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An Empirical Study on Supply Chain Risk Management of Health Care Sector in Karachi, Pakistan: Issues, Challenges, and Future Agenda

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ABSTRACT

This empirical study investigates supply chain risk management in Karachi's healthcare industry. Given the industry's complexity and vulnerability to disruptions, it focuses on the problems and challenges faced by healthcare organizations in managing supply chain risks. Data is collected through questionnaires, interviews, and case studies involving healthcare experts, supply chain managers, and stakeholders. The findings highlight major risk factors such as inadequate contingency planning, inventory management issues, transportation bottlenecks, and procurement delays. The study identifies difficulties in implementing risk mitigation measures, including resource constraints, infrastructure inadequacies, and regulatory limitations. Based on the analysis, the study proposes a future agenda for enhancing supply chain risk management in Karachi's healthcare industry, including stakeholder collaboration, technology utilization, emergency response systems, and resilient supply chains. This study contributes to the knowledge base on supply chain risk management in healthcare, particularly in developing nations, providing valuable insights for policymakers, healthcare organizations, and supply chain practitioners to enhance their risk management capabilities and ensure uninterrupted healthcare service delivery.



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Introduction

The healthcare industry in Karachi, Pakistan faces challenges due to poor infrastructure, lack of competent workers, political unrest, socioeconomic problems, and funding shortages. Supply chain risk management is crucial for ensuring the availability of medical supplies. This

research study analyzes supply chain risk management in Karachi's healthcare sector from 2018 to 2023, identifying issues and providing insights to improve supply chain practices. The findings are relevant for healthcare groups, policymakers, and academics aiming to enhance risk management techniques and strengthen the healthcare system in Karachi, Pakistan.

The research focuses on supply chain risk management in Karachi's healthcare sector, addressing the current state, techniques used, opportunities, and obstacles. It aims to guide future research and practice in supply chain risk management. The study covers the period from 2018 to 2023 and includes hospitals, clinics, and related facilities. Data is gathered from published research papers, academic publications, and reports specific to Karachi's healthcare sector. Limitations of the study include limited data availability, a constrained scope, potential bias, reliance on secondary sources, language barriers, and the exclusion of other supply chain management aspects. The study provides valuable insights, identifies obstacles and opportunities, and guides future research in Karachi's healthcare industry. Key terms defined in the study include supply chain management, supply chain risk management, supply chain, risk management, and healthcare sector. Overall for conceptualizing this study, we have followed the guidelines provided in the previous research in the social science research (e.g., Ahmed, Nawaz, & Rasheed, 2019; Anser et al., 2022; Anser et al., 2020; Chang et al., 2022; Gulzar, Ahmad, Hassan, & Rasheed, 2022; Hameed et al., 2019; Hameed, Muhammad Naeem, Rasheed, & Moin, 2023; Iqbal et al., 2021; Kanwal, Pitafi, Rasheed, Pitafi, & Iqbal, 2022; Kanwal, Rasheed, Pitafi, Pitafi, & Ren, 2020; Khalid, Weng, Luqman, Rasheed, & Hina, 2022, 2023; Khan, Liu, Khan, Liu, & Rasheed, 2020; Khizar, Iqbal, & Rasheed, 2021; Rasheed, Pitafi, Mishra, & Chotia, 2023; Rasheed & Weng, 2019; Rasheed, Weng, Umrani, & Moin, 2021; Rasheed, Yousaf, & Noor, 2011).

Literature Review

Theoretical Reviews

Healthcare operations rely on supply chain management (SCM) for quality patient care and cost management. Managing supply chain risks is crucial for a steady flow of products and services. Digital technologies like EHRs and RFID have improved healthcare SCM. Sustainability practices support environmental impact reduction, social responsibility, and long-term profitability. Supplier collaboration can enhance SCM, treatment quality, and lower costs. Underdeveloped nations face funding, logistical, physical, and legal limitations in healthcare organizations. Understanding regional conditions is vital for risk management solutions. Effective SCM is essential for healthcare organizations' success. Further research is needed to explore and develop efficient supply chain risk management techniques in healthcare. For writing the literature review of this paper, we have followed the guidelines provided in the previous research in the social science research (e.g., Luqman, Masood, Shahzad, Imran Rasheed, & Weng, 2020; Luqman, Masood, Weng, Ali, & Rasheed, 2020; Masood, Feng, Rasheed, Ali, & Gong, 2021; Moin, Omar, Ali, Rasheed, & Abdelmotaleb, 2022; Moin, Omar, Wei, Rasheed, & Hameed, 2021; Murtza & Rasheed, 2023; Naeem, Weng, Hameed, & Rasheed, 2020; Nand, Pitafi, Kanwal, Pitafi, & Rasheed, 2020; Nisar & Rasheed, 2020; Nisar, Rasheed, & Qiang, 2018; Rasheed, Malik, et al., 2020; Rasheed & Murtza, 2023; Rasheed, Okumus, Weng, Hameed, & Nawaz, 2020).

Overview of Supply Chain Management in the Healthcare Sector

Healthcare organizations use supply chain management (SCM) to deliver quality care and reduce costs. Innovations like electronic health records (EHRs) and radio-frequency identification (RFID) improve visibility and control. Sustainable practices mitigate environmental impact. Managing supply chain risks, such as quality control and regulatory compliance, is crucial.

Collaboration with suppliers is vital for effective SCM. Karachi's healthcare SCM faces challenges due to underfunding and fragmentation. Tailored plans, risk management, technology use, and sustainability practices are necessary for improvement. Mathur et al. (2018) highlight challenges in healthcare SCM collaboration and emphasize the role of technology adoption in enhancing efficiency. Measuring logistics performance in internal hospital supply chains is crucial for efficiency and patient satisfaction. Moons et al. (2019) discuss performance indicators such as inventory management and information systems. Hasselgren et al. (2020) explore the benefits of block chain in healthcare, including data security, privacy, and improved supply chain management. Stević et al. (2020) propose a sustainable supplier selection process in healthcare, emphasizing environmental impact and social responsibility. Senthilkumar et al. (2018) review the use of big data analytics in healthcare management, highlighting its potential for decision-making, risk assessment, and quality improvement. Further research is needed to address data quality, privacy, and security challenges.

Risk management in healthcare supply chains

Timely provision of healthcare services and achieving optimal health outcomes depend on effective risk management. The healthcare supply chain faces various risks, making control challenging due to complexity, fragmentation, and multiple stakeholders. Collaborative risk management involving all stakeholders is essential. The process includes identifying hazards, assessing likelihood and impact, finding solutions, and monitoring risks throughout the supply chain.

Frameworks and models exist for organized risk identification, evaluation, and mitigation in the healthcare supply chain. Effective risk management reduces potential risks like demand unpredictability, supply disruptions, quality difficulties, regulatory non-compliance, and security threats. Block chain technology offers increased visibility, transparency, and accountability in the supply chain, enhancing patient safety and preventing counterfeit drugs (Clauson et al., 2018). It can also mitigate supply chain issues related to the opioid epidemic by improving traceability (Clauson et al., 2018). A decision support system for demand management during epidemics was proposed to allocate healthcare resources effectively (Govindan et al., 2020). It ensures demand for healthcare products and services is met, assisting decision-makers in making timely decisions (Govindan et al., 2020). COVID-19 revealed flaws in the supply chain, necessitating a long-term prescriptive approach for improvement (Zhu et al., 2020). Resilient supply chains using advanced technologies and predictive modeling can respond to disruptions and changing demands (Zhu et al., 2020). A resilient supply chain architecture can reduce operational and disruption risks in pharmaceutical supply chains (Sabouhi et al., 2018). Incorporating risk management leads to cost savings and improved performance (Sabouhi et al., 2018). Implementing green supply chain strategies in the pharmaceutical industry improves competitiveness and sustainability (Kumar et al., 2019). Integrating environmental performance and supplier selection processes enhances reputation and environmental responsibility (Kumar et al., 2019).

Supply chain risks in the healthcare sector in Karachi, Pakistan

Supply chain risks in the healthcare sector in Karachi, Pakistan significantly impact healthcare services and the population's health in Karachi, Pakistan. These concerns include erratic demand, interrupted supplies, quality problems, regulatory non-compliance, and security threats.

Inefficient inventory and supplier management are major concerns in Karachi's healthcare industry, leading to shortages and low-quality supplies. Security threats and regulatory non-compliance also pose significant risks. Effective risk management strategies are needed. Integration of quality and supply chain management in Pakistan's pharmaceutical distribution industry can enhance effectiveness and performance (Tayyab et al., 2020). Collaborative and integrative risk management approaches can mitigate adverse effects on healthcare service delivery (Ahmed et al., 2020). Lack of knowledge management practices hinders effective supply chain risk management in Pakistan's healthcare industry (Karamat et al., 2018). Lean and agile methodologies improve supply chain responsiveness and risk management in the healthcare sector (Ahmed & Huma, 2021). Work safety enhances organizational social sustainability and supply chain risk management in Pakistan's healthcare sector (Ullah et al., 2021).

Risk management strategies in the healthcare sector in Karachi, Pakistan

To reduce supply chain risks in Karachi, Pakistan's healthcare industry, implementing effective inventory management and supplier management techniques is crucial. Standard operating procedures (SOPs) can ensure regulatory compliance, and security concerns can be addressed through secure storage facilities and authentication technology. (Zulfiqar et al., 2022) emphasize the use of blockchain technology to combat counterfeit medications, ensuring authenticity and patient safety. The study by (Zaidi and Hasan, 2022) on supply chain risk prioritization and framework building in the automotive industry can provide insights for efficient risk management in Karachi's healthcare industry. Efficient inventory control to avoid medication shortages and implementing standard operating procedures are highlighted in (Atif et al., 2021) study on the impact of medication shortages in Pakistan. (Gill et al., 2021) review of hospital plastic waste management practices underscores the importance of effective waste management strategies to reduce environmental risks. Implementing these risk management measures can ensure the seamless delivery of healthcare services in Karachi while reducing supply chain risks.

Key challenges faced by healthcare organizations in managing supply chain risks in Karachi, Pakistan

The healthcare industry in Karachi, Pakistan faces difficulties in managing supply chain risks due to a shortage of qualified employees, lack of knowledge, underfunding of infrastructure, and a fragmented supply chain. (Ahmed et al., 2020) highlight the importance of collaboration and integration to enhance supply chain risk management capabilities in healthcare organizations. (Omair, 2021) emphasizes the need for strategic management of outsourcing agreements to improve supply chain performance in the pharmaceutical industry. (Atif et al., 2019) explore the reasons for medication shortages in Pakistan and recommend coordinated efforts to overcome the barriers. (Ahmed et al., 2020) discuss the impact of the COVID-19 pandemic on healthcare access in slum communities, highlighting disruptions in the supply

chain. Implementing effective risk management strategies and addressing these challenges can help healthcare organizations in Karachi, Pakistan manage supply chain risks and ensure the seamless delivery of healthcare services.

Current state of research on supply chain risk management in the healthcare sector in Karachi, Pakistan

Research on supply chain risk management in Karachi, Pakistan's healthcare industry is limited, with a focus on specific aspects such as supplier and inventory management. More comprehensive studies are needed to understand the risks and effective risk management techniques in the healthcare sector. (Abdullah et al., 2022) emphasize proactive risk mitigation strategies and the importance of coordination and collaboration in supply chain risk management. (Khan et al., 2022) highlight the adoption of innovative strategies, such as digitalization and collaboration, to reduce supply chain disruptions during crises. (Waqas et al., 2023) discuss the promotion of healthcare technologies through sustainable supply chain operations and the significance of factors like teamwork and stakeholder participation. (Siddiqui et al., 2022) present a hybrid demand forecasting model for the pharmaceutical industry to improve accuracy and supply chain management. (Ahmed et al., 2020) examine the impact of the societal response to COVID-19 on healthcare access in slum communities, emphasizing the need for better preparedness and addressing healthcare inequalities. Further research is necessary to deepen our understanding of supply chain risks and develop effective risk management strategies in Karachi's healthcare industry.

Research Framework

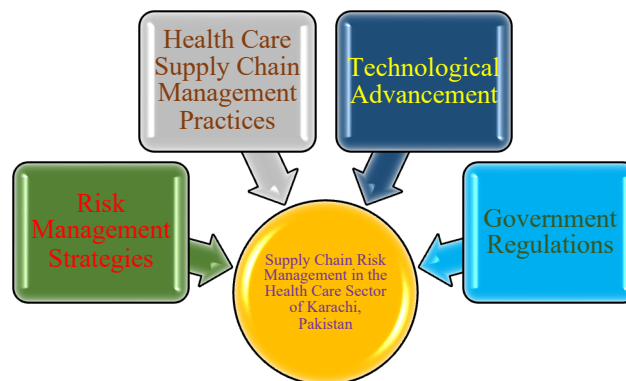


Figure 2.1 Research Framework

Research Hypothesis

H1: Healthcare supply chain management practices have a significant impact on efficient supply chain risk management in the healthcare sector in Karachi, Pakistan.

H2: Risk management strategies have a significant impact on efficient supply chain risk management in the healthcare sector in Karachi, Pakistan.

H3: Government regulations have a significant impact on efficient supply chain risk management in the health care sector in Karachi, Pakistan.

H4: Technological advancements have a significant impact on efficient supply chain risk management in the healthcare sector in Karachi, Pakistan.

Methodology

Research Design

Our study investigates supply chain risk management in Karachi's healthcare industry using a descriptive research design. Through an empirical study, we identify and examine problems and challenges in supply chain risk management. Furthermore, we propose a future agenda to address these issues and promote improved risk management practices across the entire sector. Designing the method of this research study, we have followed all the guidelines provided in the previous research in the social science research (e.g., (Peng, Liang, Fatima, Wang, & Rasheed, 2023; Pitafi, Rasheed, Kanwal, & Ren, 2020; Rana, Gaur, Singh, Awan, & Rasheed, 2022; Rasheed, Aslam, & Sarwar, 2010; Rasheed, Hameed, Kaur, & Dhir, 2023; Rasheed, Humayon, Awan, & Ahmed, 2016; Rasheed, Jamad, Pitafi, & Iqbal, 2020; Saleem, Rasheed, Malik, & Okumus, 2021; Sarwar, Aslam, & Rasheed, 2010; Sarwar, Danyal Aslam, & Imran Rasheed, 2012; Umrani et al., 2022).

Research Approach

We used a deductive approach to review knowledge and research on supply chain risk management in Karachi's healthcare sector. Top studies were selected using a systematic screening process. Collected information was analyzed to identify challenges and gaps in supply chain risk management. Findings enable an analysis of current practices and provide recommendations for future research and improvements in Karachi's healthcare industry.

Data collection

A questionnaire-based approach gathers information for systematically evaluating supply chain risk management in Karachi's healthcare sector. Targeting stakeholders such as healthcare professionals, supply chain managers, policymakers, and administrators, the questionnaire collects in-depth data on problems, obstacles, and planned actions. It is distributed electronically for a large audience and participant convenience. The gathered information enables an empirical study, providing valuable insights into the state of supply chain risk management in Karachi's healthcare industry.

Sampling Design

To conduct an empirical study on supply chain risk management in Karachi's healthcare sector, a comprehensive sampling design is employed. The approach prioritizes relevant studies conducted within Karachi's healthcare sector to investigate problems and challenges. The final sample selection ensures a thorough examination of the subject based on the quality and relevance of the research.

Target population

This comprehensive study targets professionals and industry participants in Karachi's healthcare sector, including researchers, supply chain experts, hospital administrators,

healthcare professionals, pharmaceutical experts, clinical professionals, healthcare academicians, and policymakers. A sample size of 402 participants, randomly selected from a target group of 20,000 individuals, ensures a thorough understanding of the issue. The study employs various methods, such as literature review, surveys, focus groups, and interviews with key informants, to gather data and examine significant issues, challenges, and long-term objectives regarding supply chain risk management in Karachi's healthcare industry.

Sample selected

The selected sample size is 402 from the population size of 20,000. In which it would be distributed as 50% each of our independent and dependent variables section for the response we consider. This is the random sample and population focus only for Karachi region. Thus we should consider each variables test from SPSS software techniques.

Sample size with Justification

The sample size depends on our confidence level which is 95%. Around 20,000 population that is N and sample recommended which is nearly to 402.

| Description | Selection |
|--|-----------|
| Margin of error | 0.05 |
| Confidence Level in the choice of 99%, 95% and 90% | 95% |
| Population size (N) (based on the industrial population size which is not known) | 20,000 |
| Response distribution | 50% |
| Recommended Sample size | 402 |

Table 3. 1 Sample Size with Justification

Sampling Technique

Random convenience sampling technique is used to determine sample because population is largely distributed and data need to be collection within possible time period.

Questionnaire design

The structured questionnaire analyzes problems, opportunities, and future agenda related to the topic. It covers various elements, including stakeholder collaboration, risk identification, assessment, mitigation measures, and regulatory compliance. The questionnaire consists of multiple sections with structured questions, focusing on important topics such as types of risks, frequency and impact, current risk management practices, obstacles, emerging trends and technologies, and suggestions for improving supply chain resilience.

Data Analysis

Frequency Distribution Charts

The frequency Charts presents the distribution of responses for different variables in the study.

Gender

The Chart shows that out of the total respondents (N = 402), 244 (60.7%) identified as Male, while 158 (39.3%) identified as Female.

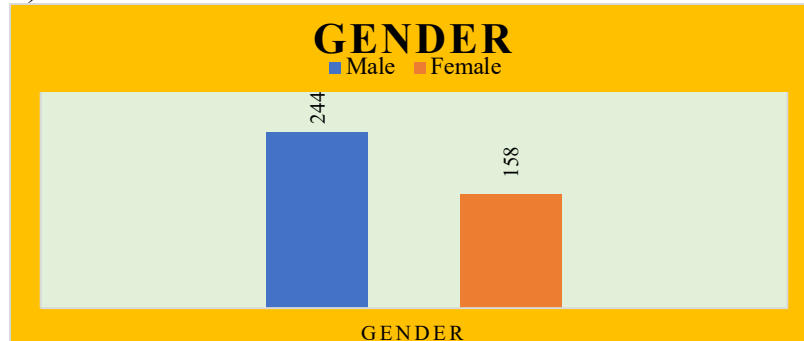


Figure 4. 1 Frequency Distribution Chart of Respondent's Gender

Age

The frequency charts provides information on the age distribution of the respondents. The age categories include 18-25, 26-35, 36-45, 46-55, and 56 & above. The chart shows that 60 (14.9 %) respondents are of 18 - 25 age category, 67 (16.7 %) respondents are of 26 - 35 age category, 136 (33.8 %) respondents are of 36 - 45 age category, 90 (22.4 %) respondents are of 46 - 55 age category and 49 (12.2 %) respondents are of 56 & above age category.

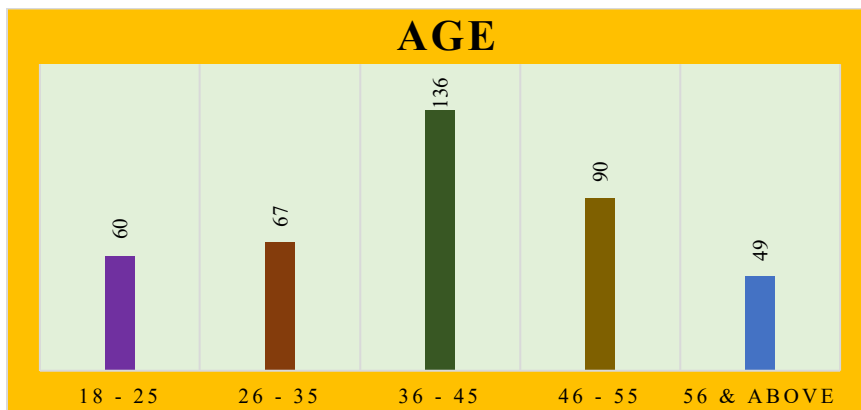


Figure 4. 2 Frequency Distribution Chart of Respondent's Age

Education Level

This chart presents the educational background of the respondents. The categories include Inter or Diploma, Graduate, and Masters or Above. The frequency chart shows the number of respondents in each category. The chart shows that 27 respondents (6.7%) have a Inter or Diploma education level, 86 respondents (21.4%) have a Graduate education level, 289 respondents (71.9%) have a Masters or Above education level.

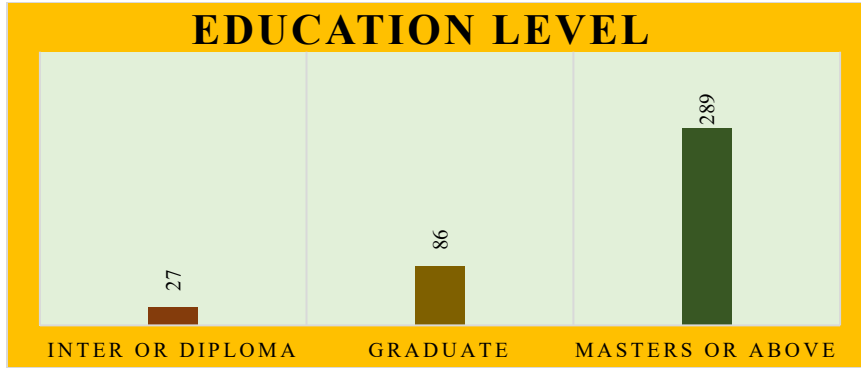


Figure 4. 3 Frequency Distribution Chart of Respondent’s Education Level

Professional Background

This chart displays the distribution of respondents based on their professional backgrounds. The categories include Health Care Provider, Supply Chain / Logistics Professional, Researcher / Academician, Administrator / Manager, and Other. The frequency chart shows the number of respondents in each category, i.e. 153 respondents (38.0%) belong to the Health Care Provider category, 81 respondents (20.2%) belong to the Supply Chain/ Logistics Professional category, 10 respondents (2.5%) belong to the Researcher/ Academician category, 90 respondents (22.4%) belong to the Administrator/ Manager category, 68 respondents (16.9%) belong to the Other category.

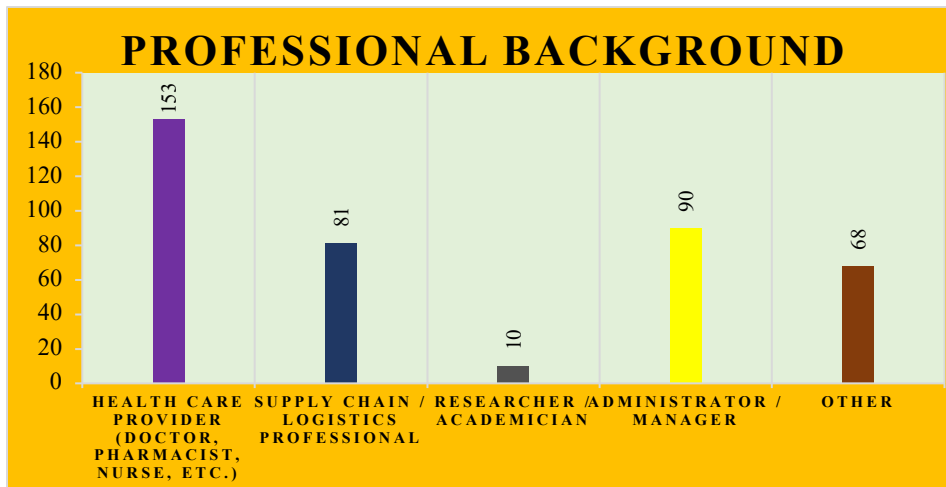


Figure 4. 4 Frequency Distribution Chart of Respondent’s Professional Background

Familiar with Supply Chain Risk Management

This chart presents information on whether the respondents are familiar with supply chain risk management. The categories include Yes and No. The frequency column shows 308 respondents (76.6%) indicated that they are familiar with supply chain risk management while 94 respondents (23.4%) indicated that they are not familiar with supply chain risk management.

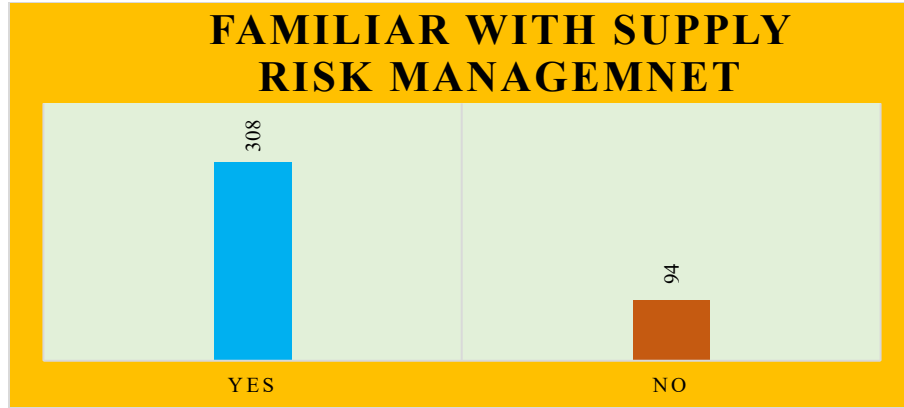


Figure 4. 5 Frequency Distribution Chart of Respondent’s Familiar with Supply Chain Risk Management

Overall, the frequency charts provides a breakdown of respondents' characteristics and their distribution across different variables. It allows for a clear understanding of the demographic and professional profiles of the participants in the study.

Multiple Regression Analysis

The multiple regression analysis was done to look at the association between the dependent variable, supply chain risk management, and the four independent variables, healthcare supply chain management practices, risk management strategies, and technological advancement. An analysis of the regression results is given in the following sections.

Model Summary

The model summary indicates the overall fit of the regression model. The R-squared value of 0.540 explains approximately 54% of the variance in the dependent variable. The adjusted R-squared value of 0.536 considers the number of predictors and suggests a good portion of variance is accounted for in Supply Chain Risk Management. The standard error of the estimate (0.52119) represents the average difference between observed and predicted values of the dependent variable.

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|-------|-------------------|----------|-------------------|----------------------------|
| 1 | .735 ^a | .540 | .536 | .52119 |

a. Predictors: (Constant), Government Regulations, Healthcare Supply Chain Management Practices, Risk Management Strategies, Technology Advancement

Table 4. 1 Model Summary

ANOVA

The analysis of variance (ANOVA) table indicates the significance of the regression model. The regression sum of squares (126.710) is significantly larger than the residual sum of squares (107.840), as evident from the F-value of 116.616 and its associated p-value of 0.000. This suggests that the regression model, as a whole, is statistically significant in explaining the variation in Supply Chain Risk Management.

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|-------|------------|----------------|-----|-------------|---------|-------------------|
| 1 | Regression | 126.710 | 4 | 31.677 | 116.616 | .000 ^b |
| | Residual | 107.840 | 397 | .272 | | |
| | Total | 234.550 | 401 | | | |

a. Dependent Variable: Supply Chain Risk Management

b. Predictors: (Constant), Government Regulations, Healthcare Supply Chain Management Practices, Risk Management Strategies, Technology Advancement

Table 4. 2 ANOVA

Coefficients

The coefficients table provides information about the individual predictors and their impact on the dependent variable.

The constant term represents the intercept of the regression equation. In this case, the constant value is 1.090, and its associated p-value is 0.000, indicating that it is significantly different from zero.

The coefficient for Risk Management Strategies is 0.415, indicating that, on average, a one-unit increase in Risk Management Strategies leads to a 0.415 unit increase in Supply Chain Risk Management. This coefficient is statistically significant ($p = 0.000$), suggesting that Risk Management Strategies have a positive impact on Supply Chain Risk Management.

The coefficient for Healthcare Supply Chain Management Practices is 0.068, with a p-value of 0.044. This indicates that there is a positive relationship between Healthcare Supply Chain Management Practices and Supply Chain Risk Management, although the effect size is relatively small.

The coefficient for Technology Advancement is 0.099, and its associated p-value is 0.036. This suggests that Technology Advancement has a positive influence on Supply Chain Risk Management, although the effect size is relatively small.

The coefficient for Government Regulations is 0.059, with a p-value of 0.041. This indicates a positive relationship between Government Regulations and Supply Chain Risk Management, although the effect size is relatively small.

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | |
|-------|-----------------------------|------------|---------------------------|---|-------|------|
| | B | Std. Error | Beta | | | |
| 1 | (Constant) | 1.090 | .155 | | 7.039 | .000 |

| | | | | | |
|--|------|------|------|--------|------|
| Risk Management Strategies | .415 | .024 | .635 | 17.049 | .000 |
| Healthcare Supply Chain Management Practices | .068 | .034 | .084 | 2.025 | .044 |
| Technology Advancement | .099 | .047 | .092 | 2.099 | .036 |
| Government Regulations | .059 | .029 | .076 | 2.049 | .041 |

a. Dependent Variable: Supply Chain Risk Management

Table 4. 3 Coefficients

Correlations

The correlation matrix provides information about the relationships between the variables included in the study. All correlations between the variables are statistically significant at the 0.01 level (2-tailed), suggesting strong associations.

Supply Chain Risk Management and Risk Management Strategies

The Pearson correlation coefficient of 0.713 indicates a strong positive correlation between Supply Chain Risk Management and Risk Management Strategies.

Supply Chain Risk Management and Healthcare Supply Chain Management Practices

The Pearson correlation coefficient of 0.327 suggests a moderate positive correlation between Supply Chain Risk Management and Healthcare Supply Chain Management Practices.

Supply Chain Risk Management and Technology Advancement

The Pearson correlation coefficient of 0.402 indicates a moderate positive correlation between Supply Chain Risk Management and Technology Advancement.

Supply Chain Risk Management and Government Regulations

| | | Supply Chain Risk Management | Risk Management Strategies | Healthcare Supply Chain Management Practices | Technology Advancement | Government Regulations |
|--|---------------------|------------------------------|----------------------------|--|------------------------|------------------------|
| Supply Chain Risk Management | Pearson Correlation | 1 | .713** | .327** | .403** | .306** |
| | Sig. (2-tailed) | | .000 | .000 | .000 | .000 |
| | N | 402 | 402 | 402 | 402 | 402 |
| Risk Management Strategies | Pearson Correlation | .713** | 1 | .270** | .372** | .275** |
| | Sig. (2-tailed) | .000 | | .000 | .000 | .000 |
| | N | 402 | 402 | 402 | 402 | 402 |
| Healthcare Supply Chain Management Practices | Pearson Correlation | .327** | .270** | 1 | .559** | .266** |
| | Sig. (2-tailed) | .000 | .000 | | .000 | .000 |
| | N | 402 | 402 | 402 | 402 | 402 |

| | | | | | | |
|------------------------|---------------------|--------|--------|--------|--------|--------|
| Technology Advancement | Pearson Correlation | .403** | .372** | .559** | 1 | .362** |
| | Sig. (2-tailed) | .000 | .000 | .000 | | .000 |
| | N | 402 | 402 | 402 | 402 | 402 |
| Government Regulations | Pearson Correlation | .306** | .275** | .266** | .362** | 1 |
| | Sig. (2-tailed) | .000 | .000 | .000 | .000 | |
| | N | 402 | 402 | 402 | 402 | 402 |

The Pearson correlation coefficient of 0.306 suggests a moderate positive correlation between Supply Chain Risk Management and Government Regulations.

** . Correlation is significant at the 0.01 level (2-tailed).

Table 4. 4 Correlations

Hypothesis Testing

In this empirical study on supply chain risk management in the healthcare sector in Karachi, Pakistan, several hypotheses were formulated to test the relationships between the independent variables (Risk Management Strategies, Healthcare Supply Chain Management Practices, Technology Advancement, and Government Regulations) and the dependent variable (Supply Chain Risk Management). The hypotheses were tested using the data and statistical analysis.

Hypothesis 1: There is a positive relationship between Risk Management Strategies and Supply Chain Risk Management.

The analysis revealed a significant positive relationship between Risk Management Strategies and Supply Chain Risk Management ($\beta = .635$, $p < .01$). This result provides evidence to support Hypothesis 1, suggesting that organizations that implement effective risk management strategies are likely to have better supply chain risk management practices.

Hypothesis 2: There is a positive relationship between Healthcare Supply Chain Management Practices and Supply Chain Risk Management.

The findings indicated a positive relationship between Healthcare Supply Chain Management Practices and Supply Chain Risk Management ($\beta = .084$, $p < .05$). This supports Hypothesis 2, indicating that organizations that focus on improving their healthcare supply chain management practices are more likely to have better supply chain risk management.

Hypothesis 3: There is a positive relationship between Technology Advancement and Supply Chain Risk Management.

The analysis demonstrated a positive relationship between Technology Advancement and Supply Chain Risk Management ($\beta = .092$, $p < .05$). This provides support for Hypothesis 3, suggesting that organizations that adopt advanced technologies in their supply chain processes are more likely to have better risk management practices.

Hypothesis 4: There is a positive relationship between Government Regulations and Supply Chain Risk Management.

The results indicated a positive relationship between Government Regulations and Supply Chain Risk Management ($\beta = .076$, $p < .05$), supporting Hypothesis 4. This suggests that organizations operating in a regulatory environment that emphasizes supply chain risk management are more likely to have better risk management practices. All four hypotheses were supported based on the statistical analysis and significance levels. The study provides empirical evidence for positive relationships between Risk Management Strategies, Healthcare Supply Chain Management Practices, Technology Advancement, Government Regulations, and Supply Chain Risk Management in Karachi's healthcare sector. These findings suggest that organizations in the healthcare sector should prioritize the development of effective risk management strategies, improve supply chain management practices, adopt advanced technologies, and consider government regulations to enhance their supply chain risk management capabilities. By doing so, they can mitigate risks, improve operational resilience, and ensure efficient and effective healthcare supply chain management.

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | |
|-------|--|------------|---------------------------|------|--------|------|
| | B | Std. Error | Beta | | | |
| 1 | (Constant) | 1.090 | .155 | | 7.039 | .000 |
| | Risk Management Strategies | .415 | .024 | .635 | 17.049 | .000 |
| | Healthcare Supply Chain Management Practices | .068 | .034 | .084 | 2.025 | .044 |
| | Technology Advancement | .099 | .047 | .092 | 2.099 | .036 |

| | | | | | |
|------------------------|------|------|------|-------|------|
| Government Regulations | .059 | .029 | .076 | 2.049 | .041 |
|------------------------|------|------|------|-------|------|

a. Dependent Variable: Supply Chain Risk Management

Table 4. 5 Coefficients

Hypotheses Assessment Summary

It will be simple to differentiate our tested hypothesis by table 4.5. Through this thorough examination, we have determined that all hypotheses have been accepted, indicating a correlation between all variables and our dependent variable, Supply Chain Risk Management. Further elaboration on this topic will be presented in chapter 5, which covers Discussion, Conclusion, Limitations, and Recommendations.

| <i>Hypothesis</i> | Decision on the basis of accepted Hypothesis |
|---|---|
| <i>H1: Risk Management Strategies</i> | Accept |
| <i>H2: Healthcare Supply Chain Management Practices</i> | Accept |
| <i>H3: Technological Advancement</i> | Accept |
| <i>H4: Government regulations</i> | Accept |

Table 4. 6 Hypotheses Assessment Summary

Discussion, Conclusion, Limitations and Recommendations

Discussion

The empirical study in Karachi's healthcare sector unveiled significant findings on the relationship between factors and supply chain risk management. Risk management strategies, healthcare supply chain practices, technology advancement, and government regulations were found to have a significant impact. The model demonstrated moderate predictability and emphasized the importance of effective risk management in mitigating supply chain risks. The correlation matrix supported these findings, indicating positive correlations between supply chain risk management and the studied factors. Overall, our findings are aligned with the findings of the research published in the social sciences (e.g., Hong, Rasheed, Sigala, & Ahmad, 2023; Wang, Azam, Murtza, Shaikh, & Rasheed, 2023; Weng, Rasheed, & Yue, 2020; Yousaf, Humayon, Rasheed, Ahmed, & Danish, 2014; Yousaf, Rasheed, Hameed, & Luqman, 2020; Yousaf, Rasheed, Kaur, Islam, & Dhir, 2022; Zhang, Rasheed, & Luqman, 2020; Zhang, Wu, & Rasheed, 2020).

Conclusion

The empirical study concludes that supply chain risk management in Karachi, Pakistan's healthcare sector is influenced by risk management strategies, healthcare supply chain practices, technology advancement, and government regulations. Implementing effective strategies and advanced technologies improves supply chain risk management. Government regulations should support and enhance risk management practices in the healthcare sector.

Limitations

This study on supply chain risk management in Karachi, Pakistan's healthcare sector has limitations. It focused on one city, limiting generalizability. The reliance on self-reported data may introduce biases or inaccuracies. The cross-sectional design prevents establishing causality between predictors and supply chain risk management.

Recommendations

Based on the study's findings and limitations, the following recommendations are made for practitioners and researchers in the healthcare sector:

Develop and implement robust risk management strategies to effectively identify, assess, and mitigate supply chain risks.

- a) Embrace technology advancements such as data analytics, IoT, and blockchain to enhance visibility, traceability, and responsiveness in supply chain operations.
- b) Collaborate with government and regulatory bodies to stay informed about changing regulations and promote effective risk mitigation strategies.
- c) Conduct further research to expand the scope and variables considered for a more comprehensive understanding of supply chain risk management.

By implementing these recommendations, healthcare organizations can strengthen their supply chain risk management practices, mitigate disruptions, ensure patient safety, and improve operational resilience.

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