flights were suspended. There was rational issuing of stock from CMS to its customers."*
	Creating a priority list	*"We had to prioritize issuing antibiotics, especially to Windhoek Central Hospital, which had many patients in Intensive Care Unit compared to other facilities. Identifying pharmaceutical Another thing we did was that we had to identify a list of fast-moving COVID-19 pharmaceuticals and related supplies like alcohol, Chlorhexidine scrub and some antibiotics. We tried to make sure that if they went beyond a certain level, we had to place an order. This list was also shared with development partners such as WHO and UNICEF so they could donate some items. And actually, as a result, we got a lot of donations, for example, face masks and dexamethasone injection."* *"From the procurement, buyouts were given a bit of priority. On distribution, we made use of a private company to deliver stock quickly to hard-hit regions."* *"We decided to look at our entire stock level and quantify what we might need for the next 12 months and started a procurement process to buy more stock because we were not sure how long this COVID situation would last. We also looked at critical key*

Themes	Subthemes	Respondents' quotes
		priority items needed during the pandemic. We had to review that and maintain a certain stock level."
	Procurement plan/negotiation	*"In terms of procurement, the negotiation was very key with suppliers because prices for commodities were fluctuating. Therefore, we had to negotiate with suppliers to give us a reasonable price that was not too inflated. In terms of Human Resources, we engaged the Ministry of Health and Social Services head office to get more staff to support us. We were able to get pharmacy graduates and some administrative staff. We also got additional staff from Global Fund."* *"In 2019, we strategized by asking the ministry of finance to grant us an exemption to have 12 months' contracts of procuring pharmaceuticals. Those contracts were awarded towards the end of 2019. So, when we went into 2020, we actually had contracts. The availability of these short-term contracts helped us."* *"We generated annual order quantity for items on contract and provided a supply plan and scheduled delivery. Items were bought through a buyout process, and just in time ordering system was implemented."*
COVID-19 pandemic-induced supply chain challenges	Delivery delays	*"When it comes to procurement of pharmaceuticals, it was difficult because, for instance, in India, which is one of our biggest markets where we get most of our pharmaceuticals, they had an issue where no flights were coming in."* *"When the borders were closed, drivers had to take 72 hours tests, and this resulted in delays in deliveries of pharmaceuticals. In pharmaceutical industries where the active pharmaceutical ingredients come from production went slow and this led to delays in stock. Also, some airlines could not operate. Furthermore, supply chain logistics went slow."* *"Basically, there were two things that gave us a challenge in terms of procurement. Firstly, there was an escalation in the prices of pharmaceuticals. Secondly, it was difficult for suppliers to commit because when they give you a price, the issue of getting stuck to our country was difficult because of lack of logistic capabilities."* *"Flights were banned, and the only way we could get items was through the sea, and that made it difficult because we could only*

Themes	Subthemes	Respondents' quotes
		get items in two months. So, we had to look for more suppliers, and that took time." *'There was also a severe shortage of shipping containers, and that meant that our consignments could not be shipped on time, and that posed a delay in the receiving of commodities.'* *"During the pandemic, most suppliers were canceling the orders due to product price inflation. Purchase orders were then advertised again, and this affected the on-time delivery of supplies. There was a shortage of staff at the CMS procurement section. There was a shortage of active pharmaceutical ingredients globally, and this also affected CMS. CMS's trend forecasting system is also outdated, and this led to erratic ordering. We also had a shortage of staff at the procurement department."*
	Export restrictions on selected medicines	*"They also started banning key COVID-19-related pharmaceuticals because they were equally affected. For example, if you want to buy a certain antibiotic, they cannot give you a price because they also want to prioritize their country. Also, because of lockdowns, the prices of pharmaceuticals were skyrocketing, and we only had a limited budget to work with, so we had to be mindful of how much we could buy."*
	Staff illness	*"The other challenge was that due to COVID-19, many people were sick, so that means manufacturers were also working on a small staff complement, and as a result, the production cycle was longer, and that increased the lead time for us to receive our goods."*
Approaching supply chain challenges		*"There has to be an understanding that once there is a pandemic declared, every nation must be able to access pharmaceuticals without being denied as long as they have money to buy. Secondly, we need to have a national carrier to be able to transport stock from foreign countries like India because we are a net importer. Thirdly, there is a need for global health insurance that each country can sign up to claim to get commodities during pandemics. Fourthly, we need to have logistical capabilities and competent human resources."* *"A national depot that is supplying the whole country should have long-term contracts to procure pharmaceuticals. Rather than using*

Themes	Subthemes	Respondents' quotes
		buyouts that are expensive. Collaboration with stakeholders is also critical." *"We need to start manufacturing basic things; during the pandemic find ourselves self-importing almost everything. There is a need for much emphasis on setting up industries to manufacture our commodities. Given the fact that Namibia is strategically located with ports, we can also take advantage of that and export to some countries that are landlocked. We also need to consider outsourcing some functions that are not core functions of CMS."* *"The ministry of finance should expedite approval of supplier price increase, especially during the pandemic."* *"We need to have a technical working group to guide the procurement process. We need to purchase in bulk. We should also get enough budgets. We need to have enough staff, and we should encourage local manufacturing."* *"Suppliers should be penalized for canceling orders."* *"Avoid relying on one supplier and identify alternative sources of supply. Use just in time approach to inventory. Keep all channels of communication with suppliers open. CMS procurement department should work with suppliers to come up with contingency and risk management plans."* *"There must be a system for accountability with regard to procurement. Most of the items should be put on long-term contracts so that there should be a continuous flow of pharmaceuticals."*
Medicine Shortages		*"Lockdowns placed a limitation on what can be bought. Some countries were just holding stock to themselves. For example, in South Africa, there was a point where they were saying you cannot buy alcohol from there."* *"Furthermore, there was also an unprecedented demand for pharmaceuticals worldwide. Considering that we do not manufacture medicines here and the demand was in every country, we had to fight for whatever was there. The budget was not enough to buy everything because the number of people who needed hospitalization was not fixed. For example, we could not quantify exactly to say so many people will need Enoxaparin injection in ICU."*

Themes	Subthemes	Respondents' quotes
		"We use the procurement process, which does not allow one to buy anything in case of a pandemic. You still have to follow the procurement act, and that takes time. This limitation can cause medicine shortage." *"There was a panic perception among health care workers. Some facilities would panic order. Our Namibia Essential Medicine List was not revised, and so some products were obsolete."* *"Central Procurement Board has been delaying advertisement and awarding of contracts. Major causes of medicine shortages also included shortages of active pharmaceutical ingredients, delayed production, increase in prices of pharmaceuticals and lack of shipping containers."* *"There is storage space constraint at the CMS, and hence CMS is not able to keep a 6 months' stock. Unreliable suppliers, cancellation of orders, late delivery of stock."* *"CMS has incompetent staff and lack of accountability by staff for wrongdoing. It largely depends on external sources, both for manufacturing and importing. There are irrational orders from facilities... Also, irrational issuing of stock from CMS."*
Looking into the future	Resource mobilization	*"We need to be well capacitated in terms of human resources, sufficient budget to buy pharmaceuticals, in terms of flexibility to buy what needs to be bought, and have enough means of transportation to Namibia and from CMS to affected regions. We also need incentives for people to stay at the CMS." Continuous training in the supply chain is also critical."* *"Adequate storage space and should have long-term or multiyear contracts in place. Good reliable data to inform supply plans. Transport should be proper. Collaboration with other ministries is needed."* *"Competent and adequate staff; adequate storage space to buy in bulk; develop software to make everyone accountable; And consider collaborating with other countries to get stock from giant suppliers. Government should create a conducive environment to manufacture or have international suppliers in the country. Government should empower local manufacturers."*

Themes	Subthemes	Respondents' quotes
		"We need to share information on time, and we need to deploy more human resources and procure in bulk. We need to encourage local manufacturing, and all items should be on a long-term contract with suppliers. There should be a strong contract management system."
	Supply chain sustenance	*"CMS needs to keep maximum stock for one year. Therefore, CMS needs to construct a standard warehouse and keep all items on a long-term contract."* *Continually communicate with suppliers. Increase human resources at the CMS and control supplier performance by use of indicators. Improve the quality of data and stock visibility nationally."* *"It will be better if we have long-term contracts with a supplier in place. CMS should also work closely with facilities for them to issue rationally and order rationally."*
	System re-engineering	*"We need several systems to be put in place. We need to have sufficient stock, safety stock, if we find ourselves in a similar situation. We also need to apply certain supply chain concepts such as enhancing visibility and collaboration."*

According to the respondents, it was reported that CMS adopted efficient stock management practices during the pandemic. For instance, the stock was kept six months ahead to reduce shortages and manage supply chain delays. Additionally, CMS adopted the rational issuing of stock to health facilities. Consistent with these findings, Butt [11] argued that modification of inventory policies helps manage supply chain challenges during the COVID-19 pandemic. Furthermore, Baporikar and Kaloia [12] indicated that proper inventory management practices are critical in mitigating supply chain disruption.

According to this study, CMS has managed the supply chain challenges by getting additional human resources. This was done with the support of the Ministry of Health and Social Services and the development partners. These findings are in accordance with Leite *et al.* [6], who argued that resource allocation might mitigate supply chain disruption. Furthermore, Uwizeyimana *et al.* [13] affirmed that government support played a pivotal role in managing the pharmaceutical supply chain during the pandemic in Rwanda. The findings of this study revealed that CMS has been negotiating with suppliers to manage the supply chain challenges. This was significant because some suppliers have been overpricing their commodities due to the high demand for essential pharmaceuticals. Similar to this study's findings, Butt [11] affirmed that buying firms should actively negotiate with their key suppliers to comprehensively understand their inventory, production schedules, and purchase order fulfillment status. Also, Lozano-Diez *et al.* [7] agree with Mehrotra *et al.* [8] that enhancing production early by taking speedy decisions can mitigate pharmaceutical supply chain disruption during the COVID-19 pandemic.

Respondents revealed that CMS was granted contract exemption by the Ministry of Finance. This helped with the continued supply of pharmaceuticals since CMS had twelve monthly contracts in place, which matches with findings by Shukar *et al.* [14], who argued that a change in governmental procurement policies could result in the mitigation of supply chain disruption during the pandemic.

The COVID-19 pandemic has exposed the weaknesses of the current procurement procedures, and plans should be put in place to update the procurement process. This is supported in the literature by Kaufman *et al.* [15], who argue that efficient and effective procurement is essential in ensuring a resilient supply chain within the pharmaceutical industry.

This study found that export bans by Namibia's main pharmaceutical suppliers led to a shortage of pharmaceuticals. For example, suppliers in India introduced export bans on COVID-19-related commodities. As a result, access to

pharmaceuticals was limited. This is because Namibia is a net importer of pharmaceuticals, which was confirmed by Kaufman *et al.* [15], who revealed that export restrictions and transport interruptions are some of the challenges during the COVID-19 pandemic.

Respondents mentioned that long lead times were one of the procurement challenges faced by CMS during the pandemic. The study further revealed that lockdowns enforced by various countries led to the restriction of cross-border movements. This measure had a negative impact on the transportation of pharmaceutical supplies during the pandemic period. Specifically, during the early stages of the pandemic, flights were banned, creating serious logistical challenges for the suppliers and resulting in delays. The results also indicated strict control measures at the ports of entry. These findings are in agreement with Munharo *et al.* [16], who argued that timely delivery of pharmaceuticals in Zimbabwe was a challenge due to strict lockdown measures which were in place. Furthermore, Kwon and Kim [17] point out that reliance on distributors poses a challenge to firms and makes them vulnerable during supply chain disturbances. The CMS faced similar challenges during the COVID-19 pandemic when logistical challenges led to delays and even cancellation of orders.

The other critical challenge CMS faced in its procurement process was that suppliers increased the prices of pharmaceuticals due to high demand during the pandemic. This was confirmed by Vecchi *et al.* [18], who indicated that the high demand for pharmaceuticals resulted in a price increase in the USA.

This study also found that Namibia's over-reliance on China and India and lack of local pharmaceutical manufacturing created serious challenges. Similarly, USA procurement challenges were due to over-reliance on international suppliers in countries such as China, resulting in shortages of medical supplies and equipment [18]. Like the USA procurement challenges, Namibia had difficulty understanding the complex procurement process with new contractors.

Furthermore, the cancellation of orders by suppliers and the lack of active pharmaceutical ingredients needed for medicines manufacture were some of the procurement challenges faced by the CMS. Similar procurement challenges were experienced in South Africa, where non-performing contracted suppliers, lack of active pharmaceutical ingredients, delayed payments to suppliers and heavy dependence on international suppliers were some of the challenges experienced [19].

Respondents identified international interventions to ensure equal distribution of pharmaceuticals and prevent hoarding of commodities by rich nations as possible means to mitigate a shortage of pharmaceuticals. This is also similar to findings in the USA, where intergovernmental collaboration is recommended to ensure the availability of pharmaceuticals [20].

It can be deduced from this study that the government's intervention in addressing shortages of pharmaceuticals during the COVID-19 pandemic is very critical. Since the CMS alone has no capacity to transport pharmaceuticals from international suppliers, it will require government intervention. Government intervention's role in ensuring pharmaceutical availability during the pandemic has been confirmed by various studies [13,21]. The findings further revealed that government intervention would be required to abandon the buyout system and ensure long-term contracts for pharmaceuticals with suppliers are in place. Consistent with this, Spieske *et al.* [22] affirmed that leveraging long-term buyer-supplier relationships can improve supply availability.

The human resources factor has been identified as one of the challenges within the supply chain at the CMS. Some employees are not skilled enough to understand and carry out key functions. Furthermore, the study's findings suggested that CMS needs competent human resources to manage the supply chain. Scala and Lindsay [23] and Kuo *et al.* [24] all support this finding by stating that governmental agencies can mitigate drug shortages by educating and training all employees involved in the supply chain [14], modifying inventory policies to address inventory shortages [11] and, use of a drug shortage reporting and tracking system [25].

Communication with suppliers was one of the findings of this study. This is supported by Butt [11], who argues that buyers should actively communicate with key suppliers to understand their inventory and production schedules comprehensively and purchase order fulfillment status.

5. CONCLUSION

Firstly, CMS managed the supply chain through efficient stock distribution with key stakeholders' help, price negotiations with suppliers, recruitment of more staff and contract exemptions through the ministry of finance. Collaboration with key stakeholders played a pivotal role in managing supply chain challenges. Secondly, the challenges faced by CMS during the procurement of pharmaceuticals were mainly due to lockdowns, lengthy procurement processes and heavy reliance on international suppliers. Finally, mitigation strategies that CMS can adopt to minimize supply chain disruption include government intervention to encourage local manufacturing, adoption of long-term procurement contracts, establishing good communication with suppliers, having a sufficient budget for pharmaceuticals, training employees in supply chain management and adequate storage space.

AUTHOR CONTRIBUTIONS

JE conceptualized and conducted the study, analyzed data, and wrote the manuscript. BAA reviewed the data analysis and final manuscript. Both authors approved the final manuscript.

CONFLICT OF INTEREST

The authors do not have any conflict of interest relevant to the study.

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