AN ASSESSMENT OF THE STRATEGIES FOR MITIGATING PHARMACEUTICAL SUPPLY CHAIN DISRUPTION DURING COVID-19 AT THE CENTRAL MEDICAL STORES NAMIBIA

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ABSTRACT

The COVID-19 pandemic has negatively impacted the public sector pharmaceutical supply chain in Namibia. The purpose of this study was 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 intensively explore the research area. Unstructured interviews were conducted with seven pharmacists from Central Medical Stores who were purposively selected. Data was analysed using thematic analysis with aid of ATLAS.ti software. The study found that there needs to be government intervention to encourage local manufacturing, international intervention to prevent hording of pharmaceuticals by rich nations, adoption of long-term procurement contracts, establishing good communication with suppliers, having 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. The study recommends that the government should encourage local manufacturing to reduce heavy reliance on foreign countries, adequate funds should be budgeted for the CMS, the CMS warehouse should be upgraded, training in pharmaceutical supply chain management should be offered to CMS employees, long term procurement contracts should be adopted, government should provide logistical support to the CMS and the CMS should improve communication with suppliers.

TABLE OF CONTENTS

ABSTRACT i

TABLE OF CONTENTS ii

LIST OF TABLES vi

LIST OF FIGURES vii

LIST OF ABBREVIATIONS viii

ACKNOWLEDGEMENTS ix

DEDICATION x

DECLARATIONS xi

CHAPTER ONE 1

INTRODUCTION 1

1. INTRODUCTION 1

1.1 BACKGROUND OF THE STUDY 1

1.2 STATEMENT OF THE PROBLEM 3

1.3 RESEARCH QUESTIONS 5

1.4 SIGNIFICANCE OF THE STUDY 5

1.5 LIMITATION OF THE STUDY 6

1.6 DELIMITATION OF THE STUDY 6

1.7 CHAPTER SUMMARY 7

CHAPTER TWO 7

LITERATURE REVIEW 7

2.1 INTRODUCTION 7

2.2 THEORETICAL LITERATURE REVIEW 8

2.2.1 The concept of pharmaceutical supply chain 8

2.2.2 The concept of supply chain risk 8

2.2.3 The concept of supply chain disruption 9

2.2.4 Supply chain risk management framework 10

2.2.5 The concept of supply chain resilience 11

2.2.6 The concept of drug shortage 13

2.2.7 Theories on pharmaceutical supply chain 14

2.2.8 Overview of the pharmaceutical supply chain in Namibia 15

2.3 EMPIRICAL LITERATURE REVIEW 16

2.3.1 COVID-19 and pharmaceutical supply chain 16

2.3.2 Strategies for mitigating pharmaceutical supply chain disruption during COVID-19 pandemic 17

2.3.3 Challenges associated with procurement of pharmaceuticals in the era of COVID-19 19

2.3.4 Sustainable public procurement strategies in the era of COVID-19 21

2.3.5 Shortage of pharmaceuticals and related supplies during COVID-19 22

2.3.6 Strategies mitigating shortage of pharmaceuticals during COVID-19 23

2.4 RESEARCH GAP ANALYSIS 24

2.5 CHAPTER SUMMARY 24

CHAPTER THREE 26

RESEARCH METHODS 26
3.1 INTRODUCTION 26
3.2 RESEARCH DESIGN 26
3.3 RESEARCH PHILOSOPHY 27
3.4 RESEARCH APPROACHES 28
3.5 POPULATION 28
3.6 SAMPLE 29
3.6.1 Sampling techniques 29
3.7 RESEARCH INSTRUMENT 30
3.8 PROCEDURE 30
3.9 DATA ANALYSIS 30
3.10 RESEARCH ETHICS 31
3.11 CHAPTER SUMMARY 32
CHAPTER FOUR 32
RESULTS AND DISCUSSIONS 32
4.1 INTRODUCTION 32
4.2 RESPONSE RATE 33
4.3 DEMOGRAPHICS 33
4.4 PRIMARY DATA ANALYSIS 34
4.5 FINDINGS 37
4.5.1 Theme 1: Managing the supply chain during the Covid-19 pandemic 37

4.5.2 Theme 2: COVID-19 pandemic induced supply chain challenges 41

4.5.3 Theme 3: Approaching supply chain challenges 44

4.5.4 Theme 4: Medicine Shortages 47

4.5.5 Theme 5: Looking into the future 48

4.6 DISCUSSIONS 50

4.6.1 CMS supply chain management strategies 51

4.6.2 Challenges being faced by the CMS in the procurement of pharmaceuticals during COVID-19 53

4.6.3 Strategies to mitigate shortage of pharmaceuticals at the CMS during COVID-19 55

4.7 CHAPTER SUMMARY 57

CHAPTER FIVE 58

CONCLUSIONS AND RECOMMENDATIONS 58

5.1 INTRODUCTION 58

5.2 SUMMARY OF FINDINGS 58

5.3 CONCLUSIONS 60

5.4 RECOMMENDATIONS 61

5.5 AREAS FOR FUTURE RESEARCH 62

REFERENCES 64

APPENDICES 76

LIST OF TABLES

Table 4.1: Concepts derived from transcripts……37

Table 4.2: Fourteen key concepts……..38

Table 4.3: Eight categories……39

Table 4.4: Themes…….39

Table 5.1: Summary of research findings……..64

LIST OF FIGURES

Figure 2.1 : SCRM framework adapted from Fan and Stevenson (2018) 11

Figure 2.2 : The Namibian pharmaceutical supply chain 16

LIST OF ABBREVIATIONS

CAT	Complex Adaptive Theory
CMS	Central Medical Stores
IQ	Interview Questions
NBS	Namibia Business School
NEMLIST	Namibia Essential Medicines List
PSC	Pharmaceutical Supply Chain
RBV	Resource-Based View
RQ	Research Question
SCRM	Supply Chain Risk Management

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DEDICATION

This thesis is dedicated to my wife Dr. Kristiana Iita-Ekandjo who has always been there for me. She kept urging me on through the difficult moments of this scholarly undertaking. To my mother Justina Shitaatala and my father Alfred Erastus who always reminded me of the value of education and worked tirelessly to ensure I got a decent education.

DECLARATIONS

I, Justus Ekandjo, declare that this thesis is my own unaided work except references cited in the body of this research. It is submitted in partial fulfillment of the requirements for the degree of Masters of Business Administration in Management Strategy at the University of Namibia. It has not been submitted for any degree or examination at this or any other institution of higher learning before.

Signed: **Date:** 13 May 2022

CHAPTER ONE

INTRODUCTION

1. INTRODUCTION

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. This chapter outlines the background of the study and the statement of the problem. In addition, it highlights the main research question and sub research questions as well as the significance of the study. Thereafter, it provides the limitations and delimitations of the study.

1.1 BACKGROUND OF THE STUDY

The COVID-19 pandemic has caused major disruptions in various supply chains globally (Ivanov, 2020). One of the hardest hit sectors is the pharmaceutical supply chain (Govindan *et al.,* 2020). According to Chowdhury *et al.* (2021) the supply chain areas which are negatively impacted by the COVID-19 pandemic include demand management, supply management, production management and logistics management. Consistent with this, Friday *et al.* (2021) has argued that the COVID-19 pandemic has caused a negative impact on availability, access and affordability of pharmaceutical items resulting in panic buying and stock holding of pharmaceutical items. This has created demand shocks, stock outs and systemic disruptions of the pharmaceutical supply chain (Friday *et al.,* 2021). These negative impacts call for firms to explore strategies to mitigate supply chain disruptions during COVID-19.

Strategies for mitigating pharmaceutical supply chain disruption during COVID-19 have been explored and adopted in developed countries (Butt, 2021; Lozano-Diez *et al.,* 2020; Scala & Lindsay, 2021). For instance Lozano-Diez *et al.* (2020) state that

enhancing production early by taking speedy decisions can mitigate shortage of pharmaceuticals. On the other hand, Leite *et al.* (2020) argue that resource allocation such as pharmaceuticals and human resources from non-priority areas to high priority areas may mitigate pharmaceutical supply chain disruption during COVID-19. Furthermore, Leite *et al.* (2020) argue that firms can mitigate pharmaceutical supply chain disruption during COVID-19 by removing non-essential services and thus building temporary capacity. These studies provide empirical evidence on how firms have mitigated pharmaceutical supply chain disruption during COVID-19. They were conducted in developed countries with financial resources to support procurement and supply chain activities. However, little is known about strategies for mitigating pharmaceutical supply chain disruption in developing countries under resource limited settings (Scala & Lindsay, 2021). Studies in Africa are predominantly focused on the impact of Covid-19 particularly the pharmaceutical supply chain with little emphasis on mitigating strategies (Faiva *et al.,* 2021; Lucero-Prisno III *et al.,* 2020; Tirivangani *et al.,* 2021; Uwizeyimana *et al.,* 2021).

In South Africa, non-performing contracted suppliers and lack of active pharmaceutical ingredients delayed payments to suppliers and heavy dependence on international suppliers has been cited as a challenge associated with the procurement process in the public sector (Modisakeng *et al.,* 2020). According to Modisakeng *et al.* (2020) effective management of supply contracts, ongoing monitoring and usage of electronic inventory systems can mitigate shortages of medicines in the South African public hospitals. A few studies on the pharmaceutical supply chain have been conducted in Namibia (Baporikar & Kaloia, 2020; Tirivangani *et al.,* 2021). A study by Baporikar & Kaloia (2020) was focused on strategies for mitigating drug shortages at public hospital level. Baporikar and Kaloia (2020) have recommended

further research on pharmaceutical supply chain disruption mitigation strategies to be conducted at the national warehouse, CMS.

Furthermore, a study by Tirivangani *et al.* (2021) evaluated the impact of COVID-19 on the pharmaceutical supply chain in Namibia (Tirivangani *et al.,* 2021). Tirivangani *et al.* (2021) argue that the COVID-19 pandemic has devastated the public pharmaceutical supply chain in Namibia by limiting access and availability of essential medicines such as sanitation and hygiene products and antibiotics. Although this study was conducted during the COVID-19 pandemic, it mostly focused on measuring the impact of COVID-19 on the pharmaceutical supply chain. Furthermore, the Ministry of Health and Social Services (2021) revealed that the CMS has experienced low service levels during the COVID-19 pandemic. Despite the pharmaceutical supply chain disruption caused by the pandemic, strategies for mitigating pharmaceutical supply chain disruption during COVID-19 have not been explored in a local context. This is the knowledge gap this study seeks to fill.

1.2 STATEMENT OF THE PROBLEM

A resilient pharmaceutical supply chain plays the critical role of ensuring uninterrupted access and availability of pharmaceuticals (Friday *et al.,* 2021). However, the COVID-19 pandemic has negatively impacted on access and availability of pharmaceuticals in Namibia and at the CMS in particular (Ministry of Health and Social Services, 2021; Tirivangani *et al.,* 2021). According to the Ministry of Health and Social Services (2021) the order filling rate for the CMS during the 2020/2021 financial year was 79%. That means that on average health facilities were only receiving about 79% of what they requested from the CMS. This

is a low service level when compared to the ideal, which is 90% (Ministry of Health and Social Services, 2021).

The low order filling rate has resulted in shortages of pharmaceuticals in the public health sector, where CMS, a state-owned entity is responsible for the procurement and distribution of pharmaceuticals. Pharmaceutical supply chain disruption can jeopardise patient safety and overall health quality (Friday *et al.,* 2021). Furthermore, it threatens the goal to ensure that the right medicine is delivered to the right customer in the right quantity and in the right condition at the right place at the right time and right cost (Miller *et al.,* 2020).

According to Butt (2021) agile production, focusing on tier 1 supplier risk, enhancing material visibility, modifying inventory, use of alternative suppliers, developing alternative outbound routes with logistics partners and finding alternative inbound routes mitigates supply chain disruption in Asian countries. Furthermore, Scala and Lindsay (2021) argue that increasing flexibility, creating redundancy, collaboration with supply chain stakeholders and enhancing supply chain agility are strategies adopted in Scotland to mitigate pharmaceutical supply chain disruption during the COVID-19 pandemic. These studies were conducted in developed countries. However, there is a dearth of empirical evidence on strategies for mitigating pharmaceutical supply chain disruption in resource limited countries like Namibia. Furthermore, Baporikar and Kaloia (2020) argue that there is need to conduct research at the CMS to investigate the strategies mitigating supply chain disruption as prior research was focused on the hospital level. Therefore, this study aims to investigate the strategies for mitigating pharmaceutical supply chain disruption during COVID-19 at the CMS.

1.3 RESEARCH QUESTIONS

Main question

What strategies can be adopted by the CMS to mitigate pharmaceutical supply chain disruption during COVID-19?

Sub questions

- How is the CMS managing the supply chain during the COVID-19 pandemic?
- What challenges are being faced by the CMS in the procurement of pharmaceuticals during COVID-19?
- What mitigation strategies can be adopted by CMS in order to minimize supply chain disruption of pharmaceuticals during COVID-19?

1.4 SIGNIFICANCE OF THE STUDY

The findings to this study are of value to the CMS and the Ministry of Health and Social Services. The CMS can use the findings of this study to prepare effective interventions that minimize future pharmaceutical supply chain disruptions. The Ministry of Health and Social Services can use the findings to inform policy decisions pertaining to dealing with pharmaceutical supply chain disruptions during pandemics. Furthermore, the study should contribute to the knowledge on the pharmaceutical supply chain in a resource limited setting. This is because there is scarcity of research in Namibia in the area of the pharmaceutical supply chain especially during the pandemic period. Also, the researcher gained research skills and the University of Namibia gained an added body of knowledge.

1.5 LIMITATION OF THE STUDY

The researcher was not able to conduct face-to-face interviews. To mitigate this, online interviews using Zoom were conducted. The findings of this study cannot be generalised to the entire pharmaceutical supply chain in Namibia since the study is based on a single organisation. However, the findings can be used to make decisions for the CMS. Moreover, the researcher was not able to schedule some interviews during working hours as some participants were busy with work. This was mitigated by making prior appointments with participants and agreeing on the time that best fitted with their schedule. Therefore, some participants were interviewed after working hours.

The study used purposive sampling. Therefore, there was a possible selection bias. However, this was minimised by selecting participants based on the number of years of experience in order to ensure that information-rich participants were recruited to participate in the study. Furthermore, there was a limitation of interview question bias and participant bias. This was achieved by keeping the questions neutral to avoid them being misunderstood by the participants and by building trust and staying neutral during the interviews.

1.6 DELIMITATION OF THE STUDY

The research was only limited to a public sector based pharmaceutical supply chain in Namibia. The private sector pharmaceutical supply chain was not part of this study. The study was limited to the CMS only. Other organisations in the public supply chain such as hospitals, health centres, clinics and regulatory bodies were not included in the study. Furthermore, the study relied on the complex adaptive system

theory. Data collection was limited to the 2020-2021 pandemic periods only in order to obtain data relevant to the study.

1.7 CHAPTER SUMMARY

This chapter has provided an outline of this study, detailing the background of the study, statement of problem, research questions, significance of the study, limitations as well as delimitation of the study. The next chapter will present a comprehensive review of literature.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This chapter outlines a review of related literature relevant to this study. Literature was reviewed based on the research questions. The chapter starts with theoretical literature focusing on the pharmaceutical supply chain, supply chain risk, supply chain disruption, supply chain risk management, supply chain resilience, drug shortage, theories on supply chain and overview of pharmaceutical supply chain in Namibia. Thereafter, it provides the empirical literature which discusses the COVID-19 and pharmaceutical supply chain, strategies for mitigating pharmaceutical supply chain disruption during COVID-19, challenges associated with procurement of pharmaceuticals during COVID-19, sustainable public procurement strategies during COVID-19, shortage of pharmaceuticals and related supplies during COVID-19 as well as strategies mitigating shortage of pharmaceuticals during COVID-19.

2.2 THEORETICAL LITERATURE REVIEW

2.2.1 The concept of pharmaceutical supply chain

By definition pharmaceutical supply chain (PSC) is a process through which pharmaceuticals and related supplies reach the clients or patients (Parmata *et al.,* 2016). The PSC is different from other supply chains due to its complexity. The PSC has manifold policies and actions that ease medicine discovery, development, manufacture and distribution under highly regulated conditions (Narayana *et al.,* 2014). Furthermore, the complexity of the PSC is due to the involvement of numerous stakeholders such as manufacturers, distributors, wholesalers, regulatory agencies, hospitals, pharmacies and patients or clients.

The purpose of the PSC is to ensure that the right medicine is delivered to the right customer in the right quantity and right condition at the right place at the right time and right cost (Miller *et al.,* 2020). According to Parmata *et al.* (2016) medicines in the PSC begin at the manufacturers and then transferred to the distribution centres, then to the wholesalers which then transfer them to hospitals and pharmacies and finally to the patients or clients. However, the structure of a pharmaceutical supply chain may vary depending on the number of stakeholders involved. For example, some hospitals or pharmacies may purchase medicines directly from manufactures. In rare cases medicines may be distributed directly from manufacturers to patients or clients.

2.2.2 The concept of supply chain risk

Supply chain risk is the probability of a disruption that would affect the continuous supply of goods and services (Jacobs & Chase, 2018). Supply chain risks are

categorized as supply coordination risks which are associated with regular management of supply chain as well as disruption risks which are caused by natural or human made disasters such as earthquakes, pandemics, outbreaks and fires (Jacobs & Chase, 2018). The supply chain risk is therefore results from an amalgamation of coordination and disruption risks.

2.2.3 The concept of supply chain disruption

Supply chain disruption is defined as an unintended and unplanned event that negatively impacts the ability of an organisation to continuously supply goods or services within the supply chain and as a result expose an organisation to operational and financial risks (Hendricks *et al.,* 2019; Jacobs & Chase, 2018). According to this definition supply chain disruption is a disturbance in the flow of products and services within the supply chain. Agrawal & Jain (2021) argued that supply chain disruption can be defined from a broader perspective to include interruptions associated with suppliers, customers, internal factors and external factors. Categorically, supply chain disruption belongs to the unknown-unknown risk category (Paul *et al.,* 2021).

In the unknown-unknown risk category the time and place of occurrence of the disruption is unknown (Paul *et al.,* 2021). The COVID-19 pandemic is an unknown-unknown risk which has disrupted the supply chains worldwide, especially in the pharmaceutical sector (Ivanov, 2020; Lozano-Diez, *et al.,* 2020). For example, the pandemic has disrupted the supply of pharmaceuticals (Lozano-Diez *et al.,* 2020), transportation and distribution networks due to lockdowns (Tirivangani *et al.,* 2021) as well as the manufacturing capacity (Leite *et al.,* 2021).

2.2.4 Supply chain risk management framework

The Supply Chain Risk Management (SCRM) is a multifaceted concept and assists firms to assess the degree to which supply chain disruption could impact them and equip themselves with capabilities to address those (Baz & Ruel, 2020). Jacobs and Chase (2018) posits that the SCRM framework consists of a three step process as follows:

- Firstly, identifying the root sources of disruptions. Sources of disruption can include natural disasters, pandemics, capacity failures, infrastructure failures and terrorists.
- Secondly, assessing the potential effect of the disruption. This involves quantifying the probability and potential impact of the risk.
- Thirdly, developing plans to mitigate the disruption. This involves coming up with a comprehensive strategy to reduce the impact of the risk depending on the nature of the problem.

Fan & Stevenson (2018) gave a more comprehensive definition of the SCRM framework as "the identification, assessment, treatment and monitoring of supply chain risks, with the aid of the internal implementation of tools, techniques and strategies and of external coordination and collaboration with supply chain members so as to reduce vulnerability and ensure continuity coupled with profitability, leading to competitive advantage". This framework is as depicted in Figure 2.1 below.

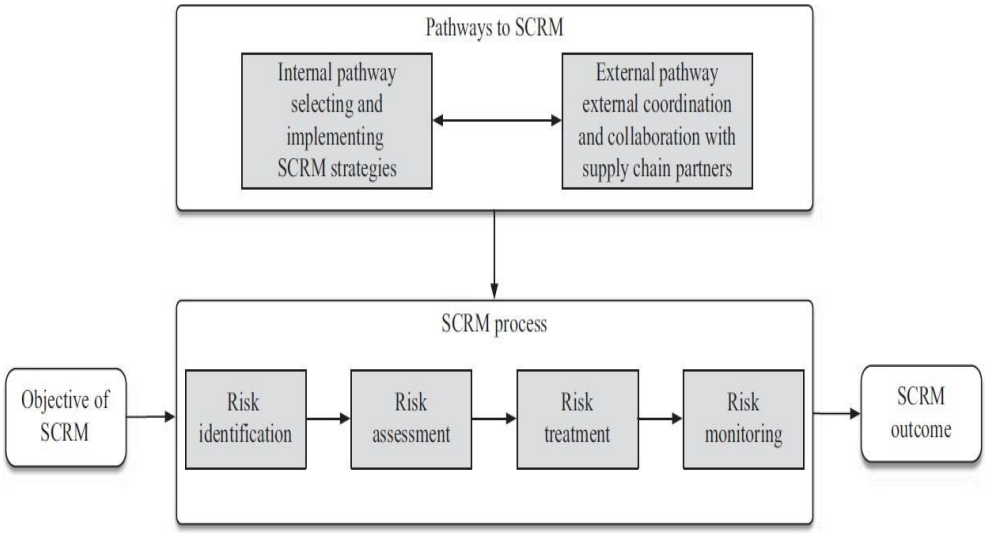

Figure 2.1: SCRM framework adapted from Fan and Stevenson (2018)

2.2.5 The concept of supply chain resilience

Organisations adopt supply chain resilience strategies to mitigate disruption in the supply chain (Melnyk *et al.,* 2014). According to Hohenstein *et al.* (2015) supply chain resilience is the capability of the supply chain to be prepared for disruptions, responding and recovering speedily in order to grow to its initial condition or grow by shifting to a new more desirable state to increase customer service, market share and financial performance. Consistent with this, Tukamuhabwa *et al.* (2015) argued that supply chain resilience is the ability of a supply chain to prepare for, respond to and recover quickly from disruptions.

Supply chain resilience is made up of four phases: preparedness, response, recovery and growth. The preparedness phase has to do with having a pre-emptive capability in order to establish dynamic control on the supply chain (Chowdhury & Quaddus, 2016). Firms with high level of preparedness have the capability to reduce supply chain vulnerabilities. During the response phase, the firms react quickly to the disruption by employing various strategies (Wieland & Wallenberg, 2013). A late

response to disruptions is costly to the firms while the quick response helps firms achieve competitive advantage (Pettit *et al.,* 2013).

The recovery phase is characterised by the ability of the firm to get back to its original state after a disruption (Scala & Lindsay, 2021). Therefore, the ability of a firm to respond and recover quickly from a disruption is a key capability. Moreover, the growth phase is characterized by the ability of a firm to move to a more desirable condition instead of just going back to its original state.

Several proactive and response strategies of pharmaceutical supply chain resilience have been identified (Karmaker & Ahmed, 2020). Those include flexibility, redundancy, collaboration, agility and visibility (Hohenstein *et al.,* 2015; Scala & Lindsay, 2021; Tukamuhabwa *et al.,* 2015). Flexibility is the ability of the supply chain to respond rapidly to changes in customer demands by restructuring operations and strategy (Pettit *et al.,* 2013). This enables the supply chain to utilize available alternatives during disruptions. However, flexibility can also be used during non-pandemic times.

Flexibility can be achieved by dual or multiple sourcing (Albertzeth *et al.,* 2020; Gaur *et al.,* 2020). Redundancy is the ability of firms to use spare capacity and inventory to mitigate disruptions (Ali *et al.,* 2017). If redundancy is created and not used, it can result in a loss to a firm as it is costly. Therefore, in most cases redundancy is used together with flexibility to reduce investment costs (Tukamuhabwa *et al.,* 2015). Redundancy strategies include inventory and capacity buffers as well as backup suppliers (Gauer *et al.,* 2020). Collaboration is the ability of supply chains to effectively work together in planning and operations during

disruptions (Pettit *et al.,* 2013). This allows firms to address major issues that cannot be easily addressed when working alone. For example, the sourcing of critical pharmaceuticals and related supplies during COVID-19 can easily be achieved through collaboration.

Furthermore, collaboration also helps create and share knowledge in the supply chain and motivate firms to support each other during disruptions. Collaboration practices include joint practices, relationship management, technological sharing practices, information sharing practices and governance practices (Duong & Chong, 2020). Agility is the ability of a firm to respond quickly to changes in supply and demand by manufacturing and delivering supplies with short lead times (Ali *et al.,* 2017).

This can be achieved by modifying lead times and customer services. On the other hand, visibility is the ability of a firm to see through the entire supply chain and locate the inventory easily (Swift *et al.,* 2019). Visibility can be enhanced through the use of monitoring programs such as gathering, processing and sharing information and transparency (Tao *et al.,* 2020). Moreover, visibility enables supply chains to identify vulnerable suppliers to prepare for contingency plans and effectively manage disruptions. When these elements of supply chain resilience are used, they will enable a firm to respond and recover quickly from disruptions (Scala & Lindsay, 2021).

2.2.6 The concept of drug shortage

Drug shortage has been defined differently by researchers (Shukar *et al.,* 2021). Pauwels *et al.,* (2015) defines drug shortage as a lack in the supply or provision of pharmaceuticals or items that can negatively impact the patient's ability to get

treatment in a specified time. Furthermore, drug shortage is a supply issue that affects how the drugstore dispenses a medicine or influences patient care when an alternative item has to be prescribed (Phuong *et al.,* 2019). Those definitions consider drug shortage from a supply perspective. On the other hand, Acosta *et al.* (2019) defines drug shortage as "a shortage that will occur when demands exceed supply at any point in the supply chain may ultimately create a stock-out at the point appropriate service delivery to the patient if the cause of shortage cannot be resolved in a timely manner relative to the clinical needs of the patient". This definition looks at drug shortage from a demand perspective. Therefore, drug shortage may be viewed as a supply or demand issue.

2.2.7 Theories on pharmaceutical supply chain

The commonly used theories in supply chain resilience and disruption studies are the Resource-Based View (RBV) dynamic capability, System Theory (Kaviani *et al.,* 2016) and Complex Adaptive System (CAS) theory (Agrawal & Jain, 2021). According to Cheng and Lu (2017) the RBV theory focuses on the resources which are used by firms to achieve competitive advantage. However, this theory applicability is limited to a firm's internal environment. The dynamic capability theory focuses on the ability of the company to adapt to changes in the external environment in order to achieve competitive advantage. Although this theory fills the gap in the RBV theory, it does not explain the systemic nature of supply chain resilience.

Both the RBV and dynamic capabilities theory may be used to examine how firms coordinate their resources and capabilities (Fan & Stevenson, 2018). The system

theory views supply chain as an open system that interacts with its environment (Spiegler *et al.,* 2012). However, it does not explain the dynamism and adaptability in the supply chain. On the other hand, the CAS theory gives a systemic approach to understanding pharmaceutical supply chain as it considers various elements such as environment, vulnerabilities, resilience strategies and pharmaceutical supply chain characteristics that form the entire system (Yaroson *et al.,* 2020).

This study is anchored on the CAS theory as it takes into account the complexity of the pharmaceutical supply chain strategies and not merely as a system or resources.

2.2.8 Overview of the pharmaceutical supply chain in Namibia

Namibia operates a public sector pharmaceutical supply chain system whereby pharmaceuticals are procured and distributed by a state-owned CMS via one integrated supply system (Levenger *et al.,* 2013). Levenger *et al.* (2013) state that the Ministry of Health and Social Services currently manages about 475 public health facilities in Namibia which comprises of 35 hospitals, 43 health centers and about 400 clinics. CMS distributes directly to about 45 health facilities on a six-weekly cycle, including 26 of the 34 district hospitals around the country and the two Regional Medical Stores (RMS) at Oshakati and Rundu (Levenger *et al.,* 2013). The Namibian pharmaceutical supply chain is shown in figure 2.2.

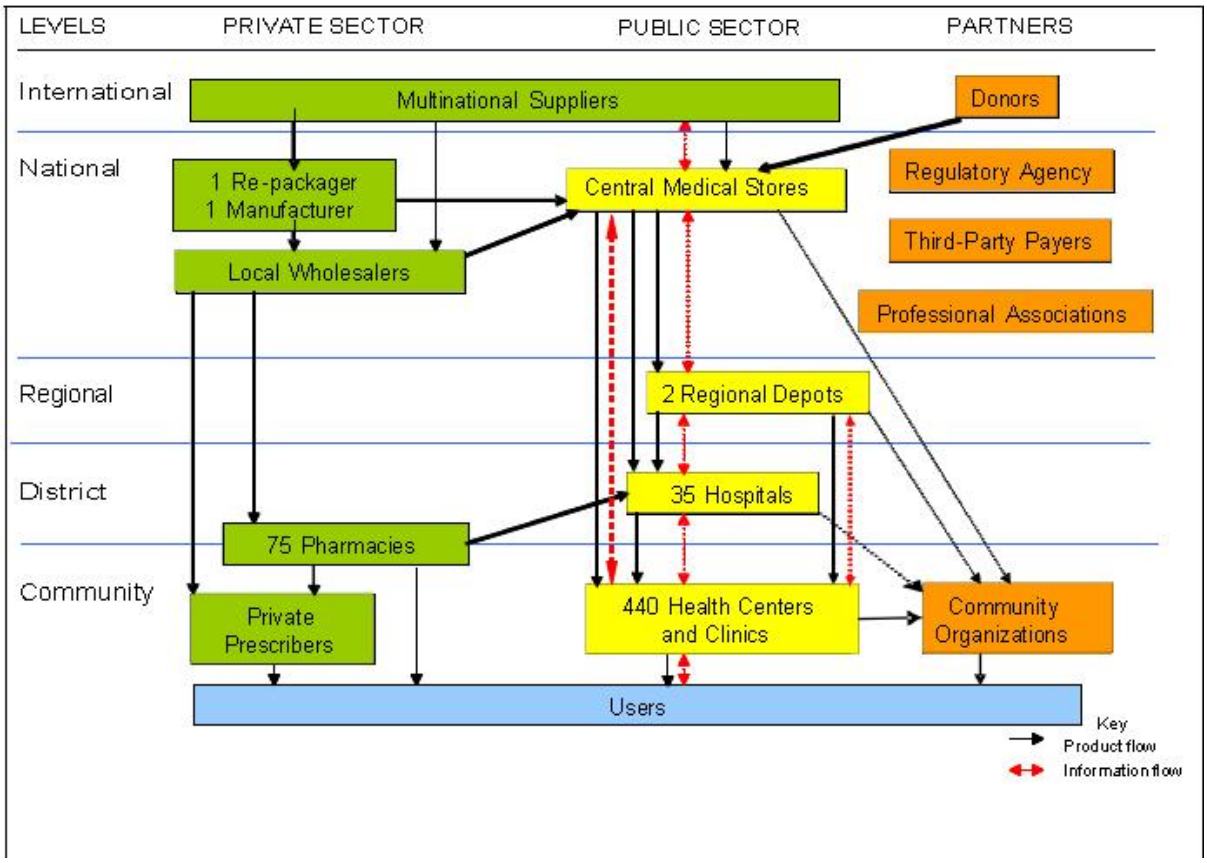

Figure 2.2: The Namibian pharmaceutical supply chain

Source: Levenger et al. (2013)

2.3 EMPIRICAL LITERATURE REVIEW

2.3.1 COVID-19 and pharmaceutical supply chain

The COVID-19 pandemic has caused major disruptions in the pharmaceutical supply chains globally (Friday *et al.,* 2021; Ivanov, 2020; Tirivangani *et al.,* 2021). Supply chain areas which are negatively impacted by COVID-19 pandemic include: demand management, supply management, production management and logistics management (Chowdhury *et al.,* 2021). In the area of demand management there is a sharp increase in demand for essential medicines (Govindan *et al.,* 2020; Leite *et al.,* 2020; Mehrotra *et al.,* 2020) shortage of essential pharmaceuticals (Kumar *et al.,*

2020; Shokrani *et al.,* 2020; Tirivangani *et al.,* 2021) shortage of active pharmaceutical ingredients (Sharma *et al.,* 2020) and delayed deliveries (Butt, 2021). In the area of supply management there is shortage of material supply or supply-side shock (Lozano-Diez *et al.,* 2020).

In the area of production management researchers mention production disruption and backlog (Mehrotra *et al.,* 2020; Shokrani *et al.,* 2020) as well as reduced production capacity and unavailability of workforce (Leite *et al.,* 2020). In the area of logistics management there is delays in distribution and lack of distribution channels due to restrictions (Tirivangani *et al.,* 2021). COVID-19 has therefore disrupted all the levels in the pharmaceutical supply chains from the manufactures to the end users. This is different from other pandemics which happened in the past such as Ebola. Butt (2021) argued that during Ebola the end users were not affected much. Furthermore, the supply chain disruption during Ebola pandemic was short term as opposed to COVID-19 pandemic which appears to be long term (Butt, 2021).

2.3.2 Strategies for mitigating pharmaceutical supply chain disruption during COVID-19 pandemic

Various studies have explored how firms are managing the impact of COVID-19 on pharmaceutical supply chain disruptions (Leite *et al.,* 2020; Lozano-Diez *et al.,* 2020; Mehrotra *et al.,* 2020; Shokrani *et al.,* 2020; Tran *et al.,* 2021). For instance, Lozano Diez *et al.* (2020) agree with Mehrotra *et al.,* (2020) that enhancing production early by taking speedy decisions can reduce scantiness. Leite *et al.* (2020) and Tran *et al.* (2021) on the other hand, argued that resource allocation such as pharmaceuticals and human resources from non-priority areas to high priority areas may mitigate pharmaceutical supply chain disruption during COVID-19.

Furthermore, Leite *et al.* (2020) argue that firms can mitigate pharmaceutical supply chain disruption during COVID-19 by removing non-essential services and thus building temporary capacities. While most of these studies provide some evidence on how organisations are mitigating supply chain disruption during COVID-19, most are based on a single entity perspective. On contrary, Butt (2021) gives a broader perspective on how firms are mitigating supply chain disruption during COVID-19 by looking at a multiple case analysis of buyers and distributors.

From the buyer's perspective, Butt (2021) argues that buying firms can mitigate supply chain disruption by:

- Moving to agile production which involves rescheduling and prioritization based on potential supply issues and shortages of requires materials and products.
- Focusing on tier-1 supplier risk by devising alternative plans and engaging in active communication with key suppliers in order to attain a comprehensive understanding of their inventory, production schedules, and purchase orders fulfillment status.
- Enhancing inbound material visibility by assessing the shipment status of suppliers and production schedule
- Temporarily closing production facilities in order to respond to effects caused by COVID-19. This includes re-routing production to other locations based on local restrictions and issues relating to onward dissemination of products.

From distributors perspectives Butt (2021) argued that distributing firms can mitigate supply chain disruption by:

- Modifying inventory policies
- Evaluating alternate inbound routes for example using rail routes, sea ports or a combination depending on the restrictions in place.
- Evaluating alternative sources of supply through collaboration with secondary suppliers to ensure effective supply to customers

While these studies provide some empirical evidence about how firms can manage supply chain disruption during COVID-19, they were conducted mostly in developed countries. However, little is known about strategies for mitigating pharmaceutical supply chain disruption in developing countries and resource limited settings (Scala & Lindsay, 2021). Studies in Africa are predominantly focused on the impact of COVID-19 on the pharmaceutical supply chain with little emphasis on mitigating strategies (Lucero-Prisno III *et al.,* 2020; Tirivangani *et al.,* 2021). In Namibia, the impact of COVID-19 on the pharmaceutical supply chain has been evaluated (Tirivangani *et al.,* 2021). However, strategies for mitigating pharmaceutical supply chain disruption during COVID-19 have not been explored in a local context.

2.3.3 Challenges associated with procurement of pharmaceuticals in the era of COVID-19

An effective and efficient procurement of pharmaceuticals is critical for a resilient supply chain (Kaufman *et al.,* 2020). Most countries procure their critical supplies through distributors (Scala & Lindsay, 2021). For example, most of the critical pharmaceuticals purchased in Namibia are sourced from China, India or South Africa through distributors (Tirivangani *et al.,* 2021). This poses a challenge for the firms to discover the origin of their items making them vulnerable during supply chain disturbances (Kwon & Kim, 2018). Furthermore, COVID-19 has posed challenges

on the procurement process of pharmaceuticals in various countries (Vecchi, *et al.,* 2020). Kaufman *et al.* (2020) argued that export restrictions and transport interruptions due to lockdowns are some of the procurement challenges during the era of COVID-19. In the United States of America (USA) challenges associated with procurement in the era of COVID-19 include (Sadiq & Kessa, 2020):

- Over reliance on international suppliers in countries such as China, resulting in shortage of medical supplies and equipment.
- Corruption in the procurement process leading to inefficiencies and higher costs.
- Increasing shortage of other essential medicines.
- Difficulty with new contractors in understanding the complex procurement process
- During the first phase of COVID-19 outbreak USA government was not fast to procure medical supplies and equipment and this led to manufacturers shipping large consignments of pharmaceutical supplies to foreign buyers
- Higher prices due to increasing demand for pharmaceutical supplies and equipment.

In South Africa, non-performing contracted suppliers, lack of active pharmaceutical ingredients, delayed payments to suppliers and heavy dependence on international suppliers has been cited as challenges associated with the public procurement process (Modisakeng *et al.,* 2020). In Namibia, although a negative impact of COVID-19 on access and availability of essential pharmaceutical has been reported, little is known about the procurement challenges in the era of COVID-19 (Tirivangani *et al.,* 2021).

2.3.4 Sustainable public procurement strategies in the era of COVID-19

Health supply chains differ from country to country and as a result, different strategies are used to handle procurement challenges (Blandine *et al.,* 2018). Several strategies have been proposed to ensure sustainable public procurement processes amid emergencies such as COVID-19 (Kaufman *et al.,* 2020; Vecchi *et al.,* 2020). For instance, Vecchi *et al.* (2020) argued that six strategies may be used to improve procurement in times of disaster. First is the recognition of the strategic role of procurement. Second is the empowerment of procurement officials. Third, maintaining trust among different governance levels. Fourth is the identification of reliable and proactive suppliers of pharmaceutical supplies and equipment. Fifth, stimulation of the economic market to diversify the production of needed supplies. Sixth, public-private collaborations to ensure responsiveness and resilience of health care systems. Furthermore, Kaufman *et al.* (2021) argued that collaboration among countries to engage in pool procurement thereby aggregating demand, increasing purchasing bargaining power is a vital strategy in improving procurement of pharmaceuticals and related items during COVID-19.

The ability to respond to procurement challenges is dependent on the developed and middle income or developing country context (Scala & Lindsay, 2021). For instance, low income and developing countries are limited in terms of responding with emergency procurement. On the other hand, developed countries have high buying power to secure essential medicines needed during COVID-19 compared to developing or low-income countries (Dai *et al.,* 2020; Garber *et al.,* 2020).

2.3.5 Shortage of pharmaceuticals and related supplies during COVID-19

The shortage of pharmaceuticals and related supplies has been reported in low-, middle- and high-income countries (Shukar *et al.,* 2021). For instance, in USA a critical shortage of pharmaceutical supplies and equipment such as ventilators, N95 respirators, face masks, testing kits and face shields have been reported (Sadiq & Kessa, 2021). Similarly, drug shortage was experienced in African countries such as Nigeria (Faiva *et al.,* 2021) Rwanda (Uwizeyimana *et al.,* 2021) Uganda (Lucero-Prisno III *et al.,* 2021) and Namibia (Tirivangani *et al.,* 2021).

The causes of drug shortage can be categorized as resulting from supply issues, demand issues and regulatory issues (Shukar *et al.,* 2021). Demand issues consists of panic ordering or buying practices of clients or firms in response to pandemics (Uwizeyimana *et al.,* 2021) and inefficient procurement processes (Sadiq & Kessa, 2020). Supply issues include manufacturing problems, unavailability of active pharmaceutical ingredients, drug discontinuation as well as logistic problems (Badreldin & Atallah, 2020).

Regulatory issues consist of lack of policies, inflexible regulatory processes or lack of communication among stakeholders (Shukar *et al.,* 2021). These are mostly observed in upper income countries. In lower-middle income countries such as Sudan drug shortages are triggered by political instability, economic instability, currency inflation, lack of price control and privatization of the pharmaceutical sector (Lucero-Prisno III *et al.,* 2020). Furthermore, drug smuggling, lodging tax state policies and licensing of producers or items can lead to drug shortage in these settings (Khan, 2019).

In upper middle-income countries like Namibia, studies on causes of drug shortage appear to be scarce. In Namibia, a study by Baporikar and Kaloia (2020) revealed that supply chain disruption, management inefficiencies, poor inventory management are causes of drug shortage. However, this study looked at causes of drug shortage at hospital level and not from the national warehouse perspective such as CMS.

2.3.6 Strategies mitigating shortage of pharmaceuticals during COVID-19

Friday *et al.* (2021) argues that prior research on strategies mitigating shortage of pharmaceuticals was conducted outside the pandemic period. As a result, these mitigating strategies may not be appropriate for use during the pandemic period. Some studies on drug shortage mitigating strategies have been conducted in USA and European countries, however little is known in the other parts of the world (Acosta *et al.,* 2019).

Different entities use different strategies to mitigate shortage of pharmaceuticals. This is outlined as follow:

- Hospitals mitigate shortage of pharmaceuticals by updating prescribers and suggesting alternative drugs, sourcing scarce medicines from other suppliers, drug substitution, updating formulary and investigating supply restoration and planning (Shukar *et al.,* 2021).
- Community pharmacies mitigate drug shortage by consulting the authorised supplier, contacting other pharmacies and recommending alternative regiment to patients (Panic *et al.* 2020).
- Manufacturers can mitigate drug shortage by redistributing the available stock (Schwartzberg *et al.,* 2017) producing generics (Panzitta *et al.,* 2017) and using multiple suppliers for raw materials (Butt, 2021).

- Governmental agencies can mitigate drug shortage by collaborative practices with stakeholders (Baporikar & Kaloia; Scala & Lindsay, 2021; Kuo *et al.,* 2020) training all employees involved in supply chain (Shukar *et al.,* 2021) modifying inventory policies (Butt, 2021) and use of drug shortage reporting and tracking system (Giammona *et al.,* 2020).

Other strategies for mitigating drug shortages include improving local production of medicines and ceasing to trade with other countries (Coustasse *et al.,* 2020; Roehr, 2020). Although, shortages of pharmaceuticals have been cited in the Namibian pharmaceutical supply chain, little is known about the mitigating strategies (Tirivangani *et al.,* 2021).

2.4 RESEARCH GAP ANALYSIS

Most supply chain studies are on the impact of COVID-19 on the supply chains (Chowdhury *et al.,* 2021; Fredy *et al.,* 2021; Ivanov, 2020; Tirivangani *et al.,* 2021). Studies on strategies for mitigating the supply chain disruption during COVID-19 have been conducted outside Africa (Butt, 2021; Leite *et al.,* 2020; Lozano-Diez *et al.,* 2020; Mehrotra *et al.,* 2020; Scala & Lindsay, 2021;). Most of the countries where the studies were conducted have financial capabilities to respond to the pandemic. There is therefore a dearth of published research on strategies for mitigating pharmaceutical supply chain in a resource-limited country setting like Namibia. Therefore, this study seeks to fill this gap.

2.5 CHAPTER SUMMARY

This chapter has presented a literature review based on the research questions to reveal what has already been done on the topic under study. The chapter started with

the theoretical literature, explaining key supply chain concepts as well as supply chain theories. It then zeroed in on empirical literature on pharmaceutical supply chain strategies in the era of COVID-19. The next chapter discusses the research methodology.

CHAPTER THREE

RESEARCH METHODS

3.1 INTRODUCTION

This chapter discusses the research methodology adopted in the study. The chapter highlights the research methods used to collect data required to answer the research questions of the study. The chapter presents the research design, population, sample, research instrument, procedure, data analysis and research ethics.

3.2 RESEARCH DESIGN

Research design is a plan of how the research question will be answered (Saunders *et al.,* 2016). Sekaran and Bougie (2016) define a research design as a roadmap for the collection, measurement and analysis of data created to answer the research questions. This study sought to answer the question: What strategies can be adopted by the CMS to mitigate the pharmaceutical supply chain disruptions during COVID-19?

Research designs for qualitative studies include case study, ethnography, action research, grounded theory and narrative inquiry designs (Saunders *et al.,* 2016). For this study, a case study design using a qualitative methodological choice was used to intensively investigate the research area. According to Yin (2014) a case study is an in-depth inquiry into a phenomenon within its real-life setting. Thus, a case study has the potential to generate insights from intensive and in-depth research into the study of the phenomenon in its real-life context, leading to rich empirical descriptions (Yin, 2014). On the other hand, Sekaran & Bougie argued that a case study is a design that focuses on collecting data about a specific object, event or activity such as particular business unit or organisation. In this study, CMS was the focal institution. The case

study design was chosen so as to gain an in-depth understanding of the uniqueness and complexity of the Namibian context, in order to guide identification of suitable strategies for mitigating pharmaceutical supply chain disruption during COVID-19.

3.3 RESEARCH PHILOSOPHY

There are five types of research philosophy. Research philosophy is the set of beliefs that the research is based on and includes positivism, critical realism, interpretivism, postmodernism and pragmatism (Saunders *et al.,* 2016). Positivism is a philosophical stance that entails working with an observable social reality and testing hypothesis (Saunders *et al.,* 2016). This research philosophy is used in quantitative research. Critical realism is a philosophical stance that is based on describing what is seen and experienced in terms of the underlying structures of reality that shape the observable events (Saunders *et al.,* 2016). This philosophical stance is associated with quantitative research.

Postmodernism is a philosophical stance that stresses the function of language and of power relations by questioning accepted ways of thinking and providing alternative marginalised views (Saunders *et al.,* 2016). This philosophy is used in qualitative studies. Pragmatism is a philosophical stance that combines both objectivism and subjectivism, facts and values, accurate and rigorous knowledge and various experiences (Saunders *et al.,* 2016). This type of research philosophy is associated with mixed methods research.

This study was informed by the interpretivist philosophy. Saunders *et al.* (2016) state that interpretivism is the philosophical stance of social sciences and emphasises that human beings are different from physical phenomenon because they create meanings. The aim of interpretivism is to create new, deep understandings and interpretations of

social worlds and contexts (Saunders *et al.,* 2016). Therefore, interpretivism is a subjective philosophy which focuses on complexity, richness, interpretations and meaning-making.

3.4 RESEARCH APPROACHES

There are three methodological choices, namely: quantitative, qualitative and mixed methods research. Quantitative research is a methodological choice based on testing hypothesis by considering relationships among variables (Creswell, 2014). This type of research uses numeric data. Creswell (2014) states that "qualitative research is an approach for exploring and understanding the meaning individuals or groups ascribe to a social or human problem".

This study adopted a qualitative methodological choice. According to Saunders *et al.* (2016) qualitative research entails the collection, analysis and interpretation of non-numeric data in order to study participants' meanings and relationships between them. Furthermore, qualitative research is associated with an inductive approach while quantitative research is associated with deductive approach. Mixed methods research is a combination of qualitative and quantitative methods.

3.5 POPULATION

A population is the totality of elements under study (Saunders *et al.,* 2016). The research population of this study comprised 22 pharmacists at the CMS, MoHSS (2021). This was the target population from which the sample was drawn.

3.6 SAMPLE

Sampling is the process of selecting a small portion of the population to represent the entire population (Saunders *et al.,* 2016). This is done because it may not be possible to conduct a study based on the entire population.

3.6.1 Sampling techniques

According to Saunders *et al.* (2016) there are two types of sampling namely: probability sampling and non-probability sampling. With probability sampling, each member of the population has an equal chance of being selected, while with non-probability sampling, members of the population have unequal chances of being selected. Examples of probability sampling techniques include, simple random sampling, systematic random sampling, stratified random sampling and cluster sampling, while non-probability sampling techniques include quota sampling, purposive sampling, volunteer sampling and haphazard sampling (Saunders *et al.,* 2016).

The sample of this study comprised of 7 pharmacists at the CMS. This was based on a similar study by Scala and Lindsay (2021). This is also consistent with Saunders *et al.* (2016) who stated that, for in-depth interviews, the sample size should be between 5 and 25. Furthermore, in this study, the purposive sampling technique was used. Saunders *et al.* (2016) argue that purposive sampling is a non-probability sampling technique that entails use of personal judgement to select participants that will best answer the research questions.

Furthermore, purposive sampling is appropriate for selecting participants with characteristics relevant to the study (Saunders *et al.,* 2016). This study needed participants who are knowledgeable in the area of the pharmaceutical supply chain.

Therefore, the sample for the study comprised of a Chief Pharmacist for the CMS, distribution pharmacists, as well as procurement pharmacists as these were thought to be knowledgeable in the area of the pharmaceutical supply chain.

3.7 RESEARCH INSTRUMENT

An interview guide with non-structured questions was used. The purpose of using the interview guide was to explore in detail, the participants' views and perspectives.

3.8 PROCEDURE

Permission to conduct this study was obtained from the Namibia Business School (NBS) and Ministry of Health and Social Services. Participants were then 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 participants. Participants were then requested to sign consent forms. Thereafter a Zoom link was sent to participants via email. Interviews were conducted via Zoom over an average time of 20 minutes for each participant. The researcher minimised 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.

3.9 DATA ANALYSIS

Data was analyzed using a qualitative data analysis method. Specifically, the thematic analysis technique was used. Thematic analysis is a strategy for analysing qualitative data and entails coding data to identify themes that occur across a data set (Saunders *et al.,* 2016). Furthermore, thematic analysis is defined as a flexible method for analysing qualitative data when seeking to understand experiences,

thoughts or behaviours across a data set (Sekaran & Bougie, 2016). The researcher used the following steps for undertaking thematic analysis as outlined by Saunders *et al.* (2016): familiarisation with the data, coding the data, creating and assigning codes to describe content, searching for patterns to generate themes, reviewing the themes, defining and naming themes (Saunders *et al.,* 2016). Furthermore, ATLAS.ti software was used to analyse the data.

3.10 RESEARCH ETHICS

Research ethics are a critical aspect of conducting research. Research ethics are standards of behaviours that direct the conduct of the researcher in relation to the rights of the participants and those affected by the research (Saunders *et al.,* 2016). Furthermore, Saunders *et al.* (2016) argued that ethical issues can occur at all stages of a study, for example when seeking permission to conduct a study, during data collection and after data collection. Ethical principles in business and management research may include: integrity and objectivity of the researcher, respect for others, avoidance of harm, privacy of those taking part, voluntary participation and right to withdraw, informed consent of participants, confidentiality of data, maintenance of anonymity of participants, responsibility in the analysis of data, reporting of findings, compliance in the management of data as well as ensuring the safety of the researcher (Saunders *et al.,* 2016).

In this study, research ethics were maintained at all aspects of the study. Ethical clearance certificate was obtained from NBS. Permission to conduct the study was then obtained from Ministry of Health and Social Services. Participants were informed that their participation in the study would be voluntary and they would remain anonymous. Also, participants were informed that refusing to participate or

withdrawing from the study has no harm on them. In addition, participants were assured of the confidentiality of their responses. Participants were requested to sign consent forms prior to the start of interviews. Interview recordings are stored on a computer with a protected password for a period of five years and will be thereafter be deleted.

3.11 CHAPTER SUMMARY

This chapter discussed the research methodology which was employed in the study. The study used a case study design following a qualitative approach. An interview guide was used to collect data from participants using Zoom interviews. Data was analysed using thematic analysis and ATLAS.ti was the software used. Furthermore, ethical considerations were observed in all aspects of the study. The following chapter will present the results and discussions.

CHAPTER FOUR

RESULTS AND DISCUSSIONS

4.1 INTRODUCTION

This chapter presents the results from the study. The data sources for this study were seven (7) pharmacists who worked for the CMS in Namibia. The interviews were scheduled to take about 20 minutes, but some took less time to finish while some ran over time.

The aim of the data analysis was to find solutions to the research questions. The first research question (RQ) sought to determine the strategies adopted by the CMS in

mitigating the pharmaceutical supply chain disruption during the COVID-19 pandemic. In order to fully address the RQ, the main RQ was broken down into three sub questions. In total, the interview was based on 7 interview questions (IQ) which addressed the RQ. Furthermore, the chapter presents a discussion of the data and its relation to literature.

This chapter is made up of six main sections: The first section outlines the response rate, section 4.3 presents the profile of the participants, section 4.4 presents the mode of analysis used, section 4.5 presents study results, section 4.6 discusses the study findings and the last section is the summary of the results.

4.2 RESPONSE RATE

Seven (7) interviews were conducted with the all the selected pharmacists at the CMS. Therefore, the response rate was 100%.

4.3 DEMOGRAPHICS

There were seven (7) participants who were interviewed. Out of the seven participants, three were female and four were male. In addition, two participants were from the warehousing department, two from the distribution department, two from the procurement department and one Chief pharmacist. The participants had an average number of years of experience as pharmacists of four years. The participants were code named as follows: P01, P02, P03, P04, P05, P06 and P07.

4.4 PRIMARY DATA ANALYSIS

In the first stage of the analysis, the researcher familiarised himself with the data by listening through the audio recordings and creating the interview transcripts. The interview transcripts were then loaded into ATLAS.ti software, which helped in connecting the concepts with the quotations.

Initial codes were created in the second stage of the analysis and were derived from the transcriptions. To help improve the coding, ATLAS.ti was used and this helped identify words of significance. Forty initial concepts were identified (Table 4.1) and open coding was implemented during the initial phase of data analysis.

Table 4.1: Concepts Derived from Transcripts

Swift delivery	Delivery period	periodisation of distribution	Identifying pharmaceutical
Stock level	Vaccines distribution	Price Negotiations	Additional Staff
Contracts	Technical Working Group	Buy out	Just in Time
Unavailability of transport	Export bans on pharmaceuticals	Increased prices	Limited budgets
Supply Challenges	Delays	Shortage of staff	Out dated procurement processes
Panic Ordering	Pharmaceutical Ingredients	Licence delays	Order Cancellation

Storage Space	Diplomatic negotiations	Transport assistance	Global health insurance
Enhanced logistical capabilities	Skilled Personnel	Long term contracts	Local manufacturing
Quick approval of supplier licenses	Bulk Purchasing	Penalizing for contract cancellation	Risk Management
Improved Accountability	Demand Analysis	Donations	

Furthermore, analysis on the forty initial concepts was done and fourteen key concepts were derived from the research findings as shown below.

Table 4.2 Fourteen (14) Key Concepts

Item	**Key concepts**
1	Efficient distribution channels
2	Prioritisation of health facilities
3	Human resources support
4	Price and contract negotiations
5	Export bans
6	Limited staff
7	Inflation
8	Production challenges
9	Logistical challenges

10	International collaboration
11	Efficient contract and supplier management
12	Local pharmaceutical manufacturing
13	Skilled employees
14	Government intervention

The same approach was used to derive 8 categories from the 14 key concepts as shown below. The categories were linked to the research questions.

Table 4.3 Eight (8) categories

Enhancing supply chain
Supplier management
Contract Management
Supply chain inefficiencies and challenges
Contingency plans
Shortages of pharmaceuticals
Workforce management
Planning

Five themes were then created from the 8 categories; these include as shown below:

Table 4.4 Themes

Managing supply chain during COVID-19 pandemic
COVID-19 induced supply chain challenges
Approaching supply chain challenges
Medicine Shortages
Looking into the future

4.5 FINDINGS

4.5.1 Theme 1: Managing the supply chain during the Covid-19 pandemic

The COVID-19 pandemic has caused unprecedented challenges within the global supply chains; various management strategies have been put in place by the CMS to help manage the situation. The first research question of this study sought to determine what is being done by the CMS to manage the supply chain during the COVID-19 pandemic. During the interviews the participants were able to provide strategies that the CMS is currently using to manage the supply chain during the COVID-19 pandemic.

Seven participants revealed that a number of strategies were used to manage the pharmaceutical supply chain during the COVID-19 pandemic. For instance, strategies were put in place to ensure that efficient distribution of pharmaceuticals from the CMS to different health facilities was in place. This was done with the support of various stakeholders. For example, P01 stated that:

> *"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 weeks 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 vaccines distribution. Luckily we were also given transport by Chemonics to transport vaccines to any region that needed them"* (P01).

Similarly, P02 stated that: *"In terms of distribution of pharmaceuticals to facilities they were times when we had to use Namibia Defence Force to assist us to deliver items"* (P02).

P04 also indicated that: *"From the procurement buyouts were given a bit of priority. On distribution we made use of private company to deliver stock quickly to hard hit regions"* (P04).

P05 also revealed that: *"For distribution CMS was assisted by NamPost courier to deliver stock to health facilities"* (P05).

In terms of distribution of pharmaceuticals from suppliers to CMS, participants indicated that alternative routes were used. For instance, P07 indicated that:

"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" (P07).

Stock distribution from CMS to health facilities was prioritised based on the number COVID-19 cases. Thus, health facilities which had more COVID-19 patients were given priority in terms of distribution. Furthermore, CMS identified pharmaceuticals which were in high demand during the COVID 19 pandemic and made sure they were readily available. Information sharing with different stakeholders was also critical. P01 stated that:

> *"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 go beyond a certain level we have to place an order. This list was also shared with development partners such as World Health* Organisation *and UNICEF so they can donate some items. And actually, as a result we got a lot of donation for example face masks and dexamethasone injection"* (P01).

Negotiations played a key role in helping CMS manage the supply chain due to the COVID-19 pandemic most of the pharmaceuticals needed to treat the COVID-19 patients was on high demand. This led to price increases, as a result to ensure the availability of these commodities; CMS had to negotiate for price reductions with some of the suppliers. In addition, participants revealed that negotiation was made with Ministry of Health and Social Services to get human resource support.

"In terms of procurement, 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 is not too much inflated. In terms of Human Resource, we engaged Ministry of Health and Social Services head office to get more staff to support us. We were able to get pharmacy graduate and some administration staff. We also got additional staff from Global Fund" (P01).

Contract exemptions by the Ministry of Finance in 2020 helped ensure the continued supply of COVID-19 pandemic pharmaceuticals. Although this was not a planned reactive strategy as it was done before the pandemic reached Namibia, it actually contributed to the availability of pharmaceuticals at the CMS during the COVID-19 pandemic. P02 indicated that:

"In 2019 we strategized by asking 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" (P02).

During the interviews it became apparent that proper planning and quantification of pharmaceuticals were put in the procurement and stock management of the commodities. Efficient stock control helped CMS to anticipate demand 12 months ahead and procure stock before it ran dry. P03 stated that:

"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 will last. We also looked at critical key

priority items needed during the pandemic. We had to review that and maintain certain stock level" (P03).

Similar strategies were also revealed by P06 who stated that:

"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" (P06)

Human resources support from the government and development partners helped in managing the supply chain during the COVID-19 pandemic. Technical Working Group comprising of CMS staff and its stakeholders was set up. This Technical Working Group played a pivotal role in coming up with strategies to overcome pharmaceutical supply chain challenges. P05 indicated that:

"CMS received Human Resource support from government and development partners. Technical Working Group on COVID-19 was established, consisting of Namibia Medicine Regulatory council, programs and CMS staff. The group was meeting to discuss how to address various supply chain challenges during the pandemic" (P05).

4.5.2 Theme 2: COVID-19 pandemic induced supply chain challenges

The second research question of the study sought to determine the challenges that are being faced by the CMS in the procurement of pharmaceuticals during the COVID-19 pandemic period. During the interviews, all participants managed to articulate on the challenges that the CMS is currently facing. Participants pointed out that lockdowns in foreign countries where Namibia source pharmaceuticals negatively

impacted the procurement of pharmaceuticals. This is because Namibia is a net importer. For instance, P01 indicated that:

"When it comes to procurement of pharmaceuticals it was difficult because for instance in India which is one of our biggest market where we get most of our pharmaceuticals, they had an issue were no flights were coming in" (P01).

During the early stages of the pandemic, lockdowns were put in place by the Namibian government as one of its control measures. This affected the delivery of pharmaceuticals mainly due to delays at the boarders because drivers were required to take 72 hours COVID-19 test and some were required to quarantine for a period of two weeks. P02 stated:

"When the boarders were closed drivers had to take a 72 hours tests and this resulted in delays in deliveries of pharmaceuticals. At pharmaceutical industries where the active pharmaceutical ingredients come from the production went slow and this led to delays in stock. Also, some airlines could not operate. Furthermore, supply chain logistics went slow" (P02).

Namibia's main pharmaceutical suppliers such as India introduced some export bans on COVID-19 related commodities. This meant that access to pharmaceutical was limited and the participants argued that this led to price increases due to increased demand. Consequently, it was difficult to procure the pharmaceuticals with the limited budget. Majority of the participants concurred that the export bans had an adverse effect on the supply chain during the COVID-19 pandemic. P01 went on to state that:

"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 could not give you a price because they also wanted 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 can buy" (P01).

The banning of flights created logistical challenges and this delayed the distribution of the pharmaceuticals. This was revealed by P01 who stated that:

"Basically, there were two things that gave us a challenge in terms of procurement. Firstly, there was an escalation of prices of pharmaceuticals. Secondly, it was difficult for suppliers to commit because when they give you a price, then the issue of getting stock 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 get items in two months. So, we had to look for more suppliers and that took time" (P01).

The pharmaceutical manufacturers were working with limited workforce due to COVID-19 infections. This affected the production capacity of these firms and delayed the distribution of pharmaceuticals to Namibia. P03 stated that:

"The other challenge was that due to COVID-19 many people were sick, so that means manufacturers were also working on a small staff compliment and as a result the production cycle was longer and that increased the lead time for us to receive our goods. There was also 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. In terms of in house there was a little bit of mistrust from a lot of offices because the pandemic needed us to do things differently" (P03)

Order cancellation by suppliers as a result of price inflation had negatively affected the procurement process. Furthermore, participants also indicated shortage of active pharmaceutical ingredients which resulted in unavailability of some items which were procured. For instance, P04 stated that: *"During the pandemic most suppliers were cancelling 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 shortage of active pharmaceutical ingredients globally and this also affected CMS. CMS trend forecasting system is also outdated and this led to erratic ordering. We also had shortage of staff at the procurement department"* (P04).

4.5.3 Theme 3: Approaching supply chain challenges

The respondents were asked about the strategies that the CMS can use to mitigate the shortage of pharmaceutical during the COVID-19 pandemic. The respondents were able to outline a number of strategies. For instance, it was suggested that a national carrier should be responsible for transporting the pharmaceuticals from foreign countries where pharmaceuticals are procured from. P01 stated that:

> *"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 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" (P01).

Participants suggested that the country should move away from buyouts which are more expensive and enter into long term contracts with the suppliers. In addition, participants indicated that collaboration with various stakeholders is very critical in addressing pharmaceutical supply chain challenges. For example, P02 stated that: *"A national depot which is supplying the whole country should have long term contracts to procure pharmaceuticals. Rather than using buy outs which are expensive. Collaboration with stakeholders is also critical"* (P02).

The participants also suggested that the Namibian government should start manufacturing its own pharmaceuticals and stop relying on imports. P03 stated the following:

> *"We need to start manufacturing basic things, during the pandemic find our self-importing almost everything. There is need for much emphasis to set 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 land locked. We also need to consider outsourcing some functions that are not core functions of CMS"* (P03).

P04 suggested that the Ministry of Finance should expedite the approval of supplier contracts as this would help increase the supply of pharmaceuticals during the COVID-19 pandemic. P04 stated that: *"The ministry of finance should expedite approval of supplier price increase especially during the pandemic"* (P04).

In addition to investing in local manufacturing, bulk purchasing supported by enough financial resources was another suggestion provided by a participant. P05 stated that:

> *"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"* (P05).

It was also suggested that in order to avoid supply delays during the COVID-19 pandemic, the CMS should identify alternative suppliers and implement the Just in Time approach to stock management. Communication between CMS and suppliers should be kept open all the time and a contingency and risk management plan should be in place. P06 stated the following:

> *"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 plan"* (P06).

In agreement, P07 also suggested that the CMS should be more accountable for its procurement activities and that long term contracts should be entered into to ensure continued supply of the pharmaceuticals. P07 stated that: *"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"* (P07).

4.5.4 Theme 4: Medicine Shortages

Several factors contributed to the shortages of medicines at the CMS during the COVID-19 pandemic. Countries that manufacture medicines had put in place some export bans and order limitations were placed on some commodities. The CMS was also operating on a limited budget which made it difficult for them to procure enough medicines. The problem was exacerbated by the in ability to quantify the pharmaceutical commodities based on the number of COVID-19 patients as the number kept changing on a daily basis.

The shortage of medicines was also caused by the cumbersome procurement process. The process was too long since it also involved the procurement management unit. This resulted in shortages of the COVID-19 pandemic essential medicines. The participants revealed that the Namibia Essential Medicine List (NEMLIST) has not been revised and some of the products on the list are out dated. Moreover, the study found that the CMS does not have enough storage space, therefore is not able to store up to 6 months' stock. The issues of incompetent staff were also mentioned as one of the contributing factors to medicine shortages. The respondents stated the following:

> *"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 of pharmaceuticals worldwide. Considering that we do not manufacture medicines here and the demand was in every country so 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 a fixed number. For example, we could not*

quantify exactly to say so many people will need Enoxaparin injection in ICU. 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" (P01).

"There was panic perception among health care workers. Some facilities would panic order. Our Namibia Essential Medicine List (NEMLIST) was not revised and so some products were obsolete" (P03).

"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" (P04).

"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" (P05).

"CMS has iincompetent staff and lack of accountability by staff for wrong doing. It llargely depends on external source both on manufacturing and importing. There is iirrational orders from facilities... Also iirrational issuing of stock from CMS" (P07).

4.5.5 Theme 5: Looking into the future

During the interviews the participants were asked about the strategies that the CMS can use to improve its supply chain so that it is prepared if another pandemic occurs in the future. The participants were of the view that the CMS needs additional human resources. P05, P06 and P07 all concurred that if CMS increases the number of

employees this could result in improved supply chain. P01 suggested that the CMS budget should be increased as this would help in the procurement of sufficient pharmaceuticals and have enough money to transport the pharmaceuticals to different regions in Namibia. Furthermore, participants indicated that there is need for employees at the CMS to be trained in supply chain management. P01 indicated that: *"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, 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 supply chain is also critical"* (P01).

Another suggestion was that the CMS needs to have adequate storage space for its stock, P02, P03, P06 and P07 were of the view that if CMS provides enough storage space, it will be able to stock in large quantities. In addition, the participants also believe that long term contracts with the suppliers would help improve the supply chain. Long term contract is beneficial to CMS in terms of ensuring continued supply of pharmaceuticals and establishing long term relationships with the suppliers. P02 stated that: *"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 need"* (P02).

P06 stated that: *"CMS need to keep maximum stock for one year, therefore CMS, a need to construct a standard warehouse and keep all items on long term contract. Continually communicate with suppliers. Increase human resources at the CMS and control supplier performance by use of indicators. Improve quality of data and stock visibility nationally"* (P06).

P07 stated that:

> *"Competent and adequate staff; adequate storage space to buy in bulk; develop a 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"* (P07).

P03 indicated that: *"We need several systems to be put in place. We need to have sufficient stock, safety stock if we find ourselves in similar situation. We also need to apply certain supply chain concepts such as enhancing visibility and collaboration."* (P03).

The issue of long-term contract was also supported by P04 who stated that*: "It will be better if we have long term contracts with supplier in place. CMS should also work closely with facilities for them to issue rationally and order rationally"* (P04).

P05 mentioned that efficient contract management systems should be put in place*. "We need to share information on time and we need to deploy more human resource and procure in bulk. We need to encourage local manufacturing and all items should be on long term contract with suppliers. There should be a strong contract management system"* (P05).

4.6 DISCUSSIONS

The main research question of the study sought to determine the strategies that the CMS can adopt to mitigate pharmaceutical supply chain disruption during COVID-19. The interview and the subsequent study findings were based on the following sub

questions: (i) How is the CMS managing the supply chain during the COVID-19 pandemic? (ii) What challenges are being faced by the CMS in the procurement of pharmaceuticals during COVID-19? And (iii) Which strategies can mitigate shortage of pharmaceuticals at the CMS during COVID-19? This section discusses the study findings. During the discussion, the current study findings were compared with findings from previous studies.

4.6.1 CMS supply chain management strategies

The first research question sought to understand how the CMS is managing the supply chain challenges during the COVID-19 pandemic. According to this study CMS managed the supply chain by adopting various strategies. Furthermore, collaborated 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 (Leite *et al.,* 2020; Lozano-Diez *et al.,* 2020; Mehrotra *et al.* 2020; Shokrani *et al.,* 2020; Tran *et al.,* 2021).

The results suggested that efficient distribution of pharmaceuticals was employed by CMS to help expedite the supply of pharmaceuticals. For instance, CMS used the sea port as an alternate distribution channel to bring in supplies from other countries. This was because during the pandemic period flights were banned, making the use of air route challenging. Similar findings were obtained by Butt (2021), who argued that valuating alternate routes such as rail routes, sea ports or a combination depending on the restrictions in place is vital during the pandemic. Results further highlighted that CMS worked closely with its key stakeholders such as Nampost, Chemonics and Namibia Defence Force to achieve efficient distribution of pharmaceuticals to health

facilities. These findings are supported by recent literature, arguing that collaboration with key stakeholders is a critical resilience strategy for pharmaceutical supply chain in the public sector during the COVID-19 pandemic (Baporikar & Kaloia, 2020; Scala & Lindsay, 2021). Results also found that in terms of distribution of pharmaceuticals to health facilities, CMS prioritized hard hit regions such as Khomas and Erongo. These findings are in agreement with recent studies which suggests that prioritization of stock distribution mitigates pharmaceutical supply chain disruption during COVID-19 (Tran *et al.,* 2021).

The findings reported that CMS adopted efficient stock management practices during the pandemic. For instance, stock was kept at six months ahead in order to reduce shortages and to manage supply chain delays. Additionally, CMS adopted rational issuing of stock to health facilities. Consistent with these findings, Butt (2021) argued that modification of inventory policies helps manage supply chain challenges during COVID-19 pandemic period. Furthermore, Baporikar and Kaloia (2020) 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.* (2020) who argued that resource allocation may mitigate supply chain disruption. Furthermore, Uwizeyimana *et al.* (2021) affirmed that government support played a pivotal role in managing pharmaceutical supply chain during the pandemic in Rwanda.

The findings of this study revealed that CMS has been negotiating with suppliers as a means of managing the supply chain challenges. This was significant because due to the high demand on essential pharmaceuticals, some suppliers have been overpricing their commodities. Similar to this study's findings, Butt (2021) affirmed that buying firms should be engaging in active negotiation with its key suppliers in order to attain a comprehensive understanding of their inventory, production schedules, and purchase order fulfillment status. Also, Lozano-Diez *et al.* (2020) agree with Mehrotra *et al.* (2020) that enhancing production early by taking speedy decisions can mitigate pharmaceutical supply chain disruption during the COVID-19 pandemic.

Results revealed that CMS was granted contract exemption by the Ministry of Finance. This helped with continued supply of pharmaceuticals since CMS was able to have twelve months' contract in place. This matches with findings by Shukar *et al.* (2021) who argued that a change in governmental procurement policies could result in mitigation of supply chain disruption during the pandemic.

4.6.2 Challenges being faced by the CMS in the procurement of pharmaceuticals during COVID-19

The second research question sought to determine the challenges being faced by the CMS in the procurement of pharmaceuticals during the COVID-19 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 literature by Kaufman *et al.* (2020) who argues that efficient and effective procurement is essential in ensuring resilient supply chain within the pharmaceutical industry.

This study found that export bans by Namibia's main pharmaceutical suppliers led to 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. This was confirmed by Kaufman *et al.* (2020) who revealed that export restrictions and transport interruptions are some of the challenges during the COVID-19 pandemic.

Results found that long lead times were one of the procurement challenges faced by CMS during the pandemic. The study further revealed that lockdowns which were enforced by various countries led to 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 and this created serious logistical challenges for the suppliers, resulting in delays. The results also indicated that there were strict control measures at the ports of entry. These findings are in agreement with Munharo *et al.* (2021) 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 (2018) points out that that reliance on distributors poses a challenge to firms and makes them vulnerable during supply chain disturbances. Similar challenges were faced by the CMS during the COVID-19 pandemic when logistical challenges led to delays and even cancellation of orders.

The other critical challenge which CMS faced in its procurement process was that due to high demand of pharmaceuticals during the pandemic, suppliers increase the prices of pharmaceuticals. This was confirmed by Vecchi *et al.* (2020) who indicated

that high demand of pharmaceuticals resulted in price increase in the United States of America (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 (Vecchi *et al.,* 2020). Similar with the USA procurement challenges, Namibia had difficulty in understanding the complex procurement process with new contractors.

Furthermore, cancellation of orders by suppliers and lack of actives or pharmaceutical ingredients 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 (Modisakeng *et al.,* 2020).

4.6.3 Strategies to mitigate shortage of pharmaceuticals at the CMS during COVID-19

The third research question sought to determine the strategies that can be used to mitigate shortages of pharmaceuticals at the CMS during the COVID-19 pandemic. Results revealed that iinternational interventions to ensure equal distribution of pharmaceuticals and prevent hoarding by rich nations could be used to mitigate shortage. This is also similar to findings in USA, where intergovernmental collaboration is recommended to ensure availability of pharmaceuticals (Sadiq & Kessa, 2020).

It can be deduced from this study that 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. The role of government intervention in ensuring availability of pharmaceuticals during the pandemic has been confirmed by various studies (Lucero-Prisno III *et al.,* 2021; Uwizeyimana *et al.,* 2021). The findings further revealed that government intervention will be required to abandon the buyout system and ensure that long term contracts for pharmaceuticals with suppliers are in place. Consistent with this, Spieske *et al.* (2022) affirmed that leveraging long term buyer-supplier relationships can improve supply availability.

This study has recommended local manufacturing of pharmaceuticals. This is also in accordance with Kuo *et al.* (2020) who point out that Taiwan can mitigate drug shortages by providing economic and policy incentives for local manufacturing of pharmaceuticals. Formulation of policies that will promote local manufacturing of pharmaceuticals will need government intervention (Tirivangani *et al.,* 2021). If Namibia manages to promote local pharmaceutical manufacturing, it will have the capacity to address the current supply chain challenges and prepare for future pandemics.

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 resource to manage the supply chain. Scala and Lindsay (2021)

and Kuo *et al.* (2020) all support this finding by stating that governmental agencies can mitigate drug shortages by educating and training all employees involved in the supply chain (Shukar *et al.,* 2021) modifying inventory policies to address inventory shortages (Butt, 2021) and use of a drug shortage reporting and tracking system (Giammona *et al.,* 2020).

Communication with suppliers was one of the findings of this study. This is supported by Butt (2021) who argues that the buyers should be engaging in active communication with key suppliers in order to attain a comprehensive understanding of their inventory, production schedules, and purchase order fulfillment status.

4.7 CHAPTER SUMMARY

This chapter presented and discussed the results from the seven interviews conducted. The chapter highlighted managing the supply chain during the COVID-19 pandemic, COVID-19 induced supply chain challenges, approaching supply chain challenges, medicine shortages and looking into the future as the five key themes which emerged. The findings were discussed in relation to the research questions and literature. The next chapter will outline the conclusions and recommendations of the study.

CHAPTER FIVE

CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

The main research question of the study was; What strategies can be adopted by the CMS to mitigate pharmaceutical supply chain disruption during COVID-19? This chapter concludes the study and makes recommendations of the study. The chapter addresses the research questions using the findings in the previous chapter. In addition, the chapter identifies the areas for further research.

5.2 SUMMARY OF FINDINGS

The following table shows a summary of the main findings from the study. The findings are presented with their link to research questions.

Table 5.1 Summary of research findings

RQ1	**Explain how the CMS managed the supply chain during the 2020-2021 COVID-19 pandemic period?**
Finding 1	Efficient distribution and stock management was established to help expedite the supply of pharmaceuticals in health facilities.
Finding 2	Human resources support was provided by the Namibian government and its development partners.
Finding 3	Supply and price negotiations with suppliers helped ensure the availability of pharmaceuticals.
Finding 4	Contract exemptions approved by the Ministry of Finance meant continued supply of pharmaceuticals.
Finding 5	During distribution of pharmaceuticals priority was given to COVID-19 treatment health facilities such as Windhoek Central Hospital and Katutura Intermediate Hospital.

RQ2	**With particular emphasis on the lockdown period, what challenges are CMS facing in the procurement of pharmaceuticals?**
Finding 6	Export bans placed on pharmaceuticals by Namibia's main suppliers affected the supply of COVID-19 essential medicines.
Finding 7	Supply delays were caused by flights bans, order cancellations, logistical challenges and strict control measures at port of entries (mainly boarders).
Finding 8	Reduced production capacity by manufacturers affected the supply of the pharmaceuticals.
Finding 9	High demand for pharmaceuticals caused price inflation and some commodities were overpriced.
Finding 10	Shortage of pharmaceutical ingredients affected CMS.
Finding 11	Staff shortages had an effect on CMS
Finding 12	CMS still uses outdated trend tracking system which is causing erratic ordering.
RQ3	**In your view, which strategies can mitigate medicine shortages during the COVID-19 pandemic?**
Finding 13	International interventions to ensure equal distribution of pharmaceuticals and prevent hording by rich nations.
Finding 14	Government interventions to address logistical challenges for example national carrier to transport the commodities from suppliers to Namibia.
Finding 15	CMS should have competent employees to help establish efficient supply chain management.
Finding 16	Namibia should abandon the buyout system and adopt long term contract approach.
Finding 17	Local manufacturing of the pharmaceuticals
Finding 18	Flexible and quick procurement system should be put in place by the Ministry of Finance.
Finding 19	Penalties on suppliers for contract cancellation.

Finding 20	CMS should establish better communication channels with its suppliers and create a system for accountability when it comes to its procurement activities.
IQ4	**In your opinion, what are the major causes of medicine shortages at the CMS during the COVID-19 pandemic?**
Finding 21	Export bans and order limits placed on COVID-19 related pharmaceuticals caused the shortage of medicines during COVID-19 pandemic.
Finding 22	CMS is operating on a limited budget therefore limiting its ability to procure adequate medicines.
Finding 23	Long procurement process means restocking is taking long thereby causing medicine shortages.
Finding 24	Lack of enough storage space at the CMS means limited stock is kept.
Finding 25	Incompetent staff at the CMS, contract cancellations and production delays causing medicine shortages at the CMS.
Finding 26	Shortages of active pharmaceutical ingredients
IQ6	**In your opinion, how can the CMS improve the supply chain better in the future during pandemics?**
Finding 27	CMS needs additional and competent staff to help manage its supply chain
Finding 28	CMS budget increment will help ensure adequate procurement of pharmaceuticals
Finding 29	Logistical support from the government to ensure timely transportation of commodities.
Finding 30	Employee incentives and training to motivate them to be more efficient and effective.
Finding 31	CMS needs to upgrade their warehouses in order to allow for more storage space**.**

5.3 CONCLUSIONS

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

Based on the research questions, several conclusions can be drawn. Firstly, CMS managed the supply chain through efficient distribution of stock with the help of key stakeholders, 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 process and heavy reliance on international suppliers. Finally, mitigation strategies which can be adopted by CMS to minimize supply chain disruption include government intervention to encourage local manufacturing, adoption of long-term procurement contracts, establishing good communication with suppliers, having sufficient budget for pharmaceuticals, training employees in supply chain management and adequate storage space.

5.4 RECOMMENDATIONS

The recommendations were made based on the findings of this study. The recommendations are linked to the research questions and are aimed at finding solutions to the issue of pharmaceutical supply chain disruption during the COVID-19 pandemic at the CMS.

It is recommended that the government of Namibia should promote and create a conducive environment for setting up local manufacturing industries of pharmaceuticals. This will reduce heavy reliance on foreign countries in terms of medicine supply.

It is recommended that the Ministry of finance should allocate sufficient funds to the CMS, in the budget for pharmaceuticals. This would enable the CMS to procure commodities in bulk and have adequate stock during supply chain disruptions.

It is further recommended that supply chain management training be provided to CMS employees to familiarise them with basic supply chain concepts.

It is also, recommended that the CMS should pursue more collaborative relationships with suppliers to improve communication and information flow. This would help improve supplier responsiveness since suppliers would not have to wait for a purchase order from the CMS in order to trigger the re-supply procurement process at their end.

It is further recommended that the Ministry of Finance should make the procurement process flexible by adopting long-term contracts with suppliers. This would reduce costs associated with the buyout system. Furthermore, it would make suppliers accountable and prevent order cancellations.

The government should offer logistical support to the CMS. This would ensure timely distribution of pharmaceuticals.

It is recommended that the CMS, with the support of the Ministry of Health and Social Services and its development partners should upgrade their warehouses. This would create more storage space which would enable the CMS to keep bulk stock for up to a year.

5.5 AREAS FOR FUTURE RESEARCH

This study focused on a public sector medical depot (the CMS). Further research could focus on comparing strategies adopted by public sector institutions with the private sector institutions. This research focused on a single public sector based pharmaceutical supply chain. Further studies should cover the entire public sector pharmaceutical supply chain including all the health facilities. Furthermore, this research adopted a qualitative approach. Further research should adopt a quantitative or mixed methods approach.

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APPENDICES

APPENDIX 1: RESEARCH PERMISSION LETTER FROM THE NAMIBIA BUSINESS SCHOOL

NBS
NAMIBIA BUSINESS SCHOOL
UNIVERSITY OF NAMIBIA

04 October 2021

TO WHOM IT MAY CONCERN

Re: MBA Management Strategy ,Student – Mr. Justus Ekandjo Student Number-200502786

As part of our MBA Programme, students are expected to submit a research report after completion of their course-work. They need to explore in detail, some concepts and issues pertaining management strategies. To do that effectively, they need to conduct interviews and obtain practical examples.

Mr. Ekandjo has chosen your organization to approach for information. It is against this background that I wish to kindly request you to assist Mr. Ekandjo with the information he requires. Accept our assurance that the data will be used for academic purposes only. A copy of the completed document will be available at the Namibia Business School for perusal. His research synopsis indicates that his topic touches on "Investigating the strategies for mitigating pharmaceutical supply chain disruption during COVID-19 at Central Medical Stores, Namibia".

Your kind assistance is highly appreciated.

Yours sincerely,

NAMIBIA BUSINESS SCHOOL
NBS
04 OCT 2021
ACADEMIC SERVICES
UNIVERSITY OF NAMIBIA
Inspiring Minds & Shaping the Future

James Camm
Research Co-Ordinator
Namibia Business School
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340 MandumeNdemufayo Ave. – Private Bag 16004 – Pionierspark – Windhoek – Website: www.nbs.edu.na
Tel: + 264 (61) 413500 – Fax +264 (61) 413512 – E-mail: info@nbs.edu.na

APPENDIX 2: AUTHORISATION LETTER FROM MINISTRY OF HEALTH AND SOCIAL SERVICES

REPUBLIC OF NAMIBIA

MINISTRY OF HEALTH AND SOCIAL SERVICES

Ministerial Building
Harvey Street
Private Bag 13198, Windhoek

OFFICE OF THE EXECUTIVE DIRECTOR

Tel: No: 061 -203 2507
Fax No: 061-222 558
Andreas.Shipanga@mhss.gov.na

Ref: 17/3/3/JE
Enquiries: Ms. C. Narib

Date: 23 November 2021

Mr. Justus Ekandjo
PO Box 322
Oshakati
Namibia

Dear Mr. Ekandjo

Re: Investigating the strategies for mitigating pharmaceutical supply chain disruption during COVID-19 at Central Medical Stores, Namibia.

1. Reference is made to your application to conduct the above-mentioned study.
2. The proposal has been evaluated and found to have merit.
3. **Kindly be informed that permission to conduct the study has been granted under the following conditions:**
   - 3.1 The data to be collected must only be used for academic purpose;
   - 3.2 No other data should be collected other than the data stated in the proposal;
   - 3.3 Stipulated ethical considerations in the protocol related to the protection of Human Subjects should be observed and adhered to, any violation thereof will lead to termination of the study at any stage;
   - 3.4 A quarterly report to be submitted to the Ministry's Research Unit;
   - 3.5 Preliminary findings to be submitted upon completion of the study;
   - 3.6 Final report to be submitted upon completion of the study;
   - 3.7 Separate permission should be sought from the Ministry for the publication of the findings.
4. All the cost implications that will result from this study will be the responsibility of the applicant and **not** of the MoHSS.

Yours sincerely,

EXECUTIVE DIRECTOR
MINISTRY OF HEALTH AND SOCIAL SERVICES

BEN NANGOMBE
EXECUTIVE DIRECTOR

All official correspondence must be addressed to the Executive Director.

My NAMIBIA

10.17739

APPENDIX 3: INTERVIEW GUIDE

Interview questions for Central Medical Stores employees

1. Briefly explain how CMS managed the supply chain during the 2020-2021 COVID-19 pandemic period?

2. With particular emphasis on the lockdown period, what challenges did CMS face in the procurement of pharmaceuticals?

3. In your view, what are the possible strategies to mitigate these procurement challenges?

4. In your opinion, what are the causes of medicine shortages at the CMS during the COVID-19 pandemic?

5. In your view, which strategies can mitigate medicine shortages during COVID-19 pandemic?

6. In your opinion, how can CMS handle the supply chain better in the future during pandemics?

Thank you for your time

APPENDIX 4: LANGUAGE AND COPY-EDITING CERTIFICATE

Dr.GM

The Rev. Dr. Greenfield Mwakipesile

ThD, MBA, HBS | mwaking@outlook.com

CONTACT

PO Box 99539,
UNAM,
Namibia

LANGUAGE & COPY-EDITING CERTIFICATE

2nd March 2022

RE: LANGUAGE, COPYEDITING AND PROOFREADING OF JUSTUS EKANDJO's THESIS FOR THE MASTER OF BUSINESS ADMINISTRATION DEGREE OF THE NAMIBIA BUSINESS SCHOOL OF THE UNIVERSITY OF NAMIBIA

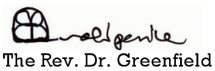
This certificate serves to confirm that I copyedited and proofread **JUSTUS EKANDJO's** Thesis for the **MASTER OF BUSINESS ADMINISTRATION DEGREE** entitled: **INVESTIGATING THE STRATEGIES FOR MITIGATING PHARMACEUTICAL SUPPLY CHAIN DISRUPTION DURING COVID-19 AT CENTRAL MEDICAL STORES NAMIBIA**

I declare that I professionally copyedited and proofread the thesis and removed mistakes and errors in spelling, grammar, and punctuation. In some cases, I improved sentence construction without changing the content provided by the student. I also removed some typographical errors from the thesis and formatted the thesis so that it complies with the University of Namibia's guidelines.

I am a trained language and copy editor and have edited many Postgraduate Diploma, Masters' Thesis, Dissertations and Doctoral Dissertations for students studying with universities in Namibia, Zimbabwe, Eswatini, South Africa and abroad. I have also copy-edited company documents for companies in the region and abroad.

Please feel free to contact me should the need arise.

Yours Sincerely,



The Rev. Dr. Greenfield Mwakipesile

greenfield.mwakipesile @mwaking +264813901701 Dr. Greenfield Mwakipesile

APPENDIX 5: SIMILARITY CHECK REPORT

Document Information

Analyzeddocument	MBAResearchThesisForSimilarityCheck.docx(D128714367)
Submitted	2022-02-24T06:10:00.0000000

Submitted by

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Similarity 7%

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