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ORIGINAL ARTICLE

Evaluation of rational use of medicines (RUM) in four government hospitals in UAE

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Abstract *Rational:* Studies conducted showed that there were gaps regarding the rational use of medicines (RUM). *Aims and objectives:* Evaluate RUM in main government hospitals in four emirates in UAE, using WHO prescribing indicators. *Method:* Multicenter prospective cross-sectional comparative study was conducted in 4 hospitals in 4 different Emirates in UAE. Using consecutive random sampling method, a total of 1100 prescriptions (2741 prescribed drugs) were collected and analyzed from surveyed hospitals from April to October 2012. Index of Rational Drug Prescribing (IRDP) was used as an indicator of RUM. *Results:* The main finding of this study was that, the mean values of prescribing indicators of RUM in the surveyed hospitals were estimated to be within the WHO optimal values for generics (100.0 vs. 100.0), antibiotics (9.8 ± 4.8 vs. ⩽30), injections (3.14 ± 1.7 vs. ⩽10) and formulary (EML) prescribing (100.0 vs. 100.0). However, the only discrepancy was reported regarding the number of drugs per prescription which was found to be more than the WHO optimal value (2.49 ± 0.9 vs. ⩽2); respectively. The mean IRDP was 4.55 which was less

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than the WHO optimal value of 5. *Conclusions:* Strategies and interventions are desirable to promote RUM and minimize the consequences of poly-pharmacy.

1. Introduction

Rational use of medicines (RUM) is an essential element in achieving quality of health care for patients and the community. The World Health Organization (WHO) defined RUM as patients receive medications appropriate for their clinical needs, in doses that meet their own individual requirements for an adequate period of time, and the lowest cost to them and their community (WHO, 2002).

As part of a national effort to achieve the optimum use of medicines in United Arab Emirates (UAE), two conferences were held regarding the RUM. The First National Conference on RUM was held in May, 2008, by the Health Authority-Abu Dhabi (HAAD) in collaboration with the Ministry of Health (MOH), WHO Headquarters and the Regional Office for the Eastern Mediterranean (Fahmy, 2008). The objective of the conference was to promote therapeutically sound and effective use of medicines. This conference initiated the first step to promote and establish RUM program in Abu Dhabi and the other Emirates.

The Conference concluded that there is a need to implement national drug policies to improve drug use, implement interventions to address drug use and integrate activities to promote RUM in the health system.

The second conference was the Pharmacy Education Forum with the theme ''Join hands to promote RUM'', held in May, 2012, and organized by MOH in collaboration with Sharjah University (http://www.cpdpharma.ae/index.php?view=details&id=12%3A2nd+Pharmacy+Educational+Forum&option=com_eventlist&Itemid=84, 2013). The main objective was to promote awareness among pharmacists and other healthcare professional about all aspects of RUM. The MOH has taken several steps to establish RUM, by developing an essential medicine list (EML) which was developed by using a rigorous selection methodology. The methodology used to construct EML involved WHO guidelines and the UAE Ministry of Health policies on drug formulary.

1.1. Hospital settings in UAE

The hospital sector in UAE is a blend of government and private facilities, with numerous international contractors from United States of America and many European and Asian countries. The private sector is growing rapidly with many specialties and quality of care. Medicines are included in health insurance schemes. Patients are covered by different insurance policies according to their work contract. EML and treatment guidelines are used in the four government hospitals. These tools were introduced to streamline the RUM and to improve the patients' health outcomes. The compliance with these guidelines is monitored by health authorities and hospitals committees.

1.2. Assessing the problem of irrational use of medicines

The prescribing, dispensing and use of medicines need to be regularly monitored in order to assess the accessibility, quality and cost-effectiveness of care. Furthermore, trends in consumption should be monitored and bench marked in order to compare data from facilities with similar settings. Further, medicines use can be compared against evidence-based practice. Awareness of stakeholders should be raised about RUM. And appropriate and targeted intervention strategies should be implemented and their impact monitored (WHO, 2002; Rational Use of Injections within National Drug Policies, 2001). This study was undertaken to monitor irrational use of medicines (IRUM) which can result in reduced quality of care, expressed in increased morbidity and mortality, and increased cases of adverse drug reactions and medication errors. Irrational RUM also has an impact on increased antimicrobial resistance, distress and harm to patient due to prolongation of illness and waste of financial resources leading to reduced availability of other vital medicines (Medicines: Rational Use of Medicines, 2010; Hogerzeil, 1995).

1.3. Study rationale

To date, only three published RUM studies are available in UAE. One was conducted in the government sector in Emirate of Sharjah in 1995, while the other two were conducted in the private sector (2005 and 2009). These studies showed that there were gaps in RUM such as the practice of poly-pharmacy and lack of generic prescribing. In addition, other gaps were identified, such as reporting of adverse drug reaction and medication errors. Therefore, a follow up study in the government hospital sector was needed to investigate the current prescribing practices and subsequently evaluate the performance of healthcare providers in RUM. The government hospitals practices are the standard for the private sector in terms of RUM and relevant clinical practices.

1.4. Aims and objectives

The study aims to evaluate the RUM in the main government hospitals in four of the seven emirates of UAE. The WHO/INRUM (International Network for Rational Use of Medicines) core drug use indicators (prescribing indicators) were used. The first objective was to study the prescribing practices of the four surveyed hospitals by using WHO/INRUM prescribing indicators in each facility. The second objective was to compare the results of this study with other similar local and international studies. The hospital outpatient departments were chosen for this study and not primary healthcare clinics that do not adhere to standard practices. There were 10,000 outpatients registered by the 4 hospitals during the year of the study.

2. Study methodology

2.1. Ethical considerations

The study was approved by the medical research committee from the department of continuing medical education in each of the four Emirates (Ajman, Dubai, Sharjah and Umm Al Quwain).

2.2. Study design

We performed a multicenter prospective cross-sectional study.

2.3. Study setting

The study was conducted in four main government hospitals in the four selected Emirates with similar specialties and the patients seen in the outpatient departments are of the same patient population. The outpatients registered during the year of the survey were nearly 40,000 patients in 2012, Table 1. Stratified random sampling was used in selecting the four main hospitals in each of the four Emirates, based on the geographical distribution of hospitals. Randomization was based on the geographical allocation of the hospitals which divides the population in two equal main areas.

2.4. Sample size

According to the WHO manual (WHO Action Programme on Essential Drugs and Vaccines, 1993), 100 prescriptions were to be collected from each facility for comparative studies. There were between 200 and 300 prescriptions collected and analyzed from each outpatient pharmacy of the four selected government hospitals. The collection time was during the whole day at different outpatient pharmacy shifts. In total 1100 prescriptions were collected (n = 1100). However, 200 prescriptions were collected from Dubai hospital reflecting the minimum sample (of 100) required was exceeded in all hospitals. Consecutive nonrandom sampling method was applied for collection of prescriptions from the healthcare facilities (included all prescriptions that were available).

2.5. Inclusion criteria

Prescriptions written with generic and non-generic medicine names, containing antibiotics (oral and injection) preparations with other medications were considered for inclusion criteria.

2.6. Exclusion criteria

Topical antibiotic preparations such as skin creams and ointments and ophthalmic drops and ointments were excluded. Also we excluded primary health care and family medicine clinics.

Table 1 WHO prescribing indicators for government hospitals in the four UAE Emirates.

Healthcare facility abbreviated code	Number of reviewed prescriptions *N*, (%)	Index of poly-pharmacy	IRDP	WHO prescribing indicators (WHO Action Programme on Essential Drugs and Vaccines, 1993)									
				Total number of drugs prescribed *F*, (%)		Generic prescribing		Antibiotic prescribing		Injection prescribing		EML	
				N	Mean (95% CI)	*N*	%	*N*	Mean% (95% CI)	*N*	Mean% (95% CI)	*N*	%
DHOSP (400 beds)	200 (18.1)	0.55	4.55	505 (18.4)	2.52 ± 0.2 (2.3–2.7)	505	100	13	6.5 (3.08–9.92)	2	1 (−0.38–2.38)	505	100
SHOSP (100 beds)	300 (27.3)	0.53	4.53	745(27.2)	2.48 ± 0.21 (2.3–2.6)	745	100	13	4.74 (2.22–7.26)	8	2.91 (0.93–4.91)	745	100
AHOSP (100 beds)	300 (27.3)	0.61[a]	4.61	713(26.0)	2.37 ± 0.19 (2.2–2.5)	713	100	43[a]	14.33[a] (10.37–18.29)	10	3.33 (1.3–5.36)	713	100
UMQHOSP (165 beds)	300 (27.3)	0.50	4.5	778(28.4)[a]	2.59 ±0.16[a] (2.4–2.7)	778[a]	100	41	13.66 (9.77–17.55)	16[a]	5.33[a] (2.79–7.87)	778[a]	100
Mean (±SD)	**1100 (100.0)**	0.55	4.55	**2741 (100.0)**	2.49 ± 0.9	–	100	–	9.8 ± 4.8	–	3.14 ± 1.7	–	100
WHO optimal value; WHO Action Programme on Essential Drugs and Vaccines (1993); Hogerzeil (1995); Nobili et al. (2011)		**1**	5.0		⩽2	–	**100**	–	**⩽30**	–	**⩽10**	–	**100**

Key: WHO = World Health Organization; EML = Essential medicine list; *N* = Frequency; CI = Confidence interval; % = Percentage. IRDP = Index of Rational Drug Prescribing. References (WHO Action Programme on Essential Drugs and Vaccines, 1993; Joncheere, 2002; Nobili et al., 2011).

[a] The highest value achieved in columns.

Table 2 Comparison between the present study (government hospitals) and studies conducted in other private hospitals in UAE.

Study	UAE 1 Holloway and Green (2003)	UAE 2 Sharif et al. (2008)	UAE 3 (current study)	WHO Joncheere (2002)
Year of study	2005	2009	2012[a]	
Number of healthcare facilities (hospitals)	1 (private)	4 (private)	4 (government)	
Number of prescriptions per encounter	1190[a] (2659 drugs)	Not reported	1100 (2741 drugs)	
Prescribing indicator				
Mean number of drugs per prescription	2.2	2.9[a]	2.5	⩽2.0
	(poly-pharmacy 7.5)	Not reported	(poly-pharmacy 4.55)	
Generics prescribing (%)	4.4	7.35	100.0[a]	100.0
Antibiotics prescribing (%)	21.4	31.1[a]	9.8	⩽30.0
Injections prescribing (%)	1.6	2.9	3.14[a]	⩽10.0
Formulary prescribing (%)	Not reported	64	100.0[a]	100.0

Key: EML = Essential medicine list, % = Percentage, UAE = United Arab Emirates; WHO = World Health Organization.
[a] The highest value achieved in rows.

2.7. Study tool testing

We used the WHO standard prescribing indicator form. A pilot test was conducted in Khalifa hospital in Ajman Emirate, where 30 outpatient prescriptions were reviewed to test the tool. We ensured the availability of the required data, estimated the time and modified the data collection form as appropriate. The results of the study tool testing were not published.

2.8. Data collection

The data were manually collected by the main study researcher (initials AB) and daily prescriptions were reviewed. Data were collected every day for 5 working days a week for 7 months during two outpatient pharmacy shifts. The period of data collection was seven months, between April and October, 2012. The prescribing indicators were recorded according to the WHO guidelines (WHO Action Programme on Essential Drugs and Vaccines, 1993) to ensure reliability. The optimal values for the WHO prescribing indicators were presented in Table 1, (Joncheere, 2002).

2.9. Data analysis

The data collected from the four hospitals were validated and analyzed according to the WHO manual (WHO Action Programme on Essential Drugs and Vaccines, 1993) and are presented in Table 2.

To evaluate the RUM comprehensively, we used a validated index system based on the mathematical model developed by Zhang and Zhi (1995). Indices were calculated for each prescribing indicator and all had the same optimal index of 1, closer to 1, and the more rational is a drug prescribing.

(1) The index of poly-pharmacy was measured by the percentage of nonpoly-pharmacy prescriptions (more than 5 medications) (Nobili et al., 2011).
(2) The index of generic prescribing was measured by the percentage of medicines prescribed by generic name.
(3) The index of prescribing from Essential Medicine List (EML) was measured by the percentage of medicines prescribed from EML.
(4) The index of rational antibiotic prescribing was calculated by dividing the optimal level (30%) by the percentage of prescriptions including antibiotic.
(5) The index of injection was calculated by dividing the optimal level (10%) by the percentage of prescriptions including injection.

The Index of Rational Drug prescribing-IRDP (optimal value is 5) was calculated by adding up all the abovementioned five indices for each healthcare facility using a published method (Dong et al., 2010).

Data entry and analysis were conducted using the statistical applications of Microsoft Office Excel 97-2003 Worksheet. Descriptive statistics were generated as mean, standard deviation (±SD), 95% confidence intervals (CI) and range. We used tabular presentations for the quantitative data. Analysis of variance (ANOVA) was used to compare the mean of measured data.

3. Results

The results are summarized in the following Tables. A description of the results in each Table was presented below.

We have reviewed 1100 prescriptions with 2741 total number of prescribed medications in the four surveyed hospitals. The highest total number of prescribed medicines was from Umm Al Quwain Emirate (778, 28.4%) and the lowest was from Dubai Emirate (505, 18.4%).

We compared the prescribing pattern among the four government hospitals in each Emirate using WHO prescribing indicators. The mean number of medicines per prescription for the four hospitals was 2.49 ± 0.9. The average number of medicines per prescription in Dubai hospital-DHOSP was (2.52 ± 0.2), in Sharjah hospital-SHOSP was (2.48 ± 0.21),

Table 3 Comparison of WHO prescribing indicators between this study and other studies.

Study	Year	Number of healthcare facilities (hospitals)	Number of prescriptions	WHO prescribing indicators				
				Average number of drugs per encounter (*N*)	Generic prescribing percentage (%)	Antibiotic prescribing (%)	Injection prescribing (%)	EML or formulary prescribing percentage
UAE (present study)	2012	4 government	1100	2.49	100.0[a]	9.8	3.14	100.0[a]
Nepal (Dong et al., 2010)	2008	Tertiary teaching	4231[a]	2.5	13.0	28.3	3.1	42.3
China (Ahmed and Awad, 2010)	2006	Tertiary teaching	1180	2.04	69.2	39.15	22.63[a]	_
India (Odusanya, 2004)	2005	Tertiary teaching	500	2.9	73.4	39.6	0.2	90.3
WHO (WHO Action Programme on Essential Drugs and Vaccines, 1993) criteria (prescribing indicators)				**⩽2**	**100.0**	**⩽30.0**	**⩽10.0**	**100.0**

Key: *N* = Frequency; % = Percentage; UAE = United Arab Emirates; WHO = World Health Organization.
[a] The highest value achieved in columns.

in Ajman hospital-AJHOSP was (2.37 ± 0.19) and in Umm Al Quwain hospital-UMQHOSP was (2.59 ± 0.16) which were all higher than the WHO optimal value (⩽2). There was statistically significant difference among these four hospitals in terms of the average number of medicines per prescription ($P < 0.001$).

The percentage of generic prescribing was 100% in all four hospitals as recommended by the WHO. The mean percentage of antibiotic prescribing was very low 9.8 ± 4.8 but was within the WHO optimal value (⩽30). The percentage of antibiotic prescribing in DHOSP (6.5) and SHOSP (4.74) was low as compared to the other two hospitals; namely, AHOSP (14.33) and UHOSP (13.66) but all of them were within the WHO optimal value. Statistically significant difference was found among these four hospitals in terms of the percentage of antibiotics per prescription ($P < 0.001$).

The mean percentage of injection prescribing was (3.14 ± 1.7) and was very low as compared to the WHO optimal value (⩽10). The distribution of this parameter was low in the surveyed hospitals as follows: DHOSP (1%), SHOSP (2.91%), AHOSP (3.33%) and UMQHOSP (5.33%). The percentage of prescribing from EML in the hospital representing Dubai Health Authority (DHA) and the three hospitals representing MOH was 100%, (Table 1).

3.1. Estimation of the Index of Rational Drug Prescribing (IRDP)

In Table 1, the mean value of the IRDP was (4.55) very close to the WHO optimal value of 5. Most of the indices (Index of generic prescribing, antibiotics, injection and index of EML prescribing) were optimal (each equal to 1) except the poly-pharmacy index (0.55) which was less than the WHO optimal value (1). The overall IRDP value was very close to the optimal value of 5. The IRDP for all the hospitals was nearly equal to each other with AHOSP which had the highest IRDP value and the first rank.

We have compared the prescribing indicators obtained in the present study with those of two similar studies conducted in UAE (2005 and 2009) but both were from private hospitals. The number of facilities included in each study was 1 and 4, respectively. The number of prescriptions in the present study was 1100 compared to 1190 in 2005 study and was not reported in the 2009 study. The average number of medicines per prescription in the present study was 2.5 compared to 2.2 and 2.9 from the other two studies; respectively.

In comparing the percentage of generic prescribing in our study with the previous two UAE studies conducted in 2005 and 2009, we reported 100% as compared to 4.4% and 7.35% in the other two studies, respectively. The percentage of antibiotics prescribing was 9.8% compared to 31.1% and 21.4%. The injection prescribing was 3.14 in our study compared to 2.9 and 1.6. The EML was 100% in our study compared to 64% in the 2009 study and was not reported in the 2005 study. A comparison between our results and studies that were conducted in UAE is shown in Table 2.

The comparison between the present study and studies conducted in government hospitals in other countries is shown in Table 3.

4. Discussions

The main finding of the present study was that, the mean values of prescribing indicators of RUM in the surveyed hospitals were estimated to be within the WHO optimal values for generics, antibiotics, injections and EML prescribing. However, the only discrepancy was reported regarding the number of medicines per prescription which was found to be more than the WHO optimal value. The mean IRDP was less than the WHO optimal value.

4.1. The index of poly-pharmacy

We compared WHO prescribing indicators from the present study (UAE 2012) with other studies conducted in Sudan (2010) (Al-Dawood, 1995), Nepal (2008) (Odusanya, 2004), China (2006) (Ghimire et al., 2009), India (2005) (Keohavong et al., 2006), Japan (2004) (Sharif et al., 2008), Nigeria (2000)

(Abdul Rasool et al., 2010) and King Saudi Arabia-KSA (1991) (Karande et al., 2005). The number of prescriptions was as follows: 1100 (present study), 600-Sudan (Al-Dawood, 1995), 4231 (Odusanya, 2004), China-1180 (Ghimire et al., 2009), India-500 (Keohavong et al., 2006), Japan-900 (Sharif et al., 2008), Nigeria-600 (Abdul Rasool et al., 2010) and KSA-500 (Karande et al., 2005). The mean number of medicines per prescription were [2.49 (present study), 2.0, 2.5, 2.04, 2.9, 2.0, 3.5 and 1.69]; respectively.

In the present study the average number of medicines per prescription was (2.49) higher than WHO optimal value ($\leqslant$2). This was similar to the situation in Nepal (2.5), Ghimire et al. (2009). However it was more than that reported from studies conducted in King Saudi Arabia-KSA (1.69), Sudan (2.0), China (2.0) and Japan (2.0), Ahmed and Awad (2010), Jun et al. (2011) and Keohavong et al. (2006), respectively, which were within the range of WHO optimal value ($\leqslant$2). Markedly higher results were revealed from studies conducted in Nigeria (3.5) and India (2.9) (Odusanya, 2004; Karande et al., 2005, respectively). The index of poly-pharmacy was the only index found outside the limits and the recommendations by the WHO, which indicated that, poly-pharmacy had the most prominent effect on irrational prescribing in the government hospitals. Therefore, actions should be taken to raise the awareness of the prescribers about poly-pharmacy as prescribing indicator and about the importance of rational prescribing and its effect on the patient's medications adherence, drug-drug interactions and adverse drug events. Physicians should be advised to prescribe the lowest number of medicines needed and to avoid symptomatic treatment whenever possible.

4.2. The index of generic prescribing

The overall index of generic prescribing was optimal in all the hospitals due to the use of the electronic prescribing system which was termed Wareed in Arabic indicating life-supply (Wareed). The average percentage of generic prescribing in hospitals in UAE in the present study was equal to the WHO optimal value (100%). Lower results were reported from studies conducted in KSA (43.2%), Sudan (49.3%), China (69.2%), Japan (78%) and India (73.4%), Al-Dawood (1995), Ahmed and Awad (2010), Keohavong et al. (2006) and Karande et al. (2005), while very low results were reported from Nepal (13%), Ghimire et al. (2009).

The importance of implementation of electronic prescribing systems was apparent in maintaining generic prescribing in healthcare facilities where all the medicines are entered to the system with their generic name. This enables patient to choose between alternatives available and not to be limited to the brand drug. The differences in generic prescribing between the hospitals were attributed to the restrictions imposed in last 5 years on generic prescribing, the lack of uniformity in electronic systems used in prescribing and the standard of adherence to practice guidelines. This indicated the importance of raising the awareness of the prescribers toward this issue and to encourage them to prescribe the medicines by their generic names even if the facility does not implement an electronic prescribing system. Moreover, the prescribing of medicines with their pharmacological group (e.g. decongestant nasal drop, emollient cream, cough syrup and mouth wash) is not regarded as generic prescribing for medicines. Interventions are needed to raise the awareness of prescribers about the importance of generic prescribing which may also improve patient's medications adherence.

4.3. Antibiotic prescribing

The index of rational antibiotic prescribing was optimal in all hospitals. The percentage of antibiotic prescribing in hospitals in UAE in the present study was (9.8%) within the range of WHO optimal value ($\leqslant$30%). Slightly higher results were obtained from KSA (15.6%) and Nepal (28.3%); Al-Dawood (1995) and Ghimire et al. (2009); but were within WHO optimal value. Higher results were reported from studies conducted in China (39.15%), and India (39.6%); Jun et al. (2011) and Karande et al. (2005).

Antibiotic prescribing in the hospitals was lower in all the Emirates. However, there were statistical differences ($P < 0.001$) between the four hospitals which was due to the enforced laws and follow-up of inspection programs in emirates of Dubai and Sharjah. Since most of patients attending outpatient clinic were having chronic diseases which did not require in most cases any antibiotics, actions should be taken by health authorities to promote the rational prescribing of antibiotics and to increase the awareness of the prescribers related to the hazard of inappropriate prescribing of antibiotics and consequently the increase of antimicrobial resistance.

4.4. The index of injection prescribing

The percentage of injection prescribing in the hospitals in UAE in the present study was (3.14%) lower than the WHO optimal value ($\leqslant$10%). Similar results were obtained from Nepal (3.1%) (Ghimire et al., 2009). Very low results were reported from India (0.2%) (Karande et al., 2005), while higher results were reported from China (22.6%) (Jun et al., 2011).

Injection prescribing in the hospitals was lower in all the Emirates since the outpatient clinic in hospitals receives chronic cases which do not require to be treated with injections. Inappropriate injections are associated with the extra risk of transmission of hepatitis B and C, HIV/AIDS and other blood-borne diseases due to non-sterile equipment and technique (Medicines: Rational Use of Medicines, 2010; Holloway and Green, 2003).

It is important to raise the awareness of prescribers and to encourage them to continuously improve their prescribing of injections according to the guidelines set by WHO and give preference to the oral route whenever possible; especially when the patient is able to take the drug orally. This is particularly important to improve patient adherence, reduce the cost and save the resources since the injection preparations are more expensive than the oral dosage forms.

4.5. The index of prescribing from EML

The percentage of prescribing from EML in all the surveyed hospitals was 100% as recommended by the WHO. This was optimal since all of them were following the set EML. High values were obtained from study conducted in India (90.3%); Karande et al. (2005), while lower results were revealed from study conducted in Nepal (42.3%) (Ghimire et al., 2009).

Prescribing from EML was optimal in all the government hospitals in UAE since they are following the EML which provides a framework for rational prescribing. The EML was already tested in practice, with established clinical use and may be cost effective.

4.6. Limitations of the study

The limitation of the study was that we did not study all hospitals in the public sector and therefore we did not include private hospitals, where the results were expected to differ in all aspects of prescribing indicators. This was attributed to the lack of systems of unified prescribing in the private sector and number of beds was less in private hospitals as opposed to government hospitals. This has impact on monitoring prescription and implementation of EML in private hospitals. Although the sampling method consecutive sampling is a strong technique, it may affect the representativeness of the study population.

4.7. Study strength and weakness

To the best of our knowledge, this study was the first to be conducted in the government sector in UAE in measuring drug prescribing patterns. Data were collected from 4 hospitals representing 4 Emirates and the consecutive sampling highly represented the surveyed population. Use of WHO core drug prescribing indicators adds strength to the study. Developing the IRDP to measure the degree of rational or irrational drug use has added more strength to the results.

The study was conducted during seven summer months only which may have excluded the winter illnesses. Also this does not show whether there are any seasonal variations in prescribing patterns as opposed to a retrospective study. The prospective study design was not designed to investigate the reasons leading to irrational prescribing of medicines, and future studies are required to investigate these factors.

5. Conclusions

There were 2 main issues concluded from the study findings, the need of rational use studies at health clinical level, awareness and training of health personnel on EML. Therefore, rational use surveys should be undertaken at primary health clinics, and health care centers levels. Poly-pharmacy practices did not change over time and this means prescribing habits have not improved. Therefore, it is advised to come forward with a proposal (strategies and interventions) for a national strategy with various components for action: awareness campaigns for health professionals (all categories) and the general public; continuing education sessions on RUM. These may be mandatory for re-licensing as a health professional in UAE, especially for foreign health professionals. RUM studies have to be conducted at primary health clinical level as patients will come forward with acute infections.

Submission statement

The paper has not been submitted elsewhere in similar form. All authors have contributed significantly to the publication. All authors were aware of the submission and agree with it. This report highlighted the need and value for clinical pharmacist in surgical clinical wards.

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References

Abdul Rasool, B.K., Fahmy, S.A., Abu-Gharbieh, E.F., Ali, H.S., 2010. Professional practices and perception towards rational use of medicines according to WHO methodology in United Arab Emirates. Pharm. Practice (Internet) 8 (1), 70–76.

Ahmed, Anas M., Awad, Abdelmoneim I., 2010. Drug use practices at pediatric hospitals of Khartoum State, Sudan. Ann. Pharmacother. 44 (12), 1986–1993.

Al-Dawood, K., 1995. Evaluation of drug prescribing habits in a postgraduate teaching set-up in Saudi Arabia. J. Family Commun. Med. 2, 41–45.

Dong, L., Yan, H., Wang, D., 2010. Drug prescribing indicators in village health clinics across 10 provinces of western China. Fam. Pract. 28, 63–67.

Sahar, Fahmy, 2008. In: The First National Conference on Rational Drug Use. Toxi-Drug Info, vol. 2(6). Health Authority-Abu Dhabi (HAAD).

Ghimire, Saurav, Nepal, Sushil, Bhandari, Sushil, Nepal, Prabha, Palaian, Subish, 2009. A prospective surveillance of drug prescribing and dispensing in a teaching hospital in Western Nepal. JPMA 59 (10), 726.

Hogerzeil, H.V., 1995. Promoting rational prescribing: an international perspective. Br. J. Clin. Pharmac. 39, 1–6.

Holloway, Kathleen, Green, Terry, 2003. In: Drug and Therapeutics Committees A Practical Guide. World Health Organization, WHO/EDM/PAR/2004.1.

<http://www.cpdpharma.ae/index.php?view=details&id=12%3A2nd+Pharmacy+Educational+Forum&option=com_eventlist&Itemid=84> (accessed on 14.06.13).

Joncheere, K.D., 2002. Implementation of rational pharmacotherapy. In: Perspectives and Achievements with Rational Pharmacotherapy. WHO/EURO, Copenhagen, Denmark.

Jun, Zou, Linyun, Li, Che, Zhang, Yuanrong, Yan, Fengxi, Gao, Heng, Zhang, 2011. Analysis of outpatient prescription indicators and trends in Chinese Jingzhou Area between September 1 and 10 2006–2009. Afr. J. Pharm. Pharmacol. 5 (2), 270–275.

Karande, Sunil, Sankhe, Punam, Kulkarni, Madhuri, 2005. Patterns of prescription and drug dispensing. Indian J. Pediat. 72.

Keohavong, Bounxou, Syhakhang, Lamphone, Sengaloundeth, Sivong, Nishimura, Akio, Ito, Katsuki, 2006. Rational use of drugs: prescribing and dispensing practices at public health facilities in Lao PDR. Pharmacoepidemiol. Drug Saf. 15, 344–347.

Medicines: Rational Use of Medicines, 2010. Fact sheet N°338.

Nobili, A., Licata, G., Salerno, F., et al., 2011. On behalf of SIMI Investigators. Polypharmacy, length of hospital stay, and in-hospital mortality among elderly patients in internal medicine wards. The REPOSI study. European Journal of Clinical Pharmacology. <http://www.springerlink.com.ezproxy.liv.ac.uk/content/n636g03017701662/fulltext.pdf> (accessed 02.01.15).

Odusanya, O., 2004. Drug use indicators at a secondary health care facility in Lagos, Nigeria. J. Commun. Med. Primary Health Care 16 (1), 224.

Rational Use of Injections within National Drug Policies, 2001. World Health Organisation Essential Drugs and Medicines Policy, Safe Injection Global Network, Cairo, October 2000. World Health Organization.

Sharif, S.I., Al-Shaqra, M., Hajjar, H., Shamout, A., Wess, L., 2008. Patterns of drug prescribing in a hospital in Dubai, United Arab Emirates. Libyan J. Med. 3 (1), 10–12.

WHO Policy Perspectives on Medicines-Promoting Rational Use of Medicines: Core Components, World Health Organization. September 2002, Geneva.

WHO Action Programme on Essential Drugs and Vaccines, 1993. How to Investigate Drug Use in Health Facilities: Selected Drug Use Indicators. EDM Research Series. No. 007, World Health Organization, Geneva.

Zhang, Y., Zhi, M., 1995. Index system, appraising method for comprehensive appraisal. J. North Jiaotong Univ. 19, 393–400.