Physicians' knowledge, attitude and practices regarding management of medications in Ramadan

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معارف الأطباء ومواقفهم وممارساتهم بشأن المعالجة الدوائية في رمضان

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الخلاصة: استلزم تقييم معارف الأطباء ومواقفهم وممارساتهم بشأن المعالجة الدوائية في رمضان من الباحثين استخدام استبيان يستكمل ذاتياً بشأن عينة الأطباء المستهدفة والبالغ عددها 381 طبيباً في مستشفى الجامعة الاردنية، ومستشفى الملك عبد الله الجامعي، وعدد من العيادات الخاصة في عمان خلال شهري أيلول/ سبتمبر وتشرين الأول/ أكتوبر من عام 2008. وبالفعل تم إعادة 297 استبياناً، وثبت أن معارف الأطباء ومواقفهم وممارساتهم بشأن المعالجة الدوائية في رمضان غير كافية بشكل عام. ويعتبر السن والجنسية والتخصص والبلد وسنة الحصول على آخر مؤهل ($P<0.05$) من العوامل الرئيسية التي تؤثر على معارف الأطباء ومواقفهم وممارساتهم، وقد سجلت الطبيبات نتائج أفضل من الأطباء، كما سجل الزملاء الخريجون نتائج أفضل من سائر المجموعات فيما يتعلق بالمعارف. وقد اتسقت معارف معظم الأطباء ومواقفهم وممارساتهم بشأن المعالجة مع الآراء الدينية فيما يتعلق بطريقة إعطاء الأدوية التي تفسد الصيام، مما يدل على أن الأطباء لديهم معرفة جيدة في هذا المضمار.

ABSTRACT To evaluate knowledge, attitude and practices (KAP) of physicians regarding the management of medications in Ramadan we used a self-administered questionnaire on a target sample of 381 physicians at Jordan University Hospital, King Abdulla University Hospital and a number of private clinics in Amman, during September and October of 2008. A total of 297 questionnaires were returned. Physicians' KAP about management of medications in Ramadan was generally insufficient. The main factors that affected KAP were age, nationality, specialty, and country and year of last qualification ($P < 0.05$). Female physicians scored better than males, and fellows scored better than other groups for knowledge. Most physicians' attitudes and practices were in line with religious opinion in regard to which routes of drug administration can nullify fasting, indicating that physicians have adequate knowledge in this area.

Connaissances, attitudes et pratiques des médecins en matière de gestion des médicaments pendant le Ramadan

RÉSUMÉ Afin d'évaluer les connaissances, les attitudes et les pratiques des médecins en matière de gestion des médicaments pendant le Ramadan, nous avons utilisé un autoquestionnaire dans un échantillon cible de 381 médecins dans un certain nombre de cliniques privées à Amman, ainsi que dans les établissements de soins Jordan University Hospital et King Abdulla University Hospital, en septembre et octobre 2008. Au total, 297 questionnaires ont été retournés. Les connaissances, attitudes et pratiques des médecins en matière de gestion des médicaments pendant le Ramadan étaient généralement insuffisantes. Les facteurs principaux qui affectaient les trois points analysés étaient l'âge, la nationalité, la spécialisation, ainsi que le pays et l'année de la dernière qualification ($P < 0,05$). Les médecins femmes ont obtenu de meilleurs résultats que les médecins hommes, et les boursiers ont obtenu de meilleurs résultats que les autres groupes pour les connaissances. La majorité des attitudes et des pratiques des médecins se situaient dans le droit fil des convictions religieuses pour identifier les voies d'administration des médicaments qui annuleraient le jeûne, indiquant que les médecins disposaient des connaissances adéquates en la matière.

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Introduction

About 2 billion Muslims throughout the world celebrate the holy month of Ramadan each year [1]: adult Muslims are required to refrain from taking any food, beverages or oral drugs, and to abstain from sexual intercourse between dawn and sunset. Since the lunar calendar is used to determine Ramadan, the timing changes each year and the duration of restricted food and beverage intake can vary from 12 hours during winter to 16 hours or more during summer [2,3].

The month-long fast should not induce any harmful effects in young healthy subjects. However, it can induce several complications in some patients with chronic diseases such as diabetes mellitus [4]. Although patients with serious illnesses, including diabetes mellitus, are exempt from fasting during Ramadan, most Muslims prefer to fast [5].

Patients taking medications during Ramadan face a dilemma in keeping up with their pre-Ramadan drug administration schedules. Routes of administration matter in this regard as certain routes do not nullify fasting. These routes have been specified by Muslim jurists, and scholars of religion, medical practitioners, pharmacologists, and specialists in other human sciences agree unanimously that some administration routes do not nullify fasting, e.g. eye and ear drops and all substances absorbed into the body through the skin, including nitroglycerin tablets placed under the tongue for the treatment of angina. Moreover, administration of drugs through injection into the skin, muscle, joints, or veins (with the exception of intravenous feeding) do not nullify fasting [3,6,7].

During Ramadan, accurate distribution of drugs prescribed twice a day is difficult to achieve between the break from fasting (*iftar*), which usually contains a sizeable amount of fat and carbohydrates, and the beginning of fasting (*sohour*), which is considered a breakfast-like meal, as the dosing time and time span between the doses are both altered. These alterations could affect the plasma concentration profile of the drug and, therefore, its efficacy and tolerance [8].

Islamic rules allow patients with chronic diseases such as diabetes and uncontrolled hypertension not to fast. However, if patients with diabetes wish to fast, it is necessary to advise them to undertake glycaemic control several times a day to prevent hypoglycaemia during daytime fasting or hyperglycaemia during the night [4]. In a 2007 study Ramadan fasting was shown to have injurious effects on the renal tubules in patients with stage 3 and stage 4 chronic kidney disease [9].

Ramadan provides an opportunity for health professionals to promote health improvement among patients by offering lifestyle advice on topics such as diet and smoking cessation, bearing in mind that in people with acute illness, fasting can be broken and made up later [6]. All patients who intend to fast should be counselled before Ramadan about changes in medication timings and doses, dietary changes, patterns of physical activity and the role of self-monitoring of blood glucose, especially during acute symptoms. Since most patients intending to fast do not come voluntarily for consultation immediately before Ramadan, it is imperative to make every effort to bring them to clinic before the commencement of fasting [10–12].

Ramadan is a unique model of intermittent fasting, and represents a great opportunity for scientific research [13]. Managing patients with chronic disease during the month is surely different from other months. Physicians managing patients with diabetes mellitus or renal failure should be aware of the possibility of hypoglycaemia/hyperglycaemia or dehydration in their patients. Even in other chronic conditions such as cardiovascular disease, it is important that physicians are able to handle patients' drug regimens and adjust medications to suite the patients' fasting schedule [4–6,9].

In general, there is no information on the knowledge, attitudes and practices of physicians about the management of medications in Ramadan. In this study, therefore, we aimed to explore physicians' knowledge, attitudes and practices regarding the management of medications in Ramadan in Jordan.

Methods

This study was conducted in 2 educational hospitals in Jordan, Jordan University Hospital in Amman and King Abdulla University Hospital in Irbid, as well as in a number of private clinics in Amman during Ramadan and the month after Ramadan 2008 (1429 Islamic calendar).

This cross-sectional survey was carried out during Ramadan and the month that followed (Shawwal), 1 September 2008–1 November 2008. We targeted the 2 university hospitals in Jordan, and for comparison, we also targeted all private clinics in all areas of Amman. We adopted the drop and pick-up technique for data collection. Since no previous studies had been conducted in this area, we did not perform a sample size calculation. We included all physicians present at the time of data collection in the target sites: a total of 380 questionnaires were distributed by hand. In Jordan University Hospital and King Abdulla University Hospital the questionnaires were delivered to the available physicians (interns, general practitioners, residents, fellows and consultants) during work days (Sunday to Thursday). Distribution to private clinics was carried out throughout the week to a convenience sample of privately practising physicians throughout Amman.

This survey employed a self-administered, anonymous questionnaire which was constructed by the authors. The initial draft of the questionnaire was examined by a panel of experts in various specialties (therapeutics, pharmacy practice and medicine) for face and content validity. Validity, reliability, and piloting measures were done prior to data collection. A statistician was consulted during the construction of the questionnaire for the design of the questions and statistical analysis afterwards. A pilot study was performed on 5% of the target sample at Jordan University Hospital, and questions were adjusted as appropriate.

The questionnaire had 2 parts. The first part gathered personal information: age, sex, nationality, place of work, current position, specialty, country of last qualification, and year of first qualification.

The second part had 9 questions, 1 open-ended and the remaining 8 closed. It investigated knowledge, attitudes and practices about management of medications in Ramadan.

Five questions were used to assess physicians' knowledge about management of medications in Ramadan, such as knowledge about drugs affected by circadian rhythms, the recommended regimen suitable for any patient who forgot to take his/her medication, alternative dosage forms and regimens suitable for Ramadan, monitoring of drugs with a narrow therapeutic index, and food–drug interactions.

Four questions examined physicians' attitudes and practices about management of medications in Ramadan such as the optimum time of administration of drugs that needed to be taken on an empty stomach, the recommended regimen suitable in case of taking the medication once or twice daily rather than more frequent dosing per day, administration routes that nullify fasting, and whether patients with specific chronic diseases should or should not fast during Ramadan.

Physicians were asked to complete the questionnaire and return it to an assigned collection station. They were informed that the researcher was a student in the Department of Clinical Pharmacy, University of Jordan. They were also informed about the aim of the study.

Approval to conduct the study was obtained from the Graduate Studies Committee at the Faculty of Pharmacy and the Deanship of Graduate Studies at the University of Jordan, and Jordan University Hospital Scientific Research Committee. Written permission was obtained to distribute the questionnaire.

The 5 knowledge questions were weighted to create a contrast to compare the results. For questions with choices of yes or no, "Yes" was scored 1 while "No" was scored 0. For questions that had more than 1 answer, each answer was scored individually. Only frequencies were obtained for the 4 attitude and practices questions; they were not scored, and each was analysed separately.

The data were coded and entered into *SPSS*, version 16. The data were analysed in several steps. First, each factor was examined using simple frequency tables. Any missing data in the returned questionnaires were excluded from the analysis.

Next, data were transferred from *SPSS* into the *Statistical Analysis System* (*SAS*), 2004. Stepwise regression analysis was performed on the knowledge criteria as a preliminary analysis to identify factors that might affect it.

Finally, factors showing statistically significant differences ($P < 0.05$) in the preliminary analysis were retested by least squares analysis of variance using the Generalized Linear Model procedures of *SAS*. Means for significant factors ($P < 0.05$) were compared using analysis of variance (ANOVA) and odds ratios were estimated using the chi-squared test.

Results

Out of 380 questionnaires delivered, only 297 were returned (response rate 78%).

The physicians who participated were predominately male (67%). Age range was 22–75 [mean 33.5, standard deviation (SD) 11.2] years. About 87% of participating physicians were Jordanians. Demographic details and distribution of participating physicians between the 2 hospitals and the private clinics are summarized in Table 1.

Physicians' knowledge about the management of medications in Ramadan was generally insufficient. The overall score for correctly answered question was 6.20 (SD 0.49) out of a total of 25.0.

In regard to drugs affected by the circadian rhythm and the optimum time for drug administration, the overall mean score was statistically significantly affected by the following factors: place of work ($P = 0.020$), current position ($P = 0.015$) and specialty ($P = 0.015$). Physicians working at private clinics had higher scores, mean 3.45 (SD 0.16) out of 10.00, for knowledge than physicians working at both King Abdulla University Hospital (mean 3.06; SD 0.20) and Jordan University Hospital (mean 2.72; SD 0.17). Consultant physicians got the highest scores for knowledge of drugs affected by the circadian rhythm.

The overall score in regard to potential food, drink and drug interactions was significantly affected by current position ($P = 0.0017$) and year of first qualification ($P = 0.0019$). Fellows got the highest scores (mean 1.51; SD 0.20), while 3rd and 4th year resident physicians scored the lowest (mean 0.52; SD 0.22).

Physicians knowledge about drugs affected by the recommended regimen suitable for any patient who forgot to take his/her medication one day during Ramadan, alternative dosage forms and regimens suitable for Ramadan and monitoring of drugs with

Table 1 Demographic details of participants (physicians) (n = 297) from Jordan University Hospital (JUH), King Abdulla University Hospital (KAUH) and private clinics

Characteristic	JUH		KAUH		Private clinics		Total	
Age (years)								
Mean (SD)	27.1 (5.01)		28.6 (6.38)		40.4 (12.24)		33.45 (11.18)	
Range (min–max)	23–52		22–56		24–75		22–75	
Sex	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Male	46	46.9	44	65.7	115	89.1	205	69.0
Female	52	53.1	23	34.3	14	10.9	90	30.3
Missing data							2	0.7
Total	98	100	67	100	129	100	295	99.3
Nationality								
Jordanian	85	86.7	56	83.6	117	90.7	259	87.2
Non-Jordanian	13	13.3	10	14.9	11	8.5	34	11.4
Missing data			1	1.5	1	0.8	4	1.3
Total	98	100	67	100	129	100	297	100
Current position								
Intern	39	39.8	15	22.4	0	0.0	55	16.8
General practitioner	0	0.0	0	0.0	4	3.1	4	3.1
1st year residency	20	20.4	14	20.9	14	10.9	48	16.2
2nd year residency	16	16.3	14	20.9	14	10.9	44	14.8
3rd & 4th year residency	16	16.3	12	17.9	17	13.3	45	15.2
Fellow	3	3.1	5	7.5	40	31.0	48	16.2
Consultant	2	2.0	5	7.5	39	30.2	47	15.8
Missing data	2	2.0	2	3.0	1	0.8	6	2.0
Total	98	100	67	100	129	100	297	100

SD = standard deviation of the mean.

a narrow therapeutic index was also tested. The overall score for knowledge questions was significantly affected by physicians' specialty (P = 0.035), and year of first qualification (P = 0.0017). Family physicians scored higher than other specialties. As for the year of first qualification, fellows (graduating from medical school 4–5 years prior to the study) scored the highest.

In regard to doctors' opinions about which routes of administration do not nullify fasting, most physicians' attitudes paralleled what the religion recommends. Detailed results are shown in Table 2.

Attitude was affected by the following factors: current position, specialty and country of last qualification. Consultant physicians had a clearer idea about which route does or does not nullify fasting in comparison with interns and different levels of residency. Surgeons appeared to have a clearer idea about which routes nullify and which will not nullify fasting in comparison with other specialties.

About 26% of physicians who answered the (open-ended) question about the optimum time of administration of a drug that has to be taken on an empty stomach thought that the most suitable time was 1 hour before *sohour*. A less frequent response (23%) was to give the medication 2 hours after *iftar*. The least frequent option (16%) was to give the medication at 22:00–24:00 midnight.

Regarding doctors' practices in case of a patient taking a drug that needs to be given 3 times daily (such as ibuprofen 1 × 3), more than half the physicians (57%) indicated that they usually changed the drug during Ramadan to another from the same class that can be given once daily (such as piroxicam 1 × 1). A less frequent option (36%) was to change the dose of the drug so that it could be taken twice daily (such as ibuprofen 1 × 2) at *iftar* and *sohour*. The least frequent option (3%) suggested not changing the dosing and asking patients to break their fast.

In regard to physicians' practice in selecting which of their patients should be advised not to fast in Ramadan, the majority (80%) advised their patients to fast in most diseases except for uncontrolled hypertension stage 2, uncontrolled diabetes (both types) and chronic kidney disease stages 3 and 4 (Table 3). This practice was affected mainly by sex, nationality, current position and year of first qualification. Female physicians had greater tendency to instruct their patient to fast than male

Table 2 Physicians' knowledge in regard to administration routes that nullify or do not nullify fasting (*n* = 297)

Administration route	Nullify		Do not nullify		Not sure	
	No.	%	No.	%	No.	%
Eye and ear drops[a]	69	23.2	202	68.0	26	8.8
All substances absorbed into the skin such as creams, ointments and patches[a]	14	4.7	268	90.2	15	5.1
Vaginal pessaries, tablets, ovules and douches[a]	84	28.3	186	62.6	27	9.1
SC, IM or IV medications[a]	111	37.4	150	50.5	36	12.1
IV feeding (e.g. glucose)	269	90.6	8	2.7	20	6.7
Oxygen and anaesthetic gases[a]	71	23.9	205	69.0	21	7.1
Sublingual nitroglycerin tablets under the tongue for the treatment of angina[a]	195	65.7	78	26.3	24	8.0
Mouthwashes, gargles, oral sprays provided nothing is swallowed[a]	47	15.8	230	77.4	20	6.8
Nasal drops, spray, inhalers[a]	203	68.4	69	23.2	25	8.4
Suppositories, enemas[a]	140	47.1	132	44.4	25	8.5

[a]*Does not nullify fasting (but important to ensure that nothing goes through the mouth if eye, ear or sublingual routes are used).*
SC = subcutaneous; IM = intra-muscular; IV = intravenous.

physicians. Non-Jordanian physicians had a greater tendency to instruct their patients to fast than Jordanians. Consultant physicians had a greater tendency to instruct their patients to fast than interns and different levels of resident physicians and fellows had a greater tendency to instruct their patient to fast than interns and residents.

Discussion

In general, we found physician's knowledge seemed to be inadequate or incomplete. Physicians were specifically asked about certain drugs that are affected by circadian rhythms. Fasting during daytime, modifications in the sleep schedule, and social habits are elements that can induce changes in the rhythmic patterns of a number of hormones such as anti-diuretic hormone, cortisol, and aldosterone [14]. Thus, the circadian rhythm has to be considered an important factor that influences drug pharmacokinetics [8]. Despite the very low scores for all physicians in this study, there was a tendency for those working in private clinics to be more knowledgeable. This may be because the majority of physicians in private clinics are consultants and fellows with an average age of 40 years. Increasing age can have a positive effect on physicians' experience and subsequently their knowledge of medications, such as the optimum time of administration. Moreover, more fellows and consultants (~ 60%) were included in the private clinic sample than the university hospital samples (~ 20%). It is possible that the poorer response rate from fellows and consultants working in university hospitals could be because of teaching duties and having a busier practice.

During Ramadan, there is an increased possibility that one drug may interfere with another causing toxic drug interactions, particularly in elderly patients [15]. Consequently, frequent monitoring is recommended for drugs with a narrow therapeutic index. Private clinic physicians appeared to be more knowledgeable about monitoring of drugs with narrow therapeutic index than physicians in the university hospitals and this appeared to be clearly related to experience.

The compatibility of fasting with the various drug administration routes and their choice during Ramadan remains a matter for the doctor's own judgment. To settle differences in opinion and to standardise the choice of routes, distinguished Muslim jurists and religious experts, medical practitioners, pharmacologists, and specialists in other human sciences agreed unanimously on which administration routes nullify fasting and which do not [16]. The alternative routes of drug administration can help in adjusting patients' medications during Ramadan. Physicians and pharmacists should be able to advise patients and practitioners on the availability of these alternative dosage forms. Our study showed that the attitudes of most physicians' (especially consultants) are in line with religion opinion since most physicians know which administration routes nullify fasting and which do not. However, 3 routes of administration seemed to confuse physicians, these were sublingual nitroglycerin, nasal drops, and inhalers. The majority of physicians believed that those routes nullify fasting, although they do not as long as the patient is sure that nothing

Table 3 Distribution of physicians in regard to advising patients with specific conditions to fast or not to fast in Ramadan (*n* = 297)

Condition	Fast		Do not fast		Not sure	
	No.	%	No.	%	No.	%
Hypertension stage 1, controlled	251	84.5	11	3.7	35	11.8
Hypertension stage 1, uncontrolled[a]	176	59.3	86	29.0	35	11.7
Hypertension stage 2, controlled	239	80.5	20	6.7	38	12.8
Hypertension stage 2, uncontrolled[a]	73	24.6	189	63.6	35	11.8
Diabetes type 1, controlled	188	63.3	72	24.2	37	12.5
Diabetes type 1, uncontrolled[a]	45	15.2	223	75.1	29	9.7
Diabetes type 2, controlled	217	73.1	42	14.1	38	12.8
Diabetes type 2, uncontrolled[a]	57	19.2	206	69.4	34	11.4
Chronic kidney disease stage 1 (GFR ≥ 90 mL/min)	203	68.4	49	16.5	45	15.1
Chronic kidney disease stage 2 (GFR 60–89 mL/min)	150	50.5	106	35.7	41	13.8
Chronic kidney disease stage 3 (GFR 30–59 mL/min)[a]	51	17.2	208	70.0	38	12.8
Chronic kidney disease stage 4 (GFR 15–29 mL/min)[a]	28	9.4	228	76.8	41	13.8
Pregnant, 1st trimester	204	68.7	50	16.8	43	14.5
Pregnant, 2nd trimester	210	70.7	43	14.5	44	14.8
Pregnant, 3rd trimester	171	57.6	81	27.3	45	15.1
Lactating mother	162	54.5	89	30.0	46	15.5
Gastric ulcer[a]	169	56.9	95	32.0	33	11.1
Duodenal ulcer[a]	135	45.5	131	44.1	31	10.4
Asthma	200	67.3	58	19.5	39	13.2
Ischaemic heart disease	203	68.4	53	17.8	41	13.8
Heart failure	137	46.1	121	40.7	39	13.2
Dyslipidaemia	246	82.8	14	4.7	37	12.5

[a]*It is preferable for patients with this condition not to fast.*
GFR = glomerular filtration rate.

is swallowed into the gastrointestinal tract.

Generally, drug–food interactions may result in reduced, delayed, or increased systemic availability of a drug. In our study, 26% of physicians recommended that the optimum time to take the medication on an empty stomach is 1 hour before *sohour* because they believe that at this time the stomach is more likely to be empty. The next option was taking the medication 2 hours after *iftar*. However, it is doubtful that the stomach would be empty at this time. The least popular choice was taking medication between 24:00 and 24:00, which might be the least convenient for patients as they might eat around this time or be asleep.

Fasting by Muslims during illness can cause medical problems if not supervised by health-care professionals. Patients suffering from minor ailments usually do not have any problems when fasting. Those suffering from acute conditions may need advice about altering their dosing regimen. Drugs that are normally required to be taken frequently can be problematic for fasting patients. However, the increasing availability of alternative drugs with long half lives such as sustained release preparations have offered much needed assistance to fasting patients [15]. In this study, the majority of physicians advised their patients to fast except those who had diseases such as uncontrolled hypertension stage 2, uncontrolled diabetes types 1 and 2 and chronic kidney disease stages 3 and 4.

Blood pressure control in hypertensive patients on medications is not affected by fasting in Ramadan [16]. So, those with well controlled blood pressure through lifestyle modification and/or medications may fast.

Although people with diabetes may be exempted from fasting, a large proportion still choose to fast [17]. However, Ramadan fasting was shown to be acceptable for well-controlled type 2 diabetics conscious of their disease

and compliant with their diet and drug intake [4].

The effect of fasting during Ramadan on patients with renal impairment is still a matter of controversy [9]. Kidney disease patients should be aware of the importance of adequate hydration because dehydration is a common occurrence during a fast [6,17]. Chronic kidney disease patients (especially stages 3 & 4) insisting on fasting should be advised to drink sufficient fluids between *iftar* and sleep to avoid dehydration [9,18].

Consultant physicians had a greater tendency to instruct their patients to fast than interns, different levels of residents and fellows physicians. It may be that experience gives the doctor greater confidence about the consequences that patient may have because of fasting. This finding clearly highlights the effect of experience on the doctor's advice on whether to fast or not.

Conclusion

The study revealed that there is a significant lack of knowledge among physicians towards the proper management of medications in Ramadan.

It is preferable for patients suffering from chronic diseases to take advice regarding fasting in Ramadan from their consultant. With regard to drug schedule changes, there is a need to activate the role of the clinical pharmacist in giving appropriate counselling and suggesting alternative dosage forms for different medications along with physicians in order to help the patients dealing with different drugs properly and fasting Ramadan safely.

In conclusion, great care is taken to improve the quality of life of patients, nevertheless, a huge amount of respect is still shown for the pillars of Islam.

In general, little research has been done on the knowledge, attitudes and practices of physicians about the management of medications in Ramadan, so further studies are needed to explore this issue.

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