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Perception, Practice, Reasons, and Challenges for Drug Shortage in Community Pharmacies of Pakistan, Lahore



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Abstract: Medication shortages are a global issue that disrupts pharmacy services and negatively impacts patient care. The Drug Regulatory Authority Pakistan (DRAP) has set a benchmark for the drugs and medication supply committee. This study was conducted in five key regions of Pakistan and found that 55% of physicians and pharmacists encountered medication shortages. This study aimed to assess the perception, practice, reasons, and challenges for Drug Shortage in community pharmacies of Pakistan, Lahore. It is a descriptive, cross-sectional study of 471 Community Pharmacists and Technicians in Lahore. The data was collected through a comprehensive instrument designed after an extensive literature review. There were significant differences in the frequency distribution between pharmacists and technicians based on gender, marital status, area of residence, education, type of retail outlet, and working experience. Factors contributing to shortages include supply issues, misunderstandings, regulatory issues, poor inventory trends, and price spikes

Key Words: Drug, Drug Shortage, Community Pharmacies, Health Care

Introduction

A drug is a substance that is commonly used for the diagnosis, cure, treatment, and prevention of an ailment. Access to Essential medicines (EMs) is a basic right for every human being (Sunaina Rafi, 2021). The rationale for prescribing medicines is to enhance therapeutic efficacy but sometimes

medicine shortage results in failure to achieve the required therapeutic outcomes (Sumaira Omer, 2021). According to WHO essential medicines shortage is becoming very popular and putting additional cost and health risk on the patients who are not receiving the medicines they need. Medicine shortage is a global issue and is growing progressively. In Pakistan, a shortage of many

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lifesaving drugs is reported all over the country (Syeda Aijaz Fatima, [2017](#)).

The American Society of Health-system Pharmacists (ASHP) defines this shortage of medicines "as a supply issue that disturbs the pharmacy services and how the patient care is affected when alternatives are used"(Muhammad Atif, [2019](#)). Medication shortage is not a new issue; however, it has gained importance in recent years all over the world. WHO describes medication shortage as a supply of medicines, health care products, and vaccines that are essential, failing to meet the patient demand and needs.

Medication Shortage results in public health issues and affects any drug type as generic, pediatrics, radiopharmaceuticals, biologics, and many more(Muhammad Atif, [2019](#)). Medicine shortage generates many healthcare barriers and results in differences in therapeutic failure, compromised medication, substitution errors, and death. This ultimately leads to

- Increased Hospital Expenses
- Enhanced cost
- Safety issues

There are multifarious and diverse reasons for drug shortages. The most important and leading factors that interrupt the supply of medicines according to WHO and ASHP are(Muhammad Atif, [2019](#)):

- Manufacturing issues
- Regulatory problems
- Increased demand and supply
- Raw and Bulk material supply issues
- Alteration in product formulation
- Natural disasters
- Grey market
- Poor inventory control

As a third-world country, Pakistan is very well likely to be confronted with a medicine shortage where only a small proportion of the total Health Care Budget prepares Medicines and medicinal appliances (Sumaira Omer, 4 August [2021](#)). Access to healthcare is one of its primary concerns, and it has established a pharmaceutical system. Products of pharmaceuticals are given to the wholesalers as

drug manufacturers which are supposed to be kept in retail pharmacies and bought from doctors. Subsequently, consumers receive them from medical stores. The distribution and selling of medications in this country are distressed by the law of the Drug Act 1967. Drug Regulatory Authority Pakistan (DRAP) has set a benchmark for the drugs and medication supply committee which deals with the shortage of drugs and medication.

Shortage of life-saving medicines will result in compromised health of the patients, medication errors, and increased therapeutic costs. Shortage at community pharmacies will deprive patients of OTC medicines and many lifesaving drugs that can be easily available to them at controlled prices.

Sumaira Omer ([2021](#)) studied the five key regions of Pakistan, Punjab, Sindh, Khyber Pakhtunkhwa, Balochistan, and Islamabad. It used 800 pharmacists who approached to carry out this study. From a total of 708 responses, respondents in five regions and slums acquired drug shortages on a daily basis. In comparison, 25% of respondents from the capital Islamabad, and 28% from Balochistan faced a shortage of drugs on a weekly basis, then Sindh and Khyber Pakhtunkhwa, in which 21% of respondents from each province faced the same, and Punjab where 21% reported the same. The top five classes of drugs that require upgrading in terms of manufacturing are oncology drugs, Cardiovascular drugs, and anti-microbials Out of 708 respondents 47% answered No when asked if there is any reporting system in place or not.. In spite of the fact that different regions represent their percentage of respondents, for example, Sindh (66%), Baluchistan (55%), and Islamabad (88%) there exists no specific consolidated reporting system.

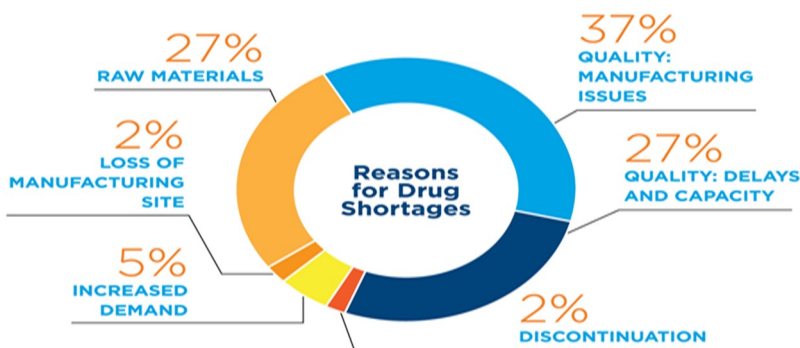
Syeda Aijaz Fatima ([2017](#)) performed a study in which a total of 472 people participated. Out of 472, 236 were physicians and 236 were pharmacists with the age group of 30-34 years. They found that 55% of the physicians and pharmacists encountered medication shortages of

various brands. They found that about 50-55% of injectables were short.

The availability of safe, quality essential, and effective medicines is fundamental for improved human health. Drug shortage on the one hand produces adversities in therapeutic results, on the other hand causes medication errors. Multiple and complex reasons are for medication shortage. Government leadership is required to improve the supply of medicines to patients (Muhammad Atif, 2019). By increasing education and training to the

pharmacists and workers we can manage the prevalence of medication shortage. Careful choice of drugs, building healthy relationships among health care providers, improved inventory management, and by drug management system we can improve challenges associated with this issue. The objective of our study is to determine perceptions, practices, reasons, and challenges for drug shortages in community pharmacies of Pakistan so that we can eradicate the key factors contributing to the shortage of medication worldwide.

Figure 1



U.S. Food & Drug Administration

Methodology

Ethical Approval

The Human Ethical Committee University College of Pharmacy, University of the Punjab, Lahore, approved the study, reference number PUCP/1139/2021. Verbal consent was obtained from all the participants.

Study Design

A descriptive, cross-sectional study was conducted by sampling respondents from Community pharmacies all over Lahore. The study was for a period of 6 months starting from

October 2021 – April 2022. Data was collected from both Pharmacists and Technicians. Community pharmacists were preferred because they are well aware of all running drug shortages. They have the expertise and cognition to deal with drug shortages by figuring out problems. They are well associated with manufacturers and wholesalers through their procurement and logistic roles. They can guide patients, caregivers, and physicians on alternative treatment options so that all of them can deal with the dilemma of medicine shortages. All the Pharmacists and Technicians were briefed about the nature and objectives of the research. Data obtained from

Pharmacists and Technicians were segregated into separate arms for comparative analysis.

Study Population

A total of 471 Community Pharmacists and Technicians were enrolled in the study. The sampling frame consisted of Pharmacists and Technicians working in community pharmacies in Lahore. A sample size of 384 was estimated by Rao-soft software using a 5% margin of error, and a 95% confidence interval with an expected response of 50% for an expected University student population size of Lahore, i.e., 2 million. However, to have a true representation of each group, more than 400 students were enrolled per group. A simple convenient sampling was used for the selection of study participants

Inclusion criteria: All the Community Pharmacists and Technicians working in various community pharmacies in different areas of Lahore irrespective of age, gender, ethnicity, religion, and social class were included. Only participants willing to take part in the study were considered.

Exclusion criteria: All Physicians, Hospital Pharmacists, Nonpharmacy persons, and those not willing to participate were excluded.

Data Collection

Data collection was done by means of a comprehensive instrument of measure designed after extensive literature review (Akan et al., 2012; Furnham & McGill, 2003; Hussain et al., 2012; Koh et al., 2003; Lie & Boker, 2006; Majeed et al., 2007; Pokladnikova & Lie, 2008) (supplementary file: (Attached as Annexure 1 The questionnaire was given to subject matter/academic experts for content validation, the feedbacks taken from them to empower the questionnaire with the features highlighted by them to be objective and issue-driven. We checked the questionnaire reliability with Cronbach's alpha coefficient (0.78) before SPSS version 22. Face validation was piloting the questionnaire among 20 Pharmacists for which the feedback from them during the pilot study was

incorporated. The pilot study was excluded from the data as all the data it provided were not considered for the final analysis. The self-administered questionnaire was given out to Casual candidates among others. We issued 600 questionnaire forms out of which we were able to obtain only 471 completed ones, these uncompleted ones were not included in the final statistical data. The questionnaire was designed as below into 4 sections. The first paragraph explained the ethical considerations that were in place to assure participants that their privacy was respected.

Section 1: Basic demographic, such as age, gender, marital status, area of residence, education, professional designation, Working experience, Satisfaction with pharmacy services, Occurrence of drug shortages, and reporting system for drug shortages.

Section 2: Medicines Shortages which is further divided into three sub-sections:

Sub-section 1: Categories or Class of medicines frequently short (over the past month)

Sub-section 2: List of prescription medicines frequently short (over the past month)

Sub-section 3: List of OTC medicines frequently short (over the past month)

Section 3: Practices to mitigate drug shortages: includes 14 statements to mitigate drug shortages based on 5- a 5-point Likert scale from 1= Strongly disagree to 5= Strongly agree.

Section 4: Perception about drug shortages: includes 14 statements regarding the perception of pharmacists and technicians based on a 5-point Likert scale from 1 = Strongly disagree to 5 = Strongly agree.

Data Analysis

Data were analyzed with the help of SPSS (IBM; version 22) unless otherwise indicated. Describing analysis helps to obtain the amounts and frequency is the focus. In consultants to dependent variables like Class of drug contributing to prescription and over-the-counter medications in shortage, the

study assessed the mitigation practices to solve drug shortages as well as the perception about the drug shortages. The independent variables included demographics, and they were measured using Pearson's Chi-square. Man-Whitney and alpha Manny-Whitney tests were used to prove that there was a differentiation between the continuous variables. The normality of the data was determined by the Shapiro-Wilk test, revealing that the data do not represent a normal distribution pattern, therefore the normality of the data was accepted. A coefficient of correlation equal to 0. A significance level of $P = 0.05$ or less was taken.

Result

Among total $N=471$ participants, pharmacists ($n=326$) and technicians ($n=145$) participated in this study. The majority of pharmacists were male 73.9% ($n=241$) and among technicians' the majority also were male 97.2% ($n=141$). Data

revealed that the mean of pharmacists and technicians were 27.94 4.47 and 31.08 8.46, $p<0.0007$, respectively. Significant differences were observed in the frequency distribution between P and T with regards to gender (**P**: Male; 73.9%, Female; 26.1%, **T**: Male; 97.2%, Female: 2.8%, $p=0.0001$), marital status (**P**: Married; 39.6%, Unmarried; 60.4%, **T**: Married; 62.1%, Unmarried: 37.9%, $p=0.0001$), area of residence (**P**: Urban; 89.9%, Rural; 10.1%, **T**: Urban; 79.3%, Rural: 20.7%, $p=0.0001$), education (**P**: Pharmacy; 95.7%, B.A; 2.8%, **T**: Pharm D; 6.9%, B.A: 49.7%, $p=0.0001$), type of medicine retail outlet ($p=0.0001$) and working experience ($p=0.002$) – majority had less than 14 years. In the rest of the variables, such as satisfaction with the pharmacy services, reporting system for drug shortages, and frequency of drug shortages, no significant differences were observed in the frequency distribution between the pharmacists and the technicians (Table 1).

Table 1

Population Demographics

Characteristics	Pharmacists, $n=326$ (%)	Technicians, $n=145$ (%)	<i>p-values</i>
Age (<i>y</i>) (Mean SD)	27.94 4.47	31.08 8.46	$<0.0007^{**}$
Gender			
Male	241 (73.9)	141 (97.2)	
Female	85 (26.1)	4 (2.8)	0.0001**
Marital status			
Married	129 (39.6)	90 (62.1)	
Unmarried	197 (60.4)	55 (37.9)	0.0001**
Area of residence			
Urban-Rural	293 (89.9) 33 (10.1)	115 (79.3) 30 (20.7)	0.002*
Education			
Pharm D	312 (95.7)	10 (6.9)	
B.A	9 (2.8)	72 (49.7)	0.0001**
F.A	5 (1.5)	63 (43.4)	
Type of medicine retail outlet			
Pharmacy	326 (100.0)	60 (41.4)	
Medical Store	0 (0.0)	85 (58.6)	0.0001**
Working experience (<i>yrs</i>)			
Less than 7	41 (43.3)	41 (28.3)	
Less than 14	104 (31.9)	48 (33.1)	0.002*

Less than 21	52 (16.0)	42 (29.0)	
Less than 28	29 (8.9)	14 (9.7)	
Satisfied with pharmacy services	283 (86.8)	130 (89.7)	
Yes	43 (13.2)	15 (10.3)	0.386
No			
The reporting system for drug shortages	150 (46.0)	54 (37.2)	
Yes	176 (54.0)	91 (62.8)	0.076
No			
Frequency of drug shortages			
Daily	97 (29.8)	41(28.3)	
Weekly	129 (39.6)	56(38.6)	0.568
Monthly	92 (28.2)	46 (31.7)	
Never	3 (0.9)	2 (1.4)	
Others	5 (1.5)	0 (0.0)	

Nearly all types of drugs have been reported in shortage and the top drug categories reported were Antibiotics(*JoiFA10*),(*JoiFA09*),(*JoiXX08*), Anxiolytics(*No5BA12*),(*No5BA12*),(*No3AE01*),(*No5BA12*),

Antihistamines(*Ro6AX26*),(*Ro6AE07*), Analgesics (*No2BE01*),(*No2BE01*), NSAIDS(*No2BA01*). The list of Prescription Medicines and OTC Medicines frequently short (over the past month) is shown in table 2.1. and table 3.1. respectively.

Table 2.1

Prescription Medicines

Characteristics	Pharmacists <i>n</i> = 326(%)	Technicians <i>n</i> = 145(%)	<i>p</i> -values
Anxiolytics	122 (37.4)	60 (41.4)	
1- Xanax (<i>No5BA12</i>)	204 (62.6)	85 (58.6)	0.416
Yes			
No			
2- Alp (<i>No5BA12</i>)	78 (23.9)	41 (28.3)	104
Yes	248 (76.1)	(71.7)	0.316
No			
3-Lexotanil (<i>No5BA08</i>)	14 (4.3)	8 (5.5)	
Yes	312 (95.7)	137 (94.5)	0.562
No			
4-Rivotril (<i>No3AE01</i>)	59 (18.1)	24 (16.6)	
Yes	267 (81.9)	121 (83.4)	0.684
No			
5-Neuxam (<i>No5BA12</i>)	55 (16.9)	21 (14.5)	
Yes	271 (83.1)	124 (85.5)	0.515
No			
6-Magura (<i>No5BA02</i>)	8 (2.5)	4 (2.8)	0.846
Yes	318 (97.5)	141 (97.2)	
No			

Characteristics	Pharmacists <i>n</i> = 326(%)	Technicians <i>n</i> = 145(%)	<i>p</i> -values
Acetylcholine esterase inhibitor 1-Amygra (No7AAo2) Yes No	19 (5.8) 307 (94.2)	8 (5.5) 137 (94.5)	0.893
β-2 Agonist Ventolin solution (Ro3CCo2) Yes No	12 (3.7) 314 (96.3)	6 (4.1) 139 (95.9)	0.811
Calcium channel blocker 1-Adalat (Co8CAo5) Yes No	55 (16.9) 271 (83.1)	20 (13.8) 125 (86.2)	0.399
Statins 1-Rovista (CroAAo7) Yes No	12 (3.7) 314 (96.3)	5 (3.4) 140 (96.6)	0.901
Antibiotics 1-Azithromycin (JoiFAro) Yes No	32 (9.8) 294 (90.2)	9 (6.2) 136 (93.8)	0.200
Klaricid (JoiFAo9) Yes No	15 (4.6) 311 (95.4)	5 (3.4) 140 (96.6)	0.567
Linezolid (JoiXXo8) 3- Yes No	8 (2.5) 318 (97.5)	3 (2.1) 142 (97.9)	0.798
Anti-malarial 1-Hydroxy chloroquine tab (PoiBAo2) Yes No	48 (14.7) 278 (85.3)	20 (13.8) 125 (86.2)	0.791
Anti-histamines 1-Corex-DSyp (Ro6ABo4) Yes No	18 (5.5) 308 (94.5)	10 (6.9) 135 (93.1)	0.560
Diuretic 1-Acetazolamide (SoiECoi) Yes No	60 (18.4) 266 (81.6)	19 (13.1) 126 (86.9)	0.155
Anti-Diabetic 1-Glucobay (AroBFoi) Yes No	61 (18.7) 265 (81.3)	24 (16.6) 121 (83.4)	0.574
Nsaid 1-Disprin CV (No2BAoi) Yes No	83 (25.5) 243 (74.5)	44 (30.3) 101 (69.7)	0.270
Anti-platelet 1-Loprin	57 (17.5) 269 (82.5)	35 (24.1) 110 (75.9)	0.093

Characteristics	Pharmacists <i>n</i> = 326(%)	Technicians <i>n</i> = 145(%)	<i>p</i> -values
(<i>No2BA01</i>)			
Yes	No		
Androgen and anabolic steroids	1-Proviron	33 (10.1)	17 (11.7)
(<i>Go3BB01</i>)		293 (89.9)	128 (88.3)
Yes	No		
Anti-epileptics	1-	45 (13.8)	26 (17.9)
Epival Inj (<i>No3AG01</i>)		281 (86.2)	119 (82.1)
Yes	No		
Liver protectant	1-	55 (16.6)	19 (13.1)
Silliver		271 (83.1)	126 (86.9)
(<i>A05BA03</i>)			0.300
Yes	No		
Nitrates	1-		
Angisid		17 (5.2)	4 (2.8)
(<i>Co5AE01</i>)		309 (94.8)	141 (97.2)
Yes	No		
β-Blocker	1-		
Inderal		145 (44.5)	76(52.4)
(<i>Co7AA05</i>)	Yes	181 (55.5)	69 (47.6)
No			0.111

Table 3.1

OTC Medicines

Characteristics	Pharmacists <i>n</i> = 326(%)	Technicians <i>n</i> = 145(%)	<i>p</i> -values
Analgesics	1-	283 (86.6)	138 (95.2)
Panadol		43 (13.2)	7 (4.8)
(<i>No2BE01</i>)	Yes		
No	2-		
Calpol	(<i>No2BE01</i>)	58 (17.8)	23 (15.9)
Yes		268 (82.2)	122 (84.1)
No	3-		
Panadol	Extended	81 (24.8)	62 (42.8)
(<i>No2BE01</i>)	Yes	245 (75.2)	83 (57.2)
No	4-		
Disprol		29 (8.9)	18 (12.4)
(<i>No2BE01</i>)	Yes	297 (91.1)	127 (87.6)
No	5-		
Panadol	Extra	94 (28.8)	40 (27.6)
(<i>No2BE01</i>)		232 (71.2)	105 (72.4)
Yes			
No	6-	21 (6.4)	12 (8.3)
Febrol		305 (93.6)	133 (91.7)
			0.472

Characteristics		Pharmacists <i>n</i> = 326(%)	Technicians <i>n</i> = 145(%)	<i>p</i> -values
(No2BE01)				
Yes				
No				
Nsaids	1-			
Brufen		104 (31.9)	44 (30.3)	
(Go2CC01)		222 (68.1)	101 (69.7)	0.737
Yes				
No	2-			
Naproxen (M01AE02)		22 (6.7)	1 (0.7)	
Yes		304 (93.3)	144 (99.3)	0.005*
No	3-			
Ponstan				
(M01AG01)		25 (7.7)	16 (11.0)	
Yes		301 (92.3)	129 (89.0)	0.232
No				
4-Sanid				
(R02AX01)		11 (3.4)	5 (3.4)	
Yes		315 (96.6)	140 (96.6)	0.967
No				
Anti-Tussive				
1-Coldrex		23 (7.1)	8 (5.5)	
(N02BE51)	Yes	303 (92.9)	137 (94.5)	0.534
No	2-			
Cofcol				
(R05FB02)		20 (6.1)	6 (4.1)	
Yes		306 (93.9)	139 (95.9)	0.381
No				
Anti-Histamine	1-			
Piriton		16 (4.9)	5 (3.4)	
(R06AB04)		310 (95.1)	140 (96.6)	0.479
Yes				
No				
3-Fexet-D (R06AX26)		101 (31.0)	42 (29.0)	
Yes		225 (69.0)	103 (71.0)	0.660
No	4-			
Baydal				
(R06AE07)		39 (12.0)	14 (9.7)	
Yes		287 (88.0)	131 (90.3)	0.464
No				
Anti-Emetic	1-			
Gravinate (R06AA11)		19 (5.8)	5 (3.4)	
Yes	No	307 (94.2)	140 (96.6)	0.278
Antibiotic	1-			
Septan		18 (5.5)	16 (11.0)	
(J01EE01)		308 (94.5)	129 (89.0)	0.033*
(J04M408)	Yes			

Characteristics		Pharmacists <i>n</i> = 326(%)	Technicians <i>n</i> = 145(%)	<i>p</i> -values
No	2-	25 (7.7)	10 (6.9)	0.768
Flagyll (<i>JorXDor</i>)		301 (92.3)	135 (93.1)	
Yes	No			0.175
Antacid	1-			
Gaviscone syp (<i>AozBX</i>)		30 (9.2)	8 (5.5)	0.175
Yes		296 (90.8)	137 (94.5)	
No				0.104
β-2 Agonist				
1-Ventolin (<i>Ro3CCo2</i>)	tab	80 (24.5)	46 (31.7)	0.104
Yes	No	246 (75.5)	99 (68.3)	
Proton pump inhibitors				0.0001**
1-Risek (<i>AozBCor</i>)	40 mg	32 (9.8)	1 (0.7)	
Yes	Yes	294 (90.2)	144 (99.3)	0.301
No	No			
Anti-Platelet	1-			0.301
Disprin (<i>No2BAor</i>)		112 (34.4)	57 (39.3)	
Yes	No	214 (65.6)	88 (60.7)	0.002*
Topical corticosteroids				
1-Clobevate (<i>Do7ADor</i>)		16 (4.9)	19 (13.1)	0.002*
Yes		310 (95.1)	126 (86.9)	
No				

Along with the Fixed dose combinations (of prescription medicines) in which major drug categories reported were Anti-tussive, Analgesic, Multi-vitamins, Ovulation stimulants, and anti-tubercular, and the Fixed dose combinations (of

OTC medicines) frequently short were Anti-malarial, Anti-tussive, Anti-histamine (over the past month) shown in table 2.2. and 3.2. respectively.

Table 2.2

Fixed dose combinations (of prescription medicines)

Anti-tussive				
1-Cosome	syp	23 (7.1)	8 (5.5)	0.534
Yes	No	303 (92.9)	137 (94.5)	
Analgesic	1-			0.527
Panadol	CF			
Yes		69 (21.2)	27 (18.6)	0.527
No		257 (78.8)	118 (81.4)	
Anti-tubercular	1-			0.268
Myrin-P				
Yes	No	11 (3.4)	8 (5.6)	0.268
		315 (96.6)	136 (94.4)	
Ovulation stimulant		8 (2.5)	12 (8.3)	0.004*

Anti-tussive			23 (7.1)	8 (5.5)	0.534
1-Cosome	syp		303 (92.9)	137 (94.5)	
Yes	No				
1-Ferti C	Inj		318 (97.5)	133 (91.7)	
Yes	No				
Multivitamins			11 (3.4)	13 (9.0)	
1-Surbex-Z	Yes		315 (96.6)	132 (91.0)	0.011*
No	2-				
Ibret folic	Yes		23 (7.1)	14 (9.7)	
No			303 (92.9)	131 (90.3)	0.333

Table 3.2

Fixed dose combinations (of OTC medicines)

Anti-Malarial	1-	16 (4.9)	10 (6.9)	0.383
Fansidar	Yes	310 (95.1)	135 (93.1)	
No	2-			
Resochin	Yes	23 (7.1)	8 (5.5)	0.534
No		303 (92.9)	137 (94.5)	
Anti-Tussive		11 (3.4)	5 (3.4)	0.967
1-Hydrillin		315 (96.6)	140 (96.6)	
Yes				
No				
2-Pulmonal	Yes	12 (3.7)	7 (4.8)	0.559
No		314 (96.3)	138 (95.2)	
Anti-Histamine		26 (8.0)	8 (5.5)	
1-Actified-P	Yes	300 (92.0)	137 (94.5)	0.341
No				
5-Flueze	Yes	16 (4.9)	5 (3.4)	
No		310 (95.1)	140 (96.6)	0.479
Anti-Infective	1-	82 (25.2)	37 (25.5)	
Arinac	Yes	244 (74.8)	108 (74.5)	0.933
No				
2-Arinac forte		51 (15.6)	25 (17.2)	
Yes	No	275 (84.4)	120 (82.8)	0.664
Menthol	lozenges			
1-Strepsils	Yes	18 (5.5)	0 (0.0)	0.004*
No		308 (94.5)	145 (100.0)	

This study showed that the medicine shortages had significant clinical and financial impact on patients. The perception of pharmacists and technicians about drug shortages in community pharmacies is shown in Table 4. In which patient

suffers due to wrong medication, therapeutic failure, delay in surgical procedures, therapy cost, serious side effects of alternative medications which are further worsened by therapy expenditure, and reduced patient adherence.

Table 4

Perception of pharmacists and technicians about drug shortages in community pharmacies of Lahore, Pakistan

Questions of perception about drug shortages	Pharmacists, n(=326) (Mean SD)		Technicians, n(=146) (Mean SD)		p-values
Compromise quality of care in the hospitals	4.018	0.864	4.227	0.863	0.015*
Patients suffer due to therapeutic failure	4.116	0.951	4	1	0.022*
A patient receives the wrong medication upon substitution	3.406	1.042	3.531	1.093	0.238
Patient's condition can deteriorate	3.547	0.893	3.724	0.901	0.049*
Surgical operations can be delayed	3.043	1.161	3.179	1.194	0.245
Analogues may not be very effective	2.76	1.121	2.889	1.124	0.247
Alternative drugs may cause more serious side effects	2.547	1.072	2.662	1.137	0.295
Analogues may cause more serious side effects	2.566	1.165	2.565	1.183	0.945
May cause substitution for inferior drugs	2.981	1.247	2.931	1.272	0.687
May need to refer the patient to another hospital	2.836	1.240	2.724	1.271	0.366
May cause medication errors	3.113	1.243	3.282	1.245	0.174
Therapy delayed	3.501	0.992	3.6	1.076	0.333
Increased therapy cost	3.375	1.191	3.482	1.196	0.368
Alternatives may be more expensive	3.338	1.200	3.496	1.080	0.174
May cause reduced patient adherence	3.606	0.912	3.593	0.982	0.888
Increased prescribing inaccuracies	3.233	1.170	3.206	1.317	0.824

The mitigation strategy used by pharmacists and technicians during drug shortage, and possible management strategies along with suggestions shown in Table 5. To track drug shortages there should be a proper inventory management

program along with the backup of alternate suppliers, referring patients to physicians to change the drug, suggesting an alternative to the patient, referring patients to another pharmacy, and the advance notification system to manage

shortages. In which pharmacists (n=326) (*Mean SD*) (3.926 0.959) with a p-value of (0.626) and technicians (n=146) (*Mean SD*) (3.972 0.935) with p-value (0.626) strongly agreed to have inventory management programs in order to track the drug shortages.

Table 5

Practices to mitigate drug shortages in community pharmacies of Lahore, Pakistan

Practices to mitigate drug shortages	Pharmacists n (=326) (Mean SD)	Technicians n (=146) (Mean SD)	p-values
Inventory management program in place to track drug shortages	3.926 0.959	3.972 0.935	0.626
Always ensure backup of alternate suppliers	4.150 0.815	4.317 0.787	0.039*
Refer the patient to the doctor to change the drug	3.864 0.971	3.772 0.962	0.341
Suggest an alternative to the patient for his/her medicine	4.092 0.826	4.193 0.801	0.218
Refer the patient to another pharmacy	3.670 1.056	3.703 1.124	0.761
Always plan for shortages to stock in adequate quantities	3.516 1.150	3.779 1.076	0.020*
Adjust budget to accommodate expenditures due to shortages	3.763 0.862	3.793 0.888	0.729
Multiple shortages	3.381 0.943	3.386 1.035	0.961
Immediately report to the prescribers and nursing staff about the shortages	3.643 0.950	3.641 1.058	0.986
Increase communication among stakeholders	3.640 1.072	3.627 1.073	0.907
Advance notification system	3.550 1.060	3.662 1.100	0.299
Re-distribution of available stock	3.212 1.074	3.165 1.219	0.676
Use of recently expired medicines-increase in expiry	2.335 0.985	2.227 1.159	0.300
Re-assign job duties – place efficient	3.756 1.015	3.820 1.011	0.529

Practices to mitigate drug shortages	Pharmacists n (=326) (Mean SD)	Technicians n (=146) (Mean SD)	p-values
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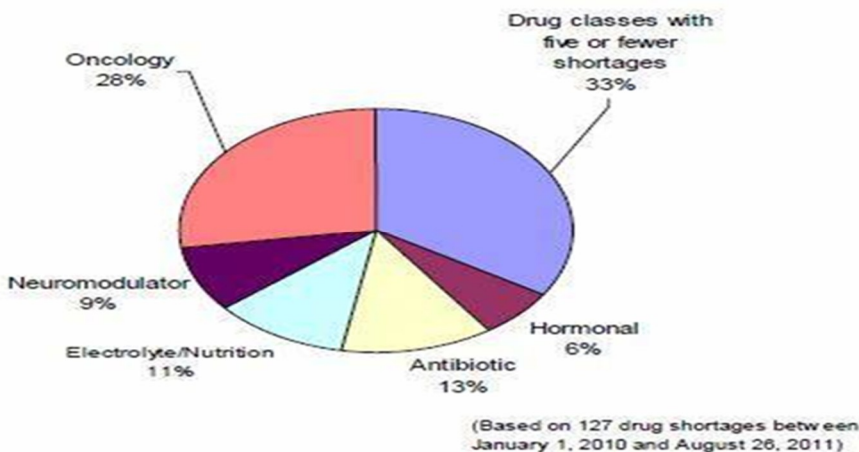
workers on managing shortages

Discussion

This is the research study to document the phenomenon of drug shortages in community pharmacies in Lahore. The majority of the participants were male pharmacists, and some were male technicians. The majority of them were satisfied with pharmacy services. Frequency of drug shortages mainly occurs weekly and there is less reporting system for drug shortages. Prescription medicines in this research include

anxiolytics, acetylcholine esterase inhibitors, beta 2 agonists, calcium channel blockers, statins, antibiotics, antimalarial, antihistamines, diuretics, antidiabetics, NSAIDs, antiplatelet, androgen and anabolic steroids, antiepileptics, liver protectants, and nitrates. Among the prescription medicines, the shortage of beta-blockers (47%) was more prominent. Among the OTC medicines, Panadol shortage (89.38%) was found to be more prevalent. Many respondents in perception stated that patients suffer due to therapeutic failure.

Figure 2



Conclusion

Drug shortage is a very severe issue in the healthcare sector of Pakistan because it is observed commonly in hospitals, endangering the lives of patients who are dependent on the drugs for their long-term health mainly when the drug is not available in the needed time. The hospital and pharmacy issues that are causing the deprivation of drugs are multi-causal and can be due to the

supplies not reaching the vendors, misunderstandings, regulatory issues, poor inventory trends, and price spikes. The lack of medicine for healthcare providers is one of the biggest problems mentioned such as providers of pharmacy care. Selective use of drugs, limiting the drugs stored in the inventory, and staffing competent drug supply personnel as well as a system of drug inventory management can forecast disease occurrence and drug management

incorporated there; these are the measures that will reduce the problem of drug shortage in future usage.

There is a growing number of drug shortage cases that lead healthcare facilities and suppliers to a great disaster to solve. For example, the shortage of drugs can affect severely the safety, treatment outcomes for the patients, quality of controls, the management of the care facilities, and other important aspects. Nevertheless, it is complicated

to foresee or to prepare for any drug shortage but can to some extent be averted through careful planning and strategic maneuvering process so as not to turn the subsequent problems into a crisis. It is critical for one to put in place well-defined processes and guidelines in order to manage cases of drug shortages. Adequate data collection, widespread interfacing with other health facilities as well as readiness for timely information sharing are key success scores of effective drug scarcity control.

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