Szent István University

Doctoral School of Management and Business Administration

Relationship Quality and Related Activities of Pharmaceutical Supply Chain in Iraq

Theses of the Ph.D. dissertation

Waleed Ali Hussein Al-Zaidi

Gödöllő, Hungary

2018

Szent István University

Doctoral School of Management and Business Administration

Name of Doctoral School: Doctoral School of Management and Business Administration

Discipline: Management and Business Administration Sciences

Head of School: **Prof. Dr. Lehota, József, DSc, HAS Doctor**
Full Professor
Faculty of Economics and Social Sciences
Szent István University, Gödöllő, Hungary

Supervisors: **Prof. Dr. Csaba Bálint Illés, CSc,** Full Professor
Dr. habil Anna Dunay, PhD, Associate Professor
Faculty of Economics and Social Sciences
Department of Business Economics and Management
Szent István University, Gödöllő, Hungary

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Approval of Head of Doctoral School   **Approval of Supervisors**

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1. INTRODUCTION

The supply chain activities (Demand forecasting / needs estimating, Procurement and Inventory management), and relationship quality with suppliers (Trust, Cooperation, Communication and Commitment) are the soul of the supply chain; therefore, this research tries to clarify the role of supply chain activities and relationship quality on supply chain risks represented by (supply risks, demand risks and inventory risks) which in their turn affect the waste, these relationships were examined in Iraqi pharmaceutical supply chain represented by the state company for drug marketing and medical appliances (Kimadia) and health institutions. Kimadia is the only company that supplies the Iraqi health sector with medicines and medical appliances, which holds agreements and contracts with local and international pharmaceutical companies for the purpose of sending them to health bureau in the Iraqi provinces which in turn send them to hospitals and health sectors in the provinces. According to the interviews, the company's financial allocations in 2015 amounted to about 1,350,000,000 USD for purchasing medicines and medical appliances. It was noted that there is surplus, shortages, expiration and delay in medicines and medical materials for many reasons which cost millions of dollars (OFS, 2012, 2016). Therefore, it is necessary to study the most important problems in the Iraq pharmaceutical supply chain and select the main causes behind that.

In general, the contents of the study problem can be identified through the following questions:

- To what extent the activities of the pharmaceutical supply chain (Needs estimating, Procurement and Inventory system) are efficient?

- How well is the supply chain relationship quality in the pharmaceutical supply chain under study?

- Is there any risk in the pharmaceutical supply chain under study?

- Is there any kind of waste in the pharmaceutical supply chain under study?

- Is there any relationship between the supply chain relationship quality and its dimensions, and supply chain risks and its dimensions?

- Is there any relationship between the dimensions of supply chain risks?

- Is there any relationship between supply chain risks and wastes?

- Is the supply chain risks transfer from supplier to customers?

1.1. The Study Importance

The importance of the study comes from the importance of pharmaceuticals supply chain because of local limited studies in this field at the academic and applied levels, as well as, there is no study in international scope has studied supply chain activities and supply chain relationship quality and their role in the supply chain risks and wastes according to researcher's aware. Hence, the importance of this study lies in its attempt to fill the gap in this field. In addition, medicines consider as essential commodities that cannot be denied and have to be provided permanently to the patient and taking into account reducing all kind of waste in all activities along the pharmaceutical supply chain. In the same time, any shortages or surplus in medicines will cost the government a lot due to increasing the risk and waste. Therefore, the importance of study can be indicated as follows:

- Present a theoretical concept through the dialogue of previous literature reviews which is related to pharmaceutical supply chain, supply chain relationship quality, supply chain risks and waste which can contribute in building a strong base that can be utilized in the practical fields to improve the efficiency of the pharmaceutical supply chain.

- Measure the extent to which the activities of the pharmaceutical supply chain can be effectively adopted and implemented in order to minimize the supply chain risks and related wastes.

- Present a guideline for health organizations related to the the activities of pharmaceutical supply chain and reducing waste. This may be a worthwhile scientific addition because of rare studies in Iraqi literature in the field of management of pharmaceutical supply chain.

- Pharmaceutical supply chain helps health institutions to deliver needed medicines as well as reduce medicines waste by enhancing their performance for providing the best service for patients, which is the main aim for health organizations, at the lowest cost.

1.2. The Study Objectives

The study objectives try to construct a theoretical and practical framework for the study variables in a way that can achieve the following:

- Present the perceptions of the researchers in the concept of the supply chain, supply chain relationship quality, supply chain risks and types of waste in the supply chain.

- Clarify the importance of supply chain activities in the pharmaceutical supply chain and its role in the supply chain.

- Clarify the importance of supply chain relationship quality in the pharmaceutical supply chain

- Identify the supply chain risks and measure to what extent they are in Iraqi pharmaceutical supply chain and its role in waste.

- Clarify the nature of relationships between the study dimensions which include supply chain activities (demand forecasting, procurement and inventory management); supply chain relationship quality (trust, cooperation, communication and commitment); supply chain risks (supply risks, demand risks and inventory risks); and waste.

- Building a base in pharmaceutical supply chain for researchers to develop the Iraqi pharmaceutical supply chain.

1.3. The Study Hypotheses

The below hypotheses are investigated in Iraq government pharmaceutical supply chain including Kimadia and health institutions.

H1: There is a significant relationship between supply chain relationship quality (trust, co-operation, communication and commitment) and supply chain risks (supply risks, demand risks and inventory risks) in the pharmaceutical supply chain.

H2: There is a significant relationship between the dimensions of supply chain relationship quality represented by trust, cooperation, communication and commitment in the pharmaceutical supply chain.

H3: There is a significant relationship between the dimensions of supply chain risks (supply risks, demand risks and inventory risks) in the pharmaceutical supply chain.

H4: There is a relationship between supply chain risks and wastes in the pharmaceutical supply chain.

H5: There is a relationship between the pharmaceutical supply chain activities (demand forecasting / needs estimating, procurement and inventory management); and the supply chain risks.

2. MATERIALS AND METHODS

In order to test and answer the hypothesis and questions of the study, the researcher depended on the analytical and descriptive methods by studying the correlation and effect between the main and secondary variables by collecting the data related to the study variables and analyzing them, as well as, using the secondary data which collected from reports belong to different years which are prepared by Office of Financial Supervision. In this part, we clarify the population and the sample of the study, the tools and methods of data collection, the type of questionnaire tests, the study boundaries and the study limitations as follow:

2.1. The sample of the study

The study sample has included the directors or managers who work in the surveyed company (Kimadia) and health institutions who have responsibilities and information about the Iraqi pharmaceutical supply chain.

The researcher distributed (48) questionnaires to the directors and their assistant in Kimadia but the number of returned questionnaires which is suitable for statistical analysis were (42) forms which mean that the response rate was 88% which is a high rate, in addition, the number of questionnaires which distributed to the Diyala health institutions was 50 and the returned questionnaires which valid for statistical analysis were 42 which represent 84% which is high rate as illustrated in the table (1). The questionnaire distribution process was required more time and efforts from the researcher because of depending on the interviewing method to clarify the questionnaires, thus providing sufficient time and atmosphere for responders for freedom of expression about their opinion. As well as, made unstructured interviews with the 19 directors in different positions and health institutions in various provinces to describe and diagnoses the main risks and waste in the pharmaceutical supply chain, as shown in the table (4) which shows the interviewers according to health institutions in detail.

Table 1. The number and rate of distributed and received questionnaires in Kimadia and health institutions

Name of institution	Distributed questionnaires	Received questionnaires	Response rate
Kimadia	48	42	88%
Diyala health institutions	50	42	84%

Source: Author's own

The tables 2, 3 and 4 below describe the responders in detail in Kimadia and health institutions, as well as, the interviewers.

Table 2. Respondents of questionnaire in Kimadia

Education qualification													
High school and below		Technical Diploma		Bachelor		Higher Diploma		Master		PhD		Others	
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
1	2.4	6	14.3	32	76.2	1	2.4	2	4.8	-	-	-	-
Field of qualification													
Medical		Biology		Managerial		Chemistry		Physics		Others		Missing	
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
17	40.5	2	4.8	12	28.6	2	4.8	-	-	8	19	1	2.4
Experience years													
Less than 2		2-5		5-8		8-11		11-15		More than 15			
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%		
1	2.4	1	2.4	4	9.5	8	19	4	9.5	24	57.1		

Source: Author's own

The table above shows that there are high qualifications in Kimadia in different fields with long experience years.

Table 3. Main features of the respondents of questionnaire in health institutions

Education qualification													
High school and below		Technical Diploma		Bachelor		Higher Diploma		Master		PhD		Others	
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
		18	42.9	24	57.1								

Field of qualification											
Medical		Biology		Management		Chemistry		Physics		Others	
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
42	100										

Experience years											
Less than 2		2-5		5-8		8-11		11-15		More than 15	
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
5	11.9	10	23.8	9	21.4	3	7.1	4	9.5	11	26.2

Place of work															
Main drug store		Hospital drug stores		Sector drug stores		Hospital pharmacies		Primary health care pharmacies		Pharmacies of specialized medical center		Pharmacies of public clinic		Others	
No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
4	9.5	3	7.1	2	4.8	10	23.8	16	38.1	2	4.8	2	4.8	3	7.1

Geographic place					
City		Town		Village	
No.	%	No.	%	No.	%
25	59.5	12	28.6	5	11.9

Source: Author's own

The table above shows that the sample of the study is distributed from the last pharmacy in Diyala pharmaceutical supply chain until the main store in the Diyala health sector which give clear perception about the pharmaceutical supply chain under study. All employees who work in pharmacies and drug stores have medical qualification according to government regulations. As well as, the study sample includes different levels (main drug store and pharmacies and drug stores in hospitals, sectors, primary health care, specialized medical centers, public clinics and others which mean medical detachment which is located in remote villages) geographical areas (cities, towns and village) which help to understand pharmaceutical supply chain in different conditions. There are 64.2% of directors who have years' experience more than 5 years which mean that they have enough experience to deal with the questionnaire.

Table 4. Sample of interviewed persons according to health institutions in details

Name of health institution	Head of department	Director of main store in the province	Hospital drug store	Sector drug store	Public clinic drug store	Total
Kimadia	3					3
Diyala		2	2	2	1	7
Kirkuk		1		1		2
Baghdad			1	1		2
Babylon			1			1
Salah Al-Deen		1		1		2
Al-Anbar		1	1			2
Total	**3**	**5**	**5**	**5**	**1**	**19**

Source: Author's own

The table above shows that the interviews which conducted with the directors in Kimadia, which is the main company that provides the Iraqi health institutions with medicines and pharmaceutical supplies, and in 6 provinces health institutions out 18 provinces. There were some difficulties to make the interviews in all 18 provinces because it is not easy to visit all provinces health institutions with the current hard situation in Iraq. In the same time, all health institutions follow the central government health system, so, the researcher saw that these provinces are enough to be represented sample to understand the nature of the system and diagnose main problems.

2.2. The tools and methods of gathering data

The purpose of obtaining the necessary data is to achieve and examine the objectives and hypotheses of the study, so the researcher depended on books, scientific papers and conferences, reports, theses and etc. to cover the literature review; and use the following methods to collect the data in practical parts of the study:

- Unstructured interviews with the main directors in Kimadia and health institutions as mentioned in the table (4) to collect general data about the governmental supply chain in Iraq and diagnose the main weaknesses in the system to find suitable solutions. The interviews lasted for a long time during the study period, conducted through face-to-face interviews and through using social media for video call.

- The questionnaire was used as the main tool in data collection. It was considered in its formulation the ability to diagnose and measure the main and sub-variables of the study. The researcher relied on previous studies to determine the variables of the study, as well as benefiting from the opinions of experts and specialists in this field. The main aim of using the questionnaires in this study is the difficulties on getting the detail quantitative data related to dimensions of the study from the authorities in the pharmaceutical supply chain because it is a sensitive data for them, so, they were hesitant.

- Using some quantitative data about the surplus, shortages, delay and quality products problems which are published in the annual and quarterly reports of the Office of Financial Supervision and official website of Kimadia. The data are not regular data because the Office of Financial Supervision, is independent office cannot find all the problems or collect data of the pharmaceutical supply chain, however, these data can support the result interviews and questionnaires.

The questionnaire consists of two parts. the first part has a demographic data such as (education qualification, the field of qualification, experience years, place of work and geographic place) and the second part represented by the main two dimensions of measuring study, each one has sub-dimensions as shown in the table (5).

Table 5. The dimensions of the study in the questionnaire

The main dimensions	The sub-dimensions	The question sequence in the questionnaire	The question sequence in the text of study
Supply chain relationship quality	Trust	1-3	X1-X3
	Co-operation	4-6	X4-X6
	Communication	7-9	X7-X9
	Commitment	10-12	X10-X12
Supply chain risks	Supply risks	13-15	X13-X15
	Demand risks	16-18	X16-X18
	Inventory risks	19-21	X19-X21

Source: Author's own

The questionnaires were distributed to Kimadia and Diyala health institutions but for health institutions, just the supply chain risks dimension was in the questionnaire because they do not have relationship with suppliers just Kimadia, and they are linked centrally with them according to the Iraqi health system. Therefore, the researcher saw there was no need to ask them about the supply chain relationship quality dimension because only Kimadia can deal with pharmaceutical suppliers, and through health institutions, we can measure the supply chain risks in their area.

In all measures of the questionnaire, the 7-point Likert scale was used from a strongly agreed phrase which took the seven weights to a phrase that strongly disagree that took one weight. the seven scales were taken to give the responder more options to express his opinion (Sekaran, 2003, 199).

3. RESULTS

The main results of the current study have been founded by using three methods which are Interviews with directors of Kimadia and health institutions to describe the Iraqi government pharmaceutical supply chain and understanding the nature of the pharmaceutical system and supply chain activities; determine the main supply chain risks and knowing the main reasons behind the risks because of lack previous studies about the Iraqi pharmaceutical supply chain. The second method is based on the secondary data which is founded in some official reports about some problems in the Iraqi pharmaceutical supply chain which can assist to support the results of interviews and statistical analysis. The third method of getting results is the statistical analysis of the data which gathered by questionnaire.

3.1. The results of interviews in Iraqi government pharmaceutical supply chain

The governmental pharmaceutical supply chain in Iraq are represented by Kimadia and Health Institutions, therefore, several aspects related to the pharmaceutical supply chain are taken in this part such as the history of the state company for drug marketing and medical supplies (Kimadia) and Iraqi health institutions. After that, describe the nature of the relationship between Kimadia and suppliers, and Kimadia with health institutions. As well as, determine the strength and weakness of Kimadia; and clarify the supply chain activities in Kimadia and health institutions in details with focusing on the main risks in the supply chain activities. The main source of information of this part is interviews with the directors, as well as, some information online.

After analyzing Kimadia and health institutions and their supply chain activities, as well as, the problems in the supply chain activities and how the Kimadia and health institutions deal with the problems. There are several issues have been indicated, the relationship between Kimadia and their suppliers rely on arm-length relationship which means the main important thing is the price and there is no long-term relationship or commitment with them which lead to renew the contract every year and they change their supplier every year if there is no agreement about the price or quality according to the financial policy situation of Kemadia, which affected negatively on the supply chain activities such as (inaccurate demand forecasting/needs estimating, long procedures of procurement and variability in inventory management), therefore, the hypothesis H1 "There is a significant relationship between supply chain relationship quality (trust, co-operation, communication, and commitment) and supply chain risks (supply risks, demand risks, and inventory risks) in the pharmaceutical supply chain" is accepted.

It also was noted that any problem in the supply chain activities can cause lots of waste in the supply chain for example if the demand forecasting of medicines and pharmaceutical supplies is inaccurate, it can cause surplus or shortage in medicines and pharmaceutical supplies which might lead to expiration or damaging the quality of health service, for example, the complicated procedures of procurement create lots of problems in the pharmaceutical supply chain such as surplus, shortage, expiration, and delay in medicines and pharmaceutical supplies because of

purchasing a huge amount annually which causes an inaccuracy to estimate needs and increase the inventory costs which mean increasing the pharmaceutical supply chain risks and adding some kind of waste in the pharmaceutical supply chain such as (transportation, waiting, inventory, extra-process), which support the hypothesis H5 "there is a relationship between the pharmaceutical supply chain activities (demand forecasting / needs estimating, procurement and inventory management); and the supply chain risks".

The inventory risks such as surplus, expired and damaged medicines push the authorities to investigate these problems and select who is responsible about it which mean extra-process and work such as the formation of committees, transfer the surplus to other health institutions or urgent orders if there is a shortage, whereas, the shortages and delay in receiving pharmaceutical supplies can cause other kinds of waste such as transportation, waiting and extra-process so, the hypothesis H4 "there is a relationship between supply chain risks and wastes in the pharmaceutical supply chain".

3.2. Cross Checks of Primary Research Results on Official Reports Data

In this part, we try to add extra information based on the annual reports of Office of Financial Supervision (OFS), which has the power to access most of the information in the government's ministries and institutions, official website pages or other reports, to support the interviews and questionnaire results because getting these real quantitative data which shows the problems of Iraqi pharmaceutical supply chain clearly. In these reports, we found some tables which shows the amount of surplus, shortage and expiration medicines and pharmaceutical supplies and some other problems related to delay and supplier obligations which consider a small window to see the reality in the Iraqi pharmaceutical supply chain because these reports cannot discover all the problems in Iraq pharmaceutical supply chain. The reports have been discussed according to the information which collected from interviews and questionnaire which describe the current situation of Iraq pharmaceutical supply chain. These reports including (12) reports as follow:

1. Annual Report for 2008 Prepared by Office of Financial Supervision (OFS)
2. Annual Report for 2011 Prepared by Office of Financial Supervision (OFS)
3. Annual Report for 2012 Prepared by (أرنست ويونغ, Ernst & Young)
4. Fourth Quarter Report for 2014 Prepared by Office of Financial Supervision (OFS)
5. First Quarter Report for 2015 Prepared by Office of Financial Supervision (OFS)
6. Second Quarter Report for 2015 Prepared by Office of Financial Supervision (OFS)
7. Fourth Quarter Report for 2015 Prepared by Office of Financial Supervision (OFS)
8. First Quarter Report for 2016 Prepared by Office of Financial Supervision (OFS)
9. Second Quarter Report for 2016 Prepared by Office of Financial Supervision (OFS)
10. Fourth Quarter Report for 2016 Prepared by Office of Financial Supervision (OFS)
11. First Quarter Report for 2017 Prepared by Office of Financial Supervision (OFS)
12. Third Quarter Report for 2017 Prepared by Office of Financial Supervision (OFS)

Data discussion in the reports

Although the data obtained with respect to surplus and damaged medicines and other related problems, it does not reflect the real situation in the Iraqi pharmaceutical supply chain because the data and reports obtained reflect just a small percentage of what actually happens due to the reluctance of the official authorities to give data, so, the study was based only on which is disclosed in the reports of the Office of Financial Supervision as well as what is published in the official website of the Kimadia because there is no inventory management database. In this part,

we clarify and discus the reasons which leaded to cause the identified problems and which kind of waste might be generated as results of the problems as follow:

1. *Surplus, Shortage and Expiration*

All reports from 2008 to 2017 indicated a lack of certain types of medicines and other species surplus as previously indicated in the 2008, 2011, 2012, 2014, 2015, 2016 and 2017 reports which is consistent with the personal interviews and questionnaire form indicating that there is a shortage of some types of medicines and surplus in others. The surplus medicines should be transferred to the other health institutions which in need of medicines and pharmaceutical supplies according to government regulations. This means more administrative procedures, storage, and transport costs, thus increasing the cost in the supply chain, or it is liable to be expired in case there is no need to these kinds of surplus and this means waste of public money, which can be used to buy important drugs or fill the shortage of other species. The existence of surplus in medicines and pharmaceutical supplies mean more administrative procedures and the formation of committees to look for the default, if there is damaged medicines and waiting for the availability of medicine if there is a shortage and increase transport operations in order to transfer the surplus to the needy health institutions if there is need and increase the consumption of energy used for storage and thus increase emissions, which reflected negatively on the environment. As well as damage to the interests of the people through the lack of the possibility of providing other essential medicines. The problems of surplus, shortfall and expiry of the validity period are due to inefficient procurement activity and existing inventory management systems Kimadia and health institutions because they depend on the annual contract and bulk purchases (DIAS, 2012) which leads to inaccurate needs estimation, which can occur due to fluctuation in demand and poor coordination between the parties of supply chain, weak transparency and length of waiting or inflexibility as stated in previous studies (LEE et al. 1997; CHENT et al. 1999; NIENHAUS et al. 2006; BALTZAN & PHILLIPS, 2009; RAHMAN et al. 2014; WANG et al. 2016; AUGUSTO et al. 2014; GOODARZI et al. 2017; CAO et al. 2017). This means that there is a weakness in the efficiency of the Iraqi pharmaceutical supply chain, which stems from the weakness of the awareness of managers to modern administrative systems, which aims to avoid waste in all activities that do not add value and maintain a low stock level by building strong relationships with all parties in the supply chain starting from suppliers to customers and commitment to a limited number of suppliers and an attempt to rely on local suppliers and thus to achieve the interests of all parties as stated in the studies (FYNES, et al. 2005a; MOHAGHAR & GHASEMI, 2011; STEVENSON, 2012; HEIZER et al., 2017). The shortage also causes more administrative procedures and urgent requests to compensate for the shortage, which is causing confusion in the work of health institutions as well as Kimadia. As for damaged products, committees should be formed to investigate the causes of the problem, in addition to accompanying administrative procedures and transport operations in order to transfer them to those responsible for their destruction, which requires additional operations and funds in addition to environmental impact. The table (6) below shows the waste associated with excess, shortfall and expiry

Table 6. The types of waste associated with the surplus, shortage and expiration in medicines and pharmaceutical supplies

Type of wastes / Problems of Ph.SC	Transport	Extra-processing	Inventory	Waiting	Defects	Energy
Surplus	*	*	*		*	*
Shortage	*	*		*		
Expiration	*	*	*			

Source: Author's own

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As well as, this type of problem can be avoided through the use of the Vendor Managed Inventory (VMI), which can be implemented by building relationships with limited suppliers and complying with them and exchanging stock and consumption information using information technology (USAID, 2012), or the use of the continuous review system (DIAS, 2012. This requires suppliers who produce high-quality products in order to adopt the principle of quality at the source and not to spend a long time in inspection procedures, which increase the length of the waiting period and thus raise the level of safety inventory (STEVENSON, 2012; HEIZER et al., 2017).

2. Delay in shipment

The reports indicate that there is a delay in the completion of contracts, therefore delay in receiving the medicines and pharmaceutical supplies which corresponds to the information contained in the questionnaire and interviews where the officials interviewed said there was a delay in the completion of some contracts which leads to a defect in the scheduling of shipping and the accumulation of some materials in the warehouses as a result of delay in the first shipment and synchronization of arrival with the second shipment and this indicates the inefficiency of some suppliers or the lack of cooperation of some others or because of repeated contracts and long and traditional procurement procedures annually, which negatively affects the availability of the needs of health institutions for medicines and pharmaceutical supplies thus adversely affect patients.

In order to solve the problem of delay, the company must select the suppliers whose products are characterized by high quality and depend on the quality at the source as well as, commitment to a specific number of suppliers, preferably local suppliers or to attract the pharmaceutical companies to the inside of the country for the advantage of Kimadia strengths and work with them or long-term contracts and coordination through data sharing to provide the needs of health institutions on time, quantity and cost. The delay in arriving the medicines shipment on time can cause several wastes as shown in Table 7.

Table 7. The types of waste associated with the delay in medicines and pharmaceutical supplies

Type of wastes / Problems of Ph.SC	Transport	Extra-processing	Inventory	Waiting	Defects	Energy
Delay	*	*		*		

Source: Author's own

3. Quality of medicines and pharmaceutical supplies

Some previous reports indicated problems with the quality of some products which mean that there is unreliability of some suppliers handled by Kimadia. This indicates either a weak relationship with suppliers or inability to choose the right supplier or decision-makers are influenced by personal preferences or personal relationships.

In order to avoid this situation, the conditions to be met by the supplier must be observed. That any problem with the quality of the product requires the return of all products from all health institutions in the country which cause extra administrative processes and transportation to return the failed goods to the main supplier to return the amounts paid or compensation, which leads to a shortage of medicines until the arrival of the new shipment. Table 8 reflects waste activities associated with product quality problems.

Table 8. The types of waste associated with the quality problems in medicines and pharmaceutical supplies

Type of wastes Problems of Ph.SC	Transport	Extra-processing	Inventory	Waiting	Defects	Energy
Quality problems	*	*	*	*	*	*

Source: Author's own

4. Delay in information sharing (Communication)

The reports indicate that there is a delay in informing some health institutions about the failed medicines and pharmaceutical supplies despite the discovery early and the continued health institutions to use them even after the results of the examination which indicate the use of a high proportion of some medicines up to 97% for some of them despite the failure of the examination. The problem can happen as a result of weak communication and adopt traditional procedures by Kimadia and the health institutions, which need time to notify all health institutions and this also has serious damage to the health of patients to continue to use some failed medicines for a long period.

There are several kinds of wastes activities associated with delaying the reporting of failed medicines and pharmaceutical supplies, the most important one is affecting the health of citizens, which lead to the formation of committees to look for the person who responsible for that, which is accompanied by very large administrative procedures.

Therefore, the health institutions and Kimadia have to adopt the modern information technology systems such as (ERP, RFID) and linking all institutions with an electronic system for the purpose of raising transparency and reducing risks.

3.3. Statistical Analysis

The questionnaire has been used as a tool to collect data for statistical analysis which is important to investigate the study hypothesis by using the following analysis:

3.3.1. Statistical description

3.3.2. Correlation and

3.3.3. Regression

3.3.1. Statistical description

In order to understand the responses of the study sample for each dimension of the research, the frequencies, percentages, mean and standard deviation (S.D.) were used. The supply chain relationship quality was measured by four main dimensions (Trust, Co-operation, Communication, and Commitment); the second main dimension was measured by (Supply risk, Demand risk, and Inventory risk). Therefore, this analysis shows to what extent the pharmaceutical supply chain of Kimadia has a relationship with the suppliers and which kind of risks they have and is there any possibility to transfer the supply chain risks of Kimadia to health institutions. so, it is necessary to clarify the supply chain relationship quality of Kimadia and the supply chain risks, as well as, illustrate the supply chain risks at health institutions as follows:

Statistical description of supply chain relationship quality in Kimadia

The supply chain relationship quality dimension including four sub-dimensions namely trust, cooperation, communication and commitment. The statistical description for mentioned variables are as follows:

1. Trust

Table 9 shows that there is consistency in the answers of the sample in question X1 and X2 which tends to disagree and with the mean (2.6) and (2.9) and standard deviation (S.D.) (0.54) and (0.66), which means there is a weakness in loyalty and mutual help with suppliers. The answers of X3 indicating the dispersion of the answers and with the mean (4) and standard deviation (S.D.) (1,06), which means that some suppliers are well-qualified while there is a weakness in the competence of other suppliers.

Table 9. Frequency, percentage, mean and standard deviation of Trust

Qs.	(1)		(2)		(3)		(4)		(5)		(6)		(7)		Mean	S.D
	F	%	F	%	F	%	F	%	F	%	F	%	F	%		
X1			18	42.9	23	54.8	1	2.4							2.6	0.544
X2			8	19	30	71.4	2	4.8	2	4.8					2.9	0.661
X3			2	4.8	15	35.7	8	19	15	35.7	2	4.8			4	1.06

Source: Authors' own based on SPSS results

2. Co-operation

Table 10 shows that there is a harmony in the answers of the sample in question X4 and X5 which tends to disagree and with the mean (2.29) and (1.76) and standard deviation (S.D.) (0.86) and (0.65), which means there is a weakness in cooperation to improve products quality; and production, demand and consumption planning. Whereas the answers of X6 indicating the dispersion of the answers and with the mean (3.98) and standard deviation (S.D.) (1.19), which means that some suppliers are able to deal immediately with the complains, whereas, there is a weakness of response from other suppliers.

Table 10. Frequency, percentage, mean and standard deviation of co-operation

Qs.	(1)		(2)		(3)		(4)		(5)		(6)		(7)		Mean	S.D
	F	%	F	%	F	%	F	%	F	%	F	%	F	%		
X4	9	21.4	14	33.3	17	40.5	2	4.8							2.29	0.86
X5	15	35.7	22	52.4	5	11.9									1.76	0.65
X6			3	7.1	18	42.9	1	2.4	17	40.5	3	7.1			3.98	1.19

Source: Authors' own based on SPSS results

3. Communication

Table 11 indicates that there is a harmony in the answers of the sample in question of communication X7, X8, and X9 which tend to disagree and with the mean (1.81), (1.81) and (1.76) and standard deviation (S.D.) (0.59), (0.74) and (0.65), which means there is a very weak communication with suppliers.

Table 11. Frequency, percentage, mean and standard deviation of communication

Qs.	(1)		(2)		(3)		(4)		(5)		(6)		(7)		Mean	S.D
	F	%	F	%	F	%	F	%	F	%	F	%	F	%		
X7	12	28.6	26	61.9	4	9.5									1.81	0.59
X8	16	38.1	18	42.9	8	19									1.81	0.74
X9	15	35.7	22	52.4	5	11.9									1.76	0.65

Source: Authors' own based on SPSS results

4. Commitment

The answers of X10 and X11 indicating the dispersion of the answers and with the mean (3.98) and (4.05) and standard deviation (S.D.) (0.97) and (1.1), which means that some suppliers

deserve to keep the relationship with them and Kimadia is committed with some suppliers whereas, other suppliers do not deserve to keep the relationship with them. The X12 with the mean (2.55) and standard deviation (0.83) indicates there is no long-term relationship with all suppliers because Kimadia follows the government regulation and it can be affected by the political situation. See Table 12.

Table 12. Frequency, percentage, mean and standard deviation of commitment

Qs.	(1)		(2)		(3)		(4)		(5)		(6)		(7)		Mean	S.D
	F	%	F	%	F	%	F	%	F	%	F	%	F	%		
X10					20	47.6	3	7.1	19	45.2					3.98	0.97
X11			3	7.1	14	33.3	4	9.5	20	47.6	1	2.4			4.05	1.1
X12	5	11.9	13	31	20	47.6	4	9.5							2.55	0.83

Source: Authors' own based on SPSS results

Statistical description of supply chain risks in Kimadia

The supply chain risks dimension including three sub-dimensions namely supply risks, demand risks and inventory risks, so, in this part we will review and clarify the the statistical description for each variable as follow:

1. Supply risks

Table 13 indicates that there is a harmony in the answers of the sample in questions of supply risks X13, X14, and X15 which tend to agree and with the mean (5.69), (5.40) and (6.26) and standard deviation (S.D.) (0.83), (0.98) and (0.73), which means there is a risk related to supply medicines and pharmaceutical supplies because of long lead-time, delay in receiving and long purchasing procedures.

Table 12. Frequency, percentage, mean and standard deviation of supply risks

Qs.	(1)		(2)		(3)		(4)		(5)		(6)		(7)		Mean	S.D
	F	%	F	%	F	%	F	%	F	%	F	%	F	%		
X13									22	52.4	11	26.2	9	21.4	5.69	0.83
X14					4	9.5	1	2.4	13	31	22	52.4	2	4.8	5.40	0.98
X15									7	16.7	17	40.5	18	42.9	6.26	0.73

Source: Authors' own based on SPSS results

2. Demand risks

Table 14 indicates that there is a harmony in the answers of the sample in questions of supply risks X16, X17, and X18 which tend to agree and with the mean (6.40), (5.31) and (5.21) and standard deviation (S.D.) (0.66), (0.84) and (0.60), which means there is a risk related to demand medicines and pharmaceutical supplies because of inaccurate needs estimating, difficulties in facing urgent orders and there is no possibility to get all needs.

Table 13. Frequency, percentage, mean and standard deviation of demand risks

Qs.	(1)		(2)		(3)		(4)		(5)		(6)		(7)		Mean	S.D
	F	%	F	%	F	%	F	%	F	%	F	%	F	%		
X16									4	9.5	17	40.5	21	50	6.40	0.66
X17					1	2.4	4	9.5	21	50	13	31	3	7.1	5.31	0.84
X18					1	2.4			31	73.8	9	21.4	1	2.4	5.21	0.60

Source: Authors' own based on SPSS results

3. Inventory risks

Table 15 indicates that there is a harmony in the answers of the sample in questions of supply risks X19, X20, and X21 which tend to agree and with the mean (5.55), (5.29) and (6.52) and standard deviation (S.D.) (0.55), (1.1) and (0.50), which means there is a risk related to inventory medicines and pharmaceutical supplies such as surplus, expiration, and shortages. In X20 we can see a high rate of neutral responses because some responders afraid of responsibility.

Table 14. Frequency, percentage, mean and standard deviation of inventory risks

Qs.	(1)		(2)		(3)		(4)		(5)		(6)		(7)		Mean	S.D
	F	%	F	%	F	%	F	%	F	%	F	%	F	%		
X19							1	2.4	17	40.5	24	57.1			5.55	0.55
X20					4	9.5	6	14.3	10	23.8	18	42.9	4	9.5	5.29	1.1
X21											20	47.6	22	52.4	6.52	0.50

Source: Authors' own based on SPSS results

Statistical description of supply chain risks in Diyala health institutions

In this part, the frequencies of questionnaires which distributed to the directors in Diyala health institutions will be clarified to illustrate the supply chain risks which are represented by (Supply risks, Demand risks, and Inventory risks) to show to what extent the supply chain risks are founded in the health institutions and show if it is possible to transfer the risk from supplier to customers as follow:

1. Supply risks

Table 16 indicates that there is a harmony in the answers of the sample in the question X13 which shows a high rate of disagree and the mean is (1.81) with standard deviation (0.67), which means that there is a suitable lead time for health institutions to get medicines and pharmaceutical supplies. Whereas there is a fluctuation in time delivery of medicines and pharmaceutical supplies as shown in the rate of agreeing of X14 which is (79.6) and the mean is (5.21) with standard deviation (1.04). In the X15 the rate of strongly disagree is (100%) they choose that because they are not responsible for buying medicines and pharmaceutical supplies which are provided by Kimadia and they can just buy a few urgent kinds of medicines.

Table 15. Frequency, percentage, mean and standard deviation of supply risks

Qs.	(1)		(2)		(3)		(4)		(5)		(6)		(7)		Mean	S.D
	F	%	F	%	F	%	F	%	F	%	F	%	F	%		
X13	14	33.3	22	52	6	14.3									1.81	0.67
X14					5	11.9	1	2.4	19	45.2	14	33.3	3	7.1	5.21	1.04
X15	42	100													1	0.0

Source: Authors' own based on SPSS results

2. Demand risks

Table 17 indicates that there is a harmony in the answers of the sample in questions of supply risks X16, X17, and X18 which tend to agree and with the mean (5.24), (5.43) and (6.19) and standard deviation (S.D.) (0.72), (0.50) and (0.67), which means there is a risk related to demand medicines and pharmaceutical supplies because of inaccurate needs estimating, difficulties in facing urgent orders and there is no possibility to get all needs.

Table 16. Frequency, percentage, mean and standard deviation of demand risks

Qs.	(1)		(2)		(3)		(4)		(5)		(6)		(7)		Mean	S.D
	F	%	F	%	F	%	F	%	F	%	F	%	F	%		
X16					2	4.8	1	2.4	24	57.1	15	35.7			5.24	0.72
X17									24	57.1	18	42.9			5.43	0.50
X18									6	14.3	22	52.4	14	33.3	6.19	0.67

Source: Authors' own based on SPSS results

3. Inventory risks

Table 18 indicates that there is a high rate agreeing on X19, X20 and X21 in the answers of the sample in questions of inventory risks and with the mean (4.95), (4.50) and (5.90) and standard deviation (S.D.) (1.05), (0.99) and (0.72), which means there is a risk related to inventory medicines and pharmaceutical supplies because of such as surplus, expiration, and shortages.

Table 18. Frequency, percentage, mean and standard deviation of inventory risks

Qs.	(1)		(2)		(3)		(4)		(5)		(6)		(7)		Mean	S.D
	F	%	F	%	F	%	F	%	F	%	F	%	F	%		
X19					7	16.7	3	7.1	17	40.5	15	35.7			4.95	1.05
X20					11	26.2	3	7.1	24	57.1	4	9.5			4.50	0.99
X21									13	31	20	47.6	9	21.4	5.90	0.72

Source: Authors' own based on SPSS results

After explaining the risks in Diyala health institutions, it can be said that the risks of supplier can transfer to the customers.

3.3.2. Correlations Analysis

The researcher seeks to verify the validity of research hypotheses related to the correlation between the research variables, which were formulated based on the problem of research and used Pearson correlation to test the correlation between the key variables and sub-variables to determine the relationship between the variables of research by using the statistical program (SPSS).

Based on the first main hypothesis, which states that there is a significant relationship between supply chain relationship quality (trust, co-operation, communication and commitment); and supply chain risks (supply risks, demand risks and inventory risks) in the pharmaceutical supply chain of Kimadia, Table 19 shows the significant correlation between the supply chain relationship quality and supply chain risks. The correlation coefficient between supply chain relationship quality and supply chain risks is (- 0.892**) which is significant at the (0.01) level which indicate that there is a significant and negative correlation of correlation, which provides a basis for accepting the first main hypothesis. The highest correlation value is between supply chain relationship quality and supply risks which is (- 0.828**) whereas the lowest one is between supply chain relationship quality and demand risks which is (- 0.727**).

The other correlation values indicate that there is a significant correlation between trust and supply chain risks can be clarified through correlation values which show that there is a significant correlation between trust and supply chain risks which is (- 0.812**) which is significant at the (0.01) level. The highest correlation coefficient recorded with supply chain risks (- 0.820**), whereas, the lowest one indicated with demand risks (- 0.603**).

The correlation values between cooperation and supply chain risks is significant. The correlation coefficient between the cooperation and supply chain risks which is (- 0.787**) which mean there is a negative significant correlation. The correlation coefficient between cooperation and

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supply risks is the highest which is (- 0.779**), whereas, the lowest correlation coefficient pointed with demand risks (- 0.584**).

The relationship between communication and supply chain risks has been indicated by correlation values (- 0.576**) which mean there is a negative significant correlation. The correlation coefficient between the communication and demand risks is the highest (- 0.584**), whereas, the lowest coefficient is recorded with inventory risks (- 0.463**).

The significant relationship between commitment and supply chain risks, proved by the correlation coefficient between commitment and supply chain risks which is (- 0.807**). the highest correlation coefficient is between commitment and inventory risks (- 0.754**), whereas, the lowest is with demand risks (- 0.686**).

Table 17. Correlation coefficients of study variables

SCR variables / SCRQ variables	Supply chain risks	Supply risks	Demand risks	Inventory risks
SCRQ	- 0.892**	- 0.828**	- 0.727**	- 0.793**
Trust	- 0.812**	- 0.820**	- 0.603**	- 0.702**
Co-operation	- 0.787**	- 0.779**	- 0.584**	- 0.699**
Communication	- 0.576**	- 0.489**	- 0.584**	- 0.463**
Commitment	- 0.807**	- 0.692**	- 0.686**	- 0.754**

Source: Author's own based on SPSS results
** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 20 shows the significant correlation between supply chain relationship quality dimensions (trust, cooperation, communication, and commitment). The highest correlation coefficient between trust and cooperation which is (0.780**) whereas, the lowest value is between cooperation and communication which is (0.471**). So, the second main hypothesis H2 "there is a significant correlation between the dimensions of supply chain relationship quality" is accepted.

Table 18. Correlation coefficients of supply chain relationship quality

	Trust	Co-operation	Communication	Commitment
Trust	1	0.780**	0.575**	0.684**
Co-operation		1	0.471**	0.703**
Communication			1	0.481**
Commitment				1

Source: Author's own based on SPSS results
** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

Table 21 shows the significant correlation between supply chain risks dimensions (supply risks, demand risks, and inventory risks). The highest correlation coefficient indicated is between supply risks and inventory risks which is (0.734**) whereas, the lowest value is between demand risks and inventory risks which is (0.588**). According to results, the third main hypothesis H3 "there is a significant relationship between the dimensions of supply chain risks (supply risks, demand risks and inventory risks)" is accepted.

Table 19. Correlation coefficients of supply chain risks

	Supply risks	**Demand risks**	**Inventory risks**
Supply risks	1	0.661**	0.734**
Demand risks		1	0.588**
Inventory risks			1

Source: Author's own based on SPSS results

** Correlation is significant at the 0.01 level (2-tailed).
* Correlation is significant at the 0.05 level (2-tailed).

3.3.3. Regression Analysis

This part clarifies the regression analysis for study variables and approving the study hypothesis by using Simple Linear Regressions.

According to Table 22, There is the significant impact of supply chain relationship quality on supply chain risks at the significance level (0.00), the F value is (155,161) and R2 is (0.795) which mean that the supply chain relationship quality can interpret 79.5% of the changes in supply chain risks, whereas, the 20.5% of changes can be happened because of other variables are not founded in the current research. Therefore, the first main hypothesis H1 "There is a significant relationship between supply chain relationship quality (trust, co-operation, communication and commitment) and supply chain risks (supply risks, demand risks and inventory risks)" is accepted.

Table 20. The impact of supply chain relationship quality on supply chain risks

Independent variable	**Dependent variable**	**R2**	**F-value**	**Sig.**
Supply chain relationship quality	**Supply chain risks**	0.795	155,161	0.00
P ≤ 0.05				

Source: Author's own based on SPSS results

The results in Table 23 indicate the significant impact of trust on the supply chain risks, the F value is (77.245) at the significance level (0.00) and R2 (0.659) which mean that trust interprets 65,9% of changes in supply chain risks, whereas, 34.1% of changes related to other variables. As well as, there are three significant impacts of trust on supply risks, demand risks and inventory risks with F value (82.244, 22.835 and 38.906) at the significance level (0.00) and R2 (0.673, 0.363 and 0.493). The significant impact of trust on supply chain risks (supply risks, demand risks and inventory risks) enhances approving of H1 "There is a significant relationship between supply chain relationship quality (trust, co-operation, communication and commitment) and supply chain risks (supply risks, demand risks and inventory risks)".

Table 21. The impact of trust on supply chain risks dimensions

Independent variable	**Dependent variables**	**R2**	**F-value**	**Sig.**
Trust	**Supply chain risks**	0.659	77,245	0.00
	Supply Risks	0.673	82.244	0.00
	Demand risks	0.363	22.835	0.00
	Inventory risks	0.493	38.906	0.00
P ≤ 0.05				

Source: Author's own based on SPSS results

The results in Table 24 shows significant impact of co-operation on supply chain risks (supply risks, demand risks and inventory risks) according to F value (65.162) at the significance level (0.00) and R2 (0.620) which interprets 62% of changes in supply chain risks, whereas, 38% of changes are interpreted by other variables. As well as, the significant impact of cooperation indicated on (supply risks, demand risks and inventory risks) with F value (61.858, 20.654 and 38.177) at the significance level (0.00) and R2 (0.607, 0.341 and 0.488). So, the significant

impact enhances approving of H1 "There is a significant relationship between supply chain relationship quality (trust, co-operation, communication and commitment) and supply chain risks (supply risks, demand risks and inventory risks)".

Table 22. The impact of cooperation on supply chain risks dimensions

Independent variable	Dependent variables	R2	F-value	Sig.
Cooperation	Supply chain risks	0.620	65.162	0.00
	Supply Risks	0.607	61.858	0.00
	Demand risks	0.341	20.654	0.00
	Inventory risks	0.488	38.177	0.00
P ≤ 0.05				

Source: Author's own based on SPSS results

Table 25 shows the significant impact of communication on supply chain risks (supply risks, demand risks and inventory risks) which is clarified through F value (19.837) at the significance level (0.00) and R2 (0.332) which mean that the communication interprets 33.2% of changes in supply chain risks, whereas, 76,8% of changes are interpreted by other variables. As well as, communication has the impact on (supply risks, demand risks, and inventory risks) with F value (12.604, 20.747 and 10.939) at the significance level (0.01, 0.00 and 0.02) and R2 (0.240, 0.342 and 0.195). So, the significant impact enhances approving the first hypothesis H1 "There is a significant relationship between supply chain relationship quality (trust, co-operation, communication and commitment) and supply chain risks (supply risks, demand risks and inventory risks)".

Table 23. The impact of communication on supply chain risks dimensions

Independent variable	Dependent variables	R2	F-value	Sig.
Communication	Supply chain risks	0.332	19.837	0.00
	Supply Risks	0.240	12.604	0.01
	Demand risks	0.342	20.747	0.00
	Inventory risks	0.195	10.939	0.02
P ≤ 0.05				

Source: Author's own based on SPSS results

Table 26 shows the impact of commitment on supply chain risks (supply risks, demand risks and inventory risks) through F value (74.443) at the significance level (0.00) and R2 (0.650) which mean that the commitment interprets 65% of changes in supply chain risks. As well as, the commitment has the significant impact on (supply risks, demand risks, and inventory risks) with F value (36.701, 35.564 and 52.666) at the significance level (0.00) and R2 (0.478, 0.471 and 0.568). So, the significant impact enhances the approving of H1 "There is a significant relationship between supply chain relationship quality (trust, co-operation, communication and commitment) and supply chain risks (supply risks, demand risks and inventory risks)".

Table 24. The impact of commitment on supply chain risks dimensions

Independent variable	Dependent variables	R2	F-value	Sig.
Commitment	Supply chain risks	0.650	74.443	0.00
	Supply Risks	0.478	36.701	0.00
	Demand risks	0.471	35.564	0.00
	Inventory risks	0.568	52.666	0.00
P ≤ 0.05				

Source: Author's own based on SPSS results

Based on the results in Table 27 and Table 28, the third hypothesis H3 "there is a significant relationship between the dimensions of supply chain risks (supply risks, demand risks and

inventory risks)" is enhanced. The supply risks and demand risks F value is (30.955) at the significance level (0.00) and R2 (0.436) which means that the supply risks interpret 43.6% of changes in demand risks. Whereas, F value of supply risks and inventory risks is (46.680) at the significance level (0.00) and R2 (0.539) which means that the supply risks interpret 53.9% of changes in inventory risks.

Table 25. The impact of supply risks on demand risks and inventory risks

Independent variable	Dependent variable	R2	F-value	Sig.
Supply risks	Demand risks	0.436	30.955	0.00
	Inventory risks	0.539	46.680	0.00
P ≤ 0.05				

Source: Author's own based on SPSS results

Table 28 shows the significant impact for demand risks on inventory risks based on the results which represented by F value (21.139) at the significance level (0.00) and R2 (0.346).

Table 26. The impact of demand risks on inventory risks

Independent variable	Dependent variable	R2	F-value	Sig.
Demand risks	Inventory risks	0.346	21.139	0.00
P ≤ 0.05				

Source: Author's own based on SPSS results

4. NEW RESULTS

Based on the discussion of my research results, the new results that are important in the pharmaceutical supply chain are summarized in the following:

1. **The long procedures of procurement which increase the lead-time, affect both the accuracy of demand forecasting/needs estimating and inventory management which increases the risks of supply chain** (i.e. supply risks, demand risks, and inventory risks) and creates waste in the pharmaceutical supply chain in transportation, extra-processes, waiting and inventory. (This was proved by the results of the interviews and the statistical analysis, as interviewed managers mentioned the long and complicated procurement which needs more than one-year for Kimadia to increase the inventory level to avoid shortages in the health institutions. This leads to the increase of inventory risks such as surplus and shortages, the long waiting time for receiving the orders placed by health institution will assist to create waste in the pharmaceutical supply chain (e.g. in transportation to transfer extra amount to another place, extra-processes and losing medicines due to expiration.)

2. **The inventory management policy in Kimadia by using annual review based on annual purchasing** affect the Iraqi pharmaceutical supply chain and **increase the supply chain risks** which mean the annual replenishment system cannot be effective in reducing the risks in the Iraqi pharmaceutical supply chain. Whereas, the vendor managed inventory (VMI) and continuous review system are effective according to the previous literature review but, in some countries, which have close suppliers and using information technology system. The current annual purchasing system forces Kimadia to use annual replenishment, which has the main role to increase the inventory risks, whereas, it was clear in the literature review that Vendor Managed Inventory (VMI) and Continues Review are effective in managing inventories.

3. **I categorized the problems and risks of the Iraqi pharmaceutical supply chain from the viewpoint of the different players and proved, that** s**upply chain risks, represented by**

supply risks, demand risks and inventory risks, are considered the essential source for generating several types of waste in Iraqi pharmaceutical supply chain. These findings were appeared clearly in the results of interviews, especially, when there is a delay in receiving the pharmaceutical materials at time that leads to the accumulation of pharmaceuticals in the coming times and causing excess inventory which in turn leads to create waste in the pharmaceutical supply chain. Health institutions have to find a solution for extra inventory by informing the authorities and transfer the surplus of medicines to another health institution if they need, otherwise the extra medicines will be exposed to expiry or damage that means extra-processes, transportation, more motion, and more energy for storage.

4. **The supply chain relationship quality including trust, co-operation, communication, and commitment has a negative significant relationship with the supply chain risks** represented by supply risks, demand risks, and inventory risks, which lead to create several kinds of waste in the pharmaceutical supply chain. This has been clarified in the statistical analysis which shows that the supply chain relationship quality represented by its dimensions (trust, co-operation, communication, and commitment) has a significant impact on supply chain risks which lead to create waste.

5. **The supply risks and demand risks in the pharmaceutical supply chain affect the inventory risks, which create waste in the pharmaceutical supply chain**. The problems created by supply risks such as delay, unreliable and inflexible supply lead to make the directors of pharmaceutical storages confused about the required amount because of uncertainty, which leads to inaccurate estimating for pharmaceutical materials which also increase the waste in the pharmaceutical supply chain.

5. CONCLUSIONS AND RECOMMENDATIONS

5.1. Conclusions

The issues of the supply chain are one of the most important topics in organizations today, especially in the field of medicines and pharmaceutical supplies, because of the challenges faced by organizations today, which is reflected in the constant search for new ways to improve the efficiency of supply chain in providing the service permanently and reduce the risks by establishing strong relationships with the supply chain members, consequently, reduce the waste. According to collected and analyzed data through interviews, questionnaires and secondary data, several results are concluded as follows:

1. According to the literature review, the management of supply chain activities has the main role in increasing the efficiency by enhancing the relationship quality through the members of the supply chain which lead to reducing risks and waste in the supply chain.

2. Based on the interviews, there is a weakness in the relationships between Kimadia and their suppliers and use traditional way for procurement and inventory management by using annual purchasing, as well as estimate needs two years before the specific time. In addition, there are several risks in the pharmaceutical supply chain of Kimadia and health institutions such as surplus, shortages, expiration, delay and quality problems which lead to creating waste like extra-transportation, waiting, inventory, over-process, and defects, because when there are surplus, shortages, expiration, delay and quality problems the authorities try to investigate the problems and transfer the surplus amount to other institutions and apply for an urgent order if there is a shortage, as well as, the health institutions have to wait without medicines and pharmaceutical supplies if there is a delay in shipment arriving, whereas, if there are expiration or problems in the medicines quality the authorities have to formulate a

committee to determine who is responsible about that. All the previous risks or problems lead to extra administration process, transportation, waiting.

3. The results of questionnaires indicate some conclusions related to frequencies, correlations and regression analysis as follow:

   - The frequencies mention that there is a weakness in the supply chain relationship quality between Kimadia and their suppliers and there are supply, demand and inventory risks in the supply chain, whereas, the frequencies of health institutions indicate that there are risks related to supply, demand and inventory which mean the risks of suppliers can affect the customer as well.

   - There is a significant correlation between supply chain relationship quality and supply chain risks, as well as, between the dimensions of supply chain relationship quality itself and between supply chain risks itself as well.

   - There is a significant regression between the supply chain relationship quality and its dimensions; and supply chain risks and its dimensions. As well as, there is a significant regression between supply and inventory risks and demand and inventory risks.

4. The secondary data / quantitative data which founded in the reports proved that there are supply, demand and inventory risks through the surplus, shortage, expiration, quality problems and delay in the medicines and pharmaceutical supplies. As well as, indicate that there is a weakness in communication through supply chain because of late informing the health institutions about the quality problems in medicines and pharmaceutical supplies which lead to create waste such as transportation, inventory, waiting, extra-process and defects as mentioned in the paragraph of interviews.

According to the results, the study hypothesis is clarified in term of acceptance in Table 29.

Table 27. Clarify the acceptance or the rejection of the hypothesis

Hypothesis	The reason of acceptance
H1:	The hypothesis is accepted according to the correlation analysis results which is (- 0.892**) and the regression analysis results which shows F-value (155,161) at significance level 0.00 and R2 is (0.795). As well as, the results of interviews confirm that. In addition, the regression analysis results of supply chain relationship quality dimensions (trust, co-operation, communication and commitment) show that there is significant impact on supply chain risks (supply risks, demand risks and inventory risks).
H2:	The hypothesis is accepted according to the correlation analysis results as follow: Trust and cooperation is (0.780**). Trust and communication is (0.575**). Trust and commitment is (0.684**). Cooperation and communication is (0.471**) Cooperation and commitment is (0.703**). Communication and commitment is (0.481**)

Hypothesis	The reason of acceptance
H3:	The hypothesis is accepted according to the correlation analysis results as follow:
	Supply risks and demand risks is (0.661**)
	Supply risks and inventory risks is (0.734**)
	Demand risks and inventory risks is (0.588**). As well as, the regression analysis confirms that according to the results of F value and R2 as follow:
	The impact of supply risks on demand risks is significant according to F-value (30.955) at significance level 0.00 and R2 is (0.436).
	The impact of supply risks on inventory risks is significant according to the F value (46.680) at significance level 0.00 and R2 is (0.539).
	The impact of demand risks on inventory risks is significant according to F-value (21.139) at significance level 0.00 and R2 is (0.346).
H4:	The hypothesis is accepted according to the interview results which shows that risks in the pharmaceutical supply chain such as delay or inaccurate demand forecasting or surplus or shortages create several kinds of waste such as waiting, transportation, extra-process, and energy.
H5:	The hypothesis is accepted according to the interview results which shows that the activities of supply such as demand forecasting, procurement, and inventory management have the main role in creating risks in the pharmaceutical supply chain especially when there are long and complicated procedures of procurement which affect the accuracy of demand forecasting and increasing the inventory risks which create waste.

Source: Author's own

5.2. Recommendations

Based on the conclusions presented earlier, this part presents the most important recommendations to the state company for medicines marketing and pharmaceutical appliances (Kimadia) and health institutions as follow:

1. Trying to invite the pharmaceutical manufacturers inside the country or support local medicines companies to ensure flow the medicines and pharmaceutical supplies in small frequent batches to reduce the inventory levels, consequently, reducing supply chain risks and waste.

2. Kimadia has to pay attention towards enhancing the relationship quality with the suppliers in order to reduce the supply chain risks and increase the efficiency of the supply chain activities such as procurement and inventory management consequently increase the accuracy of demand forecasting or needs estimating which eliminate waste.

3. Using modern information technology system to manage the warehouses, sharing information with the supply chain members and facilitate the purchasing procedures. This case needs increasing the efforts to train the employees in health institutions to use new information system and another challenge is that the internet network is still weak.

4. Using quality at source strategy instead of spending long time to inspect medicines and pharmaceutical supplies by dealing with high-quality suppliers.

5. Using the strategy of removing waste and problems from source instead of treating the problem after happening. In order to achieve this goal, the responsible managers have to deployment the lean thinking in the whole Iraqi pharmaceutical supply chain.

6. Try using the continuous review of inventory instead of annually purchasing / review to raise the level of demand forecasting or needs estimating accuracy and removing the waste in inventories such as surplus, shortage, expiration, and check time of medicines and pharmaceutical supplies. This recommendation depends on the previous recommendations which mentioned in 1, 2, 3, 4 and 5.

6. RELATED PUBLICATIONS

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