

Analysis of Saudi Medical Supply Chain
Procurement Disruptions Caused By COVID-19
Outbreak and Their Solutions

BUSINESS ADMINISTRATION

BY

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Abstract

Background: The Covid 19 pandemic is a disaster and worldwide menace. Each day records an increase in the number of new covid 19 cases. With vaccines and medicine in trial, medical supplies to treat the covid 19 symptoms are depleting and will soon catch up with the Kingdom of Saudi Arabia if diversification of their manufacturing is not thought of.

Purpose: To device solutions on how the Kingdom of Saudi Arabia can diversify the supply of PPEs, ventilators and testing kits manufacturing and shift focus from single low- cost manufacturing to localizing manufacturing through short supply chains

Research Design and Methodology: The research uses cross-sectional survey design and convenience sampling. It also employs descriptive methodology. Data will be collected using online questions and from publications. It will be analyzed using the SPSS method, MS-excel and using google sheets.

Findings: The findings were that trust and acceptance of local made medical products by patients is influenced by healthcare practitioners. Also, the medical supply chain procurement strategy adopted influenced the medical supplies to combat covid 19. Also, the research found out that diversifying the manufacturing sector from the current perspective of single location low-cost manufacturing to local manufacturing of medical supplies would solve the challenges in the supply chain procurement disruptions by providing better medical supply chain procurement strategy to overcome the COVID-19 supplies related issues. Also, studying strategic sourcing supports the National and local medical factories to enhance the medical supply chain. It further found out that allowing strategic alliances for selected products would supplement the supplies.

Practical Implications: The findings will solve the current disruptions affecting the Saudi medical supply chain procurement disruptions caused by the covid 19 outbreak. The findings will be beneficial to both the government, local manufacturers and health policy makers in Saudi Arabia.

Limitations and Future Research Directions: The researcher experienced challenges while conducting the research. One of the challenges was the unwillingness of the respondents to respond on the questionnaire promptly, which delayed the data analysis process. Also, some respondents had issues with believing that the data they provided would solely be used for research purposes only.

CHAPTER 1

1.0 Chapter 1: Introduction

1.1 General Information

Coronavirus-2 (SARS-CoV-2) and its newest manifestation covid 19 pandemics has become a menace to the entire world and has caused significant stress on healthcare systems, governments, supply chains and the global economy. The world is currently struggling with the new reality with over 1million people infected worldwide (Roser...et al, 2020). Covid 19 has changed livelihoods with most people forced to confine to their homes as they are forced to work from home.

The Covid 19 pandemic has distorted the entire pharmaceutical supply chains. It has raised questions regarding risks in the supply chain. China has for the longest time been the largest producer of pharmaceutical ingredients (Kloos...,et al, 2020). It was the first country to record covid 19 cases late in 2019 in Wuhan. To curb the spread of covid 19, industrial production has been slow and at one point even almost closed down. Shock in the supply chain has resulted from the disruption in industrial production in China. Also, India being the global leader in producing generics has also been affected by industrial production closure in China creating even more shortages of the medical supplies. The short-term disruption in the supply chain have resulted in significant realignment of supply chains in many countries.

While China was fighting Covid 19 earlier in January, 2020, most countries were not serious about the virus, with many countries terming it the Chinese virus (Velavan & Meyer, 2020). Other countries in Africa, had myths and misconceptions that the covid 19 virus did not affect the African race (Abuya...et al, 2020). These just shows that most countries were not prepared for the covid 19, and were confused on how to handle the disease. Hospital infrastructure in many countries have over stretched their facilities as far as covid 19 is concerned. There are inadequate masks, ventilators, personal protective equipment (PPE), drugs treating symptoms of corona virus (sedation drugs and antibiotics), N95 respirators, testing kits and isolation gowns. This inadequacy has created demand and therefore need for shorter supply chains. As such it is evident that covid-19 has impacted global healthcare supply chains and has affected supply of key materials and ingredients, healthcare products, logistics and shipping of these items.

1.2 Background

The novel coronavirus-2 (SARS-CoV-2) became a worldwide threat in December, 2019 and was declared a pandemic in March 2020 (Cao...et al, 2020). As the numbers continually rise, the Ministry of Health (Saudi Arabia) continually advice citizens in the KSA to sanitize and remind them of social distancing in order to reduce the transmission. The goal just like in many countries, is to flatten the curve and to reduce the burden imposed on the health care system (Xie...et al, 2020). Hospitals in Saudi Arabia are overwhelmed with no or limited chances to admit a new covid 19 patient. The Ministry of Health is even considering advising on home-based care to reduce the pressure and stress placed on medical facilities. Many hospitals have reported shortages in ventilators and PPEs for critically ill covid 19 patients ("Deep Dive: How Manufacturers Are Transitioning To Counter PPE Shortages", 2020). The upsurge in demand for medical equipment to treat covid 19 has increased and as such there is need to boost the availability. Therefore, there is need for adequate production of medical equipment's to treat covid 19 and distribution of these medical equipment.

The Saudi Ministry of Health predicts producing locally 1000 ventilators a week ("Deep Dive: How Manufacturers Are Transitioning To Counter PPE Shortages", 2020). The number of testing kits is also soon being overwhelmed because of the large number of patients testing positive. Saudi Arabia leadership has given so much attention to health services and has contributed to considerable development where by a great role has been played by the Ministry of health. As at June 21, 2020 the number of confirmed cases in Saudi Arabia stood at 154233 new covid 19 cases, with 98917 recoveries and 1230 deaths ("Saudi Arabia Coronavirus: 154,233 Cases and 1,230 Deaths - Worldometer", 2020). The number of new cases seems to be on an upward trend and with this there is need of preparedness in the number of testing kits, PPEs and ventilators. The number of medical equipment to be supplied is guided by the number of new covid 19 cases each day. The number of ventilators that is needed varies from several hundreds to thousands. Also testing kits is essential since they help in testing patients in order to keep them under intensive care. There is also a shortage in the number of testing kits. There is limited number of ventilators in the Kingdom of Saudi Arabia. Also, the number of ventilators in the strategic reserve is very small, which exhibits a shortage.

In addition to shortages of ventilators, there is also inadequate supply of PPEs for the frontline covid 19 soldiers who are the healthcare providers. Healthcare providers are heroes and are on the front-line battling this menace. This goes beyond professional qualifications, because it is hard to determine their determination considering the rising cases. Healthcare providers have sacrificed their health to humanity. This is just more than a job, it is a calling, it is love that is bigger than oneself. It is a life mission because it involves a sacrifice of self. One works for long hours and stays away from your loved ones for long. Healthcare providers are compassionate and give comfort to patients. Italy recorded the highest number of healthcare providers with covid 19 which was attributed by inadequate PPEs (Thomas...et al, 2020). The PPEs include face shields, gowns, hand sanitizers and respirators. In the recent past, the estimates by Saudi Ministry of Health that there is need of increased PPEs (Oraby...et al, 2020).

The shortages of medical equipment in Saudi Arabia have multiple causes one of them being the global supply chain. Before the pandemic countries like China were major suppliers of facemasks (Wu..., et al, 2020). However, with the rising cases of covid 19 since December, 2019 in china, this came to a halt. After cases dwindled in China, it started supply masks to other countries as good will and this was not sufficient. The shortages have resulted to the Ministry of Health and the government of Saudi Arabia making efforts to secure PPEs. The situation has become so dire that in a few months ago, the government steer headed the production of medical equipment locally. Other methods that have been advised upon is using N95 respirators when necessary and reusing facemasks. In extreme cases, people are forced to use scarves and bandanas.

With the many challenges posed by the pandemic and the supply chain, solutions need to be arrived at on how to gap the shortages of ventilators, testing kits and PPEs. As earlier stated, the government has made relentless efforts to meet the gap, one of them being directives to locally produce the medical equipment to avoid costs and to be more prepared of the global shortages in covid 19 medical equipment. However, one of the challenges is that few companies are capable of producing this, because of the limited expertise present. The other challenge is in the supply chain, whereby there are bottlenecks in supplying raw materials necessary for manufacturing covid 19 medical equipment. Other contributing factors to the shortages is that few companies are involved in the production of the PPEs. Additionally with the production of

the PPEs some are not yet approved for use by the Local Content and Governmental Procurement Authority. The other challenge is that during the first period of the COVID-19 pandemic, the Saudi Food & Drugs Authority has recalled many local hand sanitizers as recalled products due to manufacturer error in some chemical components such as methanol, ethanol, and isopropanol percentages. This can negatively affect the local medical product reputation. Another big challenge is that locally manufactured equipment is viewed as impractical as compared to international products as observed in many countries.

There is also inadequate sensitization for local companies to produce the PPEs. The heads of the local companies are not aware that not so much is needed in producing PPEs and the materials could be obtained locally and they can play a big role in filling this gap of helping or producing the PPEs. There other major challenge is hoarding of PPEs which makes it unfair to those who direly need them. Also, the necessary resources are not being distributed fairly, as areas hardest hit needs more attention.

As Saudi Arabia records a surge in the number of new covid 19 cases, there is need to ensure that the necessary medical equipment to care for patients is available and that the health care providers are safe. In order to achieve these united efforts from the local and national government, the health sector and the private sector is necessary. Failure to these, Saudi Arabia will reflect a case like Italy where health care providers were sick, because of in adequate medical equipment. Also, it would be had to care and admit patients. Inadequate testing kits, ventilators, PPEs would be meaning that more people and medical practitioners would contract the virus. Medical practitioners contracting the disease means that the functioning of the health care system has been endangered and this would be extremely costly for the government.

1.3 Statement of the problem

PPE, sterilization solutions, disinfectants and ventilators are important in caring for covid -19 patients. Without them treating and caring for covid-19 patients is impossible. Also, there is an increase in demand for PPE, sterilization solutions, disinfectants and ventilators as the cases of covid -19 keep on rising. With this ordeal, shortages are inevitable and this can cause some issues for the local manufactures even-though government has made such products limited only for the national industry. Issues can arise if the local manufacture supply chain management does not prepare properly.

Due to the interruptions in the supply chain of both medical and pharmaceutical products worldwide worsened by transportation problems countries are looking for solutions to fill this Gap. To fill this gap, Saudi Arabia is looking to strengthen localization by encouraging local production. Incorporating, local manufacturing, healthcare professionals and patients on the supply chain procurements sourcing strategies that will help to mitigate the shortages and solve the supply chain problems.

Sourcing strategies prior to the COVID-19 concentrated on low-costing, which minimized the production, competitiveness among producers and eliminated the diversity of production locations. Low cost encouraged generics from countries like India which is struggling to find a cure for covid-19. However, logistics is an issue because of social-distancing and limited travel. Therefore, the study is focused in coming up with shorter supply chains for covid-19 care and treatment necessities. Also, the study is focused on how the local manufacturer can invest the new roles that government of KSA has announced which directs all local suppliers need to supply the Personal Protective Equipment PPE to be only from local manufacturing. There is therefore the need to find ways the local factories can deal with their operation capacity during COVID-19 outbreak and the high demand. Also, there is need to find strategies and solutions to mitigate these shortages other than focusing on cost in the supply chains.

1.4 Objectives

To device solutions on how the Kingdom of Saudi Arabia can diversify its manufacturing sector and shift focus from single low- cost manufacturing to localizing manufacturing through short supply chains.

More specifically

1. To increase the trust and acceptance for the local made medical products towards healthcare practitioners and patients.
2. To provide better medical supply chain procurement strategy to overcome the COVID-19 supplies related issues.
3. To shift from the current perspective of single location low-cost manufacturing to diversify sources of manufacturing.
4. To allow for strategic alliance with medical product leaders, only for selected products.

1.5 Research Questions

Four research questions will be used to meet the aim of the study;

1. Is trust and acceptance of local made medical products by patients influenced by healthcare practitioners?
2. Has the medical supply chain procurement strategy adopted influenced the medical supplies to combat covid 19?
3. What is the effect of diversifying the manufacturing sector from the current perspective of single location low-cost manufacturing?
4. How does studying strategic sourcing supports the National and local medical factories to enhance the medical supply chain?

1.6 Significance

The study involves an analysis of Saudi medical supply chain procurement disruptions caused by covid-19 outbreak and their solutions where by a gap exists in solutions due to the interruptions in the supply chain of both medical and pharmaceutical products worldwide worsened by transportation problems. The research therefore focuses on producing solutions to mitigate the shortages brought about by the up surge in the covid 19 new cases. Health care providers are at risk in contracting the new novel corona virus disease because of inadequate PPEs. Also rising surge of covid 19 is proving difficult to test because of inadequate testing materials, thereby increasing. Additionally, ventilators for critically ill patients is insufficient. With the announcement by Mohammed al-Abd al-Ali to soon open the country there is necessities for increase in the supplies of the medical equipment ("Coronavirus: Saudi Arabia will lift COVID-19 restrictions on June 21", 2020). Therefore, the findings in the study will contribute to solutions on how to increase the supplies of covid 19 prevention equipment to cushion the health care system and to prevent surgency of new cases by the population.

1.6.1 Managerial Relevance

The study is relevant to both the local and national government, the private sector and the health sector. Most specifically it will benefit healthcare professionals, patients, medical and none-medical supply Chain professionals and local suppliers and manufacturer. The study will provide original and primary data regarding medical supply chain procurement disruptions caused by covid-19. From the forth going it is evident that a challenge is there in terms of medical supplies to

mitigate covid-19 is concerned. Aside from that this data will contribute to deep understanding regarding to local manufacturing company's and production. The study will shed light to existing challenges in medical supply chains. It will also shed light to the perception of covid 19 preparedness of the government. Other than that, it will provide knowledge that will help slow the transmission of covid 19 in the community. It will also provide alternative shorter channels of distribution as opposed to long once that are full of bottlenecks.

1.6.2 Scientific Relevance

The study will contribute to existing literature regarding supply chains and covid-19 in Saudi Arabia. It contributes to knowledge regarding supplier selection in times of pandemics. The first contribution would be improving sourcing strategies for COVID-19 from concentrating on low-costing which minimized the production competitiveness among producers and eliminated the diversity of production locations to shorter supply chains fashioned by increase in the trust and acceptance for the local made medical products towards healthcare practitioners and patients.

The study also agrees or disagrees with current information regarding supply chains and covid-19. It will immensely contribute to existing literature regarding covid-19. It will create knowledge on existing local opportunities and assist patients and health practitioners.

CHAPTER 2

2.0 Chapter 2: Literature review

2.1 Introduction

This chapter reviews literature related to supply chain procurement and covid 19. From the review a framework has been formulated from which this study is built on. The chapter also discusses ideas from other scholars regarding supply chain procurement and covid 19. The Covid-19 pandemic has disrupted the production activities throughout the world and thus has triggered a global recession. It is projected that many countries will take years to recover from the effects of the pandemic. Millions of jobs have been lost, and many healthcare facilities have been severely impacted. Due to restrictions, many activities in the Kingdom of Saudi Arabia were brought to halt (Vanini, 2020). The supply of medical products was affected. Due to this, the problem that faces the supply chain for medical products were exposed. Saudi Arabia has

relied on other countries such as China and the USA for the supply of medical equipment and other products (Addo, Jiaming, Kulbo & Liangqiang, 2020). The Saudis do not have confidence with their medical products produced in the country. The country would be required to diversify its manufacturing sector and shift focus from single location low- cost manufacturing. There is also a need to cooperate with leading players in the industry.

2.2. Theoretical Literature

As noted by Nicola, Alsafi, Sohrabi, et al. (2020), the total healthcare budget in the Kingdom in 2012 was SAR 85 billion. The drug consumption in the country stood at SAR 14 billion. 80% of the drugs that are consumed in the country are imported. Only 16 % of the drugs used by the Saudis are locally produced. There is a significant gap between the rate of consumption of the local products the imported brands. Nicola, Alsafi, Sohrabi, et al. (2020) note that generic drugs are only produced after the expiration of the patent and exclusive right to the products. The generic drugs are known to drive the prices of the medicine down. There has been an increase in the expenditure spent on medication. With the growing population in the Kingdom, the government is expected to spend more on medical products.

2.3 Increase the trust and acceptance for the local made medical products towards healthcare practitioners and patients.

90% of the medical practitioners in the Kingdom have stated that they have confidence in the generic drugs, and as such, they can prescribe them to the patients. Sen, Antara, Sen and Chowdhury (2020) note that 70% of medical practitioners prescribed these drugs due to prices differences. 35% of medical practitioners do not have confidence with generic products. Local drugs constitute 21% of the medicines in the market. This accounts for 1.25 billion (Addo, Jiaming, Kulbo & Liangqiang, 2020). The market for drugs has increased, and thus the demand for the generic drugs. However, there has a drop in the demand for local generic drugs. The knowledge and the attitude of the physicians have contributed significantly to the shift in demand of the local generic drugs. The relationship that is built between medical practitioners and the patients is key in determining the acceptance of the products recommended. As noted by Gössling, Scott and Hall (2020), the patient need to be provided with a space that allows them autonomy. Through this, it is possible to ensure that they trust the decisions that are made by the doctors. According to Gössling, Scott and Hall (2020), the patient autonomy is critical in determination of the decisions

which are made by the patients. For this reason, there is need to create an environment in which patients have the control (Addo, Jiaming, Kulbo & Liangqiang, 2020). To achieve this, there is need to ensure that communication among the parties is flowing flawless. The medical practitioners should take deliberate actions to ensures that information provided to the patients is useful as well as accurate. In Saudi Arabia, 70% of the patients have reported that they are satisfied with the flow of information from their doctors. This indication that doctors are in a position to understand the needs of the patients. As a result, they offer them the right services as well as the products. The process of the building trust takes time. Thus, there is need to plan accordingly (Addo, Jiaming, Kulbo & Liangqiang, 2020). This ensures that all the right actions are put in place. This is critical in eliminating the chance of the errors from arising. It has been reported that 67% of the doctors are in a position to plan and deliver the expected results with the right time. As noted by Gössling, Scott and Hall (2020), trust is key in healthcare services. The patients perception regarding the services offered in the hospitals is positive. This is important in determining the level of the willingness of the patients to take generic drugs. The patients should be able to trust the decisions that are made by the patients. In that case, it would be possible to ensure that patients are changing their perceptions on the local generic products. According to Gössling, Scott and Hall (2020), trust in the healthcare is essential in determining the levels of anxiety. It is important that doctors can help patients to control their stress. This ensures that the patients are able to take the recommended actions. With high level of trust between patients and doctors, there is a possibility of the patients disclosing important details to the doctors (Addo, Jiaming, Kulbo & Liangqiang, 2020). Through this, the doctors can offer the necessary services. This increases the chances of the patients recovering from the health problems facing them. Medical practitioners can determine the willingness of the patients to accept the local generic products based on their competence (Addo, Jiaming, Kulbo & Liangqiang, 2020). There has been emphasis on the need to ensure that the medical practitioners are competent. There is need to consider competence in knowledge. This can only be made possible through enrolling in various programs. The medical practitioners need to update their knowledge. This will ensure that they can offer quality services to the patients. The honesty and respect of the medical practitioners can change the perception of the patients regarding the services offered in the hospitals. This would ensure that they trust the decisions that are made by the doctors.

2.3.1 Trust of local generic drugs

According to research by Balasubramanian (2020), 26.4 of the physicians in the Kingdom believe that local generic drugs were associated with therapeutic failure. The study found out that there was a fall in the demand for local drugs such as antidepressants and antipsychotics. Balasubramanian (2020) notes that many physicians never prescribed local generic drugs when the illness is serious. Many physicians in the Kingdom consider themselves to have sufficient knowledge regarding the generic drugs and brands. However, they are not in a position to explain the bioequivalence to the patients. This was attributed to lack of knowledge and lack of motivation. Less than 50% of the patient in the Kingdom have knowledge regarding the price differences of the generic products and brands (Addo, Jiaming, Kulbo & Liangqiang, 2020). This has been attributed to patients obtaining drugs from government or insurance firms. In that case, the physicians are not inclined to find the most affordable medications for their patients. The local insurance companies are not proactive in promoting the use of local generic products. Balasubramanian (2020) notes that local generic drugs compare negatively with brand drugs in the Kingdom. It was clear that it could be attributed to lack of information on therapeutic bioequivalence. It is important to ensure that local generic drugs are potent. In most cases, these products are not potent and thus cannot help the patients. According to Gössling, Scott and Hall (2020), lack of information regarding the local products has discouraged patients to use local generic products. The flow of information regarding these products is determined by the relationship that exist among stakeholders. These relationships determine how information is disseminated from one point to another. The dissemination of information is critical in eliminating any misinformation regarding the products that are produced in the country. The government is required to ensure that people are able to access information regarding the products offered in the market. In Saudi Arabia, the government has been committed in providing the patients with the accurate information. As such, patients have been able to trust the products. There has been lack of awareness of bioequivalence. This has been a setback since the patients are not in position to access the needed information. It would be necessary to ensure that the patients are able to get any information regarding the products offered in the market. This way, they would not have problems when making a decision. The medical practitioners should ensure that the patients are in position to access the information on bioequivalence. In that case, medical practitioners can change the perception of the patients regarding the products offered in the market (Addo, Jiaming, Kulbo

& Liangqiang, 2020). The level of perception regarding the local products determines the willingness to consume these products. The patients need to have the right information regarding the quality of the products. The patients have been able to access the details on the local generic drugs. This has created the needed flow of the products. the availability of the information has boosted the level of trust. There has been consistent flow of the local generic drugs in Saudi Arabia. According to Gössling, Scott and Hall (2020), the effectiveness of the products is key in determining the demand of the products. Thus, for any product to penetrate the market, it would be necessary to ensure the effectiveness of the product. The producers of the products are required to adhere various set rules. This ensures that they are can offer the required results. In Saudi Arabia, various measures have been put in place to ensure that the drugs produced are efficient and can compare positively with the foreign drugs (Addo, Jiaming, Kulbo & Liangqiang, 2020). This has ensured that the producers are committed in meeting the set standards. The patients are keen on the price of the products. Both underpricing and overpricing can affect the perception of the patients on the products. Thus, it would be necessary to ensure that the right prices are set. In so doing, it would be possible to ensure that the patients can trust the local generic drugs. The stakeholders should be involved in determining the price of the drugs.

2.3.2 lack of confidence on the products in the market

As noted by Aitsi-Selmi, Murray, Heymann, McCloskey, Azhar et al. (2020), physicians in the kingdom do not trust the local products. In that case, there is low chance that they will prescribe them to the patients. This has impacted heavily on the health sector. Patients regard the local medicine as ineffective and thus they do not buy them even when the price is low. According to Kouam (2020), patients are not provided with the right information regarding the products. This denies them a chance to make objective decisions. Kouam (2020) noted that that less than 16% of the drugs used by the patients in the Kingdom are locally produced. This is indication that patients are inclined to use products that are produced in Saudi Arabia. The patients need to be provided with the accrruate information regarding the generic drugs. However, according to García, Veneros and Tineo (2020), this is not happening and thus the production rate has been affected negatively. The inclination of the physicians regarding the generic products has impacted negatively on the industry. The physicians believe that the generic drugs are not effective and thus they are not prescribed to the patients. As noted by Kouam (2020), this is not made from objective analysis of the available information. It would be important for the patients to buy the products

once they have been provided with accurate information regarding the available choices. In that case, it would be possible to increase the demand for the products. The physicians would be required to gain more information regarding the local products. This would help them to offer the right advice to the patients. Through this, it would be possible to increase the trust on the local products.

2.3.3 Impact of mistrust on the generic products in the Kingdom

As noted by Kouam (2020), physicians have failed to provide patients with the right information regarding the products that are produced in the country. In that case, there has been stagnation in the flow of the local products from one end to another. Gössling, Scott and Hall (2020) noted that physicians have the responsibility of promoting the local products. However, this is not the case in regard to generic products produced in the Saudi Arabia. Without the right information, patients will be denied an opportunity to make the objective decisions. There is need to demonstrate to the patients that the products produced in the Kingdom are effective through prescribing them. This will play a critical role in promoting the industry and ensuring that investors are setting project that will focus on producing local medicines. This would be a crucial step for the Kingdom. There is a possibility of making drugs available to the patients. Gössling, Scott and Hall (2020) argue that increase in the local production will be useful in reducing shortage of the needed drugs. This will play a crucial role in promoting the industry and ensuring that the products are delivered in the market at the right time. Gössling, Scott and Hall (2020) noted that the government has the responsibility of ensuring the products produced locally are penetrating the market. Thus, there is need to gather information regarding the products and determining their quality. In that case, it would be possible to ensure that patients are provided with the right products. This will ensure that there is growth of the industry and that the patients are able to access the products that they need with ease.

2.4 Provide better medical supply chain procurement strategy to overcome the COVID-19 supplies related issues.

Due to the eruption of the COVID-19, the supply chain of the medical products in the Kingdom has been negatively affected. As noted by Sen, Antara, Sen and Chowdhury (2020), there has been a depletion of drugs in the hospitals. This necessitates the need to examine the traditional supply chains. The emergence of the pandemic has overwhelmed many countries and many production activities have been stopped (Vanini, 2020). These outcomes have impacted on

every sector of the economy. It has been noted that the traditional supply chain model in Saudi Arabia has worked during the pandemic. Therefore, Balasubramanian (2020) argues that there is a need to establish new ways of supplying medical products in and out of the country. This will be required the adoption of digital supply networks. The virus has managed to expose the problems that face the supply models used in Saudi Arabia (Addo, Jiaming, Kulbo & Liangqiang, 2020). China dominates production activities in the world. With the emergence of the virus, the movement of the products from China to other countries was halted due to the set restriction aimed to contain the virus. This created disruption in regard to supply of products. In particular, Saudi has suffered significantly from these developments (Vanini, 2020). There has been a need to focus on alternate sources of supply. This has put pressure on the government to find new ways to solve the problems that face the sector. The companies are required to adopt new strategies in regard to scheduling agility. As a result of pandemic, there has been decline in the services offered to by various companies. The procurement systems have been hampered derailing any progress that need to be made. This has created new challenges. The government is finding new ways of ensuring that the products are provided in the market without relying on foreign countries. As noted by Pital (2020), many generic drugs in the Kingdom are imported from China (Vanini, 2020). This means that there is shortage of the various drugs because of the restrictions that have been set to regulate the movement of the people. This means that many patients have not been in a position to access the right products. This necessitated the need to improve the delivery of the local generic drugs in the Kingdom. This has played a critical role in ensuring that the patients are able to access the local generic products. there has been increase in the quality of the products that are offered to the patients. There has been resurgence of new product in the market that are efficient and are in a position to meet the needs of the patients. With the right products, the customers are ready to purchase. The producers have capitalized on the proposition. Thus, they have invested heavily in improvement of the products offered in the market. Through this, there has been increase of the rate of production of the drugs produced in the market. During this crisis, the healthcare has suffered immensely. It was not in a position to deal with the problem of this magnitude. The lack of preparedness exposed many problems that are faced the healthcare. There was lack of products that were needed by the patients. Lack of these products created new problems the Kingdom. The government has worked towards creation of new strategies aimed at increasing the competence of the producers. These strategies are geared towards creating a system that ensures that the

healthcare can deal with problems created by any crisis (Vanini, 2020).

The level of coordination in the procurement of drugs was low. As a result, the patients were not in a position to access the products that they needed. Orders were placed concurrently by the government and the private sectors. This created problems that hampered the flow of the activities in the Kingdom. Paital (2020) argues on the need to ensure coordination of the activities in the kingdom. This would minimize the problems that are likely to arise and thus impact negatively on the system. The system should be able to withstand the emerging problems. Therefore, there is need for the government to work with various stakeholders to make this a reality (Vanini, 2020). The centralization of the procurement system resulted to emergence of new challenges. For instance, as noted by Paital (2020), there has been lack of coordination between private and public sectors in the Kingdom. There has been emergence of bureaucracy system. This has hampered the process and eliminated the chance of the ensuring efficiency in service delivery. This has resulted to mistrust among the parts involved. As a result, they have been decrease in the quality of the service offered the patients. There is need to come up with integrated solutions. This would ensure that every part of the system is improved. This would ensure that emergence of a pandemic does not hamper the healthcare system. The patients would be able to get the needed products with ease. This would create the needed environment that ensure that all the stakeholders are working to eliminate the impending disasters.

2.4.1 Impact of the COVID-19 on the chain supply

According to Paital (2020), the emergence of the pandemic has halted many production activities in the world. Thus, the supply chain has been affected negatively. The movement of the products from one point to another has been difficult taking into account the established restrictions laws. With these laws, every industry in the Kingdom has been affected and thus revenue expected to be generated has reduced significantly. In particular, as noted by Welfens (2020), the supply of the medical products in the Kingdom has been impacted negatively. Due to this, patients have not in position to access the drugs that they need (Welfens, 2020). This has increased the mortality rate in the country. The hospitals have been overwhelmed due to lack of the needed products. As a result, they have not managed to offer the required services to the patients. This outcome has exposed many underlying issues that face the health sectors. Didier, Huneus, Larrain and Schmukler (2020) noted that the Kingdom was not prepared to deal with the emergence of a pandemic. Thus, there was limited products that were available in the Kingdom.

As such, the patients were not in a position to access the needed products. This impacted negatively on their health and reduced the rate of recovery (rekha Hanumanthu, 2020)). It would be important to focus on the local products to ensure that the country is in a position to meet its needs without relying on the countries. This would require building confidence on the generic products. This would ensure that the patients are able to access the products in the at any given time in the Kingdom. This would ensure that the industry is in a position to meet the need of the country.

2.4.2 Disruption of supply of products in the Kingdom

According to Rapisardi and Beiswenger, (2020), the COVID-19 has impacted heavily on the supply chain. Generally, the movement of the products from the produce to the market is expected to follow a given channel. This channel determines the price of the products and the time taken to provide the products in the market. After the eruption of the pandemic, the Kingdom supply chain was faced with innumerable problems (Rapisardi, & Beiswenger, 2020). The products were not flowing from or to the Kingdom at the expected rate. This was negatively impacting on the availability of the products. In that case, the customers were not in a position to access the products that they needed. This was detrimental in the operations of the country. Without the needed services, it was not possible to ensure that the products are in the market. The customers were not in a position to get the needed products (Tahoun, 2020). Also, the restriction of the movement denied patients to get the products as expected. With the emergence of the virus, the government saw the need to set new regulations that would ensure that the it was contained (Rapisardi, & Beiswenger, 2020). Though the strategies adopted by effective in the reducing the spread of the virus, the supply chain was negatively impacted. The patients were in a position to get the medicine as expected. Ghafoor (2020) notes that there is need to develop new strategies that would ensure that products are moving from one point to another even in times of the disaster. In that case, every operation in the county would run smoothly and ensure that people are able in acquire the needed products. The government should ensure that every one is provided with a chance to get the right products.

2.5 Shift from the current perspective of single location low-cost manufacturing to diversify sources of manufacturing.

There has been a need to focus on diversification rather than single location low-cost manufacturing. However, the diversification of the products is extremely hard, considering various factors (Vanini, 2020). Saudi Arabia has been relying on China for the supply of medical

products. This impacted negatively on the Kingdom and exposed many challenges that face the pharmaceutical industry (Addo, Jiaming, Kulbo & Liangqiang, 2020). As such, there has been proposition to focus on the diversification of the economy. This will require the establishment of new plants that focuses on production of generic drugs and other products that are needed in the hospital. There is also a need to focus on the expansion of the local hospital to increase its capacity to deal with emergence. The swiftness of the physicians is critical in the containment of the virus. With these changes, Saudi Arabia would be in a position to deal with the health crises in case they erupt in the future. Balasubramanian (2020) notes that the government should focus on the expansion of the private sector. This would ensure that the Kingdom has the required capacity to deal with emerging challenges. During the pandemic, it was found that the government hospitals and the private hospital cannot deal with a disastrous situation (Addo, Jiaming, Kulbo & Liangqiang, 2020). As such, there is a need to focus on the expansion of the private sectors and ensure that there are enough medical practitioners in the Kingdom. Gössling, Scott and Hall (2020) note that there is a need to focus on the expansion of the primary care centers. Through the development of these centers, it would be possible to ensure that many people can access health services.

2.5.1 Expansion of the private sector

According to Al Saleh, Sher and Gertz (2020), there is need to focus on the expansion of the medical industry. This would entail government working with various investors to ensure that there is expansion of the local industry. The expansion of the private sector would mean that there is increase in the rate of production of the local products. This would play a critical in ensuring that there is increase in medical products. Al Saleh, Sher and Gertz (2020) note that increase in the medical products would be crucial in ensuring self-sufficiency of the country (Addo, Jiaming, Kulbo & Liangqiang, 2020). It is crucial in ensure that people are in a position to access the needed products. Thus, the government is mandated to increase the rate of production in the Kingdom. To achieve this, there is need to work with various stakeholders. Through cooperation, it would be possible to ensure that every process is moving as expected and thus eliminating the shortage. As noted by Al Saleh, Sher and Gertz (2020), the eruption of the COVID-19 has exposed many problems that face the country. In that case, it would be necessary to expand to the private sector to ensure that there is increase in rate of production of the medical products. This would ensure that the Kingdom is not reliant on the imported products. Thus, patients would be in a position to

get the needed products within the expected time. The government must take action to ensure that every process is running as expected. The private sector will ensure that people are able to meet their needed. They would play a critical role in solving the problems that face people. According to Mohajan (2020), there is need to focus on expansion of both public as well as private sectors in the Kingdom.

2.5.2 Relying on China for the supply of medical products

As noted by Munro (2020), the China has become a force to reckon on the world affairs. The country is producing so products that its exports to other countries. It has also succeeded in exporting labor in in many countries. The dominance of the China in economic affairs has made many countries to rely on it. Many countries are depending on the china to run their activities. Saudi Arabia is relying on the China for the provision of the medical products. Due to this reliance, the Kingdom has not managed to focus on developing the systems that would ensure its sustenance. Munro (2020) noted that Saudi Arabia would need to focus on the local production to reduce reliance on the products from China. Schilirò (2020) notes that focus on the production of the generic products would play a critical role in reducing reliance on the China. The production of the local products would eliminate the need to depend on other countries. The rate of production in the Saudi Arabia is determined by the availability of the needed systems. This would require government to work with various stakeholders to promote the operations in the country (Munro, 2020). This would play an important role in promoting the state of the Kingdom. Through reduction of the reliance on the products from China, it would be possible to ensure that every process is running as expected (Addo, Jiaming, Kulbo & Liangqiang, 2020). This would ensure that readiness of the country to counter any problem that is likely to emerge at any given time. This would ensure that the government is able to meet the needs of the Kingdom and ensure that every activity in the kingdom is running smoothly.

2.6 Allow for strategic alliance with medical product leaders, only for selected products

The government recognizes the need to expand its alliances with various partners to expand its health services and ensure efficiency in service delivery. There has been the adoption of strategic programmes aimed at expansion of the collaboration with multiple partners. Through the development of a partnership with various stakeholders, it will possible to ensure that the Kingdom is in a position to deal with crises and ensures that researches are being conducted in the country to study various patterns in the Kingdom (Addo, Jiaming, Kulbo & Liangqiang, 2020). Expansion

of partnership would ensure that many foreign investors are setting firms in the country (Vanini, 2020). This would ensure the availability of the product in the country. This would ensure the readiness of the Kingdom to deal with any emergency that can derail progress. There is also a need to focus on establishing strategies to challenges competition from China. Gössling, Scott and Hall (2020) note that most of the drugs that are imported to the country come from China. It would be essential to create measures that eliminate competition and ensure that Saudis are relying on products produced in the country. Balasubramanian (2020) notes the urgency to deal with the threats that face the healthcare sector and putting in place measures to deal with emerging challenges such as COV-19. Through the national transform program, the Kingdom would be positioned in a way that it can deal with them any threat. The government has been committed in working with other governments to create new systems to deal with emergence of pandemic. Through creation of these alliances, it has been possible to reduce the problems that are likely to emergence and hamper the process of the procurement (Addo, Jiaming, Kulbo & Liangqiang, 2020). It has been possible to increase the rate of collaboration of the professionals. This has increased the speed at which the services are offered to the patients.

2.6.1 Alliance with various partners.

There is need to ensure that the government is working with various stakeholders to meet needs of its people. Zaman, Islam, Khan, Shweta, Rahman, Masud, et al. (2020) note that the government has the noted that working with other partners. Through cooperation with other partners would ensure that the products are produced at the right time. This has been crucial in ensuring that people are ready to deal with the problems that face them. Zaman, Islam, Khan, Shweta, Rahman, Masud, et al. (2020) noted that working with various stakeholders to promote the wellbeing of the people. This would ensure that there is diversification of the products produced in the country. According to Abdullah-Al-Shafi (2020), there is need for the government to work with other partners to ensure medical products are produced. This would reduce reliance on the products from other country. Through working with various partners would ensure that there is diversification of the products. By ensuring that diversification, it would be possible to ensure that the products are supplied in the market. This would guarantee that people are in a position to acquire the needed products. In that case, people would be able to deal with the problems that face them. Also, through production of various products, it would be possible to guarantee the Kingdom is able to meet its needs without overlying with other countries. Badreldin and Atallah.

(2020) noted that there is need to expand the local market and ensure that the people are provided with the right products. Sforza and Steininger (2020) note the government is in a position to ensure that people access the right products. This is essential in ensuring that people are able to working in eliminating the problems that face them. Through working with various stakeholders, it would be possible to improve the conditions in the Kingdom.

2.6.2 Adoption of strategic programs aimed at expansion of the collaboration with multiple partners

Through creating various strategies, it possible to ensure that the people are able to access the products that they need. The strategic programs are important in enabling the government to understand the problems that needed to be dealt with (Sajid, Hashmi, Khan, Sajid, Sohail & Siddiqi, 2020). These strategic programs will help the country to deal with emerging crises. The preparedness of the government would be crucial in ensuring that the disasters are contained in the right time. This would be important in ensuring that economic activities are not halted. In that case, it would be possible to make sure that people are carrying on with their lives. Hua and Shaw (2020) noted that the government will need to create systems that embrace changes and allow people to explore various options. Through exploration of the available options, it would be possible to eliminate the problems and ensure that every activity is moving as expected. It would be important to put in place measures that would ensure cooperation of the stakeholders (Senthilkumar, Reddy & Subramaniam, 2020). The companies involved in the productions processes should be able to work hand in hand in identifying the problems that face the sectors and thus taking the right actions. With this outcome, the government would be able to steer its programs forward. Through working with researchers in the medical field, the government will be able to understand the situation in the Kingdom (Giwa, & Desai, 2020). This would provide it with an opportunity to focus on eliminating the problems. The government will ensure that right actions are taken and the right strategies are implemented. The programs should seek to inform people of the usefulness of the products in the market. This would play an important role in promoting local products.

2.6.3. Adopt programs that eliminate reliance on the imported products

According to Sawanny, Bajetha, Sharma and Joshi, (2020), there is need to put various measures that would eliminate the need to imported from China. By adopting these programs, it would be possible to people are dealing with the problems that face in the times of disasters.

Generally, as noted by Noreen, Dil, Niazi, Naveed, Khan, Khan et al, (2020), there is need to anticipate the arising of disasters. In that case, it would be possible to deal with them and ensure people are prepared to towards setting the right precedents for the future. According to Katakam, Adiki, Assaleh and Ahmed (2020), people in the Kingdom need to pay attention to changes that arising in the world. This would allow them to understand how their lives are likely to be affected (Home, O. E. C. D 2020). As a result, they will have the willingness to take the right actions and ensure that the problems do not overwhelm them (Chaudhry & Sachdeva, 2020). The readiness of the people is key in averting the effects of the disaster. Thus, the government should ensure that the right learning programs are offered to the people. This would ensure that they are in a position to take the right actions and ward of the effects the pandemic. There is need to ensure that students are interested in studying medicine (Harapan, Itoh, Yufika, Winardi, Keam, Te & Mudatsir, 2020). This would ensure that there is increase in the number of the practitioners working in the country (Obstfeld & Posen, 2020). Through this, it would be possible to meet the needs of the needs of the country. This is essential in reducing reliance in other countries. The programs offered in the schools should emphasis on the need for self-sufficiency. There is also need to focus on the providing practical solutions to the problems that face people.

2.7 Hypothesis

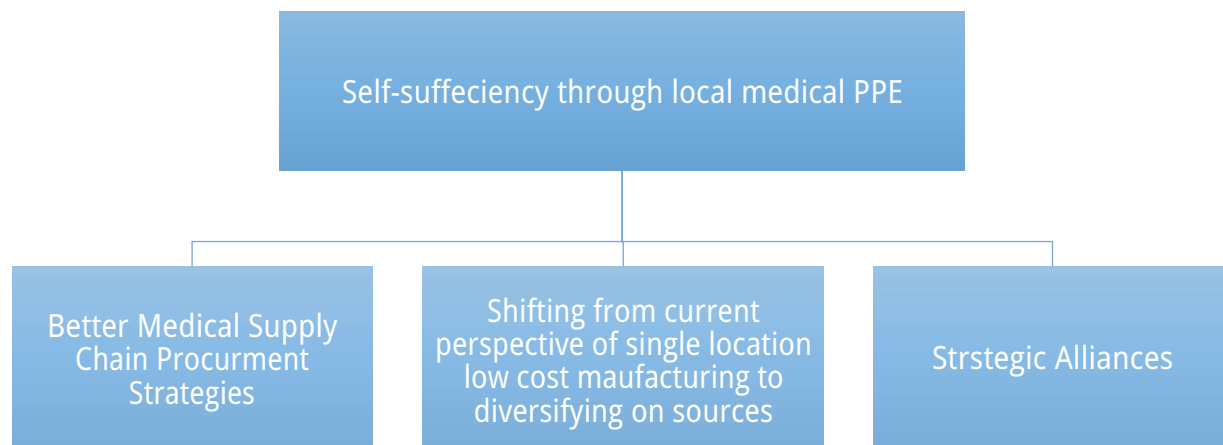


Figure 1

In order to meet the objectives of the study, the below hypotheses are presumed. The hypotheses are formed from the above conceptual framework adopted from the discussions held from studies

done regarding Saudi medical supply chain and procurement disruptions caused by the covid 19 and their solutions.

Hypothesis -1

- *H1: The provision of the better medical supply chains procurement strategy is significantly associated with self-sufficiency for the local medical PPE in containing the pandemic in Saudi Arabia.*

Hypothesis -2

- *H2: Shifting from current perspective of single location low manufacturing to diversifying on the sources manufacturing is significantly associated with promoting the medical products in Saudi Arabia.*

Hypothesis -3

- *H3: The strategic alliance with medical leaders is significantly associated with promoting the sustainable / durable/ high quality, operation and supply chain risk management for medical products produced in the Kingdom.*

CHAPTER 3

3.0 Chapter 3: The methodology

3.1 Introduction

The primary objective of this study is to devise solutions on how the Kingdom of Saudi Arabia can diversify its manufacturing sector and shift focus from single low- cost manufacturing to localizing manufacturing through short supply chains. It is focused on finding solutions to the disrupted procurement supply chain. As such, a highlight of the methodologies is discussed. The chapter discusses the research methodology that was adopted while undertaking the research. It discusses the research approach, research design, target population, sampling technique and sample size, instrumentation and method analysis.

3.1 Research Approaches

Research approach refers to the manner in which the researcher collected the data. A descriptive survey research was adopted in conducting the study. Survey involves a means of

collecting information about the opinions, characteristics and action of a group of people (Groves...et al, 2011). Descriptive statistics is efficient as it is able to give reliable data over a large group. Descriptive statistics compares and is able to establish a relationship between variables. It is used to describe characteristics of some items and explain where people or things behave the way they do. This approach is efficient as it is able to summarize the information of a large group. The approach was also useful as it analyzed Saudi medical supply chain procurement disruptions caused by covid 19 outbreak and their solutions.

3.2 Research Design

Research design describes the general map of how the research questions were handled. The study will incorporate cross-sectional survey design. Respondents will be sampled out from major hospitals and those in the manufacturing and supply sector. This method is appropriate since one is able to get a lot of information at once. It is also very fast and does not involve a lot of funds. The research will use mixed methodology and the data will be descriptive. Using cross-sectional method provokes further research and allows one to have in-depth knowledge about a concern.

3.3 Target Population

The study is to be conducted in the Kingdom of Saudi Arabia. It targets those in the medical field, specifically those in the procurement department. It also targets the health ministry and the local manufacturing sector. Respondents will involve, healthcare professionals, patients, medical and non-medical supply chain professionals and local suppliers and manufacturer.

3.4 Sampling Technique and Sample Size

Sampling involves taking a representative from the a whole and using the representative to explain the whole (Taherdoost, 2016). Sampling is very important as it is cheap, convenient, fast and enables high accuracy when analyzing data. On the other hand, the sample size represents the number chosen to conduct a study. In selecting a sample size, the marginal error and the confident interval is very important. Convenience sampling method will be used, since respondents will be required answer the questionnaires and their own convenience. Convenience sampling collects data haphazardly and ensures collecting data until the researcher is ok with the sample size. This method was arrived at as a result of collecting data from a targeted group and in order to get accurate results. Purposively the researcher knows those respondents in the Saudi medical supply

chain. As result of Covid-19 respondents will respond to their questionnaires online. The sample size consists of 577 respondents which was conclude as most appropriate one .

3.5 Instrumentation

The researcher used primary data in the study. The study involved quantitative data. Therefore, primary data was be obtained. Primary was obtained through questionnaires. Data collection will be done through questionnaires. The questionnaires will be distributed through emails and the social media in order to reach many of the respondents. Data will be collected online to reduce instances of social interactions.

3.6 Method Analysis

The analysis done was quantitative in nature. The primary data was collected using a structured questionnaire. The researcher undertook to administer the questionnaire to the population through the social media and email. The response given was out of ones' own free will and this ensured that the data was not biased. This was done to avoid interviewer biasness. Collected data was analyzed using SPSS, MS-excel and google forms. The data collected was edited and completeness test done. The data was then coded and fed into the SPSS software. The results were presented in graphs and charts from SPSS, MS-excel and google forms for easier understanding of the data. Inferential statistics will be analyzed. Cronbach alpha was used in assessing the reliability of the data collected.

3.7 Data Reliability and Validity

Validity is the degree to which a sample of a study represent the population or tests what it was designed to test. For validity of the research instrument used, expert opinion from the field of study, more specifically the supervisor facilitating opinions and the revisions given were used. Reliability on the other hand refers to the consistency in measurement. To improve reliability more similar questions are put together, until the best results are achieved. To do this the results from the questionnaire were analyzed until the desired results were obtained and a final questionnaire representing good results was prepared as final.

3.8 Analytical Model

The study used the linear regression to analyze Saudi medical supply chain procurement disruptions caused by the covid-19 outbreak and their solutions. The model was chosen in this study as it predicted the dependency of the dependent variable based upon other independent

variables. The model helps us to understand the relationship between the disruption in medical supply chain management and the covid 19 outbreak and their solution. The model includes;

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon$$

In this model Y is the self-sufficiency through locally made PPE where as β_0 is the constant, ϵ is the error. The various variables being studied are as follows.

X1	Provision of the better medical supply chains procurement strategy
X2	Shifting from current perspective of single location low manufacturing to diversifying on the sources.
X3	Strategic alliance with medical leaders

Table 1

CHAPTER 4

4.0 Chapter 4: Analysis and results

4.1 Introduction

The data collected from the online questionnaires is analyzed and interpreted in this chapter. The study aims at analyzing Saudi supply chain procurement disruptions caused by covid-19 outbreak and their solutions. The sample size was 600. The chapter discusses the study findings.

4.2 Response rate.

For this study, the sample size was 600. However out of the 600 a considerable number of 577 respondents responded to the questionnaires. Out of 100% the response rate was 96.1%, which is enough to arrive at conclusions and recommendations. The response rate is crucial as it measures the acceptance and the willingness of the respondents to participate in the study.

4.3 Demographic analysis

Under this section the general information about the respondents will be analyzed. Among the factors to be analyzed are the age of the respondents, nationality, educational background, professional field, work sector and working experience. The demographic analysis is summarized in the table below.

		Statistics					
		Gender of the respondent	Nationality	Educational background	Professional field	Work Sector	Working experience
N	Valid	577	577	577	577	577	577
	Missing	0	0	0	0	0	0
Mean		.21	.17	2.23	1.92	.81	1.71
Std. Error of Mean		.017	.016	.038	.087	.038	.047
Median		.00	.00	2.00	1.00	.00	2.00
Mode		0	0	2	0	0	3
Std. Deviation		.407	.377	.924	2.097	.901	1.123
Variance		.166	.142	.853	4.399	.812	1.261
Skewness		1.430	1.747	.156	.660	.388	-.147
Std. Error of Skewness		.102	.102	.102	.102	.102	.102

Range		1	1	4	5	2	3
Minimum		0	0	0	0	0	0
Maximum		1	1	4	5	2	3
Sum		121	99	1289	1106	466	988
Percentiles	25	.00	.00	2.00	.00	.00	1.00
	50	.00	.00	2.00	1.00	.00	2.00
	75	.00	.00	3.00	5.00	2.00	3.00

Table 2

4.3.1 Gender of the respondents

The study sought to know the gender of the respondents. Out of the 577 respondents 456 were males represented by 79% while 121 were females represented by 21 %. Collecting data about both genders is important as it shows that the researcher is sensitive in matters to do with gender. It also shows that the study is gender sensitive and that both genders are important as are both affected by the supply chain procurement disruptions caused by the covid-19 outbreak. The results are represented below.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	male	456	79.0	79.0	79.0
	female	121	21.0	21.0	100.0
	Total	577	100.0	100.0	

Table 3

577 responses

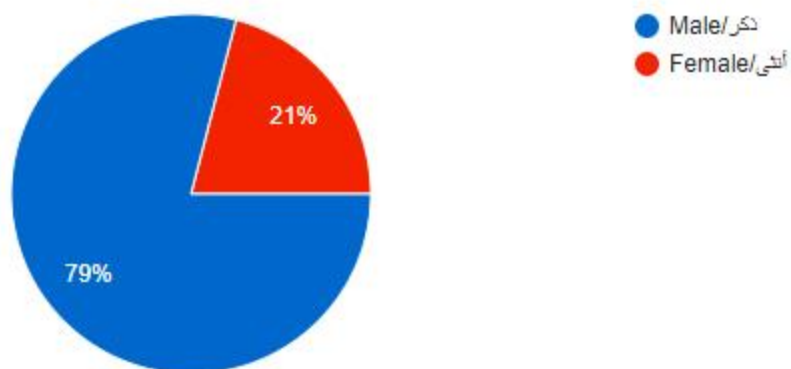


Figure 2

4.3.2 Nationality

The study also sought to know about the nationality of the respondents. The study recorded that 478 (82.8%) of the respondents were Saudis' while 99 (17.2 %) were not Saudi Citizens. This data is important as it shows that the study involved everyone within the borders of Saudi Arabia irrespective of whether they were Saudi citizens or not.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Saudi	478	82.8	82.8	82.8
	Not Saudi citizen	99	17.2	17.2	100.0
	Total	577	100.0	100.0	

Table 4

4.3.3 Educational background

From the findings, 336 of the respondents, that is represented by 58.2% reported to have a bachelor's degree while 93 a master's degree, 71 PhD. 9.4% had diplomas while 4% represented the high school. These is summarized in the table below.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	high school	23	4.0	4.0	4.0
	diploma	54	9.4	9.4	13.3
	bachelor's degree	336	58.2	58.2	71.6
	master's degree	93	16.1	16.1	87.7
	PhD	71	12.3	12.3	100.0
	Total	577	100.0	100.0	

Table 5

4.3.4 Professional field

The study also sought to find out the professional field of the respondents. A higher percentage was reported to be health care professionals followed by those in the medical supply chain and procurement in the health sector, represented as 34.8 % and 30 % respectively. Those not in the medical supply procurement were 4.2% whereas those in the local medical manufacturer were 1.7%. Others were represented by 29.3 %. Knowing the professional field of the respondents was important as it reflects that the study conducted was majorly done on those in the health sector who have vast knowledge in the health sector represented by 64.8%.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Health care professional	201	34.8	34.8	34.8
	Medical Supply Chain procurement in health sector	173	30.0	30.0	64.8
	Non-medical supply chain procurement	24	4.2	4.2	69.0
	Local medical manufacturer	10	1.7	1.7	70.7
	other	169	29.3	29.3	100.0
	Total	577	100.0	100.0	

Table 6

4.3.5 Work sector

Additionally, the study reported findings on the work sector in which the respondents were working in. The sector in which the respondents were working in were divided into public /governmental sector, private sector and semi-governmental sector. 300 (52%) of the respondents reported to be working in the governmental /public sector. Those in the semi government sector and private sector were reported to be 15.3% and 32.8 % respectively.

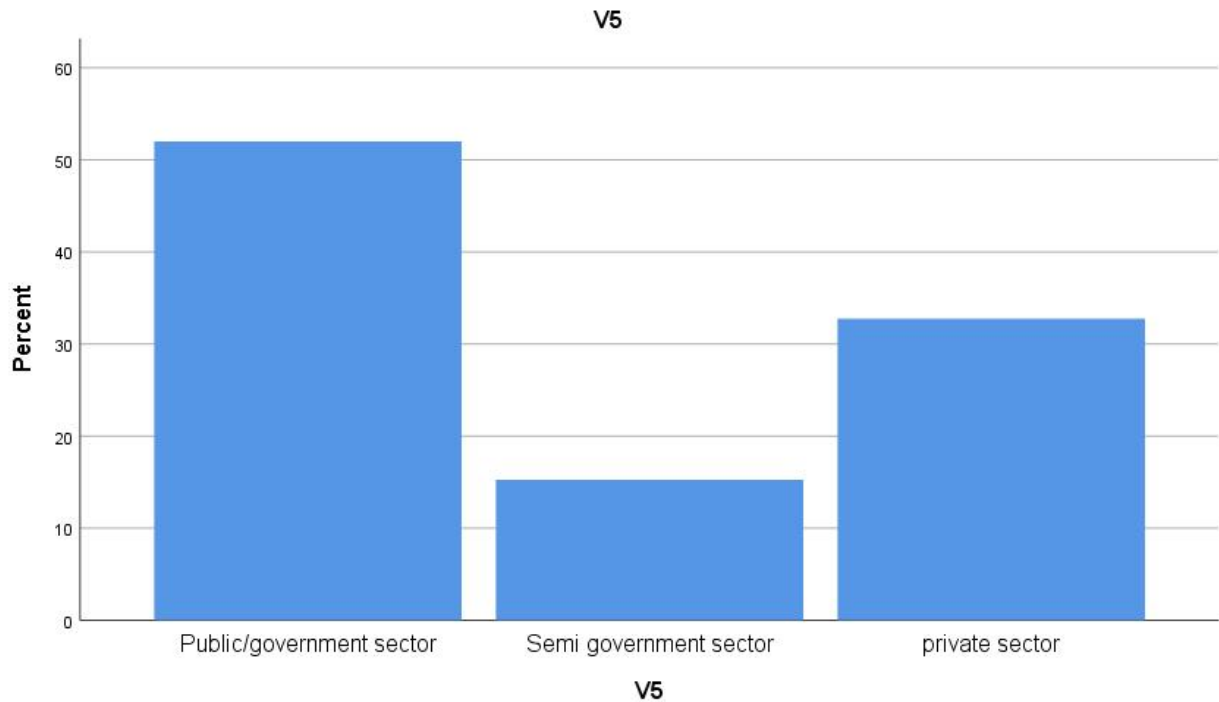


Figure 3

4.3.6 Working experience

Getting data about work experience is very important as it gives light of the knowledge the respondent has regarding the research topic. The table below is a summary of the findings. Those who worked more years were the majority represent by 18years plus at 35.5%, therefore meaning that most respondents had more knowledge regarding the medical supply chain. Those who worked between 12-17 years were 17. 3%, 6-11 years 30% while 0-5 years 17.2%.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	0-5 years	99	17.2	17.2	17.2

6-11 years	173	30.0	30.0	47.1
12-17 years	100	17.3	17.3	64.5
18 + years	205	35.5	35.5	100.0
Total	577	100.0	100.0	

Table 7

4.4 Trust and acceptance of local made medical products by patients influenced by healthcare practitioners

To analyze and conclude as to whether trust and acceptance of the local made PPEs, ventilators, testing kits, gloves , face shield is influenced by medical practitioners, the study sought to investigate whether during the COVID-19 outbreak, healthcare workers have supported the local products than before, the local medical products are as practical as international products, preference between international and local medical PPE as long as they meet the accepted standards, due to the rise of the local medical products prices, one prefers purchasing the available international products because of branding reputation and the preference for international products by healthcare sectors negatively harmed the local manufacturers' productivity. The summary of the analysis is as below.

Statistics

		Healthcare workers have supported the local products than before	The local medical products are as practical as international products	I do not have any preference between international and local medical PPE as long as they meet the accepted	Due to the rise of the local medical products prices one prefers purchasing the available international products because of branding reputation	The preference for international products by healthcare sectors negatively harmed the local manufacturers' productivity
N	Valid	577	577	577	577	577
	Missing	0	0	0	0	0
Mean		1.2912	1.1872	.9757	1.2860	1.8596
Median		1.0000	1.0000	1.0000	1.0000	2.0000
Mode		1.00	1.00	1.00	1.00	2.00
Sum		745.00	685.00	563.00	742.00	1073.00

Table 8

1	During the COVID-19 outbreak, Healthcare workers have supported the local products than before
2	The local medical products are as practical as international products.
3	I do not have any preference between international and local medical PPE as long as they meet the accepted standards.
4	Due to the rise of the local medical products prices, I prefer purchasing the available international products because of branding reputation.

Table 9

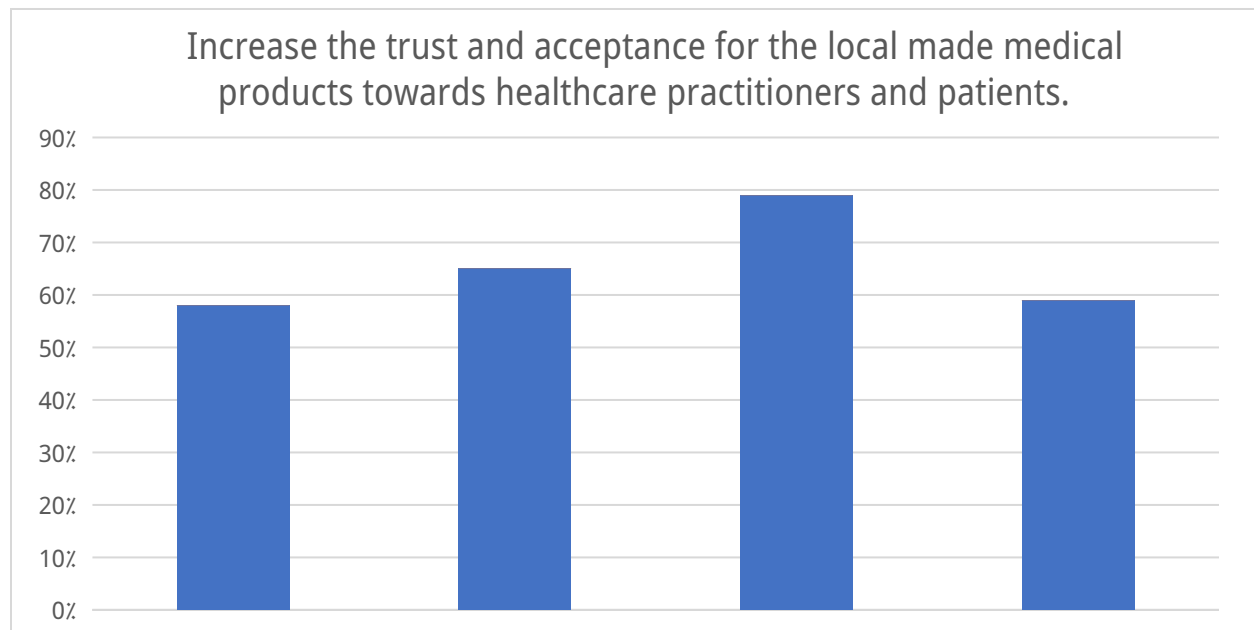


Figure 4

The results showed that there is support and believe of the local PPE. We can see that more than 50% of the respondents have trust towards the local manufacturers.

4.5 Instruments, Reliability

The confidence that the readers will have in this research is highly dependent on whether the information is reliable or not. For the purpose of testing reliability, the Cronbach's alpha coefficient was used and performed on the data collected. The test was purposed to know how correct data is in conjunction with consistency with the scales used in the questionnaire. These tests show whether the scale used measures similar underlying construct. According to Hair...et al (2006) Cronbach's alpha is a very good measure of the consistency associated with the latent variable, and the acceptable value are always above 0.70. However, Hair...,et al (2006) further states that values near 0.6 are not nearly bad , with unacceptable < .60; poor .60-.69; acceptable .70-.79; good .80-.89; excellent > .89. A higher percentage of the reliability that was run shows a value above 0.60 which is acceptable. These is summarized as follows.

For the whole project the Cronbach alpha is 0.719 which is acceptable and therefore the questionnaire is reliable.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.719	.753	34

Table 10

4.5.1 Provision of the better medical supply chains procurement strategy

In order to evaluate the provision of better medical supply chains strategy, the following items were analyzed.

		Possible answer
Provision of the better medical supply chains procurement strategy	The demand for the local medical personal protective equipment (PPE) has increased, during the COVID-19 outbreak.	Multiple choices (Strongly agree, agree, neutral, disagree, Strongly disagree)
	The prices for the local medical personal protective equipment (PPE) has increased during the COVID-19 outbreak.	
	The supply chain process has been affected worldwide, due to the COVID-19 pandemic. As a result, the best solution is to think about diversifying	

	procurement sourcing in the healthcare sector.	
	Saudi hospital supply chain suffered from serious shortage in medical PPE against COVID-19. The shortage due to the high demand for PPE which the local manufactures cannot meet.	
	When the supply chain sources for medical PPE in China and Malaysia were shut-down temporary, the local manufacturers were unable to cover the shortage in supplies.	
	Due to the increase in demand for the PPE and the transportation costs, it is very important to divide the demand between local and international products in a way that rises the local manufacturers' performance.	

	During the COVID-19 pandemic, the Saudi manufacturer production capacity weakened because of inadequate planning before COVID-19 crisis.	

Table 11

Based on the findings the following is a summary of the analysis. The Cronbach alpha value is 0.711 which is enough.

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.711	.708	7

Table 12

Also, the results showed that most respondents supported the hypothesis as shown below

1	The demand for the local medical personal protective equipment (PPE) has increased, during the COVID-19 outbreak.
2	The prices for the local medical personal protective equipment (PPE) has increased during the COVID-19 outbreak.
3	The supply chain process has been affected worldwide, due to the COVID-19 pandemic. As a result, the best solution is to think about diversifying procurement sourcing in the healthcare sector.
4	Saudi hospital supply chain suffered from serious shortage in medical PPE against COVID-19. The shortage due to the high demand for PPE which the local manufactures cannot meet.
5	When the supply chain sources for medical PPE in China and Malaysia were shut-down temporary, the local manufacturers were unable to cover the shortage in supplies.
6	Due to the increase in demand for the PPE and the transportation costs, it is very important to divide the demand between local and international products in a way that rises the local manufacturers' performance.
7	During the COVID-19 pandemic, the Saudi manufacturer production capacity weakened because of inadequate planning before COVID-19 crisis.

Table 13

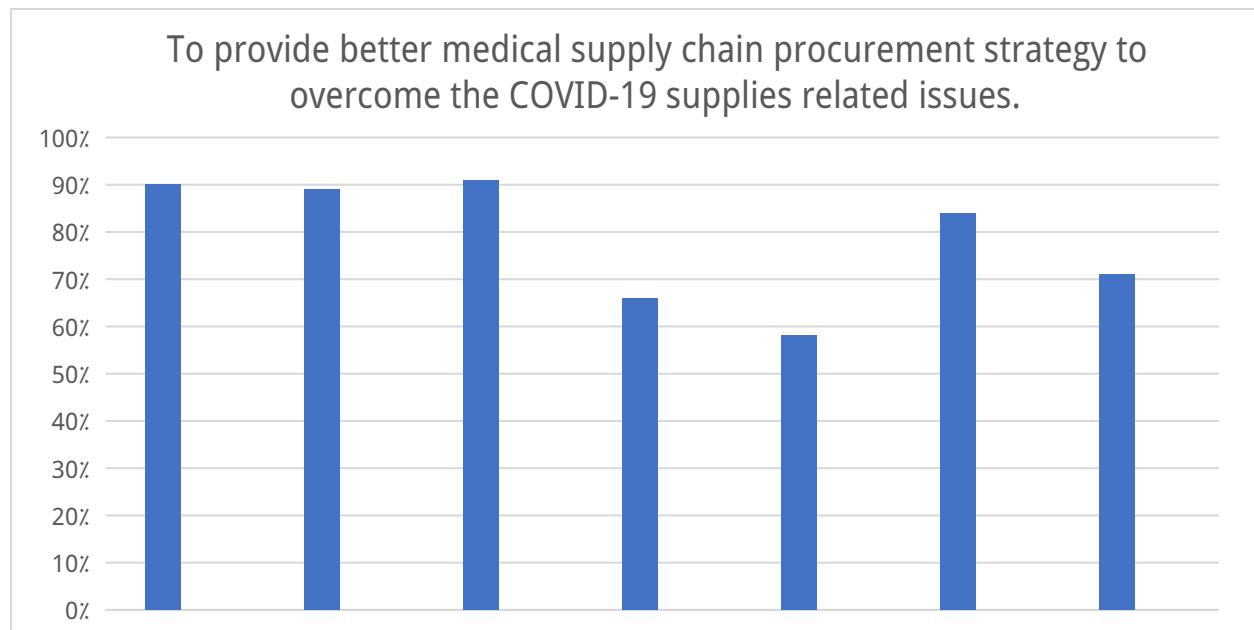


Figure 5

The results showed that most respondents believe in provision of better medical supply chains strategy and are in support of it. We can see that more than 50% of the respondents affirm this. The respondents agreed with 60% to 70% that the demand and prices for local products rise during COVID-19 outbreak. About 84% of the respondents agreed that the supplying process must be divided between local producers and international suppliers, since the logistics cost for importing increased. In addition, the survey showed that near 72% of the respondents agree that the current crisis of the lack of PPEs is due to inadequate planning from local suppliers. Finally, almost 66% of the respondents agreed that the local manufacturers that produces PPE cannot meet the current demand and that caused the shortage in the hospital's warehouses.

4.5.2 Shifting from current perspective of single location low manufacturing to diversifying manufacturing sources

In order to analyze the shift from current perspective of single location low manufacturing to diversifying manufacturing sources, the following items were analyzed. The items have been measured using the Likert scale. These are represented in the table below.

Shifting from current perspective of single location low manufacturing to diversifying manufacturing sources	Prior to COVID-19 pandemic, the procurement sourcing was focused on low-cost locations.	Multiple choices (Strongly agree, agree, neutral, disagree, Strongly disagree)
	Prior to COVID-19 pandemic, the procurement sourcing did not consider location diversity because of low prices preference.	
	The procurement sourcing strategies have changed from low cost/price locations to more diversified sourcing locations even with changeable prices, during the COVID-19.	

Table 14

The summary of the findings is represented below

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.679	.679	3

Table 15

Also, the following questions were tabulated as follows

1	Prior to COVID-19 pandemic, the procurement sourcing was focused on low-cost locations.	59%
2	Prior to COVID-19 pandemic, the procurement sourcing did not consider location diversity because of low prices preference.	71%
3	The procurement sourcing strategies have changed from low cost/price locations to more diversified sourcing locations even with changeable prices, during the COVID-19.	72%

Table 16

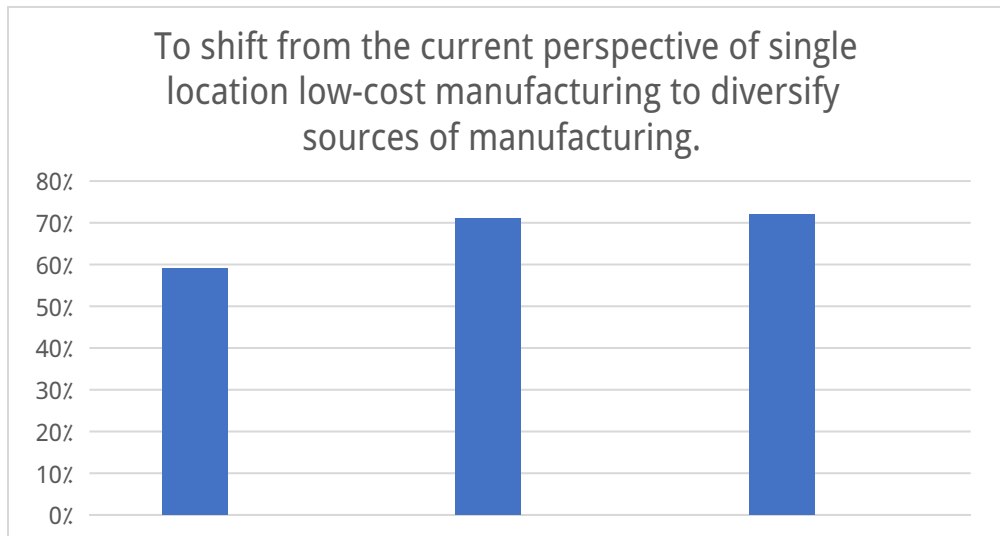


Figure 6

The single or limited procurement sourcing that is favoring low cost or prices locations prior COVID-19 pandemic, respondent agree about 60%. Also, respondent agreed that the diversification for procurement was low prior COVID-19 and it reached nearly 71%. Finally, almost 73% of the respondents agreed that the sourcing of the procurement was changed with regardless the PPE prices during the pandemic.

4.5.3 Strategic Alliances

In order to analyze strategic alliances, the following items were analyzed. The items have been measured using the Likert scale. These are represented in the table below.

Strategic Alliances		Possible answers
	The right joint venture or strategic alliance with international manufacture will increase your market share and acceptance.	Multiple choices (Strongly agree, agree, neutral, disagree, Strongly disagree)
	The local products' quality is lower than international brands.	

	The local medical PPE products quality is not constant.	
	During the first period of the COVID-19 pandemic, the Saudi Food & Drugs Authority has recalled many local hand sanitizers as recalled products due to manufacturer error in some chemical components such as methanol, ethanol, and isopropanol percentages. This can negatively affect the local medical product reputation.	

Table 17

Reliability Statistics

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.616	.596	4

Table 18

1	The right joint venture or strategic alliance with international manufacture will increase your market share and acceptance.	80%
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2	The local products' quality is lower than international brands.	45%
3	The local medical PPE products quality is not constant.	59%
4	During the first period of the COVID-19 pandemic, the Saudi Food & Drugs Authority has recalled many local hand sanitizers as recalled products due to manufacturer error in some chemical components such as methanol, ethanol, and isopropanol percentages. This can negatively affect the local medical product reputation.	68%

Table 19

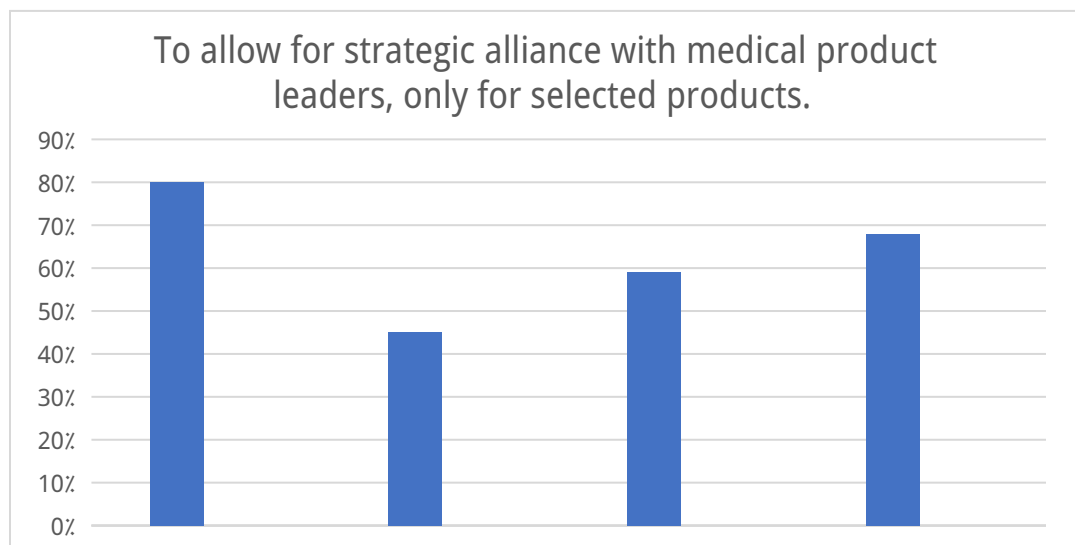


Figure 7

4.5.4 Self-Sufficiency through local Medical PPE

In order to analyze Self-Sufficiency through local Medical PPE the following items were analyzed. The items have been measured using the Likert scale. These are represented in the table below.

Self-Sufficiency through local Medical PPE		
	Do you believe that the current crisis will lead Saudi Arabia to be self-sufficient in the medical PPE	Multiple choices (Strongly agree, agree, neutral, disagree, Strongly disagree)
	Local suppliers are negatively affected by the non-compliance of the health sectors with the existing dues.	
	The current crisis will motivate Saudi Arabia to be self-sufficient in the medical PPE. The Local Content and Governmental Procurement Authority (LCGPA) has announced a mandatory order that suppliers are only allowed to supply protective products that are locally made. This announcement will contribute to covering the shortage of supplies.	
	With the governmental support for the localization of medical product, the local manufacture can overcome the protective supplies shortage.	

Table 20

Reliability Statistics

Reliability Statistics	
Cronbach's Alpha	N of Items
.653	4

Table 21

Cronbach alpha summaries

Item	Cronbach alpha	No. of items	Reliability comment
Self sufficiency	0.653	4	Accepted
Strategic alliance	0.616	4	Accepted
Provision of the better medical supply chains procurement strategy	0.711	7	Good
Shifting from current perspective of single location low manufacturing to diversifying manufacturing sources	0.679	3	Accepted

Table 22

4.6 Verification of the model and hypothesis

Linear regression method has been used to verify the hypothesis.

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.388a	.151	.146	.693	.151	33.898	3

Table 23

Model Summary

Model	df2	Change Statistics	
		Sig. F Change	
1	573	.000	

Table 24

The R square is 0.151, with an adjusted R of 0.146 meaning that the dependent variable, i.e self-sufficiency through local medical PPE is elaborated by the independent variables, Strategic alliance, provision of the better medical supply chains procurement strategy and shifting from current perspective of single location low manufacturing to diversifying manufacturing sources. The low R square value is acceptable since it is difficult to predict human behavior (Hinton, 2014).

ANOVAa

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	48.881	3	16.294	33.898	.000b
	Residual	275.424	573	.481		
	Total	324.305	576			

Table 25

The F value is 33.898 showing that the model is fit and accepted and the significance value is below 0.05 meaning that it is statistically significant.

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.164	.053		3.113	.002
	Strategic alliance	.156	.037	.170	4.198	.000
	Shifting from low cost	.095	.036	.109	2.665	.008
	Procurement supply chain strategy	.271	.044	.251	6.106	.000

Table 26

The table above describes the relationship of the dependent variable and the independent variables. The first hypothesis has been accepted since its t value is greater than 1.96 and the significance value less than 0.05. The second and the third hypotheses have also been accepted because of 2.665 and 4.198 t values respectively furthermore the significance values are less than 0.05.

CHAPTER 5

5.0 Chapter: Discussion and conclusion

5.1 Introduction

This chapter constitutes the discussion, interpretation, validation and interpretation of the results. It further discusses the limitations of the study and what needs to be studied in future that has been found lacking while conducting the study.

5.1 Discussion

The study sought to study, research and answer the following objectives.

1. To increase the trust and acceptance for the local made medical products towards healthcare practitioners and patients.
2. To provide better medical supply chain procurement strategy to overcome the COVID-19 supplies related issues.
3. To shift from the current perspective of single location low-cost manufacturing to diversify sources of manufacturing.
4. To allow for strategic alliance with medical product leaders, only for selected products.

A discussion in regards to the objectives is presented below.

1. To increase the trust and acceptance for the local made medical products towards healthcare practitioners and patients.

From the analysis of the study it was found out that, during the COVID-19 outbreak, healthcare workers have supported the local products than before. Majority of the respondents agreed that local medical products are as practical as international products, preference between international and local medical PPE as long as they meet the accepted standards and due to the rise of the local medical products prices, one prefers purchasing the available international products

because of branding reputation. Also, many respondents were seen to agree to the fact that preference of international products by healthcare sectors negatively harmed the local manufacturers' productivity. These is reflected by the questions below

❖ The local medical PPE products quality is not constant?

In this question, the respondents have different opinion. This question reflected that the trust on the quality continuity is not matched with the local PPE production. About 60% of the participants choice were to agree and strongly agree that the local PPEs need to rethink about the quality. As a result, it is highly suggested that the local manufacturers need to work more in the quality side for their products. By that, the local production will not lose the rise in the trust especially during this outbreak.

❖ The local products' quality is lower than international brands?

This question is continuation of the researcher study for the trust towards the local PPE production. The construction of this question aimed to compare the quality for the local PPEs and its international rivals. Almost 55% agreed and strongly agreed that the quality of the local PPEs is lower than the internationals.

Indeed, there is support for the local medical products but also there are serious concerns when the quality comes in the consideration. Since the National Transformation Program 2020 is going to allow the international manufacturers to produce in the Saudi Arabian soil, then it is very important for the local products to increase their quality aspects. To do so, the quality control departments in the Saudi Hospitals must work hand in hand with the local suppliers. According to Miller and Kelly, the medical product evaluation in the healthcare sectors are highly important for both healthcare workers and patient safety. They continued by focusing on the evaluation appraisal that must be on the product quality, safety cost and standardization (Valenti, W. M,2010). By that, the medical products representatives will have feedbacks on their products. The feedback will give the manufacturers idea about what their product quality and the areas where their product miss in regards to the quality and safety. Also, it will help the health sector as well as decrease their massive spending when the diversification of bards is not present.

2. To provide better medical supply chain procurement strategy to overcome the COVID-19 supplies related issues.

It was found out that there was need to provide better medical supply chain procurement strategy to overcome the COVID-19 supplies related issues, this was reflected by an overwhelming agreement among the respondents. It was seen that the effect of shortage of the medical supplies was greatly felt by the respondents. Many inclined to having a diversified local manufacturing system. NUPCO is National Unified Procurement Company that is funded and supported by the Public Investment and Fund of Saudi Arabia. Since 2017, NUPCO became the official channel that is responsible to provide the supply chain and procurement process on behalf of the public hospitals. It is considered as the largest value driven and healthcare procurement in the Middle East.

As a result, NUPCO and LCGPA must not overwhelm the production capacity for local producers. The LCGPA has announced that PPE products must be supplied and purchased from the local producers. In fact, it is economically supportive for both the governmental spending and for the national economy. However, this will harm the local producers' reputations and hospitals will suffer shortages. For the time being, NUPCO and LCGPA need to divide the procurement orders for PPEs between local producers and international manufactures. This strategy will help the local suppliers to forecast for demand future and then increase their production and operation capacity gradually. The procurement limitation for local suppliers must be gradually implemented so that suppliers can reach the market demand and users will not lose the trust on the local production.

3. To shift from the current perspective of single location low-cost manufacturing to diversify sources of manufacturing.

From the analysis it is evident that the current perspective of single low-cost manufacturing is a pain and a dissatisfaction to many respondents. Many were inclined to the fact that there is need to diversify from the current perspective to diversifying sources of manufacturing. Many felt that the current perspective is inadequate and that if the sources of manufacturing were diversified, this could curb the shortages.

Supply chain and procurement diversification sourcing was subjected for discussion worldwide even before COVID-19 pandemic. Relying on single or two locations for PPE as supplying source will limit the supply chain options during diseases outbreak. According to Sarkis, Cohen, Dewick, and Schröder the current pandemic has implemented some behavioral

changes such as social distancing and rethinking of reverse logistics. Shifting from single source location for supplies to more diversified location become a must (2020). Sharma, Adhikary, and Borah suggested some strategic recommendations and one of them is to diversify the supply chain. They have suggested that it is important for firms and supply chain professionals to expand their supplier relationships instead of relying on few suppliers (2020). As discussed previously, NUPCO has a powerful procurement power that can be used to diversify the suppliers to enhance PPE availability in the public hospitals. NUPCO is using the bulk purchasing which means that they have the ability to purchase very high quantities of PPEs on behalf of 80% of the healthcare sectors in the country. With the limitless support from the government to NUPCO, the sourcing diversification for medical supplies can create larger relationships between health sectors and PPE suppliers to overcome this outbreak.

By looking at the respondents results we can see the following:

The single or limited procurement sourcing that is favoring low cost or prices locations prior COVID-19 pandemic, respondent agree about 60%. Also, respondent agreed that the diversification for procurement was low prior COVID-19 and it reached nearly 71%. Finally, almost 73% of the respondents agreed that the sourcing of the procurement was changed with regardless the PPE prices during the pandemic.

These results supported the need for rethinking about diversifying the supply sourcing strategies. It is not short-term suggestion but it must be considered strategic long-term. This will enhance the PPE logistics and procurement solutions in the future. But also, it will increase the quality and ability of the local suppliers to be the first choice when there is a need for PPE supplies.

4. To allow for strategic alliance with medical product leaders, only for selected products.

Strategic alliances are important as they provide room for bench marking and also assist when there is entirely total shortage of medical supplies. Many respondents agreed that it was not wise to cut down strategic alliances even in the effect of having a diversified manufacturing sector. This is because a country cannot entirely depend on its own but it does need others in order to survive.

Strategic alliance and joint venture are very important strategies that local suppliers can utilize during this current global pandemic. The recent announcement from LCGPA to have 29 items that are categorized under PPE will have its negative affect on the local suppliers in terms of not meeting the current demand and overwhelming the production capacity. Also, the 2030 vision will allow the international medical products brands to open their own factories in the Saudi soil. As a result, the strategic alliance or joint venture between local and international factories will benefit both parties in the subject of PPE products.

A discussion in regards to the hypothesis is discussed below.

- H1: The provision of the better medical supply chains procurement strategy is significantly associated with containing the pandemic in Saudi Arabia is accepted. This hypothesis is accepted since the t-value is greater than 1.96. The t-value is 6.106 which is great. Also, the significance value is less than 0.05 which is 0.000. All these values make the hypothesis to be accepted.
- H2: Shifting from current perspective of single location low manufacturing to diversifying on the sources manufacturing is significantly associated with promoting the medical products in Saudi Arabia has also been accepted. The t-value is 2.665 and the significant value is 0.008 which is less than 0.05.
- H3: The strategic alliance with medical leaders is significantly associated with promoting the sustainable / durable/ high quality, operation and supply chain risk management for medical products produced in the Kingdom has also been accepted. This is because the t-value is 4.198 which is greater than 1.96 and significant value is less than 0.05 which is 0.000.

5.2 Conclusion

Apart from locally manufacturing the PPEs, the government should issue a directive to suppliers to ease the supply of raw materials necessary for the production of the needed medical equipment. The government should also ensure that other subsidiary companies come on board, for instance the automakers can be tasked with making of ventilators. The Automakers will thus boost the supplies of ventilators. The government through The Local Content and Governmental Procurement Authority (LCGPA) should also ease restrictions in approving PPEs for used and

should allow the mandatory supply of locally manufactured PPEs, to boost the supply of PPEs. Even if PPEs and sanitizers have not been approved by Saudi Food & Drugs Authority they should be used if they have been approved by LCGPA and health and safety authority. With the Local Content and Governmental Procurement Authority (LCGPA) announcing a mandatory order that suppliers are only allowed to supply protective products that are locally made. This announcement will contribute to covering the shortage of supplies. With the governmental support for the localization of medical product, the local manufacture can overcome the protective supplies shortage. The local medical products are as practical as international products.

There should be adequate sensitization for local companies to produce the PPEs. The heads of the local companies should be aware that not so much is needed in producing PPEs and the materials could be obtained locally and they can play a big role in filling this gap of helping or producing the PPEs. The government should reduce hoarding of PPEs which makes it unfair to those who directly need them. Also, the necessary resources should be fairly distributed, as areas hardest hit need more attention.

5.3 Managerial relevance

The findings from the current study reveal some significant facts regarding Saudi Arabia and worldwide COVID-19 medical procurement supply chain. The findings will therefore help the Saudi Arabian government, the local manufacturers, the medical fraternity and Saudi Arabians in general with knowledge and solutions towards the current problems that have affected the procurement supply chain. The findings are very important and crucial as they present the challenge that is grappling the procurement medical supply chain. It is prudent to acknowledge the fact that medical supply chain procurement experts conduct these studies with an aim to devise appropriate supply chains as solutions. However, since this is a new and prolonged challenge not so much studies have been carried out regarding COVID-19 and the shortages and challenges in the procurement supply chain. As such the study will be influential and will join the current research and researchers in studying issues to deal with the COVID-19 menace. As a result, the findings will give insightful unique managerial perspectives that would help the medical supply chain procurement, the government and the local manufacturers to come up with alternative solutions towards the current challenge. It will further expose the current world wide position in regards to the supply chain.

To the local manufacturers the study will offer insightful knowledge on the new niche and market gap that exists in regards to insufficient medical supplies. By targeting the government, it will expose the local manufacturers strength towards the economy and finding the solutions for the already shortage that is affecting the Saudi medical supply chain procurement disruptions. A very good example is that what was never felt before in the medical procurement supply chain in terms of local manufacturing will be felt now, this will create more jobs and will diversify the economy geared towards accomplishing the vision 2030. Such means that more room for local medical supplies will be opened. Also, self-sufficiency will mitigate the challenges that have come as a result of disruptions in the medical supply chain procurement.

5.4 Scientific relevance

Research on medical supply chain procurement has always been conducted by the medical scholars and experts. As such merging them with a business perspective will some of the factors and conditions affecting the supply chain will be understood better. As such it is evident that two fields of study can be interrelated in order to solve problems. The study contributes to existing literature regarding supply chains and covid-19 in Saudi Arabia. It contributes to knowledge regarding supplier selection in times of pandemics. The first contribution is improving sourcing strategies for COVID-19 from concentrating on low-costing which minimized the production competitiveness among producers and eliminated the diversity of production locations to shorter supply chains fashioned by increase in the trust and acceptance for the local made medical products towards healthcare practitioners and patients. It immensely contributes to existing literature regarding covid-19. It creates knowledge on existing local opportunities and assist patients and health practitioners.

5.5 Limitation and Scope for Future Research

The research was highly successful; however, some challenges were experienced. The scope and depth of the study was affected by the time factor. This put the researcher under immense pressure. Another challenge was that some respondents needed assurance that the information they presented could only be used for research purposes, they were so worried about confidentiality and this affected how open they were to giving out the answers. The researcher also encountered challenges with the respondent's willingness to respond to the questionnaire on time, which delayed the data analysis process.

The research suggests that future research should be focused on skills set in the supply chain industry. In order for local manufacturing industry to be effective there is need to ensure that the right skill set is there in the industry for quality products to be produced. The research recommends research on skills in the supply chain industry since the current study focused on local production to boost medical supplies. Such a study should establish the effect of matching the necessary skills with quality in the medical supply chain.

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APPENDIX

Analysis of Saudi Medical Supply Chain Procurement Disruptions Caused By COVID-19 Outbreak and Their Solutions

Thank you very much for your valuable participation in this survey. The survey consists of 34 questions but it will take only 5 minutes from your valuable time.

The survey questions are intended to collect data on the effect of the supply chain on COVID-19 in Saudi Arabia. The sole purpose of the questions is to collect data for research. All data collected will be treated with the utmost confidentiality.

شكراً جزيلاً لمشاركتكم الثمينة في هذا الاستطلاع. الاستبيان مكون من ٣٣ سؤال ولكن لن يأخذ منكم أكثر من خمس دقائق لإكماله.

الهدف من هذا الاستبيان هو جمع البيانات على مدى تأثير فيروس كورونا المستجد على سلاسل الإمداد للمنتجات الطبية في المملكة العربية السعودية. الغرض الوحيد هو من الأسئلة هو جمع بيانات من أجل البحث. جميع المعلومات والبيانات سوف يتم التعامل معها بأعلى درجة من السرية والخصوصية

1. Gender/ الجنس*

- Male/ذكر
- Female/أنثى

2. Nationality/الجنسية *

- Saudi/سعودي

• Not Saudi citizen / غير سعودي
3. Education degree / مستوى التعليم* • High school / الثانوية العامة • Diploma / دبلوم • Bachelor Degree / بكالوريوس • Master's Degree / ماجستير • PhD / دكتوراه
4. Professional field/ مجال العمل* • Healthcare Professional / ممارس صحي • Medical supply Chain procurement in hospital / سلسلة الإمداد واللوجستيات قطاع الصحي • Non-medical supply chain procurement / سلسلة الإمداد واللوجستيات قطاع غير صحي • Medical Supplier / مورد منتجات طبية • Local Medical Manufacture / الصناعات الطبية • Other / أخرى
5. Work sector / جهة العمل* • Public sector / القطاع حكومي • Semi-governmental sector / القطاع الشبه حكومي • Privet sector / القطاع الخاص
6. Working experience / سنوات الخبرة* • 0 – 5 Years / سنوات ٥ - ٠ • 6 – 11 Years / سنوات ١١ - ٦ • 12 – 17 Years / سنوات ١٧ - ١٢

- ١٨ سنة و أكثر / 18 years and more

7. Which of the following organizations is/are your main source of information about COVID

* أي من المنظمات التالية تعتبرها مصدرك الأساسي للمعلومات عن فيروس كورونا؟ / COVID-19

- SFDA and MOH / هيئة الغذاء و الدواء السعودية و وزارة الصحة
- US-FDA and CDC / الغذاء و الدواء و مراكز السيطرة على الأمراض والوقاية منها
- WHO / منظمة الصحة العالمية
- All of the above/ جميع ما سبق

8. The prices for the local medical personal protective equipment (PPE) has increased during the COVID-19 outbreak. / ارتفعت أسعار منتجات الوقاية الشخصية المصنعة محلياً خلال فترة

* تفشي فيروس كورونا المستجد

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

9. The demand for the local medical personal protective equipment (PPE) has increased, during the COVID-19 outbreak. / لوحظ ارتفاع في الطلب على المنتجات الطبية المصنعة محلياً

* الطلب على المنتجات الطبية المصنعة محلياً

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

10. Due to the rise of the local medical products prices, I prefer purchasing the available international products because of branding reputation / أفضل شراء المنتجات الطبية العالمية * ذات السمعة في ظل ارتفاع أسعار المنتجات الطبية المحلية

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

11. The Local Content and Governmental Procurement Authority (LCGPA) has announced a mandatory order that suppliers are only allowed to supply protective products that are locally made. This announcement will contribute to covering the shortage of supplies. قرار هيئة المحتوى المحلي والشراء الحكومي بإلزام الموردين بتوفير منتجات الوقاية الشخصية المصنعة محلياً، سيسهم في سد العجز في المستلزمات

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

12. With the governmental support for the localization of medical product, the local manufacture can overcome the protective supplies shortage/ المصانع المحلية قادرة على سد العجز في المستلزمات الوقاية الشخصية، في ظل الدعم الحكومي لتوطين الصناعات الطبية

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

13. The local medical products are practical as international products. / المنتجات الطبية

*المحلية عملية مثل المنتجات العالمية

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

14. During the first period of the COVID-19 pandemic, the Saudi Food & Drugs Authority has recalled many local hand sanitizers as recalled products due to manufacturer error in some chemical components such as methanol, ethanol and isopropanol percentages. This can negatively affect the local medical product reputation. هيئة الغذاء والدواء طلبت سحب

العديد من المنتجات المحلية لمعقمات اليدين من السوق أثناء جائحة كورونا، بسبب خطأ مصنعي في النسب المئوية لبعض المواد الكيميائية مثل الميثانول والإيثانول والأيزوبروبانول. *هذه الأخطاء المصنعية سوف تؤثر سلباً على سمعة المنتجات المحلية لدى المستهلك

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

15. I do not have any preference between international and local medical PPE as long as they meet the accepted standards. ليس لدي أي تفضيل بين منتجات الوقاية الشخصية الطبية.

*العالمية والمحلية طالما أنها تستوفي المعايير المقبولة

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق

- Strongly disagree / لا أوافق بشدة

16. The local medical PPE products quality is not constant / جودة منتجات الوقاية الشخصية المحلية ليست ثابتة

*

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

17. The local products quality is lower than international brands/ جودة المنتج المحلي أقل من نظيرتها من العلامات التجارية العالمية

*

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

18. Prior to COVID-19 pandemic, the procurement sourcing was focused on low-cost locations/ كان تركيز مصادر المشتريات على المناطق ذات تكلفة منخفضة, قبل جائحة كورونا المستجد.

*

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

19. Prior to COVID-19 pandemic, the procurement sourcing did not consider location diversity because of low prices preference/ لم تكن مصادر التوريد تأخذ بعين الاعتبار تنوع المصادر * بسبب تفضيل الأسعار المنخفضة, قبل تفشي جائحة فيروس كورونا المستجد

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

20. During the COVID-19, the procurement sourcing strategies have changed from low cost/price locations to more diversified sourcing locations even with changeable prices/ تغيرت استراتيجيات مصادر التوريد من مصادر منخفضة التكلفة أو الأسعار إلى مصادر أكثر تنوعاً حتى مع تغيير الأسعار, أثناء جائحة فيروس كورونا المستجد.

*

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

21. Saudi hospital supply chain suffered from serious shortage in medical PPE against COVID

-19. The shortage due to the high demand for PPE which the local manufactures cannot meet. سلاسل التوريد في المستشفيات السعودية عانت من نقص خطير في منتجات الوقاية الشخصية الطبية ضد فيروس كورونا المستجد. هذا النقص بسبب ارتفاع الطلب على منتجات الوقاية الشخصية التي لا يستطيع المصنعين المحليين توفيرها *

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

22. When the supply chain sources for medical PPE in china were shut-down temporary, the local manufacturers were unable to cover the shortage in supplies / بعد الإغلاق المؤقت لمصادر سلاسل التوريد لمنتجات الوقاية الشخصية الطبية في الصين ، لم يتمكن المصنعين المحليين من تغطية النقص في الإمدادات

*

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

23. Due to the increase in demand for the PPE and the transportation costs, it is very important to divide the demand between local and international products in a way that rises the local manufactures performance. / نظرًا لزيادة الطلب تكاليف الشحن على منتجات الوقاية الشخصية /

، من المهم جدًا تقسيم الطلب بين المنتجات المحلية و العالمية بطريقة تؤدي إلى رفع أداء المصانع المحلية

*

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

24. The supply chain process has been affected worldwide, due to the COVID-19 pandemic. As a result, the best solution is to think about diversifying procurement sourcing in the healthcare sector. / عملية سلسلة تأثرت في جميع أنحاء العالم بسبب جائحة فيروس كورونا. / لذلك، أفضل حل هو التفكير في تنويع مصادر الشراء في قطاع الرعاية الصحية

*

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

25. The preference for international products by healthcare sectors negatively harmed the local manufacturers' productivity. / تضررت إنتاجية المصانع المحلية بسبب تفضيل المنشآت الصحية للمنتجات العالمية.

*

- Strongly agree / أوافق بشدة
- Agree / أوافق

- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

26. The quality control department in healthcare sectors regularly updates suppliers with their product quality whenever there is a quality-related issue. / تقوم إدارة مراقبة الجودة في قطاعات الرعاية الصحية بشكل منتظم بتحديث الموردين بجودة منتجاتهم كلما كانت هناك مشكلة تتعلق بالجودة.

*

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

27. The Saudi Food and Drugs Authority provides daily list of suppliers and manufactures that have personal protective equipment available for sale. / توفر الهيئة العامة للغذاء والدواء قائمة يومية بالموردين والمصنعين الذين لديهم منتجات الوقاية شخصية متاحة للبيع

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

28. Local suppliers are negatively affected by the non-compliance of the health sectors with the existing dues. / عدم إلتزام القطاعات الصحية بدفع يؤثر على الموردين المحليين. للمستحقات القائمة

*

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

29. During the COVID-19 outbreak healthcare workers have supported the local products than before. / الممارسين الصحيين دعموا المنتجات المحلية أكثر من ذي قبل أثناء تفشي فيروس كورونا المستجد

*

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

30. The right joint venture or strategic alliance with international manufacture will increase your market share and acceptance / المشاريع المشتركة أو التحالف الاستراتيجي الصائب مع الشركات العالمية القيمة السوقية و القبول للمصانع المحلية

*

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق

- لا أوافق بشدة / Strongly disagree

31. During the COVID-19 pandemic, the Saudi manufacturer production capacity weakened because of inadequate planning before COVID-19 crisis. / ضعف التخطيط المصانع السعودية قبل تفشي فيروس كورونا في السعودية أدى إلى ضعف القدرة الإنتاجية أثناء فترة جائحة كورونا

*

- أوافق بشدة / Strongly agree
- أوافق / Agree
- محايد / Neutral
- لا أوافق / Disagree
- لا أوافق بشدة / Strongly disagree

32. As COVID-19 crisis continues, the local manufactures supply and logistics will be able to develop/ ستكون المصانع المحلية قادرة على التطور المستلزمات و الدعم اللوجستي مع استمرار جائحة كورونا

*

- أوافق بشدة / Strongly agree
- أوافق / Agree
- محايد / Neutral
- لا أوافق / Disagree
- لا أوافق بشدة / Strongly disagree

33. The current crisis will motivate Saudi Arabia to be self-sufficient in the medical PPE /

الأزمة الحالية ستكون محفزاً للمملكة العربية السعودية للوصول إلى الإكتفاء الذاتي في منتجات
الوقاية الشخصية

*

- Strongly agree / أوافق بشدة
- Agree / أوافق
- Neutral / محايد
- Disagree / لا أوافق
- Strongly disagree / لا أوافق بشدة

