Drug Shortages and Its Effects on Service Delivery among Key Informants (KIs) in Fiji

Asaeli Raikabakaba[1], Masoud Mohammadnezhad[2], Ledua Tamani[2] & Devina Gaundan[3]

[1] World Health Organization, Suva, Fiji

[2] School of Public Health & Primary Care, Fiji National University, Fiji

[3] Labasa Hospital, Labasa, Fiji

Correspondence: Masoud Mohammadnezhad, School of Public Health & Primary Care, Fiji National University, Fiji. Tel. +679-33-11-700. E-mail: masraqo@hotmail.com

Abstract

Background: Drug shortage is a global problem that adds extra burden to health systems with additional costs and posing risks to patients who fail to receive the medicines they need. *Aim* This study aimed to describe drug shortage and its effects on service delivery among Key Informants (KIs) in Fiji.

Materials and Methods: In this quantitative cross-sectional study, the information on drug shortage per month was collected through the stock status report and pharmacy records of the main referral hospital in Fiji, the Colonial War Memorial hospital (CWMH) from 1st June to 30th November 2015. Purposive sampling was applied to reach 50 KIs who met the study crietria. A pilot tested structured questionniare was used to collect data and descriptive statistic was used to analyze data.

Results: The results showed the most frequent out of stock items were antibiotics (49) followed by vitamins (18) and antihypertensive (17). The frequency of total drugs on shortage ranged from 29 to 50 items per month with an average rate 10% (n=40) drug shortages per month. Additionally, 98% (n=49) of the KIs indicated that drug shortage increased workload of staff and 90% (n=45) indicated that the standard treatment was deviated or alternatives were sought due to shortage of drugs.

Conclusions: The findings of this study revealed that drug shortage was experienced in CWMH during the study period and had an impact on the clinical service delivery. There is a needed to focus on the use, selection, procurement and storage and distribution of medicines at CWMH.

Keywords: drug shortage, key informants, predictors, Fiji

1. Introduction

Most leading causes of death and disability in developing countries can be prevented, treated or at least alleviated with cost-effective essential drugs (WHO, 2017b). Essential medicines need to be available at all times in adequate amounts, in appropriate dosage and quality and at an affordable price for individuals and communities (Fox et al., 2014). It is estimated that two billion people do not have access to medicines and four million lives per year could be saved in Africa and Southeast Asia with the appropriate treatment and medicine (Bochenek et al., 2018; Marks, 2009; Yadav et al., 2011).

The World Health Organization (WHO) states that access to essential medicines should be a priority for all countries, where an effective drug management system will ensure that there are no shortages or stock outs happening (WHO, 2017b). Drug shortage is defined as a supply issue that affects the preparation and dispensing of a drug product that affects patient care when prescribers must use an alternative agent (WHO, 2017a). Drug shortage is a global problem and is not limited to low income countries as several studies have revealed that affluent countries are not free from it (Acosta et al., 2019). European countries, United States, Canada, Australia and New Zealand are also facing this similar drug shortage problem (UNDP, 2017).

With a five-year (2004–2008) collaborative project between WHO and the European Commission – Partnership on Pharmaceutical Policies – progress has been made in the areas of national medicines policies, procurement and supply chain management, quality assurance, and rational use of medicines. However, challenges still remain and

drug shortage still occur in many countries including the Pacific (Walker et al., 2017).

The Pacific Island Countries (PICs) are faced with unique complexities of geographical isolation and low population densities that present multitude of challenges. The double burden of Non-communicable Diseases (NCDs) and communicable diseases, health emergencies caused by natural disasters and disease outbreaks further exacerbate the problem of drug shortage (Pellny, 2019). With limited human and financial resources, PICs continue to struggle to ensure quality medicines imported are distributed on time in adequate amount that will meet the demand forecasted. Overuse of medicines fueled by consumer demand is a public health challenge and the weak drug management system has also affected the delivery of quality health services (Nand, 2019).

Drug shortage has been recognized globally and this problem continues to escalate. WHO reported that this problem affects high, middle and low income countries respectively. While it is not a new phenomenon, it has been increasing over the years and the most common essential medicines being recognized as out of stock were antibiotics, cancer medications, cardiovascular drugs and anesthetic agents (WHO, 2017a).

Published evidence from low-income countries showed that drug shortage is indeed an established problem. A study from Malawi that looked at the "Impact of Procurement Operations on Health Care Delivery" interviewed clinicians, hospital and procurement managers in five public healthcare delivery centers in Southern Malawi. It reported an overwhelming agreement at all hospitals that drug shortage had occurred at various departments (Kanyoma & Khomba, 2013).

Mwathi and Ben (2014) conducted a study in Nakuru, Kenya to assess the availability of essential medicines in public hospitals. They reported that the most common out of stock medicine was analgesics (91%), followed by antibiotics (75%). Other medicines that were commonly out of stock were antihypertensive agents, emergency drugs and pediatric formulations (Mwathi & Ben, 2014).

In 2010, WHO conducted a study in 39 low to middle income countries and revealed that the average availability of essential medicines was only 20% (Yadav et al., 2011). Moreover, Health Action International Africa in Kenya, revealed that essential medicines are available in only 50% of lower health facilities (health centers and dispensaries) and 65% of hospitals (Mwathi & Ben, 2014).

High income countries have also reported that drug shortage is an increasing problem that they face. The US FDA reported the number of medications on the shortage list to be increasing from 61 to 178 between 2005 and 2010. It further increased to 200 in 2012 and 754 in March 2014 (Caulder et al., 2015). In the same way, the Drug Information Service at University of Utah Health Care also tracked an increase in drug shortages in the US from 129 in 2007 to 211 in 2010 (Ventola, 2011).

An online survey that was conducted in 2010 which included 427 pharmacists throughout Canada, reported that majority of pharmacists (93.7%) had trouble locating medications to fill a prescription. Some indicated having trouble for over 200 prescriptions and this shortage of drugs have greatly increased over the past 12 months (CPhA, 2010).

This problem has also spread across Europe. An online survey on drugs shortage in France, Netherlands, Italy, Spain, England, and Germany confirmed that drug shortage was a problem in these countries with life preserving drugs such as oncology drugs amongst the drugs that were out of stock (Pauwels et al., 2014).

The European Association of Hospital Pharmacists supported this finding with another study which showed that 86.2% of total responders agreed that medicine shortage is a current problem in delivering the best care to patients. This survey included more than 600 hospital pharmacists from 36 European countries (EAHP, 2014). In Israel, based on the data collected by Ministry of Health, between 2013 and 2015 shows that total of 677 drug shortages notification were received (Schwartzberg et al., 2017).

Incidentally, developed countries closer to our shores are also not free from this problem. In another study reported by Morrison and Quilty, they have highlighted that drug shortage also occurred in Australia and New Zealand but not as extensive compared to the other countries. It was noted that the impact of shortages is complex, and adverse outcomes are probably happening such as consequent errors in patients' prescription and dosing (Morrison, 2011; Quilty, 2014).

Gathering information on drug shortage in PICs including Fiji remains a challenge and there has been few studies conducted in the Pacific on drug shortage ("Drug Shortage," 2010; "Drug shortage cripples hospital," 2009; "Hospitals Face Medicine Shortage," 2012; "Medicine Shortage," 2014). In Fiji, even though the media have frequently voiced the concerns and complaints of patients and health care workers regarding the unavailability of medicines, only one published study was conducted to establish the facts on this drug shortage (Josephine et al.,

2017). However, detailed information on the rate, frequency, causes, impact and the perception of health care workers on the effect of drug shortages on the services delivery have not been explored. Hence, this study aimed to describe the perception of Key Informants (KIs) on drug shortages and its effects on service delivery at Colonial War Memorial Hospital (CWMH) in Fiji. The findings of this study will enable policy makers to strengthen the existing structures within the drug management cycle to avoid drug shortages and thus improve health outcomes.

2. Materials and Methods

2.1 Study Design and Setting

A quantitative study was conducted using the stock status report, which was collected and analyzed between the 5th December 2016 and 27th January 2017. This study was to establish the groups of drugs that were on shortage and their frequency from 1st June to 30th November 2015 at CWMH. Face to face interviews were also conducted from 30th January to 31st March 2017, at the CWMH wards and departments identified in consultation with the CWMH medical superintendent. CWMH was the best choice for this study as it is the main referral hospital in Fiji that provides basic and specialized health services in Fiji.

2.2 Study Population and Sample

Study population was the group of KIs at CWMH who have key information that are relevant to the scope of study. The inclusion criteria involved KIs who are selected according to their position and designation at CWMH during the period of study, their management and clinical experiences that are linked to the key variables of this study and those that gave informed consent to participate and have their response recorded during the interview. This included pharmacists, nurses and doctors working at CWMH. However, a senior accounts' officer of Fiji Pharmaceutical & Biomedical Services Centre (FPBSC) was also part of the study since FPBSC is the main supplier of drugs to all the hospitals in Fiji including CWMH. Those who didn't meet the inclusion criteria or were not interested in participating in this study were excluded. Exclusion criteria were those that did not participate and does not meet the inclusion criteria discussed above. A non-probability purposive sampling method was used to identify KIs. The purposive sampling was used because those that were selected for the study hold key information that fits the purpose of this study. Initially there were 64 participants identified, however it was reduced to 60 after applying the inclusion criteria. The actual number of participants interviewed was 50 that were sufficient to meet the objectives of this study while 10 refused to participate. The independent variable for this study is drug shortage, and the dependent variables were clinical services.

2.3 Data Collection Tool

The modified structured questionnaire was developed from two published studies in Malawi (Kanyoma & Khomba, 2013) and United States (Ventola, 2011) and combined with other developed questions specifically to meet the scope of the study and to gather data. The study questionnaire focused on the demographic characteristics of participants interviewed and the effect of drug shortage on clinical services. The responses of each part were in check boxes whether to "agree", "disagree" or "do not know".

Prior to collecting the data, the questionnaire was validated and piloted to five KIs who met the inclusion criteria at Nausori Maternity Hospital that is the closest hospital to CWMH, in order to review the clarity and understanding of the questions used during the interview. Minor editing was made on the questionnaire following the comments received by the participants. As all the study participants were educated, only English version of the questionnaire was used for this study.

2.4 Study Procedure

After securing ethical approval, a phone call was made to the principal pharmacist of CWMH pharmacy to inform about the plan of extracting stock status report from the pharmacy. Then the main researcher visited the CWMH department in order to gain access to the stock status report and pharmacy records. The stock status report from 1st June to 30th November 2015 was extracted from the CWMH department for quantitative analysis. The stock status report for December 2015 was not available in the data base at CWMH pharmacy hence it was not included in this study.

The questionnaires were given to the identified KIs together with the information sheet which outlines the intended purpose of the study. They were informed that their participation will be totally voluntary, their information will be confidential and participating in this study will not affect their job status in future. Those who agreed to participate in this study were asked to sign the consent form. As all the KIs were able to read and answer, the modified semi-structured questionnaire was given to them to read and complete it. They took about 15–20 minutes to complete.

2.5 Data Management and Analysis

For data processing, the stock status report from the pharmacy records and responses from the questionnaire were first entered into the Microsoft Word for quality checks to ensure that name of drug and month it was on shortage and participants' answers were entered correctly. A database was designed and entered into the Microsoft Excel for data cleaning and analysis. For data cleaning, initial analysis on the name of drugs that were on shortage, the month that were affected by the shortage and total number of drugs that were on shortage per month and responses from the face-to-face interview were recorded. This initial analysis was used to cross check the data entered in the Excel and any wrong entries were identified and corrected.

For data analysis, a descriptive analysis was used to establish the group of drugs that were on shortage and frequency of shortages per month and responses of participants whether they "agree" or "disagree" or "do not know answers" to each question. A further analysis was performed to identify the highest group of drugs that were on shortage and average number of drug shortage and effect of drug shortage on service delivery at CWMH during the study period.

2.6 Ethics Approval

Prior to data collection, approval was obtained from the Fiji national University's (FNU) College Health Research Ethics Committee (CHREC), Fiji National Health Research Ethics Committee (FNHREC) and Medical Superintendent of CWMH. All the study participants signed an informed consent form.

3. Results

3.1 Demographics of KIs

A total of 50 KIs were interviewed that included 19 doctors, 19 nurses, 11 pharmacists and 1 accountant. The doctors interviewed were consultants or acting consultants from different specialties at CWMH while the nurses were wards sisters in charge. Pharmacists that participated were both from CWMH and FPBSC. The senior accountant interviewed was involved with the budgeting and managing funds for the procurement of medicines.

In terms of work experience, majority of KIs (56%) have been working in CWMH for more than 10 years, 26% have worked between 6 to 10 years and 18% have worked between 1 to 5 years (Table 1).

Table 1. Demographic status of health care workers

Demographic Status (n=50)		Number	Percentage (%)
Profession	Doctors	19	38
	Nurses	19	38
	Pharmacists	11	22
	Accountant	1	2
Years of Service	<12 months	0	0
	1-5 years	9	18
	6-10 years	13	26
	11-19 years	23	46
	>20 years	5	10

3.2 Drugs Shortage

From 1st June 2015 to 30th November 2015 there were a total of 242 items that were on shortage at CWMH. The drugs on shortage were grouped according to the Fiji Essential Medicines 2015 classifications. As shown in Figure 1, antibiotics (49) were by far the most group of medicines on shortage during the 6 months of study. This was followed by vitamins (18), antihypertensive (17), parenteral (16) and antiarrhythmic medicines (15). Included in this group of antibiotics were some key medicines such as Ceftriaxone, Vancomycin, Benzathine Penicillin and Meropenem and other antibiotics that belong to the class of Penicillin and Cephalosporins. The group of antiarrhythmics that were on shortage includes Adenosine, Amiodarone, Digoxin, Dobutamine and Isoprenaline injections.
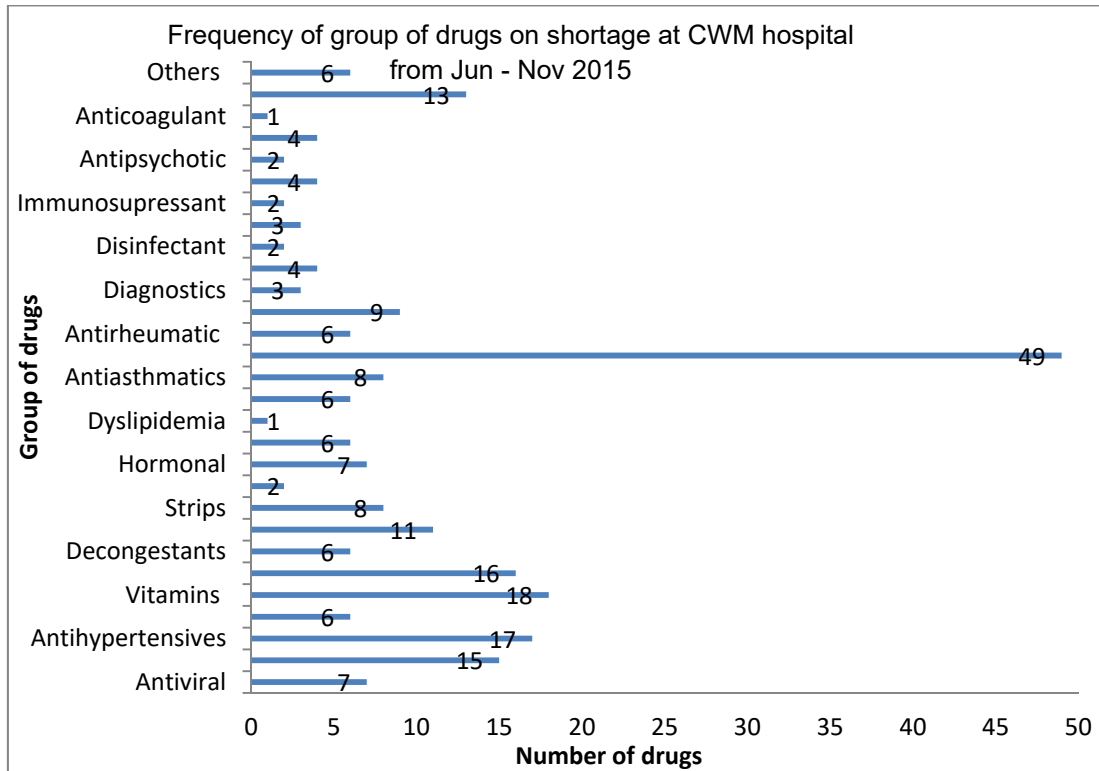
Figure 1. Group of drugs on shortage at CWMH from 1st June to 30th November 2015

3.3 Number of Drugs Shortage per Month

The month of September recorded the most, where 50 out of 400 medicines (12.5%) were not available and August recorded the least where 29 out of 400 medicines (7.3%) were on shortage. The drugs on shortages ranged from 29 (7.3%) to 50 (12.5%) with an average of 40 (10%) items per month (Figure 2).
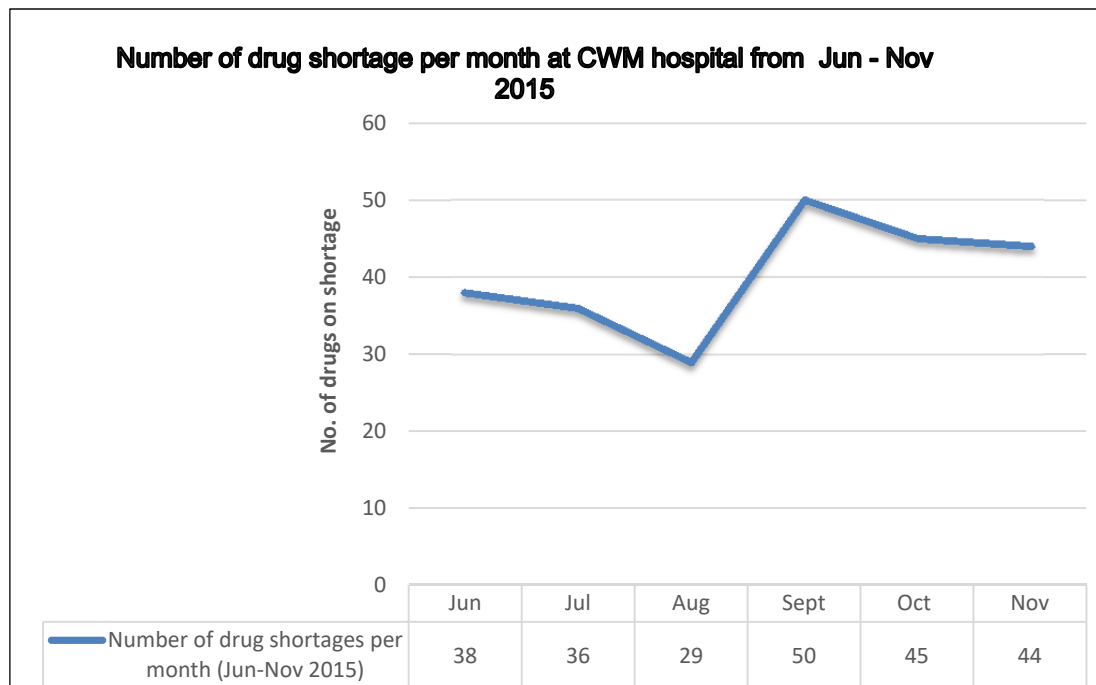

	Jun	Jul	Aug	Sept	Oct	Nov
Number of drug shortages per month (Jun-Nov 2015)	38	36	29	50	45	44

Figure 2. Number of drugs on shortage at CWMH from 1st June to 30th November 2015

3.4 Effects of drug shortages on clinical services

KIs were interviewed on the effect of drug shortage on clinical services. Out of the 50 interviewed, 98% (n=49) agreed that drug shortage increased workload on staff and only 2% (n=1) did not know. All KIs interviewed (n=50) agreed that drug shortage did compromise the quality of care that patients receive. When KIs were asked about the effect of drug shortage on clinical practice, 90% (n=45) agreed that drug shortage causes management of patients to deviate from the standard treatment guideline and resorted to alternative treatment that is not effective or inferior while only 4% (n=2) did not agree with this and 6% (n=3) did not know (Figure 3).
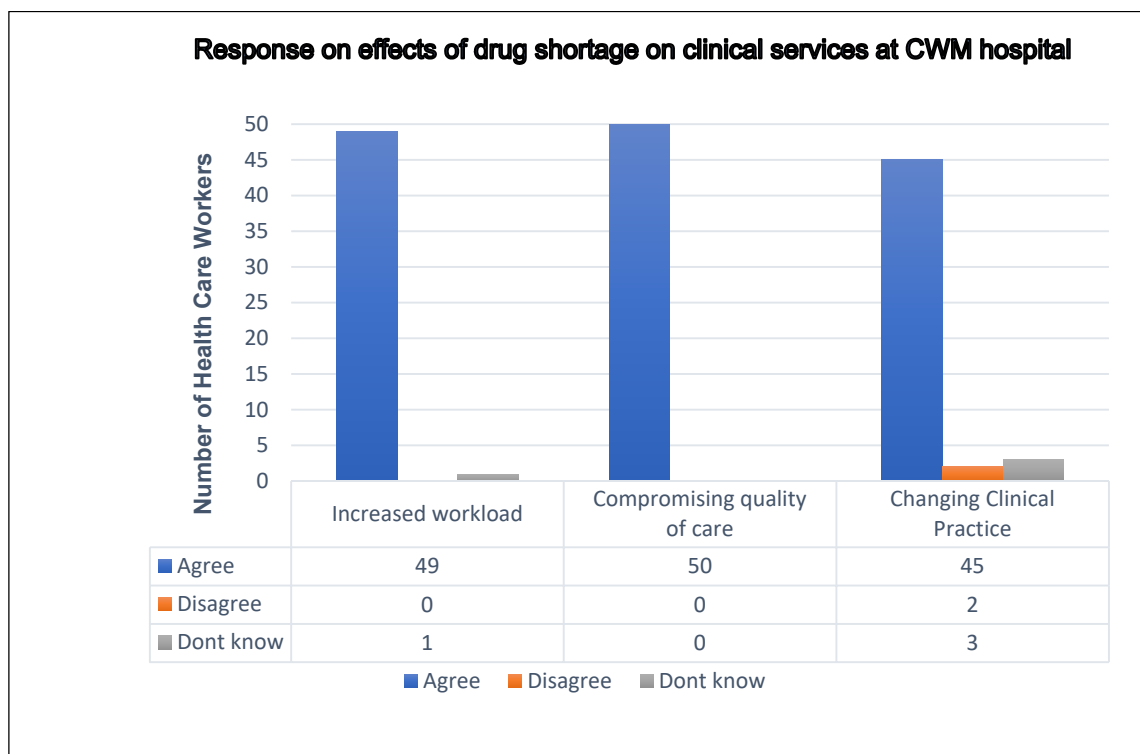

Response on effects of drug shortage on clinical services at CWM hospital

	Increased workload	Compromising quality of care	Changing Clinical Practice
Agree	49	50	45
Disagree	0	0	2
Dont know	1	0	3

Figure 3. Effects of Drug Shortage on Clinical Services CWMH from 1st January to 30th November 2015

4. Discussion

From the results of this study, it is evident that drug shortage occurred at CWMH during the month of June to December 2015. The study revealed that antibiotics were by far the most frequent group of drugs that were on shortage throughout the study period. It is worrisome that some of these antibiotics that were on shortage includes key injectables like Vancomycin, Ceftriaxone, Benzathine Penicillin and Meropenem. All of these key medicines are used in the treatment and prevention of serious bacterial infections.

The other group of drugs that were on shortage list were Vitamins that are used as supplements, followed by antihypertensive drugs which are used to treat hypertensive patients, parenteral that are mostly 0.9% Sodium Chloride (Normal Saline) intravenous fluid used for electrolyte replenishment and then antiarrhythmic agents that are used for patients with cardiac problem. These groups of drugs that were on shortage were only affecting Fiji during this study period which could mainly due to the delay of delivery from the manufacturer.

The result of this present study corresponds with a survey conducted in Europe where antimicrobial agents were reported to be the most commonly out of stock agents. This was followed by oncology medicines, emergency medicines, cardiovascular medicines and then anesthetic agents (EAHP, 2014). Similarly, a study in Shaanxi Province, China also reported that the most group of drugs affected were antimicrobials and cardiovascular drugs (Yang et al., 2016).

On the contrary, the Canadian surveys in 2010, analyzed medicines individually and found that the ten most frequently out of stock medications were Amitriptyline (antidepressant), followed by Cephalexin (antibiotic), Metoclopramide (antiemetic), Clonidine (antihypertensive), Methotrimeprazine (antipsychotic), Diltiazem

(antihypertensive), Tetracycline (antibiotic), Amoxicillin + Clavulanate (antibiotic), Hydralazine (antihypertensive) and Metronidazole (antibiotic). However, if the antibiotics in this list are grouped together, they will come out on top of the list as the most common group of drugs that were out of stock which is similar to the findings in this study (CPhA, 2010).

Additionally, a survey in Kenya reported a slightly different pattern, where analgesics were the most frequently out of stock medication reported followed by antibiotics and then antidiabetic (Mwathi & Ben, 2014). This is an interesting finding because when comparing this to this present study, antidiabetics never appear in the drug shortage list at CWMH, even though prevalence of diabetes in Fiji is high.

In this present study, drug shortage had occurred every month at a range of 7.3% (n=29) to 12.5% (n=50) per month and it appeared to be on the rise throughout the six months of study. The findings further highlight that some medicines (antibiotics) continued to be shortage for throughout the whole period of study. The month of September had recorded the greatest number of medicines that were on shortage (n=50) and were assumed to be related to the inconsistency of reordering of medicines and inadequate funding. However, comparing this finding to the 2013 and 2014 CWMH data, range of drug shortage between month of June and November were from 23.2% (n=93) to 33.8% (n=135) and 11.5% (n=46) to 29.5% (n=118) respectively. Therefore, in terms of frequency of drug shortage, the situation at CWMH has improved despite its effect on health service.

An online survey that was done in 2010 which included 427 pharmacists throughout Canada, reported that 93.7% of the respondents had trouble locating medications to fill a prescription. Some indicated having trouble for over 200 prescriptions and nearly 90% of the respondents also indicated that this shortage of drugs have greatly increased over the past 12 months (CPhA, 2010). Therefore, our present study has supported other researches in highlighting that drug shortage affects both developed and developing countries with its frequency varies according to data reported from each country.

While understanding that drug shortage poses serious problems on clinical services, this study has highlighted some interesting findings. More than 90% of KIs who participated in this study agreed that drug shortage affected clinical services. Drug shortage has increased the workload on hospital staff, compromised the quality of care and changes the clinical practice at CWMH. According to participants, drug shortage had contributed to prolong patient hospitalization which will increase the risk of nosocomial infections and aggravated bed shortages at CWMH. Similar findings on patient's length of stay have been reported in Malawi where there was an overwhelming agreement from both patient care givers and managers (92.5% and 83.3%) that drug shortage caused overcrowding in hospitals (Kanyoma & Khomba, 2013). Overcrowding was caused by the same reason that was voiced by the participants of this study that it prolongs patient's hospitalization.

There was also a concern raised by KIs interviewed that specialized clinical services like oncology and cardiology were frequently affected by drug shortage. Findings from a survey conducted on oncology pharmacists in the United States supported the view of participants in this present study. The survey indicated that oncology drug shortages occurred frequently in the first half of 2011 and shortages affects clinical services provided to patients. Services affected include the delay in chemotherapy and changes in therapy which increases the risks of medication errors and adverse events including the increased medication costs (McBride et al., 2013).

To compare our findings to other studies, the US Food and Drug Administration (FDA) reported the number of medications on the shortage list to be increasing from 61 to 178 between 2005 and 2010. It further increased to 200 in 2012 and 754 in March 2014 (Caulder et al., 2015). Another online survey that was done in 2010 which included 427 pharmacists throughout Canada, reported that 93.7% of the respondents had trouble locating medications to fill a prescription. Some indicated having trouble for over 200 prescriptions and nearly 90% of the respondents also indicated that this shortage of drugs have greatly increased over the past 12 months (CPhA, 2010). Therefore, our present study has supported other researches in highlighting that drug shortage affects both developed and developing countries with its frequency varies according to data reported from each country

Moreover, the findings from this present study correspond with a study conducted in Europe that survey more than 600 hospital pharmacists on medicine shortage. Our study indicated that 100% of the key health care workers interviewed agreed that drug shortage compromises the quality of care provided to patients while the study in Europe reported that 86% of total responders agreed that medicine shortage is a current problem that affects the delivering of best care to patients. Drug shortage does not only affect the pharmacy services but has a detrimental impact to patients (EAHP, 2014). Also, an investigation that was conducted at CWMH in 2017 highlighted that the shortage of antibiotics was one of the contributing factors to the frequent infectious disease outbreak in the intensive care units, these disease outbreaks have had some clinical and economic impact towards patient care at CWMH however it was not quantified during the investigation (Zimmerman et al., 2017). Agreeing with this study,

(Phuong et al., 2019) also report that medication shortages result in negative impact on clinical, economical and humanistic outcomes for patients

4.1 Limitations

Data was collected during working hours so it may have limited the detail response provided by the participants.

5. Conclusion

Antibiotics were most frequent group of medicines reported followed by vitamins, parenteral, antihypertensive then antiarrhythmic agents. The study also showed that drug shortages are having effects on clinical services at CWMH. The effects included deviation of management from the standard treatment guideline and resorting to alternative treatment leading to ineffective or inferior treatment. To improve drugs shortages situation at CWMH it is heavily recommended to conduct regular stock take and auditing of stock management in the wards and pharmacy, establish a standard definition of drug shortages in Fiji to be used for data monitoring and reporting purposes and conduct a detail quantitative research on impact of drug shortage in Fiji.

Competing Interests Statement

The authors declare that there are no competing or potential conflicts of interest.

References

Acosta, A., Vanegas, E. P., Rovira, J., Godman, B., & Bochenek, T. (2019). Medicine Shortages: Gaps between Countries and Global Perspectives. *Frontiers in Pharmacology*, *10*(763). https://doi.org/10.3389/fphar.2019.00763

Bochenek, T., Abilova, V., Alkan, A., Asanin, B., de, M. B. I., & Besovic, Z. (2018). Systemic measures and legislative and organizational frameworks aimed at preventing or mitigating drug shortages in 28 European and Western Asian Countries. *Frontiers in Pharmacology*, *8*. https://doi.org/10.3389/fphar.2017.00942

Caulder, C., Mehta, B., Bookstaver, P., Sims, I., & Stevenson, B. (2015). Impact of Drug Shortages on Health System Pharmacies in the Southeastern United States. *Hosp Pharm*, *50*(4), 279-286. Retrieved from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4589883/pdf/hpj-50-279.pdf

CPhA. (2010). *Canadian Drug Shortages Survey - Final Report*. Canadian Pharmacists Association. Retrieved from https://www.theglobeandmail.com/migration_catalog/article4078233.ece/BINARY/CPhA+report+on+drug+shortages

Drug Shortage. (2010). *The Fiji Times*. Retrieved from http://www.fijitimes.com/story.aspx?id=150517

Drug shortage cripples hospital. (2009). *Fiji Sun*. Retrieved from http://fijisun.com.fj/2009/01/03/drug-shortage-cripples-hospital/

EAHP. (2014). *Medicines shortages in European hospitals – Full Report.* Retrieved from http://www.eahp.eu/sites/default/files/shortages_report05online.pdf

Fox, E. R., Sweet, B. V., & Jensen, V. (2014). Drug Shortages: A Complex Health Care Crisis. *Mayo Clinic proceedings*, *89*(3), 361-373. https://doi.org/10.1016/j.mayocp.2013.11.014

Hospitals Face Medicine Shortage. (2012). *Fiji live*. Retrieved from http://fijilive.com/fijliive-print-story.Fijilive?46598.Fijilive

Josephine, W., Betty, B., Numa, V., Alvish, S., Jessy, S., Lisa, B., & Rebekah, J. (2017). *Medicine shortages in Fiji: A qualitative exploration of stakeholders' views*. Retrieved from http://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0178429&type=printable

Kanyoma, K. E., & Khomba, J. K. (2013). The Impact of Procurement Operations on Healthcare Delivery: A Case Study of Malawi's Public Healthcare Delivery System. *Global Journals*, *13*(4). https://doi.org/10.5430/jms.v4n3p16

Marks, S. (2009). *Access to Essential Medicines as a Component of the Right to Health*. Retrieved from https://cdn1.sph.harvard.edu/wp-content/uploads/sites/580/2012/10/marks_access_to_essential_medecines-2009.pdf

McBride, A., Holle, L. M., Westendorf, C., Sidebottom, M., Griffith, N., Muller, R. J., & Hoffman, J. M. (2013). National survey on the effect of oncology drug shortages on cancer care. *American Journal of Health-System Pharmacy*, *70*(7), 609-617. https://doi.org/10.2146/ajhp120563

Medicine Shortage. (2014). *The Fiji Times Online*. Retrieved from

http://www.fijitimes.com/story.aspx?id=264858

Morrison, A. (2011). Drug Supply Disruptions. *Environmental Scan*, (17). Retrieved from https://www.cadth.ca/sites/default/files/pdf/Drug_Supply_Disruptions_es-18_e.pdf

Mwathi, M. W., & Ben, O. O. (2014). Availability of essential medicines in public hospitals: A study of selected public hospitals in Nakuru Country, Kenya, Africa. *Journal of Pharmacology*, *8*(17), 438-442. https://doi.org/10.5897/AJPP2014.4000

Nand, S. S. (2019). Access to Medicine in the South Pacific: Endogenous Factors Impeding the Benefits of WTO-TRIPS Agreement. 2019 Pacific Update Conference, University of the South Pacific.

Pauwels, K., Huys, I., Casteels, M., & Simoens, S. (2014). Drug Shortages in European countries: a trade-off between market attractiveness and cost containment? *BMC Health Services Research, 14*, 438. https://doi.org/10.1186/1472-6963-14-438

Pellny, M. (2019). *Strengthening Regulations of Medical Products in the Pacific Island Countries: Assessment and Options*. World Health Organization. Retrieved from https://spccfpstore1.blob.core.windows.net/digitallibrary-docs/files/60/606e67d01385b734e9a163810377e0 05.pdf?sv=2015-12-11&sr=b&sig=QvL2%2BVHQjxVvdvr5zGo3Yfggm1s0%2FozSrGJvAwFmg6c%3D& se=2022-03-06T11%3A32%3A02Z&sp=r&rscc=public%2C%20max-age%3D864000%2C%20max-stale% 3D86400&rsct=application%2Fpdf&rscd=inline%3B%20filename%3D%22IP5_Item4_Sub_Regulatory_Pl atform_Final.pdf%22

Phuong, J. M., Penm, J., Chaar, B., Oldfield, L. D., & Moles, R. (2019). The impacts of medication shortages on patient outcomes: A scoping review. *PLOS ONE*, *14*(5). https://doi.org/10.1371/journal.pone.0215837

Quilty, S. (2014). Medicines shortages in Australia—the reality. *Australasian Medical Journal*, *7*(6), 240-242. https://doi.org/10.4066/AMJ.2014.1933

Schwartzberg, E., Ainbinder, D., Vishkauzan, A., & Gamzu, R. (2017). Eyal Schwartzberg, Denize Ainbinder, Alla Vishkauzan, Ronni Gamzu, (2017). Drug shortages in Israel: regulatory perspectives, challenges and solutions. *Israel Journal of health policy Research*, *6*(17), 40-49. https://doi.org/10.1186/s13584-017-0140-9

UNDP. (2017). *What are the Sustainable Goals?* Retrieved from http://www.undp.org/content/undp/en/home/sustainable-development-goals.html

Ventola, C. L. (2011). The drug shortage crisis in the United States: causes, impact, and management strategies. *Pub Med*, *36*(11), 740-757. Retrieved from www.pubmedcentral.nih.gov/articlerender.fcgi?artid=3278171&tool=pmcentrez&rendertype=abstract

Walker, J., Chaar, B. B., Vera, N., Pillai, A. S., Lim, J. S., Bero, L., & Moles, R. J. (2017). Medicine shortages in Fiji: A qualitative exploration of stakeholders' views. *PLOS ONE*, *12*(6). https://doi.org/10.1371/journal.pone.0178429

World Health Organization [WHO]. (2017a). Essential medicines and health products. Retrieved from http://www.who.int/medicines/services/essmedicines_def/en/

World Health Organization [WHO]. (2017b). *Seventieth World health Assembly. Addressing the global shortage of and access to medicines and vaccines*.

Yadav, P., Tata, H. L., & Babaley, M. (2011). *The World Medicines Situation 2011; Storage and Suppy Chain Management*. https://doi.org/10.1371/journal.pone.0165183

Yang, C., Wu, L., Cai, W., Zhu, W., Shen, Q., & Li, Z. (2016). *Current Situation, Determinants, and Solutions to Drug Shortages in Shaanxi Province, China: A Qualitative Study*. Retrieved from http://journals.plos.org/plosone/article/file?id=10.1371/journal.pone.0165183&type=printable

Zimmerman, P. A., Lyman, M., & Andersson, P. (2017). *Acinetobacter Baumannii Outbreak in NICU At The Colonial War Memorial Hospital Suva, Fiji*.

Copyrights