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Original Research

A two-year purchasing system versus a one-year purchasing system applied to medications public tenders in Jordan: A descriptive and cost-saving retrospective study

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Abstract

Background: Governments are concerned about medication costs and the availability of medications in healthcare systems. Medications shortages lead to added expenses, such as transportation costs and purchasing from a single supplier. No previous research has been conducted with the Jordanian Joint Procurement Department (JPD) to address this issue. **Objective:** This study aims to investigate Jordan's purchasing system and provide suggestions for improving medication availability, in particular, to reduce costs, stock-outs, and shortages of medications. This study compares the one-year purchasing versus the two-year purchasing system for public tender medications. **Study design:** the present study followed a retrospective study design, with questionnaires for validation and conduct. We also conducted a cost analysis to compare the savings of purchasing medications for one year with two years. **Method:** A 15-question questionnaire was meticulously created and extensively validated by experts in the field for both face and content validity. The questionnaire was then completed by pharmacists from the Jordan Food and Medication Association and JPD. Furthermore, statistical analytical methods were used to identify the most optimal cost-benefit scenario for medications. **Results:** In the survey, 81 pharmacists participated and shared their views on the purchasing system in the JPD. As per the majority of the participants (71.6%), the two-year purchasing system ensures the availability of medications and minimises stock-out situations compared with the one-year system. Additionally, 79.0% of the sample said that purchasing a larger quantity of medications is beneficial. The study findings showed that following the two-year purchasing system, a saving of 5,218,875.92 JD was achieved, which accounted for 2.5% of the total savings. Conclusion: This novel study captures pharmacists' views on JPD procurement systems, highlighting the cost benefits of the two-year model over the one-year model. It urges policymakers to shift, enhancing efficiency.

Keywords: procurement; cost analysis; purchasing; group purchasing; cost-benefit analysis

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INTRODUCTION

Governments are concerned about healthcare costs, with pharmaceuticals being among the most expensive items for both governments and their people, regardless of who pays for them. In the meantime, they are critical to improving health outcomes.[1] Ministries of Health and their appointed authorities play an important role in negotiating rates to minimise the cost of medication, reduce out-of-pocket costs, and ensure that the public is not financially burdened (Bartels, 2016). Furthermore, pharmaceutical cost reductions have a significant effect on ensuring that the best medications are delivered to patients at the right time.[1]

Medication procurement is a critical component of a well-functioning healthcare system, and plays a significant role in determining the quality of healthcare services. It is a complicated procedure that includes tasks such as product selection, quantification need, and documentation. Detect as the best procurement method; by selecting a high-quality product with the lowest price. Supplier selection, contract awards, negotiation of delivery and payment terms, and order tracking are also part of the procurement process., such as quantity, cost, and quality.[2] The procurement process is a key element in solving a complex health issues, such as the availability of medication and access to essential medication.

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The healthcare system in Jordan is government-funded (public procurement), represented by the joint procumbent department (JPD) established in 2005.[6] The JPD procures medications and medical devices based on the regulations outlined in JPD No. 91 of 2022 to meet the country's requirements. Moreover, prior to 2002, the condition sponsored by the JPD Institution. In 1997, a report undertaken by the Jordanian government and the international bank revealed that Jordan spends 27% of the total health sector budget on pharmaceuticals.[4] Initially, the JPD included multiple parties. In 2018, seven participants, including the Jordanian Ministry of Health (JMOH), Royal Medical Services (RMS/Army), official Jordanian University hospitals, King Hussein Cancer Center, and Mutah University, were part of the JPD. Furthermore, in 2019, the Government Procurement Department (GPD) was established through Law No. 28 of 2019. El-Dahiyat reported that the purchasing procedure remains the same. Procurement is coordinated annually and begins with the issuance by each of its five partners of a purchasing order, which is submitted to the JPD specifying the required items and followed by an authorized financial document verifying the availability of funds.[5] Medication shortages have recently become recurrent in the healthcare system, causing critical problems for pharmacists, hospitals, and physicians. When demand exceeds supply, doctors are forced to resort to less sui alternatives (Cogan et al., 2018). Therefore, the procurement process can help increase the medication availability, affordability of medication, and easy access to essential medications, through long-term contracts by tenders. The healthcare system in Jordan purchases medications and vaccines through a one-year purchasing policy with a small quantity of medications.

This study aims to explore the impact of an increased tender duration to two years on cost-savings in the purchasing process.

Table 1. Frequency Distribution of Study Participants' Demographics (Employees in Joint Procurement Department and Jordan Food and Drug Administration (n=81)

Participants' characteristics	Total n (%)
Age (years) 20-30 31-40 41-50 51-60 >60 years	14 (17.3%) 53 (65.4%) 4 (4.9%) 10 (12.3%) 0 (0.0%) 81 (100.0%)
Gender Male Female	21 (25.9%) 60 (74.1%) 81 (100.0%)
Educational Level Diploma Bachelor Master PhD	4 (4.9%) 55 (67.9%) 22 (27.2%) 0 (0.0%) 81 (100.0%)
Employment Purchase officer in the JPD Specialist procurement and supply Pharmaceutical suppliers Other	18 (22.2%) 6 (7.4%) 9 (11.1%) 48 (59.3%) 81 (100.0%)

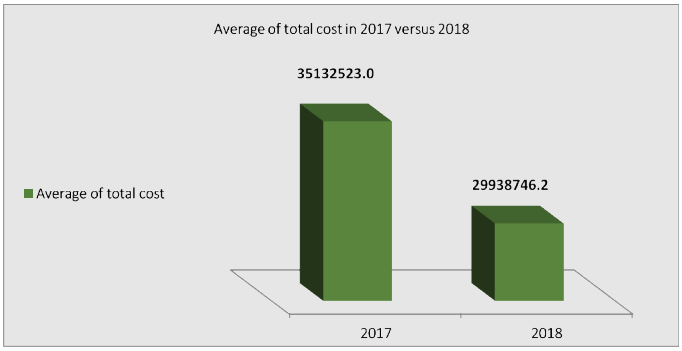

Figure 1. Represents the total cost in each scenario as reported by the study subjects (n= 81)

METHODS AND MATERIALS

Study Design and Participants

This study followed a descriptive and cost-saving retrospective study design. It was conducted in Amman, the capital of the Hashemite kingdom of Jordan, from December 2019 to 2021, in collaboration with the Joint Procurement Department (JPD) located in Amman/Jordan (Table 1). The eligible participants included licensed pharmacist working in the JPD and people in charge of contract purchasing (purchasing committee and receiving committee). Ethics approval for study was obtained from the research ethics committee, Applied Science Private University, approval number 2020-PHA-35.

Questionnaire Development

The research team, consisting of three professors: two in clinical pharmacy and one in pharmacoeconomics and pharmacy practice, as well as experts from the Joint Procurement Department (purchasing department) and a master' pharmacy student, collaborated to address the study's aims and objectives. The questions were tabled and reviewed to combine concepts and eliminate duplicate questions (Figure 1). The questionnaire was initially prepared in Arabic and then translated into English, as English is the official language for pharmacist education in Jordan.

To determine and conduct validity, the questionnaire assessed by experts in the JPD. They informed the researcher if any element in the survey were not clear or difficult to comprehend. Feedback was considered by the researcher and the research team (Table 2). The necessary modifications were made to complete the final version of the questionnaire that was concise and fit on paper administration.

The final version of the questionnaire was structured into three main parts: the first part included elements to gather demographic data, and the second part evaluated participants' knowledge about the tendering process. The third part assessed participants' perspectives on the one-year purchasing policy compared with the two-year policy for medications.

Survey conducting

Most study participants were gathered in a meeting room, where a written questionnaire was distributed to all

Table 2. Results of Wilcoxon Signed Ranked Test (n= 10)

Variable	Mean±SD Deviation	Minimum	Maximum	Z-test	P-value
Total cost 2017	3513252.3 ±5686003.9	618788.8	19493760.0	-2.803	0.005
Total cost 2018	2993874.6 ±4963799.9	131936.0	16853980.0		

SD: standard deviation.

pharmacists and employees involved in the tendering process, including purchasing and receiving committee. The next day, the questionnaire was distributed to the pharmacists of the JFDA (Table 3), collected after completing the questionnaire, and placed in an envelope. The first page of the questionnaire contained the ethics committee's approval for the study and informed consent.

Statistical Analysis

The sample characteristics were described, and data were collected through self-administered questionnaires, from a convenience sample of 81 pharmacists, from the JPD and JFDA in Jordan**.** The collected data were analyzed by using the Statistical Package for Social Science (SPSS) version 21 (Figure 2). Descriptive statistics were performed for analyze, and inferential statistics (paired samples t-test and chi-square test) were conducted at a significance level of 0.05. Furthermore, both primary and secondary data were analyzed. The secondary data were analyzed by Microsoft Excel to conduct a cost-benefit analysis.

RESULTS

A total of 81 pharmacists completed the questionnaire. most study sample (71.6%) answered that the purchase system following the two-year purchasing system guarantees the availability of medications and prevents medication stock-outs. Additionally, most study sample (79.0%) stated that purchasing a large quantity of medications helped save on the unit cost.

Table 3. Investigating the potential association between purchasing medications for two years and unit cost (chi-square test), (n=81)

Test	Value	DF	P-value
Pearson Chi-Square	**82.186**	**4**	**0.000**
Likelihood Ratio	48.600	4	0.000
Linear-by-Linear Association	40.373	1	0.000

DF: degrees of freedom

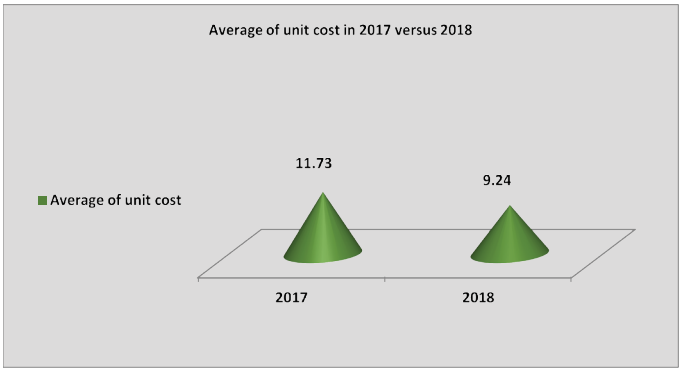

Figure 2. Average unit cost following the one-year purchasing system versus the two-year purchasing system

The study findings showed that implementing the two-year purchasing system resulted in savings of 5,218,875.92 JD, representing 2.5% of the total savings.

The above illustrates, that 74.1% of the sample were females. The majority of the participants, 53 individuals (65.4%), fell into the age range of 31-40 years, followed by 14 individuals 17.3% in the age range of 20-30 years (Table 4).

Table 4. Investigating the potential association between the purchase of the medications for two-years and ensuring that the supply of the medications is not interrupted (n=81)

Test	Value	DF	P-value
Pearson Chi-Square	**49.453**	**4**	**≤0.001**
Likelihood Ratio	30.495	4	**≤0.001**
Linear-by-Linear Association	26.605	1	**≤0.001**

In terms of education, 55 (67.9%) individuals held a bachelor's degree, while 22 (27.2%) held a master's degree. More than half of the participants 84(59.3%) had previous work experience in other jobs, and 18 individuals (22.2%) had worked as Purchase Officers in the JPD.

We addressed the first question by comparing two metric procurement policies variables for a specific group of medications using a paired-samples t-test as the first choice. These variables are the two-year purchasing policies (Total cost of medications in 2018) and the one-year purchasing policies (Total cost of medications in 2017). To perform a paired-samples t-test, it is necessary for the difference scores between the two cost variables to be normally distributed. To determine this, we conducted the Shapiro-Wilk Test of Normality, which is more sui for small sample sizes (n=10 medications) and has higher sensitivity.

The results of the Shapiro-Wilk test indicated that the difference score between the cost variables did not follow a normal distribution, as indicated by a p-value < 0.05 (Table 5). Therefore, we must use an appropriate nonparametric test for related samples, such as the Wilcoxon Signed Ranked Test.

Based on the results of the Wilcoxon Signed Ranked Test (Z= -2.803, p <0.05), we can conclude that there is a significant statistical difference between the two-year purchasing system (Total cost of medication 2018) and the one-year purchasing system (Total cost of medications in 2017) according to JPD, at a 5% significance level.

Table 5. Represent quantity and prices following the one-year and two-year purchasing system

Medication name	Quant(two-years purchasing system)	The unit cost of two-years (JD)	Total cost of (two-year)	Quant (one-year purchasing system)	Unit cost of (one year) (JD)	Total cost of (one-year)	Price unit (JD) 2018-2017	Benefits(JD)
Diphtheria ,pertussis and tetanus(DTR)	1,100,000.00	15.32	16,853,980.00	800,000.00	17.72	19,493,760.00	2.40	2,639,780.00
Measles, Mumps, and Rubella (MMR)	700,000.00	4.10	2,868,670.00	300,000.00	4.28	2,997,890.00	0.18	129,220.00
Amoxicillin 500	116,550,000.00	0.02	2,121,210.00	62,160,000.00	0.02	2,214,450.00	0.00	93,240.00
Piperallin + tazobctam injection	274,000.00	2.86	783,366.00	249,000.00	3.20	876,800.00	0.34	93,434.00
lansoprazole 30 mg	34,070,000.00	0.03	885,820.00	17,000,000.00	0.03	953,960.00	0.00	68,140.00
insulin	2,087,696.00	1.34	2,797,512.64	890,000.00	1.48	3,096,470.71	0.14	298,958.07
metformin	226,950,000.00	0.01	2,087,940.00	107,600,00	0.01	2,246,805.00	0.00	158,865.00
Lamtinib 400 mg	56,000.00	2.36	131,936.00	64,800.00	11.50	643,888.00	9.14	511,952.00
deferasirox 500 mg	692,000.00	0.93	640,100.00	275,500.00	2.50	1,730,000.00	1.58	1,089,900.00
Sevoflurane usp liquid inhalation 250 ml bottle	11,740.00	65.0	768,265.60	5400	76.97	903,598.45	11.53	135.386.854
			29,938,800.24			35,157,622.16		**5,218,875.92**

To investigate the potential significant association between purchasing medications for two years (applying the purchasing system for two years will positively affect the spending control in the health sector in Jordan) as the first categorical variable, and unit cost (purchasing large quantities of the medication saves on the unit cost price) as the second categorical variable, the chi-square test was used as the follows:

The results of the chi-square test revealed a significant statistical association between purchasing medications following the two-year system and unit cost (chi-square = 82.186, p <0.001).

To investigate the potential significant association between the purchasing of the medications for two-years (apply the purchasing system for two years that guarantees the availability of medications to a higher degree) as the first categorical variable, and ensuring that the supply of the medication is not interrupted (the purchase policy for two-years guarantees uninterrupted medication supply as the second categorical variable, the chi-square test was used as the following:

The results of the chi-square test above revealed a significant statistical association or correlation

between purchasing medications for two years to guarantee interrupted medication supply (chi-square= 49.453, p <0.001).

Cost analysis

To increase market competition, Jordan has implemented public procurement for medications. The contract or tender is awarded to the producer who offers the lowest price for the medications. Price becomes the determining factor among competitors. To take advantage of this situation, Jordan implemented a regional public procurement scheme. Jordan's healthcare system is based on a joint procurement structure that consists of seven groups, each of which is responsible for defining the quantity and providing healthcare services to their respective populations department website: http://www.jpd.gov.jo/.[10]

The JPD achieved a total saving of 20 million(JD) for all items purchased, specifically, for the ten medications that following the two-year purchasing system. There was a cost saving of 5,070,575.07 JD, which represents 2.5% of the total items.

DISCUSSION

This study successfully addresses its aim by, demonstrating the effectiveness of the two-year purchasing policy for medications and vaccines in the public health sector in Jordan through the joint procurement process. The findings revealed the advantages of adopting a two-year policy compared with one-year policy in pharmaceutical purchasing, highlighting the benefits of cost reduction and increased overall efficiency. In their empirical assessment for the US, Burns and Lee found that 80% of the hospitals in their research made 50% of their pharmaceutical purchases through group purchasing organizations (GPOs). Interestingly, the findings of this study were similar.[7]

To reduce costs, the results of the present study, based on Wilcoxon signed ranked testing, indicated a significant statistical difference between the two-year and the one-year procurement policies, particularly the 5% significant level on the unit cost, increasing total benefit and reducing cost. The study reported that the implementation of the new policy in Jordan in 2018 achieved savings of about 5 million JD. Furthermore, the pooled procurement structure of the OECS/PPS also relied on a centralized tendering and procurement method supported by a revolving medication fund-based financial framework. The payment is centralized and is carried out by the Central Bank of the Eastern Caribbean, which is backed by a national currency, the s East Caribbean dollar. There are approximately 700 items in the product portfolio, with pharmaceuticals accounting for 70%, representing around 80% of the public sector's needs in

the member countries. The number of annual sales increased by more than 100% between 1997 and 2006. A median cost savings of 37% for 25 selected products was estimated over a five-year period (1998-2002).[2]

In line with the present study, Jordan indicated that purchasing through the joint procurement process obtained an average savings of 2.4% in 2007 compared to the previous year, according to a one-year evaluation study.[8] This figure increased to 8.9% in 2009.[8]

To the best of our knowledge, this study demonstrates that purchasing large quantities of medications results in a lower unit cost. In this regard, Embray, suggests that promoting competition among suppliers through the tendering process can contribute to lower unit costs.[9] Moreover, studies have shown that the national health technology assessments (HTAs) encourage the use of cost-effective equipment range,[11]and a decline in the unit price of creative equipment (Scottish Health Technology Group, 2008). In addition, research conducted in six low- and middle- income countries (Bangladesh, Brazil, Malawi, Nepal, Pakistan and Sri Lanka) found significantly lower overall public-sector medication availability in all countries relative to private-sector medication availability.[12] In this regard, another research study in Jordan showed that in the public sector, the availability of lowest-price generic (LPG)medicines was high but not for originator brand (OB) medicines. This demonstrates the effective generic policy implementation by the government in the public sector, whereas the private sector showed fairly high availability for both essential and other categories of medicines. The availability of LPG and OB medicines was fairly high.[13]

Based on the findings of this study, it is recommended to increase the purchasing quantity depending on demand to determine the quantity needed. The Ministry of Health (MOH) comprises 44% of the population, and the establishment of the Joint Procurement Department (JPD) in 2005 aimed to increase the quality of the public sector procurement process.[6] The duties of the JPD include preparing, verifying, and announcing all bid documents, coordinating procurement processes, determining terms of participation, studying bids and completing procurement contracts.[14]

CONCLUSION

We hypothesis that purchasing medications through a two-year policy could help address issues related to medication availability and accessibility. On the other hand, purchasing medications in the long-term can ensure a sufficient quantity of medications, guaranteeing their availability. The comparison between the two models also revealed cost-saving and overall benefits in favour of the second model (two-year purchasing system) when compared to the first scenario (one-year purchasing system).

In conclusion, we recommend that implementing a two-year purchasing strategy, rather than the standard approach, can achieve cost savings in tender procurement. However, the communication with suppliers was challenging due to the impact of COVID-19. The present study encourages decision-makers, pharmacists in the procurement department and purchasing or supply chain managers to use the results of this study to apply sustainable procurement (purchasing for more than one year) to achieve greater availability and affordability for medications in public procurement.

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COMPETING AND CONFLICT OF INTERESTS

The authors declare that there is no competing or conflict of interests.

DATA AVAILABILITY STATEMENT

The dataset used and/or generated during the current study is available within the manuscript and the supporting materials.

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AUTHORS CONTRIBUTION

Dima AL-jakhim: Study conception and design, Methodology, Data curation, Analysis and interpretation of results, Investigation, Visualization, and Writing – original draft.

Iman A. Basheti: Study conception and design, Methodology, Analysis and interpretation of results supervision, Project administration, Validation, Supervision, and Writing – review and editing.

Nizar Mahmoud Mhaidat: co-supervisor, Study conception and design, Methodology, Analysis and interpretation of results supervision, Project administration, Validation, Supervision, and Writing – review and editing.

Eman ABU-GHARBIEH: Project administration, Validation, and Writing – review and editing.

Faris El-Dahiyat: Study conception and design, Methodology.

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