Original Article

In-home Drug Storage and Self-medication with Antimicrobial Drugs in Basrah, Iraq

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Abstract

Objectives: To estimate the prevalence of self-medication with antimicrobial drugs and to record the stored medicine at home.

Methods: This is a descriptive study involving a questionnaire survey to determine the extent of drug storage and self-medication. A total of 300 household units in Basrah, Iraq were including in this study. A survey was conducted in 300 households in Basrah, southern Iraq to determine the availability, source, and storage conditions of medicinal drugs and the prevalence of self medication with antimicrobials.

Results: The majority of households (94%) stored drugs at home. A total of 4279 of different types of drug preparations were encountered, the mean being 14.26 products/household. The results also showed that a minority of these drugs (31%) were rationally prescribed. Hence only 31% of the total drugs were for current use, while 45% were leftovers and 23% of the drugs were kept for future use. A large proportion of the stored drugs (66%) was obtained from private pharmacies. Only 42% of all the drugs were stored appropriately. Antibiotics, as a group was the most common drug stored and used at home (26%). The results indicated that the level of education has influence over dose compliance, storage of expired drugs and drugs exchange. Furthermore, a majority of the families (78%) admitted to practicing self-medication. The most common reasons for self-medication with antimicrobial drugs were associated with influenza, upper respiratory tract infections, diarrhea and tonsillitis.

Conclusion: There are numerous indications of inappropriate storage, self- medication, poor compliance and use of drugs that have been kept beyond their expiry date in Basrah, Iraq.

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Received: 29 Dec 2009
Accepted: 16 Feb 2010

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Jassim AM. *OMJ*. 25, 79-87 (2010); doi:10.5001/omj.2010.25

Introduction

To date, information about the storage of drugs at home and self-medication are unavailable in Basrah, Iraq.

The distribution of drugs in Basrah since the gulf war (2003) has been uncontrolled and widespread due to the presence of large numbers of unlicensed drug outlets that dispense drugs without prescriptions. This has promoted home drug storage and self-medication.[1] Taking drugs particularly antimicrobial agents at home without prescription has become a practice often encouraged in Basrah's communities. Easy access to home-stocked medicine has enable a high consumption rate of medicine for self-limiting diseases. Moreover, the inappropriate use of antimicrobial drugs may result in a waste of resources, increased resistance of pathogens, serious health hazards, prolong suffering, increases in adverse reactions and drug interactions, and also delays in getting proper treatment when there is misdiagnosis.[1,2,3] On other hand, the use of antimicrobial drugs without medical guidance may lead to the use of insufficient dosages or incorrect or unnecessary drugs.[4]

Self-medication and the use of leftover drugs are widespread in countries where drugs are sold without prescriptions.[5,6] This study aims to estimate the prevalence of self-medication with antimicrobial drugs in Basrah, to record the presence of prescribed and non-prescribed medicines, to assess the safety of drug storage at home and to identify community drug-use habits in Basrah.

Methods

This is a descriptive study involving a questionnaire survey to determine the extent of drug storage and self-medication in 300 household units Basrah, Iraq between 2007-2008.

The heads of the households or their spouses or any adult capable of delivering required information were interviewed and asked about the number of people in each house and the educational background of the head of the household.

A number of questions were asked, namely; whether and why drugs were kept at home; where precisely the drugs were being stored; whether the drugs had been prescribed by a physician; whether the drugs were currently being used; if they had been prescribed for previous infections (leftover drugs) or were being kept for future use (standby drugs). The subjects were also asked whether they exchanged drugs among the family members and their relatives, friends or neighbors, and if they normally completed the prescribed dose.

The heads of households were asked to produce all drugs in their premises. The index of each drug stored was recorded. The names, types and dosage forms of the drugs, the storage conditions

and storage places, the dispensing date, the remaining unused quantity and expiry dates. The respondents were asked that in case any one of the family falls sick, would she or he consult a doctor or directly use the stored drugs (over-the counter use) were also recorded.

Respondents were classified as 'self-medicating' if they reported that they had taken any antimicrobial or other drugs without prescription from a physician or dentist or as "prescribed users" if the above drugs had been previously prescribed. The reasons for self-medication (symptoms or the diseases) were also noted. Statistical analysis was performed using the Z-test to determine the difference between two proportions.

Results

Table1: Number of households by number of preparations stored*+

No. of drugs stored/ household	No. of households n=300	%	Total drugs stored in these households	% from Total stored n= 4279
Nil	18	6.00	Nil	Nil
1-5	56	18.66	164	3.83
6-10	57	19.00	405	9.44
11-15	64	21.33	833	19.46
16-20	35	11.66	628	14.67
21-25	20	6.66	457	10.65
26-30	17	5.66	453	10.58
31-35	10	3.33	324	7.57
36-40	8	2.66	295	6.89
41-45	5	1.66	217	5.07
> 45	10	3.33	503	11.75

* The mean number of drugs stored per household=14.26+
There were a total of 4279 stored drugs.

Of the 300 households visited, 282 (94%) were found to store drugs of various types. (Table 1)

Altogether, there were 4279 stored preparations. The average household possessed 14.26 products and the range was 1-72 per household. The results also showed that most families (70%) kept between 1-20 products. The families stored approximately half the products in their households.

Overall, 4279 items of drugs were analyzed in order to collect data about type of drugs, how the drugs were prescribed, dispensed, used and stored at home. (Table 2)

Antibiotics were the leading household stored drugs (26.43 %), followed by antipyretic/analgesics (19.58%), and NSAIDs (non-steroidal anti-inflammatory drugs) (11.45%). These drugs constituted (57%) of the total drugs stored.

31% of these drugs represented the drugs in current use at the time of visiting, while 45% were drugs leftover or unused drugs, and 23% were drugs kept for future. The majority of leftover drugs were also kept for future needs. The results also showed that 13% of the drugs were out of date (expired). The antimicrobial drugs constituted 29% of the total drugs.

The results also indicated the adequacy of drug storage, (Table 2). An appropriate storage condition was defined as keeping the medicines under refrigeration, exposed to a ventilated area and away from the reach of children. Inappropriate storage conditions were defined as storage conditions in which the above measures were not carefully implemented.

Only 42% of the total drugs stored at home were kept in appropriate storage conditions.

Physician prescribed and non-physician prescribed drugs (i.e. self-prescribed or prescribed by pharmacists or their assistants, relatives, friends or ordinary shop sellers) are shown in Fig. 1. Approximately one-third of both antimicrobial and non-antimicrobial drugs were rationally delivered (prescribed by physicians). There was a significant difference between prescribed and non-prescribed drugs ($p<0.01$).

The number of drugs with respect to the common sources where household heads obtained the drugs are shown in Fig. 2. Private pharmacies were the leading source of drugs stored at

home, (66%). On the other hand, relatives and friends were the least common source of drugs in Basrah (4%). Other sources such as ordinary shops and government health centers also represented a significant figure compared to the rest of sources of drugs, accounting for 19% and 10% respectively.

Table 2: Data on drugs stored

Type of drug	No. of preparations	% of total	Type of delivery		Storage condition	
			Prescribed by physician	Self- prescribed	Appropriate	Inappropriate
Antipyretic Analgesics	838	19.58	213	625	182	656
NSAIDs*	490	11.45	138	352	97	393
Steroid Preparations	138	3.22	44	94	72	66
Antibiotics	1131	26.43	388	743	655	476
Antiparasitics	80	1.86	23	57	34	46
Antifungals	27	0.63	17	10	13	14
Cough mixtures	191	4.46	74	117	80	111
Antiacids	300	7.01	52	248	133	167
Antihistamines & decongestants	82	1.91	21	61	37	45
Anxiolytics, sedatives, hypnotics & antidepressants	198	4.62	112	86	98	100
Antidiarrhea, laxatives, others	88	2.05	36	52	47	41
Vitamins & minerals	294	6.87	32	262	190	104
Others	422	9.86	202	220	182	240
Total/percent	**4279**	**100**	**1352 (31.59%)**	**2927(68.40%)**	**1820(42.53%)**	**2459(57.46%)**

Table 2 - continued

Type of drug	Usage			Expiry status		Source of drugs	
	Current use	Leftover	For future	Expired	Un- expired	Pharmacy	Other
Antipyretic Analgesics	211	506	121	122	716	320	518
NSAIDs*	178	210	102	83	407	371	119
Steroid Preparations	52	61	25	19	119	88	50
Antibiotics	305	572	254	214	917	898	233
Antiparasitics	21	45	14	6	74	67	13
Antifungals	11	13	3	0	27	20	7
Cough mixtures	74	81	36	12	179	137	54
Antiacids	40	77	183	0	300	122	178
Antihistamines & decongestants	33	34	15	7	75	61	21
Anxiolytics, sedatives, hypnotics & antidepressants	57	87	54	22	176	181	17
Antidiarrhea, laxatives, others	20	58	10	7	81	65	23
Vitamins & minerals	135	140	19	12	282	187	107
Others	205	50	167	68	354	311	111
Total/percent	**1342(31.36%)**	**1934(45.19%)**	**1003(23.44%)**	**572(13.36%)**	**3707(86.63%)**	**2828(66.09%)**	**1451(33.9%)**

* Nosteroidal anti-inflammatory drugs

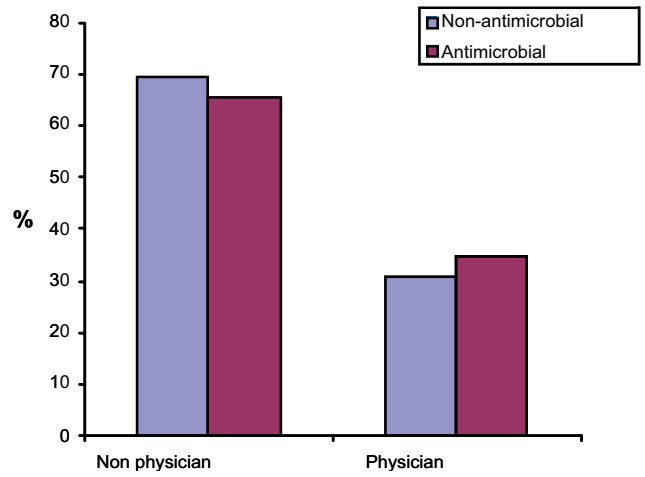

Figure 1: Percentages of Physician and non- physician prescribed drugs

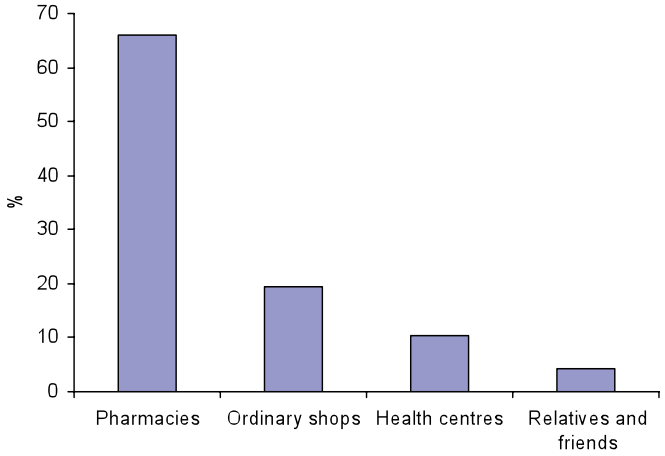

Figure 2: Source of drugs stored at the households

When drug exchange patterns were correlated to the level of education, only 5% of the respondents with university degrees exchanged drugs with friends and relatives, while a higher exchange rate (18%) was observed for subjects who had no college education (Table 3). There was a statistically insignificant association ($p>0.05$).

When comparing level of education to drug intake compliance, household heads without university degrees exhibited the lowest compliance rate (34%), while this rate reached (58%) for subjects with no university degree. According to the Z-test, there was a statistically significant difference between the two groups ($p<0.01$).

Families whose heads had graduated from university were significantly associated with self medications ($p<0.01$). 92% of these families used stored drugs without consulting or visiting doctors in comparison to 64% of those who had no university degrees. A total of 235 families used stored drugs for self-medication, representing 78.33% of the total households visited. (Table 3)

The least educated household heads were four times more likely as the university educated household heads to have expired drugs in their houses. 42% of household heads without university degree compared to 10% with formal degrees. There was a statistically significant difference between the two groups ($p<0.01$). (Table 3)

When comparing the level of education of the interviewees and number of drugs stored, out of the 18 subjects who did not store medicines at home, 12(66%) were university-educated while 6(33%) had no college degree. However, the difference was not statistically insignificant ($p>0.05$).

Antimicrobial drugs from all classes were kept and used in the households.

A total of 1238 of antimicrobial preparations were recorded at surveyed households, (Table 4). 34% were prescribed by physicians, 27% were for current use at the time of visiting and the remaining 73% were kept for future use. The latter included drugs leftover prescribed for previous infections as well as the drugs kept for standby use.

Table 3: In-home drug use habits and level of education of the head of households.

Habits	No. of families whose heads had university degree (n=150) %	No. of families whose heads had no university degree (n=150) %	% of total (n=300)	*p value*
Drugs exchange	8 (5.33%)	28 (18.66%)	12	$p>0.05$
Dose compliance	87 (58.00%)	51 (34.00%)	46	$p<0.01$
Over the counter used	138 (92.00%)	97 (64.66%)	78.33	$p<0.01$
Storage of expired drugs	16 (10.66%)	64 (42.66%)	26.66	$p<0.01$
No drugs stored	12 (8.00%)	6 (4.00%)	6	$p>0.05$

Table 4: Usage of the major categories of antimicrobial drugs

Antimicrobial	No. of total preparations	Prescribed by physician (%)	Self –Prescribed (%)	In current use (%)	For future use (%)	% of total
Penicillins	304	66(21.71)	238(78.29)	94(30.92)	210(69.08)	24.63
Cephalosporins	212	48(22.64)	164(77.36)	77(36.32)	135(63.68)	17.12
Tetracyclines	71	28(39.43)	43(60.56)	17(23.94)	54(76.05)	5.73
Chloraphenicol	24	18(75.00)	6(25.00)	8(33.33)	16(66.66)	1.93
Erythromycins	132	47(35.60)	85(64.39)	36(27.27)	96(72.23)	10.66
Clindamycins	36	26(72.22)	10(27.77)	9(25.00)	27(75.00)	2.90
Glycopeptides	15	12(80.00)	3(20.00)	3(20.00)	12(80.00)	1.21
Aminoglycosides	105	68(64.76)	37(35.24)	8(7.62)	97(92.38)	8.48
Quinolones	49	29(59.18)	20(40.82)	19(38.77)	30(61.22)	3.95
Co-trimoxazole	183	46(25.13)	137(74.86)	34(18.58)	149(81.42)	14.78
Metronidazole	54	10(18.52)	44(81.48)	13(24.07)	41(75.52)	4.36
Mebendazole & Albendazole	26	13(50.00)	13(50.00)	8(30.77)	18(69.23)	2.10
Antifungals	27	17(62.96)	10(37.03)	11(40.74)	16(59.26)	2.18
Total	**1238**	**428(34.57)**	**810(65.42)**	**337(27.22)**	**901(72.77)**	**100**

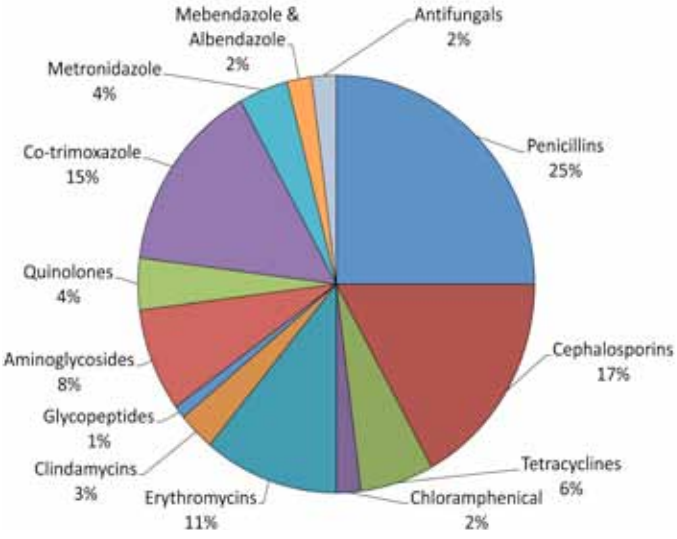

Figure 3: Distribution of antimicrobial drugs stored at home.

Penicillins (24%) were the most commonly encountered antimicrobial drugs followed by cephalosporins (17%), co-trimoxazole (14%), erythromycins (10%) and aminoglycosides (8%). Many other antibiotics were also reported but with low frequencies. (Fig. 3)

Antiprotozoals, anthelmintics and antifungal drugs were also found in visited households in the following frequencies respectively; 4%, 2% and 2%. (Fig. 3)

A total of 337 different types of antimicrobial drugs were kept for current use at time of study, (Table 4). A majority of these drugs were antibiotics (90%), followed by antiparasitics (6%), and antifungals accounting for only 3%.

Antibiotics are the almost common used antimicrobial without prescription (i.e. over the counter use), approximately 68% of these drugs were self prescribed compared to 57% and 27% of antiparasitics and antifungal drugs respectively.

The results showed that influenza, upper respiratory tract infections (including sneezing, nasal congestion, runny nose and cold), diarrhea and tonsillitis were the most common reasons for self-medication. (Table 5)

Fever, teeth/gum symptoms, cough, skin infections, urinary tract infections, throat symptoms/complaint and ear infections were among the other reasons for self-medication, representing 8%, 5%, 5%, 5%, 4%, 3.6% and 3.6% respectively.

Table 5: Prevalence of self-medication by symptoms or diseases

Symptoms/Diseases	No. (%) n=222
Teeth/gum symptom/complaint	12(5.40)
Upper respiratory tract infection, sneezing , nasal congestion, runny nose , cold	25(11.26
Throat symptom/complaint	8(3.60)
Fever	18(8.10)
Tonsillitis	20(9.00)
Influenza	37(16.66)
Inflammation/infection , not specified	26 (11.70)
Urinary tract infection	9(4.05)
Skin infection , other	11(4.95)
Cough	12(5.40)
Diarrhea	25(11.26)
Ear infections	8(3.60)
Chronic diseases, others	11(4.95)

Unspecified infections were reported in 12% of cases. Other infections such as eye infections, lower respiratory infection (pneumonia), sinus symptoms /complaint and chronic diseases were reported in 5% of cases.

Discussion

The study involved a total of 300 households from Basrah, Iraq. A majority of households (94%) stored drugs. The results from this study are comparable to those conducted in Sudan and Kinondoni district, Tanzania. The Sudanese study showed that 97.5% of households had at least one drug product stored at home while in Tanzania, a similar study showed a prevalence rate of 73%.[7,8]

Other studies conducted in New Guinea, Spain and European countries also reported high prevalence rates of stored drugs but at lower extents, the rates were 53%, 42% and 50% respectively.[2,9,10] The high prevalence rate may be attributed to uncontrolled distribution of drugs and the presence of a large number of drug outlets dispensing drugs without prescriptions.

In the present study, households with no drugs comprised only of 6% of the total households investigated compared with 81% and 78% observed in similar studies conducted in the United Kingdom and Bagamoyo, Tanzania respectively.[1,11] The differences can be attributed to applied policy of essential drugs in these countries during the time of study.

The mean number of drugs stored per household in this study was 14.26%, which may be considered very high in comparison with other studies conducted in Sudan,[7] New Guinea,[2] Tanzania,[8] and Switzerland[12]. The number of drugs reported by these studies were 4.4, 2.4, 1.7, 10.3 per household respectively, while higher numbers were reported by other studies, (22.8) products/household was reported by Edwards[13] in the United Kingdom during 1982 and (16.2) products/household by Hayes et al.[14] in Australia during 1976. This variation in numbers of stored drugs may be related to the method of dispensing and availability of drugs. Places with high availability of drugs other than licensed (authorized) outlets where over the counter dispensing is practiced have emerged as the contributing factors in promoting home drug storage.[1] Socioeconomic factors, cultural attitudes and drug advertising are also to influence the prevalence.[2]

Among the other causes of home storage of drugs are excessive prescribing, imperfect therapeutic adherence, treatment modifications after hospitalization and oversized drug packages resulting in home storage of leftover drugs. Hence, the presence of chronic diseases as in case of elderly people who are frequently treated for several conditions and by several physicians.[12]

Antibiotics were the most commonly encountered drugs, followed by antipyretic-analgesics and non-steroidal anti-inflammatory drugs respectively.

The high percentage of antibiotics in this study indicates the high rate of consumption of this group of drugs.

The results from this study are comparable to Sudanese and Ethiopian studies,[7,15] but in contrast with other similar studies carried on Tanzania,[1] New Guinea,[2] and United Kingdom,[13] which reported that most of the household stored drugs were Antipyretic-analgesics.

70% of the total drugs kept in households in the present study were self-prescribed. Non-physician prescribed drugs were reported in high proportion by several researchers, 83% and 62% observed by Temu et al.and Edwards respectively.[8,13] However, other studies conducted in Sudan, New Guinea and Australia showed lower percentages for non-prescribed drugs, (29%, 34%, 48% respectively).[2,7,14]

The source of drugs for the households was established to be the from private pharmacies (66%), ordinary shops (19%) and health centers (10%). The majority of drugs obtained from government health centre were physician prescribed. Private pharmacies in Basrah dispensed all types of drugs even non-physician prescribed. Other unlicensed drug outlets also recorded included ordinary shops and drugs obtained from friends or relatives.

Other studies also found that pharmacies were the leading source for home storage of drugs.[7,8,10,16]

The study showed that most of the drugs stored at home were leftover drugs (45%). This indicated a higher storage rate

of medicines of incomplete quantities. The finding of high levels of leftover drugs suggests that prescriptions often do not equate to use. Persons may keep leftover drugs because too much was prescribed for the initial infection. On the other hand, some people may keep leftover drugs for further use in the future. Furthermore, most community-acquired infections are respiratory and urinary, for which many prescribed courses of antimicrobial drugs are longer than necessary.[17]

It is not clear whether the sources providing the drugs in Basrah give the appropriate dose. Otherwise, it is either that the patients do not take the required course or patients may even be over dosed resulting in unwanted toxic effects.

The rate of inappropriate storage conditions in this study was 57% compared to 26% in Sudan,[7] and 31.8% leftover in New Guinea.[2] This higher rate was due to lack of refrigeration. Higher rate was also reported by Temu et al.[8]

The appropriate drugs storage conditions required included adequate space with proper ventilation-lighting, temperature controls and refrigeration, and being out of reach of children.[7,18,19,] The use of refrigeration for drug storage would be a logical solution for people who could afford it. In Basrah there is an extended power outage, an average of 14 hrs/day.

Drugs are chemicals that react to external stimuli such as heat, humidity, light, dust, and etc. In many cases, such reactions can lead to cosmetic changes such as fading or the reaction can have an impact on drug trafficking, more seriously leading to the reduction or elimination of its effectiveness and/or strength.[19] Thereby, accelerating the deterioration of drug quality, production of toxic degradation compound and increasing morbidity or mortality.[1,2]

On the other hand, summer heat, can expose the medication to dangerous temperatures that can potentially degrade the drug and often, unnoticed, paricularly in Basrah where the summer heat can reach up to 50°C.[18]

In this study, most of the stored medication had no child-resistant barriers. Some of the accessible storage locations included kitchen counters, table tops or tops of dressers or beside tables for example. Also, some of the dangerous drugs were not stored in locked spaces. This may lead to accidental ingestion of oral drugs by children under the age of five.[20] In a study conducted in Turkey, 50% of poisoning accidents stemmed from the storage of drugs within reach of children.[21]

The level of education had an influence on dose compliance, storage of expired drugs and drug exchange. The present study showed that the respondents without university degrees exhibited the highest rate of drug exchange, storage of expired drugs and lowest compliance rate. These results also conform to study of Yousif.[7]

The effect of the level of education on in-home drug storage was demonstrated by the relatively higher rate of university graduates who did not store drugs at home, (8%) compared to only 4% of those without university degrees.

Persons who were more prone to self-medicate were more educated. Self medication in this study was reported in 92% of households in which the heads of households (respondents) had university degrees compared with 64% in households where the respondents had no university degree. This finding corresponds to the findings of studies conducted in Sudan, Europe, United States, and Greece, which also reported that higher educational status was associated with use of drugs, perhaps due to the fact that more educated patients have relatively more (knowledge) on drugs.[7,10,22,23]

This current study showed that 27% of the stored antimicrobial drugs were in current use, of which approximately two-thirds were self prescribed. This high prevalence rate of antimicrobial drug self-medication among Basrah's community suggests that cultural and socioeconomic factors play a role. Another factor may be the acquisition of antimicrobial drugs from pharmacies and other drug outlets without prescription. These results are comparable to results from other studies.[7,8]

In the United States, studies have indicated that there is considerable use of drugs without prescription.[24] In Europe, several studies have also reported self-medication. In Russia, Greece and Malta, studies have also suggested a considerable use of drugs without consulting physicians.[5,23,25]

Antimicrobial drug self-medication is a cause for concern because it may contribute to the spread of antimicrobial drug resistance. Self-medication with a drug that is ineffective against the causative organism or with an inappropriate dosage may increase the risk of selection of resistant organisms that are difficult to eradicate. The resistant organisms may then be transferred into the community. Other problems related to self-medication include drug interactions, masked diagnosis and super-infections.[10] Among the possible adverse consequences of self-medication to individual patients are those that include misdiagnosis and missed diagnosis, misuse of drugs (including unintentional access by children), increased risk of adverse reactions and drug interactions, particularly in children, the elderly, pregnant women and those with pre-existing diseases.[3]

Misdiagnosis could have several adverse consequences, includes; a) partial or complete failure to treat an infection, b) failure accurately to identify or treat the presenting infection, c) exposure to the risks of antibacterials without benefit when no treatable bacterial infection is present, and d) failure to recognize that an infection might be a manifestation of underlying disease

(e.g. sepsis in diabetes mellitus).[3]

Antimicrobial drug resistance is a rapidly increasing global problem and the prevalence varies widely among countries.[26,27] Prevalence of resistance is positively correlated with using drugs obtained without prescriptions, leftover drugs from treatment courses previously prescribed or drugs obtained from relatives or friends.

The use of leftover drugs may increase antimicrobial drug resistance in the community by exerting selective pressure in the commensal flora.[28] Evidence shows that repeated treatment with antimicrobial drugs exerts greater selective pressure on normal bacterial flora than a single course of treatment.[29] Consequently, persons who use leftover antimicrobial drugs repeatedly are at greater risk for colonization and infection with drug resistant organisms.[28, 29]

It is possible that self-medication may alter the type of antimicrobial used for good. For example, if agents used solely for (UTI) were released for self-medication of acute (UTI), then this could result in a lowering of the number of prescriptions of β-lactam agents and trimethoprim which are used systemically for other, sometimes more serious infections. This may be beneficial to the general problem of resistance. Furthermore, the prescription of fewer β-lactams may result in less super-infections with *clostridium difficile* and *Candida spp*.[3]

Antimicrobial drugs from all classes were stored at home. A high percentages of these drugs were self-prescribed (65%). Only 27% were used for current ailments at time of visiting, large proportion of leftover drugs were stored for future use.

Penicillins, Cephalosporins, co-trimoxazole and Erthromycins were widely used for self-medication in Basrah. The high prevalence rates of penicillins and co-trimoxazole have also been reported by other studies.[2,11] Higher rates of prevalence of these four drugs in Basrah may be related to the wide use in treatment of community-acquired infections, mostly respiratory and urinary since these drugs are more effective, cheap, and available in authorized an un-authorized drugs outlets.

Influenza, diarrhea, upper respiratory tract infections and tonsillitis were the most common reasons for self medications. These diseases and symptoms are highly recurrent in household members. The recurrence of familiar symptoms after an initial diagnosis by a physician is a common trigger for self-medication. If patients are given simple guidelines, it is likely that they could recognize symptoms of a range of simple recurrent infections which a physician would commonly treat with an antibiotic without microbiological evaluation.[3]

Conclusion

There are numerous indications of inappropriate storage, self-medication, poor compliance and use of drugs that had been kept beyond their expiry date in Basrah, Iraq. In order to minimize this practice, over-the-counter antimicrobial drugs sales should be restricted. Health education should be given not only to the patients but also the entire general public on the appropriate drug use, safety, expiry date and appropriate storage.

In Basrah, there is a great need to educate and motivate the general public to apply the principle of rational drug use and thus to obtain both economic and health benefits. Leftover drugs should be discarded or should only be taken after consulting a health professional.

Although over-the-counter sale of antimicrobial drugs is illegal in Iraq, people do not abide by the law, therefore it must be reinforced with strict guidelines.

Acknowledgements

The author reported no conflict of interest and no funding has been received on this work.

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