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Original Research Article

Impact of Illegible Handwritten Prescriptions on Dispensing Errors: A Focus on Look-Alike Sound-Alike Medications in Libyan Community Pharmacies

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Abstract: ***Introduction***: Illegible handwritten prescriptions (IHPs) for look-alike sound-alike medications (LASAMs) compromise pharmaceutical service quality, dispensing errors, and patient safety risks. ***Methods***: To date, little is documented on the real dispensing practices of Libyan community pharmacists when presented with illegible prescription orders involving poorly handwritten LASAMs. Therefore; this cross-sectional study using simulated patient methodology, was performed to assess predictors for dispensing errors among 400 community pharmacists and evaluate their ability to interpret and dispense IHPs of LASAMs. Four prescriptions, each with 1–4 items (10 total items, including either Duphalac® or Duphaston®) were evaluated, yielding a thousand measurements. ***Results***: The findings revealed significant challenges in interpreting IHPs, with 45.5% of pharmacists correctly identifying the LASAM. Generic drug names as Aspirin (94%) and Dexamethasone (77%), were interpreted more accurately compared to brand names like Utrogestan® (21%) and Pregnyl® (12%). Key predictors of dispensing errors include: single drug item prescriptions ([AOR] [95% CI]: 1.842 [1.15-2.950]; $p = 0.011$), crowded pharmacy ([AOR] [95% CI]: 2.165[1.256- 3.731]; $p = 0.005$), and evening visits ([AOR] [95% CI]: 1.983[1.119- 3.517]; $p = 0.019$). Pharmacists who sought additional information ([AOR] [95% CI]: 0.330 [0.208- 0.524]; $p < 0.001$), or referred patients to the physician ([AOR] [95% CI]: 0.241 [0.124- 0.468]; $p < 0.001$) achieved correct dispensing, reducing errors by 67% and 75.9%; respectively. ***Conclusion***: Urgent systemic interventions, including the implementation of Computerized Physician Order Entry (CPOE) systems, standardized prescription-writing practices, and targeted pharmacists training programs are critical to enhance patient safety in Libya's healthcare system.

Keywords: Illegible Handwritten Prescriptions, Look-Alike Sound-Alike Medications, Dispensing Error, Community Pharmacist, Libya.

INTRODUCTION

Illegible handwriting, incomplete information, and non-compliance with regulatory standards in handwritten medical prescriptions remain critical contributors to preventable medication errors worldwide, posing significant risks to patient safety (Aronson, 2009; Brits et al., 2017; Bousoik et al., 2023). These errors ranging from misinterpreted drug names to incorrect dosages, are exacerbated by systemic underreporting and inconsistent adherence to prescribing protocols, particularly in resource-limited settings (Bousoik et al., 2023). Studies across diverse regions, including Libya, South Africa, Saudi Arabia, and the Philippines, highlight alarming rates of illegibility and incompleteness (e.g., missing patient demographics, prescriber details, or diagnoses) in illegible handwritten prescriptions (IHPs), directly correlating with adverse drug events (Pasco et al., 2017) and mortality (Abdalla et al., 2024; Albarrak et al., 2014; Cerio et al., 2015; Pasco et al., 2017).

IHPs are predominate in Libya (Kutrani et al., 2019; Bousoik et al., 2023), recent research by Abdalla et al. (2024) underscores the prevalence of IHPs, with 20–30% of prescriptions in Zliten City exhibiting illegible drug names, doses, or dosage forms in addition

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to pervasive deficiencies in such prescriptions. These findings mirror global studies, Brits et al. (2017) found 25% of prescriptions in South Africa were misread by pharmacists, and illegibility rates exceeding 20% in Saudi Arabia beside; frequent omissions in drug strength, route, and patient age (Albarrak et al., 2014; Raja et al., 2019). Such inconsistencies underscore the need for standardized protocols and technological interventions, as manual systems remain prone to error under high clinical workloads (Abdalla et al., 2024; Joshi et al., 2016).

Globally, medication errors due to IHPs affect over 1.5 million patients annually, with unclear abbreviations and IHP being major contributors (Brits et al., 2017). These errors can occur at various stages of the medication use process, including prescribing, dispensing and administration. Among the leading causes, illegible handwriting is frequently cited as a significant contributor (Calligaris et al., 2009). Studies estimate that 15–30% of prescriptions are IHP, leading to incorrect drug dispensing (Yilmaz et al., 2011; Rodriguez-Vera et al., 2002) and mortality, with 7,000 annual U.S. deaths attributed to prescription inaccuracies (Lewis et al., 2009). For instance, 52% of prescriptions in a Swiss hospital were difficult to read, with 4% entirely indecipherable (Hartel et al., 2011, cited in Robaina Bordón et al., 2014). Similarly, Zhang et al. (2020) found that 25% of handwritten prescriptions were poorly legible, resulting in dosage omissions and incorrect administration instructions.

Misreading IHPs have life-threatening consequences (Robaina Bordón et al., 2014). A U.S. Legal case involving a fatal misinterpretation of “Isordil” as “Plendil” led to a $225,000 penalty, underscoring the lethal impact of indecipherable handwriting (Brits et al., 2017). In South Africa, “lorazepam 4 mg” was misinterpreted as “40 mg.” (Brits et al. 2017). Alarmingly, 22% of healthcare workers admit ignoring illegible text rather than seeking clarification, perpetuating risks (Zhang et al., 2020). Other studies revealed that 92% of healthcare workers committed errors when transcribing handwritten orders, often omitting drug details or misrepresenting dosages (Cerio et al., 2015; Benitez et al., 2024; Zhang et al., 2020).

Another major factor contributing to medication errors is the use of ambiguous drug names, which is a global concern (Kenagy & Stein, 2001). Look-alike sound-alike medications (LASAM) are a significant source of errors in healthcare systems, accounting for approximately 29% of dispensing errors (Rahman & Parvin, 2015). Reports indicate that name confusion contributes to 15–25% of all medication errors, as these similarities can lead to the inadvertent exchange of drugs, potentially harming patients or even causing death (Rahman & Parvin, 2015). Factors such as illegible handwriting, insufficient knowledge of drug names, the introduction of new products, similarities in packaging and labelling exacerbate this issue (McCoy, 2005). With the vast array of brand and generic drugs available, along with the constant introduction of new medications, healthcare providers are increasingly vulnerable to such errors (Hoffman & Proulx, 2003).

A study conducted in Benghazi- Libya, found that 42.6% of IHPs exhibited incomplete medication identification, compared to only 5.6% of computerized prescriptions, highlighting a systemic issue with handwritten prescriptions being prone to errors and illegibility (Kutrani et al., 2019). While the study focused on assessing prescription quality in terms of illegibility and incompleteness, it did not explore the real implications of these issues on pharmacy personnel or patient outcomes in the country. Consequently; there is a critical need to investigate how Libyan pharmacists read, interpret and dispense illegible prescriptions, particularly in the context of LASAM, which are high-risk medications susceptible to errors due to their similar names or appearances. Such research would provide valuable insights into the challenges faced by pharmacists and inform strategies to mitigate risks associated with prescription errors.

Despite the critical nature of this issue, there is limited documentation on the real dispensing practices and performance of Libyan community pharmacists in handling IHPs, particularly those involving poorly handwritten LASAM. Therefore; this study was conducted to evaluate the ability of pharmacy personnel to read and interpret IHPs and to identify the challenges they face when dispensing LASAM. The study also seeks to identify key predictors of dispensing errors to raise awareness of systemic challenges faced by pharmacy professionals. By providing evidence-based insights into these risks, the findings will highlight the critical role of legible prescriptions in mitigating errors and safeguarding patient care. Furthermore; the research underscores an urgent call for prescribers to acknowledge the dangers posed by illegible documentation and adopt corrective measures, such as improved handwriting practices or electronic prescribing systems, to prevent avoidable harm and prioritize patient safety.

MATERIALS AND METHODS

Ethical Approval

This study was approved by the Ethical Committee at University of Tripoli; registered under the reference number: SREC /010 / 51. Throughout the research procedure, strict anonymity was maintained, and the information was kept confidential.

Study Design and Period

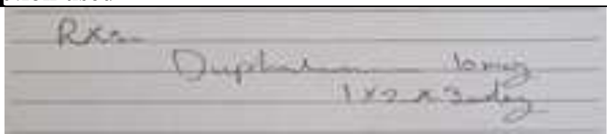
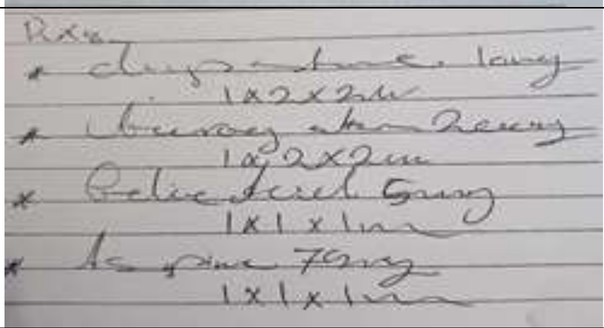
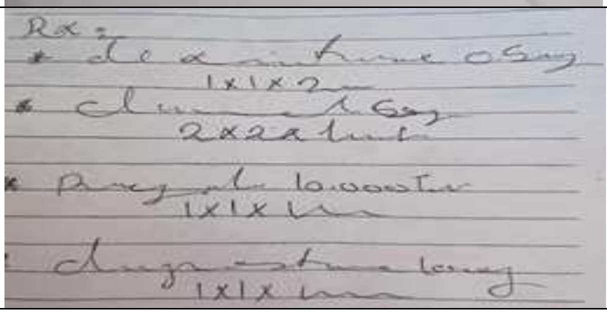
A cross-sectional study was conducted in the Libyan capital, Tripoli, between May and July 2024. The study aimed to explore the dispensing practices and performance of community pharmacists when presented with IHPS involving LASAMs. The simulated patient (SP) approach was employed, a well-established method used globally to evaluate the quality of pharmacy services (Watson et al., 2006). This methodology effectively reduces the Hawthorne effect, where individuals may alter their behaviour when aware of being observed, and minimizes the bias of socially desirable responses often seen in self-assessment evaluations (Björnsdottir et al., 2019).

Medication Selection and Prescription Design

In this study, brand names of LASAMs were selected over generic names due to their greater recognisability, ease of recall, and prevalence in prescribing practices among clinicians in Libya. The following pairs of medications were initially considered due to their similarity in names: (Triderma®, Triderm®), (Feldene®, Foladin®), (Visanne®, Vissen®), (Unical®, Uricol®), (Librax® , Liberex®), (Eprex® 4000 iu, Enoxa® 4000 iu). However; the final selection focused on the two medications: Duphaston® and Duphalac®. Duphaston® (Dydrogesterone), is a synthetic progesterone used for infertility treatment, miscarriage prevention and other conditions. Whereas; Duphalac® is a laxative used to treat chronic constipation and is safe for use during pregnancy. The selection of Duphaston® and Duphalac® for this study was driven by multiple factors: their therapeutic significance, the pronounced risk of confusion due to brand-name similarity, their relevance to common prescribing practices in Libya and their elevated potential for patient harm. These criteria align with the study's overarching goal of advancing medication safety and reducing preventable errors.

Four poorly IHPs were generated for this study, as shown in Table 1. All prescriptions featured a female patient in her mid-thirties and omitted the patient's diagnosis. Prescriptions 1 and 2 contained one medication each, while Prescriptions 3 and 4 included four items, Duphaston® alongside three other drugs, to evaluate whether the presence of multiple medications aided pharmacists in correctly identifying the LASAM (Duphaston®). Generic drug names were incorporated to assess pharmacists' ability to distinguish between generic and brand-name medications. Duphalac® was intentionally included in Prescription 2 to test whether pharmacists might confuse it with Duphaston® due to their similar names. To ensure consistency, a physician was instructed to write all prescriptions illegibly, mimicking real-world scenarios where poor handwriting contributes to dispensing errors. All prescriptions were formatted according to standard guidelines and included necessary patient information for use by the SPs.

Table 1: Illegible and poorly handwritten prescriptions with their correct details used by the simulated patient for assessing community pharmacists' dispensing practice

Prescription used		Correct details
No. 1		Rx: Duphaston 10 mg tablet 1×2×30 day
No. 2		Rx: Duphalac 10 cc 1×2×3 day
No. 3		Rx: - Duphaston 10mg tab 1×2×2 week - Utrogestan 200mg 1×2×2 week - Folic Acid 5mg 1×1×1 month - Asprin 75mg 1×1×1 month
No. 4		Rx: - Duphaston 10mg tab 1×1×1 month - Dexamethasone 0.5 mg tab 1×1×20 day - Clomid 50mg tab 2×2×5 d - Pregnyl 10.000 IU injection

Sample Size Determination and Sampling Technique:

The sample size was calculated based on the number of registered pharmacies in the Libyan Pharmacist Syndicate (384 pharmacies located in Tripoli city). Using an online sample size calculator (Raosoft, Inc.) with a 95% confidence level, the minimum required sample size was determined to be 193 pharmacies (Raosoft, 2004). A convenience sampling method was employed, where pharmacists in close proximity to the researchers were approached during their available time.

Data Assessment Form:

To assess the practice, the authors developed an online data assessment form (via Google Forms) specifically for this study to document immediately, the information from the visits.

The form was validated by two academic members. Their feedback was incorporated to refine the tool ensuring its clarity, relevance and comprehensiveness. The reliability of the assessment form was tested using Cronbach's Alpha, which yielded a value of 0.767, indicating acceptable internal consistency. The assessment form was structured into three sections. The first section comprised closed-ended questions capturing participants' demographic characteristics and details about the pharmacies visited. The second section evaluated pharmacists' responses to the IHPs, specifically their ability to accurately read and interpret prescribed medications, including how they deciphered unclear handwriting. The final section documented additional pharmacist actions, such as requesting a diagnosis, claiming medication unavailability, or referring the SP back to the prescriber to resolve ambiguities.

Data Collection

A selection of four BSc. students from University of Tripoli / Faculty of the Pharmacy, were chosen to play the role of the simulated patients in this study. This number was chosen based on a systematic review by Watson *et al*., (2006), which recommends a minimum of two SPs for such studies. Written informed consents to volunteer as a simulated patient were collected from the students. To ensure consistency in interactions and accurate presentation of prescriptions, student participants underwent a structured week-long training to act as SPs. The training emphasized standardized prescription presentation, since they were trained to introduce prescriptions uniformly, using non-technical, layperson language and avoiding medical jargon. All SPs requests prescription as: "Can you please give me the medication(s) in this prescription?" If the pharmacist decides to dispense the prescription, SPs followed a scripted request to verify accuracy: "Can I take a photograph of the medication(s) to confirm with my doctor that it matches the prescription?". This step ensured objective documentation of dispensed drugs, minimizing reliance on subjective recall. SPs were also instructed to avoid behaviours that might influence pharmacist decisions as, asking leading questions or expressing preferences. A pilot study involving 30 community pharmacies was conducted to familiarize the SPs with their roles. Seven pharmacists were assessed for prescriptions 1 and 2, and eight for prescriptions 3 and 4.

The four SPs were divided into two teams, with each team assigned one single-item prescription and one multi-item prescription. The four SPs were randomly assigned to the prescriptions, and community pharmacies were randomized across the SPs to ensure no overlap. A total of 200 pharmacies were visited twice, with each pharmacy receiving a different prescription during each visit: the first visit involved the single-item prescription, followed by the multi-item prescription in the second visit. To maintain consistency, the location and time of each visit were documented to prevent repeated visits to the same pharmacy at the same time for the same prescription. No pharmacist was assessed for more than one prescription. The visits were conducted over three months (May–July 2024) at varying times and days of the week. At the beginning of each visit, the SP requested a pharmacist to ensure that only pharmacists were included in the study. Data were recorded immediately after each visit using the online data collection form.

Data Processing and Analysis

Data were analysed using the Statistical Package for Social Sciences (SPSS) version 26 (IBM SPSS Inc., Chicago, IL). The data were transferred from Excel to SPSS and coded into variables. Descriptive statistics, including frequency tables, were used to summarize the results. Logistic regression analysis was conducted to identify predictors associated with correct dispensing, with statistical significance set at $p < 0.05$.

RESULTS

Demographic Characteristics of the Community Pharmacies Visited

As illustrated in table 2; a total of 400 pharmacists were assessed in this study. The majority of the participants were female 64.8% (n = 259), while 35.3% (n = 141) were male. Visits were distributed across different times of the day, with the highest proportion occurring in the afternoon (1 pm–6 pm) 40.3% (n = 161), followed by evening visits (7 pm –12 am) 31.3% (n = 125) and morning visits (8 am–12 pm) 28.5% (n = 114). Most visits took place on weekdays 87% (n = 348), with only 13% (n = 52) occurring on weekends (Friday and Saturday). At the time of the visit, the majority of pharmacies were not crowded 79.5% (n = 318), and the number of customers was generally low (1–2 customers) 80.5% (n = 322). Only 2.3% of pharmacies (n = 9) were busy with more than 5 customers. In terms of staffing, the majority of pharmacies had only one pharmacist on duty 73% (n = 292), while 24% (n = 96) had two pharmacists, and 3% (n = 12) had more than two pharmacists.

Table 2: Pharmacist demographic and characteristics of visited pharmacies

Variable	Category	Total (n = 400)	
		n	%
Pharmacist gender	Female	259	64.8
	Male	141	35.3
Time of visit	Morning (8 am-12 pm)	114	28.5
	Afternoon (1 pm-6 pm)	161	40.3
	Evening (7 pm –12 am)	125	31.3
Day of visit	Week days	348	87.0
	Weekends	52	13.0
Pharmacy crowded status	No	318	79.5
	Yes	82	20.5
Customer volume	Low (1-2)	322	80.5
	Moderate (3-5)	69	17.3
	Busy (>5)	9	2.3
Pharmacists on duty	1 pharmacist	292	73.0
	2 pharmacists	96	24.0
	> 2 pharmacists	12	3.0

Accurate Prescription Interpretation

Four IHPs (Table 1) were analysed by 100 participants each, totalling 400 prescription readings. Each prescription contained 1–4 items (10 items total), including one LASA medication. This resulted in a thousand measurements across the four prescriptions. Accurate prescription interpretation among the 400 community pharmacists assessed are presented in table 3. The overall correct interpretation of LASAM in the four IHPs is 45.5%. Prescription 4 was the most illegible, with only 14% (n = 14) correctly interpreting the LASA drug. In contrast, Prescription 2 had the highest correct interpretation rate 72% (n = 72).

Correct interpretation rates varied significantly across medications, with Duphalac® 72% (n = 72) and Aspirin 94% (n = 94) having the highest rates, while Duphaston® 14% (n = 14) in Prescription 4 and Clomid® 8% (n = 8) had the lowest. Overall, 20.3% (n=81) of pharmacists failed to identified any medication in the prescriptions. For Prescriptions 3 and 4 (each containing four medications), 70.5%(n=141) of pharmacists correctly interpreted one drug, while only 10.5% (n = 21) interpreted all four drugs correctly. Aspirin 94% (n = 94) and Dexamethasone 77% (n = 77) were the most correctly interpreted medications, whereas Pregnyl® 12% (n = 12) and Clomid® 8% (n = 8) were the least correctly interpreted. These findings confirm that the prescriptions met the criteria for illegibility.

Table 3: Accurate interpretation of illegible handwritten prescriptions

Category	Variable	Total = 400 (100/prescription)	
		n	%
LASAM accurately identified	Rx.1 (Duphaston®)	47	47.0
	Rx.2 (Duphalac®)	72	72.0
	Rx.3 (Duphaston®)	49	49.0
	Rx.4(Duphaston®)	14	14.0
Other medications accurately identified	Rx.3 (Utrogestan®)	21	21.0
	Rx.3 (Folic Acid)	46	46.0
	Rx.3 (Asprin®)	94	94.0
	Rx.4 (Dexamethasone)	77	77.0
	Rx.4 (Clomid®)	8	8.0
	Rx.4 (Pregnyl®)	12	12.0
Failed to identified any item		81	20.3
Medications correctly identified in Rx 3,4 (n = 200)	One	141	70.5
	Two	18	9.0
	Three	20	10.0
	Four	21	10.5

Response of Community Pharmacists to the Illegible Handwritten Prescriptions and interpretation methods

Upon receiving the illegible prescriptions, a significant proportion 19.5% (n = 78) admitted they could not read the prescription. Approximately half of the pharmacists 50.7% (n = 203) asked for a diagnosis, while the other half did not. Most community pharmacists 83% (n = 332) did not refer the SP to the physician. Nearly one-third 31.3% (n = 125) informed the SP that the medication was not available and only 5%

(n = 20) of pharmacists refused to dispense the prescription. The majority of pharmacists 65% (n = 260) relied solely on their knowledge and experience to decipher prescriptions, whereas 19.3% (n = 77) sought assistance from colleagues to verify unclear prescriptions. Only 6.5% (n = 26) of pharmacists used mobile applications, social media platforms, or online databases to cross-reference ambiguous drug names. See table 4.

Wrong Interpretations

Dispensing error of LASAMs and other medications due to IHPs are shown in Table 5. Duphalac® was incorrectly dispensed as Duphaston® 18% (n = 18). Duphaston was misread as Duphalac® 2.3% (n = 7) and as other medications such as Dumperidone® 1.3% (n = 4) and Dostinex® 1.3% (n = 4). Folic Acid was misread as Glovit-cal® 13% (n = 13) and Glibenclamide 5% (n = 5) and Utrogestan was misread as Clarithromycin 9% (n = 9).

Table 4: Pharmacist responses to illegible handwritten prescriptions and interpretation method

Category	Variable	Total (n = 400)	
		n	%
Response to illegible prescriptions	Ask for diagnosis	203	50.7
	Admitted inability to read	78	19.5
	Claimed medication unavailable	125	31.3
	Referred SP to physician	68	17.0
	Refuses to dispense prescription	20	5.0
Pharmacist interpretation method	Interpreted independently	260	65.0
	Asked another pharmacist	77	19.3
	Used phone/ social media	26	6.5

Table 5: Dispensing error of LASAMs due to illegible handwritten prescriptions

Intended medication	Incorrectly dispensed		n	%
	Medication	**Therapeutic class**		
Duphalac®	Duphaston®	Hormone replacement	18	18
Duphaston®	Duphalac®	Laxative	7	2.3
	Domperidone®	Antiemetic	4	1.3
	Dostinex®	Dopamine agonist	4	1.3
	Doliprane ®	Analgesic	1	0.3
	Dulcolax®	Laxative	1	0.3
	Dexamethasone	Corticosteroid	1	0.3
Folic acid	Glovit-cal®	Nutritional supplement	13	13
	Glibenclamide	Antidiabetic	5	5
	Paracetamol	Analgesic	2	2
Utrogestan	Clarithromycin	Antibiotic	9	9

Predictors for Dispensing Errors

Predictors associated with dispensing wrong medication are illustrated in Table 6. Prescriptions with a single drug item were associated with 1.842 times higher like hood of dispensing errors compared to multiple-drug prescriptions ([AOR] [95% CI]: 1.842 [1.15-2.950]; p = 0.011). Visits between 7 pm and midnight had 1.983 times higher cause of errors compared to morning visits ([AOR] [95% CI]: 1.983[1.119- 3.517]; p = 0.019). Crowded pharmacies were associated with 2.164 times higher like hood of errors ([AOR] [95% CI]: 2.165[1.256- 3.731]; p = 0.005). Conversely, pharmacists not asking for a diagnosis reduced the like hood errors by 67% ([AOR] [95% CI]: 0.330 [0.208- 0.524]; p < 0.001), and returning the patient to the physician reduced the errors by 75.9% ([AOR] [95% CI]: 0.241 [0.124- 0.468]; p < 0.001). These findings highlight key modifiable factors influencing dispensing accuracy.

Table 6: Predictors associated with dispensing errors due to LASAMs

Predictors for dispensing errors	P value
Prescription with one drug item	0.011
Pharmacist not asking for diagnosis	< 0.001
Pharmacist return patient to the physician	< 0.001
Evening visit (7 pm – 12 am)	0.019
Pharmacy was crowded at the time of visit	0.005

DISCUSSION

The present study is the first of its kind to evaluate, in the Libyan capital, Tripoli, the real dispensing practices and responses of Libyan community pharmacists when presented with IHPs involving poorly handwritten LASA medications. IHPs persist as a significant issue despite the existence of professional standards and regulations addressing this problem (Modi et al., 2022). IHPs have been identified as one of the four leading causes of dispensing errors (Motulsky et al., 2008), particularly those with poor and illegible handwriting (Rambhade et al., 2012).

Demographically, the sampled community pharmacists were predominantly female, consistent with both the long-standing global trend of feminization within the pharmacy profession and findings from recent national surveys focused on community pharmacists in the country (Rghebi, et al. (2025).

Four IHPs were utilized in this study (Table 1), each analysed by 100 participants, resulting in a total of 400 prescription readings. Each prescription contained between one and four medication items (10 items in total), one of which was a LASAM. Consequently, a total of a thousand measurements were conducted and recorded across the four prescriptions. Illegibility was noted for all prescriptions among the 400 community pharmacists assessed. The overall correct interpretation of LASAM in the four prescriptions is 45.5%. Prescription 4 was identified as the most illegible, with only 14% of pharmacists able to correctly read and interpret the LASAM. For Prescriptions 3 and 4, which contained four medication items each, only 10.5% of pharmacists were able to correctly read all four drugs, while 70.5% correctly interpreted only one drug. A South African study reported that pharmacists performed unexpectedly worse than doctors and nurses in reading prescriptions, raising concerns given that pharmacists are the primary dispensers of medications (Brits et al., 2017). The study speculated that this observation might be attributed to the fact that pharmacy personnel were primarily engaged in community service and lacked prolonged exposure to working alongside doctors in hospital settings. This finding introduces the potential role of exposure and familiarity with specific prescribers' handwriting as factors influencing the ability to interpret illegible prescriptions accurately.

As recommended by the WHO (De Vries et al., 1994), the use of generic names is one of the key indicators for assessing the accuracy of medical prescriptions and ensuring compliance with writing regulations (Nkera-Gutabara & Ragaven, 2020). Numerous studies have identified the use of brand names as a contributing factor to prescription errors (Fadare et al., 2013; Calligaris et al., 2009). In this study, the generic drug names included in the prescriptions (Aspirin and Dexamethasone) were the most accurately interpreted, with correct readings by 94% and 77% of pharmacists, respectively. In contrast, the trade names Utrogestan® and Pregnyl® were the least accurately interpreted, with only 21% and 12% of pharmacists correctly identifying them, respectively. Brits and colleagues suggested that brand names are often short and share similar starting and ending letters, which may increase the confusion (Brits et al., 2017). Prescribing medications by their generic names could promote uniformity and reduce dispensing errors (Mohan et al., 2014). This approach may also help alleviate delays in the dispensing process, as pharmacists would not need to look up unfamiliar brand names to identify the active components and ingredients.

IHPs detrimentally affect the quality of pharmaceutical services in the dispensing process, resulting in delays, unintentional dispensing errors, risks to patient safety, and legal issues (Mandal et al., 2013). Another root cause identified is LASAM, a familiar cause of medication errors in the literature (Kelly, 2004). In this current study and as seen in Table 5, Duphalac® (a laxative) was misread and dispensed as the synthetic progesterone Duphaston® and vice versa. In addition, Duphaston® was also misread as Dumperidone® (an anti-nausea medication) and Dotinex® (a dopamine agonist used for hyperprolactinemia). It was also misread and dispensed as Doliprane® (Paracetamol), Dulcolax® (a stimulant laxative), and Dexamethasone (an anti-inflammatory corticosteroid). Unexpectedly, Folic Acid was misread as Glovit-cal® (a nutritional supplement containing calcium and vitamin D), Glibenclamide (an anti-diabetic), and Paracetamol. Utrogestan® (a hormone replacement therapy used to maintain pregnancy) was misread as Clarithromycin (an antibiotic), despite the fact that clarithromycin is not available in the 200 mg strength. Errors from LASAM names can be minimized by instituting non-alphabetic storage of medicines to separate products that are easily confused (Lambert et al., 2005). The medical industry and regulatory authorities should be involved in future initiatives to eliminate this problem.

The study also identified several factors contributing to dispensing errors, including high crowded pharmacies during peak hours and evening shifts. Crowded pharmacy environments were linked to increased workload and stress, while evening hours often correlated with staff fatigue and reduced personnel availability. Excessive workload stemming from pharmacists' multiple responsibilities, coupled with poorly designed pharmacy layouts, was found to limit time and privacy for patient counselling, increasing the risk of errors. These findings align with prior research highlighting fatigue and frequent interruptions (e.g., phone calls, patient inquiries, and ambient distractions) as significant contributors (Gogazeh, 2020). In the United Kingdom, such factors ranked as the second and third most common causes of dispensing errors (Beso et al, 2005). Collectively, these insights underscore the need for systemic improvements to enhance dispensing accuracy and patient safety. Key strategies include ergonomic workspace design, structured protocols to minimize disruptions, and policies to mitigate fatigue; such as balanced scheduling and optimized workload distribution. Additionally, ensuring adequate staffing during peak hours and allocating additional resources for evening shifts are critical measures to address challenges like overcrowding and staff shortages. Conversely; the study also revealed that pharmacists not asking for a diagnosis and returning the patient to the physician reduced the likelihood of errors by 67% and 75.9%, respectively. While prescriptions with a single drug item might intuitively seem less prone to errors, further investigation is needed to understand why they were associated with higher error rates in this study.

Clear, legible prescriptions are vital, as they reflect a prescriber's commitment to minimizing errors and achieving optimal prescribing practices (Velo & Minuz, 2009). In cases of unclear prescriptions, pharmacy staff must prioritize contacting the prescriber to verify details rather than making assumptions about medications or dosages, a step proven to prevent avoidable errors (Modi et al., 2022).

To mitigate dispensing errors, healthcare professionals must enhance their understanding of these errors and adopt rigorous reporting practices, which are critical for reducing their incidence (Al-Worafi, 2018). A key strategy involves implementing targeted training programs for pharmacists to improve their ability to interpret and dispense medications accurately, particularly when handling illegible or poorly handwritten prescriptions (De Vries et al., 1994). Additionally, community pharmacy dispensers should receive education on common dispensing errors, coupled with fostering stronger collaboration and communication with prescribers. Pharmacists can further reduce risks by clarifying diagnoses to guide appropriate interventions and consulting physicians when ambiguities arise (Al-Worafi, 2018).

Another effective mandatory strategy to address illegible prescriptions, particularly those involving LASAM, is the nationwide implementation of Computerized Physician Order Entry (CPOE) via e-prescribing (Raja et al., 2019) and Computerized Physician Decision Support (CPDS) systems (Bates et al., 2001). These systems have been shown to significantly reduce prescription errors and enhance drug safety, making their adoption essential for all healthcare facilities (Raja et al., 2019). Furthermore, the establishment of a mandatory prescription-writing quality improvement program should be prioritized as a complementary framework to systematically address and prevent prescription-related errors. These measures are not merely recommendations but must be enforced as mandatory standards to ensure patient safety and improve the overall quality of healthcare delivery.

Limitations

The study was conducted in Tripoli, limiting the generalizability of findings to other cities in Libya. Expanding the study to include public sector pharmacies and comparing practices between public and private sectors regarding IHPs would provide more comprehensive insights. While the simulated patient methodology reduced observation bias, audio recording could enhance quality assurance by minimizing recall bias, which cannot be entirely ruled out due to data privacy constraints. The study focused on only two LASAM, excluding other drugs. The study lacked pharmacists' demographic data due to resource and time limitations during visits. Additionally; performance feedback, crucial for optimizing practice, was not provided due to the high number of community pharmacies and limited resources.

CONCLUSION

The current study provided valuable insights into the real dispensing challenges of handling IHPs in community pharmacy settings. It highlights the significant challenges faced by Libyan community pharmacists in Tripoli, in interpreting and dispensing IHPs, particularly those involving LASAMs. The findings reveal that illegible handwriting and the reliance on brand names contribute to high rates of misinterpretation and dispensing errors, posing substantial risks to patient safety. Key predictors of dispensing errors included prescriptions with single drug items, crowded pharmacy conditions, and evening visits. Conversely, pharmacists who sought additional information or referred patients back to prescribers demonstrated improved accuracy, highlighting the importance of proactive communication in mitigating errors.

Targeted training programs for pharmacists, promoting the use of generic drug names, and optimizing workload management during peak hours are essential strategies to enhance dispensing accuracy and patient safety. Additionally, Comprehensive reforms to improve prescription clarity, enhance pharmacist performance, and safeguard patient safety is recommended. Future research should expand to other regions, incorporate a broader range of medications, and explore the impact of demographic factors on dispensing errors. Addressing these issues is imperative to reducing medication errors and advancing the quality of pharmaceutical care in Libya and beyond.

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