

Cardiovascular medication therapy during the holy month of Ramadan: a literature review

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ABSTRACT

Objectives: To review cardiovascular medication therapy during the Holy month of Ramadan. **Methods:** In this study, we performed an extensive search of 50 databases through the Saudi Digital Library search engine. We included meta-analysis, randomized controlled studies and observational studies published in English language in May 2017. The search terms included Ramadan, fasting, medication, therapy, type of disease and medication based on therapeutic class. The list of cardiovascular medications and switch from regular days to Ramadan days based on literature revealed that's included comparative safety studies, efficacy and cost of type of medication for each disease studies and national or international evidence-based guidelines of switching short half-life to long half-life. All parenteral dosage form of medication were excluded from this study. All medications should be listed in the Ministry of Health drug formulary. **Results:** A total of 710 studies were obtained after an extensive search with specific terms. Of those, 104 studies were duplicate studies and 606 studies were included for further evaluation. The evaluation revealed that there were 30 studies published on cardiovascular medications and Ramadan. Seven studies were further evaluated. The authors recommend to have a list of cardiovascular medications that can be switched from regular days to Ramadan days. **Conclusion:** There were very studies about cardiovascular medications use during the holy month of Ramadan. Suggested usage of the frequency administration single or twice daily is required during fasting. Future investigations of cardiovascular medication intake during Ramadan is highly recommended in Muslim countries. **Key words:** Cardiovascular, Medication, Therapy, Review.

INTRODUCTION

Cardiovascular disorders are one of the significant medical problems that is existing in the Kingdom of Saudi Arabia.¹ There are several diseases which the Saudi population is dealing with including but not limited to hypertension, coronary heart disease and lipid disorders; for each these disorders requires multiple medications to be administered to the patient.¹ The medications can be administered as a single dose or can be administered more frequently throughout the year. However, during the holy month of Ramadan, the administration of medications needs to adjust accordingly. Every year, all healthy Muslim population fast in the month of Ramadan; the individuals do not eat or drink or ingest any oral medications during fasting. The fast lasts for a duration of 10–15 h per day. It start from the sunrise until sunsets. Previous studies have shown that fasting does not negatively affect the cardiovascular disease except in the cases where the patient had a recent episode of myocardial infarction or acute coronary heart diseases.²⁻⁴ In addition, the anticoagulation properties bleeding increase during the Ramadan.^{4,5} However, to best of our knowledge, there are no randomized clinical trials conducted to evaluate the effect of switching of medications from regular days to Ramadan days, for example, the switching of doses, frequency and time of administration. Moreover, there are no review studies regarding the use of cardiovascular medications during the holy month of Ramadan. Therefore, in this study, we aimed to review the literature regarding the

use of cardiovascular medications during Ramadan and recommend the switching of medications from regular to Ramadan days based on the available literature.

METHODS

In this study, we performed an extensive search of 50 databases through the Saudi Digital Library (SDL) search engine: Wiley Online Library, Web of Science, Springer Link, Taylor and Francis, Social Science Journal accessed via ProQuest, Science Journal accessed via ProQuest, Scopus, SciFinder, Science Direct, Sage Journal, Royal Society of Medicine, Royal Society of Chemistry, Psychology Journals accessed via ProQuest, Pharmaceutical News Index accessed via ProQuest, Patient Education accessed via MD Consult, Drug accessed via MD Consult, Oxford Journals accessed via Oxford University Press, Ovid Journals, Nursing and Allied Health Sources accessed via ProQuest, Nature Publisher Group, MEDLINE Index accessed via ProQuest, MEDLINE Complete accessed via EBSCO, Medical Evidence Matter accessed via ProQuest, IGI InfoSci Journals, Health Management accessed via ProQuest, Health and Medical Complete accessed via ProQuest, Global Health Database-CABI, Family Health accessed via ProQuest, Eric accessed via ProQuest and EBSCO, Emerald, DynaMed accessed via EBSCO, Directory of Open Access Journal (DOAJ), Current Content accessed via Web of Knowledge, Dentistry and Oral Science accessed via EBSCO, Clinical Key-Nursing,

Clinical Key-Physician, CINAHL accessed via EBSCO, Central accessed via ProQuest, CBCA accessed via ProQuest, Canadian Science Publishing. Cambridge Journals accessed via Cambridge University, Britannica Academic, BMJ Journals, BMJ Clinical Evidence accessed via BMJ Best Practice, BMJ Best Practice, Biology Journals accessed via ProQuest, ACM Digital Library, Academic Search Ultimate accessed via EBSCO and Cochrane Library PubMed. In addition to Google Scholar searched without SDL search engine. We included meta-analysis, randomized controlled studies and observational studies in English language in May 2017. The search terms included Ramadan, fasting, medication, therapy, type of disease and medication based on therapeutic class. The literature search on list of medications that can be switched from regular days to Ramadan days revealed that included comparative safety studies, efficacy and cost of type of medication for each disease studies and national or international evidence based guidelines of switching short half-life to long half-life.⁶⁻⁸ The cardiovascular medication list included name of the drug, general dosing and frequency of administration during regular and Ramadan days. Oral medication under all patient-care settings such as inpatient, ambulatory care and community services were included in the search. All parenteral dosage form of medication were excluded from the study. All medications should be listed in the MOH drug formulary. The location of studies included were Saudi Arabia as the top priority, if not existed in Gulf or Middle Eastern countries; otherwise rest of the countries were included. If studies evidence not existed; the suggested came from author's experiences.

RESULTS

A total of 710 studies were obtained after an extensive search with specific terms. Of those, 104 studies were duplicate studies and 606 were included for further evaluation. The evaluation revealed that 92 studies discussed about medications related to diabetes mellitus and Ramadan, 27 studies discussed the psychiatric medications and Ramadan, 27 studies investigated medications related to the gastrointestinal disorders and Ramadan, 30 studies discussed about the use of antibiotics and Ramadan, 30 studies discussed about the cardiovascular medications and Ramadan, 15 studies discussed about medicines for asthma and rheumatoid arthritis and Ramadan and 402 studies discussed other diseases and Ramadan. Finally, 7 studies were considered fit for further analysis. Among these, 3 studies discussed about the effect of INR coagulation indices. One retrospective study discussed about the anticoagulation therapy with doses and adverse effect which does not get affected by the fasting, whereas two observational studies discussed about the increase in the INR indices during fasting. One observational study discussed about the antihypertensive therapy during fasting and the other systematic review discussed about hypertension during fasting. Two systematic reviews discussed about acute cardiac diseases during fasting, whereas one review paper explored the medical disease affected by Ramadan (Table 1). We recommend the list of cardiovascular medications that can be switched from regular days to Ramadan days (Table 2).

DISCUSSION

One of the pharmacy practice mentioned in the pharmacy strategic plan is RPC.^{9,10} This program takes care of medication-related issues in the

Table 1: The cardiovascular studies conducted during the holy month of Ramadan.

No	Author	Year of publication	Country	No of participants	Duration	Study design	Outcome	Comments
1	JN Saour <i>et al.</i> ¹¹	1989	KSA	289	1981-1985	Retrospective analysis	The Ramadan fasting will not affect the anticoagulation therapy, doses or adverse drug reactions	Only one study in KSA with old anticoagulation therapy, new study with new anticoagulation is warranted
2	Ural, E <i>et al.</i> ²	2008	Turkey	45	2 month	observation study	The fasting of holy month of Ramadan did not affect both group of patient in the hypertensive manner angiotensin-converting enzyme inhibitors, calcium channel blockers, diuretics, b-blockers and a-blockers treated the mild to moderate hypertension treated with monotherapy combination therapy	Despite the few number of patients, the authors recommended that's the mooring dose can be taken before fasting and evening dose can be taken just after the breaking fast and
3	Beshyah SA ¹² <i>et al.</i>	2010	UAE	-	-	Review	The authors discussed the effect of fasting the holy month of Ramadan and medical diseases	The authors did not discussed the medication with medical illness
4	Salim I, <i>et al.</i> ³	2013	Multinational	26 studies	1980-2012	Systematic review	The acute cardiac diseases is similar during Ramadan days. Most of cardiac diseases improved during Ramadan except lipid profile	Most of medications keep it the same expect anti-hypercholesterimia
5	Lai, Y F <i>et al.</i> ⁵	2014	Singapore	32		Prospective study	Fasting significantly increases the mean INR of medically stable patients taking warfarin and the likelihood of having an INR above therapeutic targets. For patients maintained at the higher end of INR target ranges or at increased risk of bleeding, closer monitoring or dosage adjustment may be necessary during fasting.	The study about the problems during Ramadan

Table 1: Con's

6	M.O. Awiwi <i>et al.</i> ¹³	2016	Turkey	36	12 week	cohort study	The INR level was normal during the holy month of Ramadan while decrease at the first week after Ramadan	The number of patient was few
7	Namaghi MA, Salehi M ⁴	2016	Multinational	5 studies	until September 2015	Systematic review	The study showed it safe to treat the essential hypertension during the holy month of Ramadan and continue the medication, the fasting may help in reducing blood pressure	More studies needed and consider other factors of increasing hypertension including calories consumption and weight changes

Table 2: Cardiovascular drug therapy during regular days versus Ramadan days

No	Drug therapy during Regular days ^{14,15}			Drug therapy during Holy Ramadan			Registration ^{*16,17}
	Regular Days	Doses/ Day	Frequency Per day	Regular Days	Doses/Day	Frequency Per day	
1	Acebutolol	200-1200 mg	Divided in 1-2 doses	Acebutolol	200-1200mg	Divided in 1-2 doses	RSFDA, MOHDF
2	Aliskiren	150-300 mg	In 1 dose	Aliskiren	150-300 mg	In 1 dose	RSFDA
3	Amiloride HCl	5-10 mg	In 1-2 divided dose	Amiloride HCl	5-10 mg	In 1-2 divided doses	RSFDA, MOHDF
4	Amitriptyline	50-150 mg	In 1 dose or divided doses	Amitriptyline	50-150 mg	In 1 dose	RSFDA, MOHDF
5	Amlodipine besylate	2.5- 10 mg	In 1 dose	Amlodipine besylate	2.5- 10 mg	In 1 dose	RSFDA, MOHDF
6	Amoxicillin	250- 500 mg	3 times/day	Cotrimoxazole	490- 960 mg	2 times/day	RSFDA, MOHDF
7	Amisulpride	400-800 mg	Divided in 2 divided doses	Amisulpride	400-800 mg	Divided in 2 divided doses	RSFDA, MOHDF
8	Apixaban	5 mg	2 times/day	Apixaban	5 mg	2 times/day	RSFDA
9	Aspirin	100 mg (prophylactic dose)	In 1 dose	Aspirin	100 mg (prophylactic dose)	In 1 dose	RSFDA, MOHDF
10	Atenolol	25-100 mg	In 1-2 doses	Atenolol	25-100 mg	In 1-2 doses	RSFDA, MOHDF
11	Atorvastatine	10-80 mg	In 1 dose	Atorvastatine	10-80 mg	In 1 dose	RSFDA, MOHDF
12	Betoxalol	5-40 mg	In 1 dose	Betoxalol	5-40 mg	In 1 dose	RSFDA, MOHDF
13	Bisoprolol	5-20 mg	In 1 dose	Bisoprolol	5-20 mg	In 1 dose	RSFDA, MOHDF
14	Candesartan	8 -32 mg	In 1 dose	Candesartan	8 -32 mg	In 1 dose	RSFDA, MOHDF
15	Captopril	12.5- 150 mg	Divided into 2-3 divided doses	Enalapril Lisinopril Fosinopril Perindopril Quinapril Ramipril Trandolapril	2.5 - 40 mg 5 - 40 mg 10-80 mg 4-8 mg 5-80 mg 1.25-20 mg 1-8 mg	In 1-2 doses In 1 dose In 1-2 doses In 1-2 doses In 1-2 doses In 1-2 doses In 1-2 doses	RSFDA, MOHDF
16	Carbamazepine	800 –1600 mg (Blood Level 8-12 mcg/ml)	In 2-3 divided doses	Carbamazepine Carbamazepine SR	800 – 1600 mg (Blood Level 8-12 mcg/ml) 800 – 1600 mg (Blood Level 8-12 mcg/ml)	In 2 divided doses In 2 divided doses	RSFDA, MOHDF
17	Carteolol	2.5-10 mg	In 1 dose	Carteolol	2.5-10 mg	In 1 dose	RSFDA
18	Carvedilol	12.5- 50 mg	Divided in 2 doses	Carvedilol	12.5- 50 mg	Divided in 2 doses	RSFDA, MOHDF

Table 2: Con's

19	Cerivastatin	0.3mg	In 1 dose	Cerivastatin	0.3mg	In 1 dose	RSFDA
20	Chlorthalidone	12.5- 50 mg	In 1 dose	Chlorthalidone	12.5- 50 mg	In 1 dose	RSFDA, MOHDF
21	Cholestyramine	4 GM	2 times	Cholestyramine	4 GM 8 GM	2 times In 1 dose	RSFDA, MOHDF
22	Clopidogrel	75 mg PO daily	In 1 dose	Clopidogrel	75 mg PO daily	In 1 dose	RSFDA, MOHDF
23	Clonidine	0.1-0.6 mg	Divided in 2-3 doses	Clonidine	0.1-0.6 mg	Divided in 2 doses	RSFDA, MOHDF
24	Dabigatran etexilate	150 mg	2 times/day	Dabigatran etexilate	150 mg	2 times	RSFDA, MOHDF
25	Dalteparin	5000-10,000 IU SC daily or q12h	In 1-2 doses	Dalteparin	5000-10,000 IU SC daily or q12h	In 1-2 doses	RSFDA, MOHDF
26	Digoxin	0.125- 0.5 mg	In 1 dose	Digoxin	0.125- 0.5 mg	In 1 dose	RSFDA, MOHDF
27	Diltiazem HCl	60-360 mg	Divided in 3 doses	Diltiazem SR HCl	120 -360 mg	Divided in 1-2 doses	RSFDA, MOHDF
28	Dofetilide	0.125-0.5 mg	Divided in 2 doses	Dofetilide	0.125-0.5 mg	Divided in 2 doses	RSFDA
29	Doxazocin Mesylate	1-16 mg	In 1 dose	Doxazocin Mesylate	1-16 mg	In 1 dose	RSFDA, MOHDF
30	Edoxaban	30-60 mg	In 1 dose	Edoxaban	30-60 mg	In 1 dose	RSFDA, MOHDF
31	Eplerenone	25-100 mg	In 1-2 doses	Eplerenone	25-100 mg	In 1-2 doses	RSFDA, MOHDF
32	Eprosartan	400-800 mg	In 1-2 doses	Eprosartan	400-800 mg	In 1-2 doses	RSFDA, MOHDF
33	Enalpril maleate	5- 40 mg	Divided in 1-2 doses	Enalpril maleate	5- 40 mg	Divided in 1-2 doses	RSFDA, MOHDF
34	Enoxaparin	1 mg/kg bid or 1.5 mg/kg SC daily;	In 1-2 doses	Enoxaparin	1 mg/kg bid or 1.5 mg/kg SC daily;	In 1-2 doses	RSFDA, MOHDF
35	Ethosuximide	750- 1250 mg (blood level 40-100 mcg/ml)	Divided in 2 doses	Ethosuximide	750- 1250 mg (blood level 40-100 mcg/ml)	Divided in 2 doses	RSFDA, MOHDF
36	Escitalopram	10-20 mg	In 1 dose	Escitalopram	10-20 mg	In 1 dose	RSFDA, MOHDF
37	Ezetimibe	10 mg	In 1 dose	Ezetimibe	10 mg	In 1 dose	RSFDA, MOHDF
38	Felodipine	2.5- 10 mg	In 1 dose	Felodipine	2.5- 10 mg	In 1 dose	RSFDA, MOHDF
39	Fenofi brate	120-200 mg	In 1 dose	Fenofi brate	120-200 mg	In 1 dose	RSFDA, MOHDF
40	Flecainide	50-200 mg	Divided in 2 doses	Flecainide	50-200 mg	Divided in 2 doses	RSFDA, MOHDF
41	Fluconazole	50- 400 mg	In 1 dose	Fluconazole	50- 400 mg	In 1 dose	RSFDA, MOHDF
42	Fosinopril sodium	10- 80 mg	Divided in 1-2 doses	Fosinopril sodium	10- 80 mg	Divided in 1-2 doses	RSFDA, MOHDF
43	Furosemide	20- 320 mg	Divided in 2 doses	Furosemide Torsemide	20-320 mg 5-20 mg	Divided in 2 doses In 1 or 2 doses	RSFDA, MOHDF
44	Heparin (Unfractionated)	60-100 units/kg IV bolus, then 12-18 units/kg/hr IV; or, 5000 units SC q8-12h	Divided in 2-3 doses	Enoxaparin OR Dalteparin OR Tinzaparin	1 mg/kg bid or 1.5 mg/kg SC daily; 5000-10,000 IU SC daily or q12h 175 IU/kg SC daily	In 1-2 doses In 1-2 doses In 1 dose	RSFDA, MOHDF
45	Hydralazine HCl	40-200 mg	Divided in 2-4 doses	Hydralazine HCl	40-200 mg	Divided in 2 doses	RSFDA, MOHDF
46	Hydrochlorothiazide	12.5- 50 mg	In 1 dose	Hydrochlorothiazide	12.5- 50 mg	In 1 dose	RSFDA, MOHDF
47	Indapamide	1.25- 5 mg	In 1 dose	Indapamide	1.25- 5 mg	In 1 dose	RSFDA, MOHDF

Table 2: Con's

48	Irbesartan	150- 300 mg	In 1 dose	Irbesartan	150- 300 mg	In 1 dose	RSFDA, MOHDF
49	Isosorbide Dinitrate	10- 240 mg (at least 8 h washout period to avoid Nitrate Tolerance)	Divided in 3 doses	Isosorbide Dinitrate SR	20-120 mg (at least 8 h washout period to avoid Nitrate Tolerance)	Divided in 2-3 doses	RSFDA, MOHDF
50	Isradipine	5-20mg	Divided in 2 doses	Isradipine SR	5-20 mg	In 1 dose	RSFDA, MOHDF
51	Labetalol HCl	200- 1200 mg	Divided in 2 doses	Labetalol HCl	200- 1200 mg	Divided in 2 doses	RSFDA, MOHDF
52	Lisinopril	5- 40 mg	In 1 dose	Lisinopril	5- 40 mg	In 1 dose	RSFDA, MOHDF
53	Losartan	25- 100 mg	Divided in 1-2 doses	Losartan	25- 100 mg	Divided in 1-2 doses	RSFDA, MOHDF
54	Methyldopa	250- 2000 mg	In 2 divided doses	Methyldopa	250-2000mg	In 2 divided doses	RSFDA, MOHDF
55	Metolazone	1.25-5 mg	in 1 dose	Metolazone	1.25-5 mg	in 1 dose	RSFDA , MOHDF
56	Metopralol Succinate SR	50- 400 mg	Divided in 1-2 doses	Metopralol scsinate SR	50- 400 mg	Divided in 1-2 doses	RSFDA, MOHDF
57	Metoprolol Tartrate	50-200 mg	Divided in 1-2 doses	Metoprolol	50-300 mg	Divided in 1-2 doses	RSFDA, MOHDF
58	Minoxidil	2,5-40 mg	Divided in 1-2 doses	Minoxidil	10-40 mg	Divided in 1-2 doses	RSFDA, MOHDF
59	Montelukast	10 mg	In 1 dose	Montelukast	10 mg	In 1 dose	RSFDA, MOHDF
60	Nadolol	20-320 mg	In 1 dose	Nadolol	20-320 mg	In 1 dose	RSFDA, MOHDF
61	Nebivolol	5-40 mg	In 1 dose	Nebivolol	5-40 mg	In 1 dose	RSFDA
62	Nifedipine SR	20-120 mg	Divided in 1-2 doses	Nifedipine SR Nifedipine SR	20-120 mg 30-90 mg	Divided in 1-2 doses In 1 dose	RSFDA, MOHDF
63	Nifedipine SR	30-90 mg	In 1 dose	Nifedipine SR	30-90 mg	In 1 dose	RSFDA, MOHDF
64	Nifedipine	10-120 mg	Divided in 3 doses	Nifedipine SR	20-120 mg	Divided in 1-2 doses	RSFDA, MOHDF
65	Olmesartan	20-40 mg	In 1 dose	Olmesartan	20-40 mg	In 1 dose	RSFDA, MOHDF
66	Pravastatin	20-40 mg	In 1 dose	Pravastatin	20-40 mg	In 1 dose	RSFDA, MOHDF
67	Prazosin HCl	1-20 mg	Divided in 2-3 doses	Doxazocin Mesylate Terazosin HCl	1-16 mg 1-20 mg	In 1 dose In 1 dose	RSFDA, MOHDF
68	Perindopril	4-8 mg	In 1-2 doses	Perindopril	4-8 mg	In 1-2 doses	RSFDA, MOHDF
69	Propranolol HCl	40-480 mg	Divided in 2-3 doses	Propranolol HCl (LA)	40-480 mg	In 1 dose	RSFDA, MOHDF
70	Quinapril HCl	5-80 mg	Divided in 1-2 doses	Quinapril HCl	5-80 mg	Divided in 1-2	RSFDA, MOHDF
71	Ramipril	1.25-20 mg	In 1-2 doses	Ramipril	1.25-20 mg	In 1-2 doses	RSFDA
72	Rivaroxaban	20 mg	In 1 dose	Rivaroxaban	20 mg	In 1 dose	RSFDA, MOHDF
73	Rosuvastatin	10-40 mg	In 1 dose	Rosuvastatin	10-40 mg	In 1 dose	RSFDA, MOHDF
74	Simvastatin	20-40 mg	In 1 dose	Simvastatin	20-40 mg	In 1 dose	RSFDA, MOHDF
75	Sotalol	40-160 mg	Divided in 2 doses	Sotalol	40-160 mg	Divided in 2 doses	RSFDA, MOHDF
76	Spironolactone	12.5-100 mg	Divided in 1-2 doses	Spironolactone	12.5-100 mg	Divided in 2 doses	RSFDA, MOHDF
77	Telmisartan	40-80 mg	In 1 dose	Termisartan	40-80 mg	In 1 dose	RSFDA, MOHDF
78	Terazosin HCl	1-20 mg	In 1 dose	Terazosin HCl	1-20 mg	In 1 dose	RSFDA, MOHDF
79	Telmisartan	40-80 mg	In 1 dose	Telmisartan	40-80 mg	In 1 dose	RSFDA, MOHDF

Table 2: Con's

80	Tinzaparin	175 IU/kg SC daily	In 1 dose	Tinzaparin	175 IU/kg SC daily	In 1 dose	RSFDA, MOHDF
81	Torsemide	5-20 mg	Divided in 1-2 doses	Torsemide	5-20 mg	Divided in 1-2 doses	RSFDA, MOHDF
82	Triameterene	50-150 mg	In 1-2 divided dose	Triameterene	50-150 mg	In 1-2 divided dose	RSFDA, MOHDF
83	Trandolapril	1 mg	In 1 dose	Trandolapril	1 mg	In 1 dose	RSFDA
84	Valsartan	80-320 mg	In 1 dose	Valsartan	80-320 mg	In 1 dose	RSFDA, MOHDF
85	Verpamil HCl	40-480 mg	Divided in 3 doses	Verpamil HCl (SR)	90-480 mg	Divided in 1-2 doses	RSFDA, MOHDF
86	*RSFDA: The Drug had been registered in Saudi Food and Drug Authority, MOHDF: The Drug is Ministry of Health Drug Formulary.						

holy month of Ramadan. One of the significant classes of medications is related to cardiovascular disease management, for example, diseases including hypertension, coronary heart disease, heart failure, coagulation disorders and lipid disorder. Fasting during the holy month of Ramadan will not affect the status of the disease except it changes the level of lipid in blood during the holy month of Ramadan.³ In this study, the authors tried to formulate the switch protocol of medications from regular days to the Ramadan days based on the duration of action and frequency of administration. During fasting, once or twice administration is appreciated during the holy month of Ramadan. The authors tried to formulate the medications with multiple doses of frequency to switch to single or twice daily doses. The administration time should be changed to morning before sunrise and evening after sunset. The list suggests 85 medications based on their alphabetical order. All medications listed there are among those classes of medications that have a wide dosing range. The healthcare providers can refer to this list during Ramadan; the healthcare providers should review the approved indication with specific dose required. The switch therapy should be started before the holy month of Ramadan or at the beginning of the Ramadan. The patient should follow strict medication adherence during the holy month of Ramadan. Further clinical studies are highly recommended to validate the suggested schedule.

CONCLUSION

The cardiovascular medications intake may breakfast the holy month of Ramadan. Suggested the cardiovascular medication switch therapy from regular days to Ramadan days is highly recommended. All cardiovascular medication need submission individual studies about the medication during fasting during official country registration. Further studies of cardiovascular medication intake during the holy month of Ramadan is highly suggested in Muslim countries.

ACKNOWLEDGEMENT

None.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

ABBREVIATIONS

MOH: Ministry of Health; KSA, Kingdom of Saudi Arabia; USA: United State of America, RPC: Ramadan Pharmaceutical Care; SDL: Saudi Digi-

tal Library; INR: international normalized ratio.

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