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RESEARCH ARTICLE

Assessment of pharmaceutical inventory management in an Indonesian district health office: A pioneer study during the Covid-19 pandemic

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Abstract

Background: Pharmaceutical inventory management (PIM) is important for efficient budgeting and cost control of medicines. This is particularly critical for local health offices in Indonesia, especially during the Covid-19 pandemic. **Objective:** To assess the PIM in the Gunungkidul health office in Indonesia. **Method:** A cross-sectional descriptive study evaluating inventory data was conducted between January and May 2022. Data obtained from 2019 to 2021 were triangulated with other data from the Ministry of Health and public health centres in Gunungkidul. **Results:** The availability of medicine items as compared to the national formulary was 95% (2019), 94% (2020), and 90% (2021), respectively. Purchasing budget was achieved at 96% (2019), 87% (2020), and over 120% (2021), respectively. The Inventory Turnover Ratio was between 1.23 and 1.49. The shortage of medicine occurs at a minimum rate of 15% per year. This was in contrast with overstocking at 35% for a particular medicine. Expired medicine was found at the rate of 8% (2019), 5% (2020), and 13% (2021) respectively. **Conclusion:** The Covid-19 pandemic has presented significant challenges in the pharmaceutical inventory management in Gunungkidul as indicated by irregularities in the planning and procurement trajectories. The inability to anticipate crises due to the pandemic has contributed to poor management of pharmaceuticals.

Introduction

Gunungkidul is one of the districts in Indonesia with a high ratio of regional financial dependence with a ratio above 80%. This means that revenue obtained by the local government is small with funding from the national government has been dominant in the budget structure (Fathah, 2017). When Gunungkidul was hit by the Covid-19 pandemic in March 2020, this dependence imposed a significant multicrisis implication with casualties accounting for more than 22 thousand people infected and nearly 1100 cases of death reported (Dinkes, 2020).

The pandemic has also significantly disrupted the operation of the public primary care centre (known as *Puskesmas*). One of these impacts was the increased demand for certain medications e.g. antivirals,

antibiotics and respiratory medications. In addition, stock shortages and stockouts were evident due to increased demand and supply chain disruptions (Ismail *et al.*, 2022; Safarah *et al.*, 2023). The Gunungkidul Health office plays a vital role in the inventory management of pharmaceuticals for thirty *Puskesmas* across the district. This means essential activities in inventory management, including planning, procurement, distribution and use of medicine are under the responsibility of the office. Poor inventory management in public medicines can lead to wastage of inefficient financial resources, irrational use of medicines, medicine shortage, and increased expired medicines which eventually result in a decline in the quality of healthcare services (Management Sciences for Health, 2012).

The Covid-19 pandemic resulted in an unprecedented challenge to healthcare delivery in Gunungkidul. The local health office was under extreme pressure to control the pharmaceutical inventory which was already a complex issue (tight budget, insufficient funds, lack of systematic monitoring, lack of transparency etc.) before the pandemic situation (Sanjaya & Hidayat, 2016).

The assessment of pharmaceutical inventory management practices in districts with limited capacity such as Gunungkidul is required. Hence, to the best of the authors' knowledge, this study is the first to examine the management of pharmaceutical inventories at the local health office level during the pandemic in Indonesia.

Methods

This study was conducted between January and May 2022 in as a descriptive and cross-sectional study. This study used exact data as published in regulatory documents, district planning reports, *Puskesmas* medicine stock reports, and district accountability reports from 2019 to 2021. The data was evaluated using parameters defined by Satibi et al (2019) which were commonly used to measure pharmaceutical

inventory management performance in Indonesian *Puskesmas*.

This evaluation includes the availability of essential medicine items, purchasing budget (as compared to initial budget allocation), Inventory Turnover Ratio (ITOR), rate of stockouts, overstocks and expired medicines. The data were entered to Microsoft Excel and subsequently analysed (Satibi et al., 2019).

Results

Table I showed that the availability of essential medicine items in 2019, 2020, and 2021 as compared to the list of items in the National formulary reached 96%, 98%, and 92%, respectively. In 2019, the health office was only able to spend (purchase budget) 96% of the budget allocated for the procurement of medicines.

This rate declined in 2020 to 87% but it soared to exceed 120% in 2021. Shortage of medicine was evident every year at a minimum rate of 15%. In contrast, some medicines were abundant with overstock conditions of 16% (2019), 41% (2020), and 47% (2021), respectively. This led to an increasing trend of expired medicine from 5% in 2020 to 12% in 2021.

Table I: Pharmaceutical inventory management Gunungkidul health office 2019-2021

No	Indicators	Annual rate (%)			Acceptable rate (%)
		2019	2020	2021	
1	Availability of essential medicine items	95.5	94	90	100
2	Purchasing budget	96	87	124	100
3	Inventory Turnover Ratio (ITOR)	1.49	1,23	1.44	12
4	% Out-of-stock drug items (< 1 month*)	15	19	17	0
	% Overstock drug items (> 18 months**)	16	41	47	0
5	Expired drugs	8.08	5.38	12.88	0

*Out-of-stock occurred if the quantity of available medicine is smaller than one month supply

**Overstock occurs if the medicines have not been used after 18 months of storage

Discussion

This study highlighted the challenges of pharmaceutical inventory management in areas with limited capacities such as Gunungkidul. Managing pharmaceuticals is a complex, yet critical process within the healthcare delivery system. Not only does it requires accurate planning and proper implementation, but also maintains a balance between cost and quality of patient care.

The decreasing trend of essential pharmaceutical items available in Gunungkidul that fit into the national formulary may translate to the fact that the basic stock

of pharmaceuticals in the district was not met. This might be caused by several factors, among which is poor compliance during planning and procurement highlighting that some medicines might be purchased beyond the formulary requirements. Other possibilities as indicated by Kokilam and colleagues (2015) may reflect a "sick" inventory system as illustrated by poor decision-making at any level. This has contributed to the inefficiencies and ineffectiveness of the system. The Covid-19 pandemic has also jeopardised the system since it placed a strain on resources and funding opportunities. However, this is not the only case in

Indonesia, as this was also experienced by other districts such as the neighbouring regions of Surakarta whose rate was even lower than that of Gunungkidul (61%) (Pramukantoro & Sunarti, 2019).

In contrast to the availability of medicines, purchasing budget showed a fluctuating trend. It is important to note that the budget for purchasing medicines was the highest during the pandemic crisis accounting for 124% in 2021. This has stretched almost 70% more than the last budget spent in 2020, which was only 87%. Perhaps it is easy to use the Covid-19 pandemic as justification for this trend. Whilst the uncertainties caused by the pandemic have led to demand and supply chain disruptions contributing to increased expenses for handling medicines, it is also clear that the local health office lack planning resilience when anticipating supply chain disruptions (Safarah *et al.*, 2023). A comparison was made with surrounding districts and facilities such as Sukoharjo District Hospital (96.16%), Karel Sadsuitubun Hospital Maluku Regency (100%), and Muntilan Hospital Magelang Regency (100.14%) which were more proficient in meeting the acceptable standard (Satibi *et al.*, 2021).

The value of ITOR was 1.49 in 2019, 1.23 in 2019, and 1.44 in 2021, respectively. ITOR highlights the efficiency of pharmaceutical inventory management as it indicates the frequency of the turnover of funds over a specific amount of time (in this study is annual). The lower the ITOR, the more the inventory will accumulate in the district pharmacy warehouse. This will increase the cost of holding and storing the pharmaceuticals.

In principle, low ITOR may reflect a discrepancy between the demand and supply of pharmaceuticals as a result of poor planning and procurement (Hakim & Ulfah, 2019). The ITOR in Gunungkidul is lower than other regions such as Brebes, Yogyakarta city and Banjarmasin which reached 4.08 and much even lower than the acceptable standard of 12 (Satibi *et al.*, 2021). This strengthened the other observed parameters in this study that lack of planning resilience was eventually a problem from the beginning with or without the pandemic crisis. A low ratio requires inventory analysis to discover the root cause which may include many possible variables from market demands, pricing strategy, and purchasing policy to the use of pharmaceuticals by the public. The need for such analysis is critical, particularly in the subsequent parameters in which medicine shortage, overstock and expired medicines were evident in Gunungkidul.

The percentage of out-of-stock medicine in Gunungkidul was above 15% annually, indicating several obstacles, including suppliers unable to fulfil the orders of medicines (Athiyah *et al.*, 2015), incorrect forecasting, financial constraints to purchase medicines, inappropriate storage management (Iqbal *et al.*, 2015).

In contrast, the overstock items in Gunungkidul reached 40% exceeding the acceptable standard of 0%. A possible issue regarding this poor figure is the reliance on the consumption method as the predominant method for planning medicines in Gunungkidul (Athiyah *et al.*, 2015).

It is evident that the Covid-19 pandemic was a novel challenge to global healthcare with no former available data about the disease patterns and treatment. Therefore, it is not surprising that when the Covid-19 pandemic struck, a former approach and method of healthcare delivery and treatment did not match (Boserup *et al.*, 2020; Berkenstock *et al.*, 2021; Kranz *et al.*, 2021; Wongtanasarasin *et al.*, 2021). This means business as usual was not applicable during the pandemic, including the projection using the consumption method might not be relevant given the high uncertainties and disruptions in the supply and demand chain.

Likewise, a surge in the number of expired medicines can be predicted as well. During the pandemic, expired medicines in Gunungkidul accounted for 13% which was higher than the standard of 0% (Management Sciences for Health, 2012). The pandemic has disrupted the normal flow of medicine distribution and use. As a result, there was an increased risk of medications expiring before they can be used. Another feature contributing to the expiration of medicines is a mismatch between planning and the actual use of medicines leading to some medicines being eventually deserted. Such incidence was common in other facilities in Indonesia mainly due to the inability to forecast the demand for pharmaceuticals during the pandemic crisis (Rosmania & Supriyanto, 2015; Rahem *et al.*, 2021).

Conclusion

The pandemic has presented many significant challenges in the practice of pharmaceutical inventory management in the Gunungkidul health office. Irregularities in the planning and procurement trajectories contributed to some poor performance indicators. Overhaul inventory analysis along with efforts to improve office capabilities in planning and procurement processes are critical to efficient healthcare services delivery.

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