Medication therapy during the holy month of Ramadan

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ABSTRACT

Objectives: In this study, we aimed to explore the switching of oral drug therapy from regular days to the Ramadan days. **Methods:** We performed extensive search on 50 databases. Studies such as meta-analysis, randomized controlled studies and observational studies published in English language with human participants during the month of May 2017 were included in this study. The search terms included "Ramadan, fasting and medication," "Therapy and type of disease," or "Medication based on therapeutics class." The medication list used to switch the medications from regular days to Ramadan days. It was based on best literature found. The literature included the comparative safety and efficacy studies and cost of type of medication for each disease studies and national or international evidence-based guidelines of switching short half-life medications to long half-life. The medication list included drug name, general dosing and frequency of administration during regular and Ramadan days. All medications should be registered at the Ministry of Health (MOH) drug formulary or registered in the Saudi Food and Drug Authority. **Results:** A total of 710 were shortlisted based on the extensive search with specific terms. Of those, 104 were duplicate studies and therefore were omitted from further analysis. A total of 606 studies were unique and were further evaluated. Ninety-two studies discussed about medications related to diabetes mellitus and Ramadan; 27 studies discussed about the anti-psychiatric medications and Ramadan; 27 studies investigated gastrointestinal medications and Ramadan; 30 studies discussed about the various antibiotics and Ramadan; 30 studies discussed about the cardiovascular medications and Ramadan; 15 studies discussed about the medications for asthma and rheumatoid arthritis and Ramadan; and finally, 402 studies discussed about other diseases and Ramadan. There were no randomized controlled studies regarding switching of drug dosing from regular days to Ramadan days. The suggested draft about switching of 171 drug therapy from regular to the holy month of Ramadan designed and registration status in the MOH formulary and Kingdom of Saudi Arabia based on the best available literature from common illnesses including cardiovascular diseases, infectious diseases and psychiatric illness. **Conclusion:** The literature of drug therapy during Ramadan is seldom found and there is no randomized clinical trial to validate the usage of medication during Ramadan. This is the review of medication used for common diseases infectious diseases, cardiovascular system, psychiatry and gastrointestinal system during the holy month of Ramadan with the first suggestion draft of switch drug therapy from regular days to Ramadan days.
Key words: Medication, Therapy, Ramadan.

INTRODUCTION

Ramadan is the holy month in the Islamic calendar. During Ramadan, millions of Muslims fast during daylight h.[1] The fast lasts almost more than 12 h and is then broken in the evening after the sun sets. In the early evening and late night, within a short period, two meals are usually consumed during this month called (Sohur, dinner and Iftar). Prayers are regularly performed, which is a great form of exercise.[2] Because of the short duration between each meal consumed during Ramadan, the intake of medicines is therefore not rational. Several factors might alter the pharmacokinetics and pharmacodynamics of medications consumed during the month of Ramadan.[3] For examples, some patients alter the use of medications and their form, whereas others alter the intake pattern. Thus, changes in the pharmacokinetics and pharmacodynamics of most of the medications needs to be precisely determined for fasting conditions.[3] Several studies have shown that even though the Koran exempts the sick people from fasting, most of the patients wish to fast regardless of the time of medication administration and their health condition.[4-7] This leads to poor disease management which might affect the health of the patient seriously.[7] Moreover, several healthcare workers not taken the proper drugs and drug therapy during the holy month of Ramadan.[8] As a result, patients might experience many drug-related problems.[4-6] Some dosage forms will not break the fasting for instance eye, nasal and ear drops; creams; ointments; medicated plasters; injections through the skin, muscle and joints; oxygen; puffers and nasal sprays and inhalers according to "*An Islamic view of certain contemporary medical issues*".[1] The authors based on the best knowledge, there is not any publications discussed the medication therapy during the holy month of Ramadan in the Kingdom of Saudi Arabia or Gulf and Middle East countries. In this study, we aimed to explore the switching oral drug therapy from during regular days to during Ramadan days with the emphasis of the doses and administration time.

METHOD

In this study, we performed an extensive search of the following 50 databases: Wiley Online Library, Web of Science, Springer Link, Taylor and Francis, Social Science journal via ProQuest, Science journal via ProQuest, Scopus, SciFinder, Science Direct, Sage Journal, Royal Society of Medicine, Royal Society of Chemistry, Psychology Journals via ProQuest, Pharmaceutical News Index via ProQuest, Patient Education via MD Consult, Drug via MD Consult, Oxford Journals via Oxford University, Ovid Journals, Nursing and Allied Health Sources via ProQuest, Nature Publisher group, MEDLINE Index via ProQuest, MEDLINE complete via EBSCO, Medical Evidence Matter via ProQuest, IGI InfoSci Journals, Health Management via ProQuest, Health and Medical Complete via ProQuest. Global Health Database-CABI, Family Health via ProQuest, Eric via ProQuest and EBSCO, Emerald, DynaMed via EBSCO, Directory of Open Access Journal (DOAJ), Current Content via Web of Knowledge, Dentistry and Oral Science via EBSCO, Clinical Key-Nursing, Clinical Key-Physician, CINAHL via EBSCO, Central via ProQuest, CBCA via ProQuest, Canadian Science Publishing. Cambridge Journals via Cambridge University, Britannica Academic, BMJ Journals, BMJ Clinical Evidence via BMJ Best Practice, BMJ Best Practice, Biology Journals via ProQuest, ACM Digital Library, Academic Search Ultimate via EBSCO, Cochrane Library PubMed and Google Scholar. The search included meta-analysis, randomized controlled studies and observational studies published in English language with human participants only in the month of May 2017. The search terms included "Ramadan, fasting and medication," "Therapy and type of disease" or "Medication base on therapeutics class." The medication list and switch from regular days to Ramadan days based on literature found the search, that's included comparative safety studies, efficacy studies 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.[9-11] The medication list included drug name, dosing and frequency of administration during regular and Ramadan days. We included only oral medications in an inpatient, ambulatory care and community services patient care settings. All parenteral dosage form of medication were excluded from this study. Medications related to cardiovascular diseases, kidney diseases, infectious diseases and psychiatric illness were included, whereas medications related to DM were excluded from this study. Any medication cannot switch from three or four doses frequency administration to one or two doses daily administration excluded from study. All medications should be registered in the MOH drug formulary or should be registered in the Saudi Food and Drug Authority (SFDA). Studies conducted in Saudi Arabia, Gulf and Middle Eastern counties were included. If studies evidence not existed; the suggested came from author's experiences.

RESULTS

The search terms yielded a total of 710 results. Of these, 104 were duplicate studies and were therefore excluded from further analysis. The remaining 606 studies were further evaluated. The evaluation revealed that 92 studies were about medications related to DM and Ramadan, 27 studies were about anti-psychiatric medications and Ramadan, 27 studies investigated gastrointestinal medications disease and Ramadan, 30 studies evaluated antibiotics during Ramadan, 30 studies were about cardiovascular medications and Ramadan, 15 studies were about medicines for asthma and rheumatoid arthritis and Ramadan and 402 studies were about other diseases and Ramadan. There were no randomized controlled studies regarding switching of drug dosing from regular to Ramadan days. Some studies were regarding safety of fasting during Ramadan including the systematic reviews in cardiovascular diseases, kidney diseases, infectious diseases and psychiatric illnesses. Others studies demonstrated the guidelines of administration of DM medications during the holy month of Ramadan (Table 1). The suggested draft about switching of 171 drug therapies from regular days to Ramadan days and drug registration status in the MOH formulary and KSA, that's based on the best available literature of common illnesses including cardiovascular diseases, infectious diseases and psychiatric illness (Table 2).

DISCUSSION

The RPC is one of the programs founded by the GAPC of the MOH in the KSA. Since 1986, the switching of medications from regular days to a more specific schedule for patients during Ramadan has been considered as an important problem to solve.[7] We performed an extensive search on the databases using different terms. In this research, we were trying to implement a more focused approach, in which pharmacists and patients follow a plan that is more convenient, efficient and cost-effective. In the beginning of the results it was few of articles about medications intake during the holy month of Ramadan. However, after conducting an in-depth analysis, we found reports on common diseases investigated during the holy month of Ramadan, for example DM, psychiatric illnesses, infectious diseases, cardiovascular diseases, asthma and gastrointestinal diseases, as well as rheumatoid arthritis.[12-18] Those common diseases investigated to explore safety of the fasting on the disease or the medications. Furthermore, the diseases that demand the administration of medication with multiple doses leads to the breaking of the fast during the holy month of Ramadan. The majority of studies are systemic reviews which investigate the diseases affected by fasting during the holy month of Ramadan. To the best of our knowledge, there are no randomized clinical trials, meta-analysis, or systemic reviews to investigate the switch in the intake of medications from regular to Ramadan days with the same efficacy and safety. Besides, there is not existed studies discussed the switching of the drug with multiple doses per day to the same drug less frequency administration or switch to alternative medications with the same indication and few doses. Most of the studies were observational studies or were cases reports of single or multiple medications. As a result, we tried to establish drug therapy from regular to Ramadan days with multiple doses to equivalent and two or single dose during fasting. We also tried oral medications and those that are listed in the MOH formulary from each group of common diseases presented earlier. The table regimen suggested guiding the prescriber or pharmacist of switching medication from regular days to Ramadan days without breakfasting. The healthcare provider should revise the list of approved indications for each country registered and review the patient's condition and other comorbid diseases, for instance, renal or hepatic failure. The table suggested for patients with healthy kidney and liver function. The table of drug therapy during Ramadan can be used for future clinical trials to validate the suggestion in the regimen. The table can be used to prevent medications errors during prescribing, including intake of multiple doses during the night, not around the clock or day. The medications therapy during the holy month of Ramadan may help the healthcare care provider to treat the patient during Ramadan with close monitoring of the disease and patient. The healthcare providers need to have programs specifically for the month of Ramadan where counseling, medication and doses are altered for a better outcome. The medications list should be updated regularly at all healthcare institution at MOH in the KSA. To the best of our knowledge, there are no randomized clinical trials, meta-analysis, or systemic reviews to investigate the switch in the intake of medications from regular to Ramadan days with the same efficacy and safety. Besides, there is not existed studies discussed the switching of the drug with multiple doses per day to the same drug less frequency administration or switch to alternative medications with the same indication and few doses. Most of the studies were observational studies or were cases reports of single or multiple medications. As a result, we tried to establish drug therapy from regular to Ramadan days with multiple

Table 1: Systematic review of studies on healthcare diseases during the holy month of Ramadan.

No	Author	Year of publication	Country	No of participants	Duration	Study design	Outcome	Comments
1	Beshyah SA, *et al.*[12]	2010	UAE	-	-	Review	The authors discussed the effect of fating the holy month of Ramadan and medical diseases	The authors did not discussed the medication with medical illness
2	Salim I, *et al.*[13]	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-hyperchlolesterimia
3	Bragazzi NL[14]	2014	Multinational	26 studies	1989-2013	Systematic review	The disease covered was renal diseases including kidney transplant, renal colic, Chronic Kidney Diseases	The concentration of kidney transplant remain stable
4	Bragazzi NL *et al.*[15]	2015	Multinational	51 studies	1954-2015	Systematic review	The disease covered was infectious in Diabetes mellitus, Hepatitis, Diarrheal disease, HIV, Anti-helminthic therapy, Ulcer disease, Appendicitis, Urinary tract infectious diseases, Eye infectious diseases and Other infectious diseases	Each diseases had different recommendations and guidelines
5	Sadikot, S, Hassanein, M.[16]	2016	-	-	-	Guidelines	Diabetes and Ramadan: Practical Guidelines	Each diseases had different recommendations and guidelines
6	Heun, R[17]	2017	Multinational	22 studies	up to September 2017	Systematic review	The disease covered was Psychiatric illness the general population and healthy volunteers, sports, eating disorders, physical disorders and mental disorders including bipolar disorder and schizophrenia	Most of the diseases do not change except bipolar disorder had increase of relapse rate
7	Hassanein, M *et al.*[18]	2017	-	-	-	Guidelines	Diabetes and Ramadan: Practical Guidelines	Each diseases had different recommendations and guidelines

Table 2: Drug therapy during regular days versus drug therapy during the holy month of Ramadan.

No	Drug therapy during Regular days[15,19]			Drug therapy during Holy Ramadan*			Registration and[20,21]
	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 diveded dose	Amiloride HCl	5-10 mg	In 1-2 diveded doses	RSFDA , MOHDF
4	Amitriptyline	50-150 mg	In 1 dose or divided doses	Amitriptyline	50-150 mg	In 1 dose	RSFDA , MOHDF
5	Amlodepine besylate	2.5- 10 mg	In 1 dose	Amlodepine 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	Aripiprazol	10-30 mg	In 1 dose	Aripiprazol	10-30 mg	In 1 dose	RSFDA , MOHDF
13	Betoxalol	5-40 mg	In 1 dose	Betoxalol	5-40 mg	In 1 dose	RSFDA , MOHDF
14	Bisoprolol	5-20 mg	In 1 dose	Bisoprolol	5-20 mg	In 1 dose	RSFDA , MOHDF
15	Budesonide	9 mg	In 1 dose	Budesonide	9 mg	In 1 dose	RSFDA , MOHDF
16	Candesartan	8 -32 mg	In 1 dose	Candesartan	8 -32 mg	In 1 dose	RSFDA , MOHDF
17	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
18	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
19	Carteolol	2.5-10 mg	In 1 dose	Carteolol	2.5-10 mg	In 1 dose	RSFDA
20	Carvedilol	12.5- 50 mg	Divided in 2 doses	Carvedilol	12.5- 50 mg	Divided in 2 doses	RSFDA , MOHDF
21	Cefacolr	250- 500 mg	3 times	Cefuroxime axitel	250- 500 mg	2 times	RSFDA , MOHDF
22	Celeoxib	200 mg	2 times	Celeoxib	200 mg	2 times	RSFDA , MOHDF
23	Cephalexin	250 -500 mg	4 times	Cefadroxil	500-1000 mg	2 times	RSFDA
24	Cerivastatin	0.3mg	In 1 dose	Cerivastatin	0.3mg	In 1 dose	RSFDA
25	Chlorthalidone	12.5- 50 mg	In 1 dose	Chlorthalidone	12.5- 50 mg	In 1 dose	RSFDA , MOHDF
26	Cholestyramine	4 GM	2 times	Cholestyramine	4 GM 8 GM	2 times In 1 dose	RSFDA , MOHDF
27	Cimitidine	400 800 mg	2 times In 1 dose	Cimitidine	800 mg	In 1 dose	RSFDA , MOHDF
28	Ciprofloxacin	250-750 mg	2 times	Ciprofloxacin	250-750 mg	2 times	RSFDA , MOHDF
29	Citalopram	20-40 mg	In 1 dose	Citalopram	20-40 mg	In 1 dose	RSFDA , MOHDF
30	Clobazam	20-40 mg	In 1-2 divided doses	Clobazam	20-40 mg	In 1-2 divided doses	RSFDA
31	Clonazepan	1.5-8 mg	In 2-3 divided doses	Clonazepan Clobazam	1.5-8 mg 20-40 mg	In 2 divided doses In 1-2 divided doses	RSFDA , MOHDF
32	Clopidogrel	75 mg PO daily	In 1 dose	Clopidogrel	75 mg PO daily	In 1 dose	RSFDA , MOHDF
33	Clonidine	0.1-0.6 mg	Divided in 2-3 doses	Clonidine	0.1-0.6 mg	Divided in 2 doses	RSFDA , MOHDF
34	Cloxacillin	250 -500 mg	4 times	Cefadroxil	500-1000mg	2 times	RSFDA
35	Cotrimoxazole	490- 960 mg	2 times/day	Cotrimoxazole	490- 960 mg	2 times/day	RSFDA , MOHDF
36	Dabigatran etexilate	150 mg	2 times/day	Dabigatran etexilate	150 mg	2 times	RSFDA , MOHDF
37	Dalteparin	5000-10,000 IU SC daily orq12h	In 1-2 doses	Dalteparin	5000-10,000 IU SC daily orq12h	In 1-2 doses	RSFDA , MOHDF
38	Dapagliflozin	5-10 mg	In 1 dose	Dapagliflozin	5-10 mg	In 1 dose	RSFDA
39	Diclofenac	50- 200mg 75 mg	Divided in 3-4 dses 2 times	Diclofenac Diclofenac SR	75 mg 100 mg	2 times In 1 dose	RSFDA , MOHDF

40	Diflunisal	500-1500 mg	Divided in 2-3 doses	Diflunisal	500-1500 mg	Divided in 2-3 doses	RSFDA
41	Digoxin	0.125- 0.5 mg	In 1 dose	Digoxin	0.125- 0.5 mg	In 1 dose	RSFDA , MOHDF
42	Diltiazem HCl	60-360 mg	Divided in 3 doses	Diltiazem SR HCl	120 -360 mg	Divided in 1-2 doses	RSFDA , MOHDF
43	Dofetilide	0.125-0.5 mg	Divided in 2 doses	Dofetilide	0.125-0.5 mg	Divided in 2 doses	RSFDA
44	Doxazocin Mesylate	1-16 mg	In 1 dose	Doxazocin Mesylate	1-16 mg	In 1 dose	RSFDA , MOHDF
45	Doxycyline	100-200 mg	Divided in 1-2 doses	Doxycyline	100-200 mg	Divided in 1-2 doses	RSFDA , MOHDF
46	Duloxetine	60 mg	In 1 dose	Duloxetine	60 mg	In 1 dose	RSFDA , MOHDF
47	Edoxaban	30-60 mg	In 1 dose	Edoxaban	30-60 mg	In 1 dose	RSFDA , MOHDF
48	Eplerenone	25-100 mg	In 1-2 doses	Eplerenone	25-100 mg	In 1-2 doses	RSFDA , MOHDF
49	Eprosartan	400-800 mg	In 1-2 doses	Eprosartan	400-800 mg	In 1-2 doses	RSFDA , MOHDF
50	Empagliflozin	10-25 MG	In 1 dose	Empagliflozin	10-25 MG	In 1 dose	RSFDA , MOHDF
51	Emtricitabine/ tenofovir DF	600/300 mg	In 1 dose	Emtricitabine/ tenofovir DF	600/300 mg	In 1 dose	RSFDA , MOHDF
52	Enalpril maleate	5- 40 mg	Divided in 1-2 doses	Enalpril maleate	5- 40 mg	Divided in 1-2 doses	RSFDA , MOHDF
53	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
54	Erythromycin	250-500 mg	4 times	Clarithromycin Azithromycin	250-500 mg 500-1000 mg	2 times 1 time	RSFDA , MOHDF
55	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
56	Escitalopram	10-20 mg	In 1 dose	Escitalopram	10-20 mg	In 1 dose	RSFDA , MOHDF
57	Esomeprazole	20-40 mg	In 1 dose	Esomeprazole	20-40 mg	In 1 dose	RSFDA , MOHDF
58	Efavirenz [EFV]	600 mg	In 1 dose	Efavirenz [EFV]	600 mg	In 1 dose	RSFDA , MOHDF
59	Ezetimibe	10 mg	In 1 dose	Ezetimibe	10 mg	In 1 dose	RSFDA , MOHDF
60	Felodipine	2.5- 10 mg	In 1 dose	Felodipine	2.5- 10 mg	In 1 dose	RSFDA , MOHDF
61	Fenofi brate	120-200 mg	In 1 dose	Fenofi brate	120-200 mg	In 1 dose	RSFDA , MOHDF
62	Flecainide	50-200 mg	Divided in 2 doses	Flecainide	50-200 mg	Divided in 2 doses	RSFDA , MOHDF
63	Flucloxacillin	250-500 mg	4 times	Cefadroxil	500-1000mg	2 times	RSFDA
64	Fluconazole	50- 400 mg	In 1 dose	Fluconazole	50- 400 mg	In 1 dose	RSFDA , MOHDF
65	Fluoxetine	10-20 mg	In 1 dose	Fluoxetine	10-20 mg	In 1 dose	RSFDA , MOHDF
66	Folic acid	1- 5 mg	In 1 dose	Folic acid	1- 5 mg	In 1 dose	RSFDA , MOHDF
67	Famotidine	20 mg 40 mg	2 times in 1 dose	Famotidine	40 mg	In 1 dose	RSFDA , MOHDF
68	Fosinopril sodium	10- 80 mg	Divided in 1-2 doses	Fosinopril sodium	10- 80 mg	Divided in 1-2 doses	RSFDA , MOHDF
69	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
70	Glibenclamide	5-10 MG	In 1dose	Glibenclamide	5-10 MG	In 1dose	RSFDA , MOHDF
71	Glibenclamide	5-20 MG	Divided in 2 doses	Glibenclamide	5-10 MG	Divided in 2 doses With 50% reduction of second dose at Shour time	RSFDA , MOHDF
72	Glibenclamide (high risk patients)	5-20 MG	Divided in 2 doses	Gliclazide	40-320mg	Divided in 2 doses With 50% reduction of second dose at Shour time	RSFDA , MOHDF

73	Gliclazide plain	40-320mg	Divided in 2 doses	Gliclazide	40-320mg	Divided in 2 doses With 50% reduction of second dose at Shour time	RSFDA , MOHDF
74	Gliclazide XR	30-120	Divided in 1-2 doses	Gliclazide	30-120mg	Divided in 1-2 doses With 50% reduction of second dose at Shour time	RSFDA , MOHDF
75	Gemfibrozil	600 mg	2 times	Gemfibrozil	600 mg	2 times	RSFDA , MOHDF
76	Heparin (Unfractionated)	60-100 units/ kg IV bolus, then12-18 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 orq12h 175 IU/kg SC daily	In 1-2 doses In 1-2 doses In 1 dose	RSFDA , MOHDF
77	Hydralazine HCl	40-200 mg	Divided in 2-4 doses	Hydralazine HCl	40-200 mg	Divided in 2 doses	RSFDA , MOHDF
78	Hydrochlorothaizide	12.5- 50 mg	In 1 dose	Hydrochlorothaizide	12.5- 50 mg	In 1 dose	RSFDA , MOHDF
79	Ipratropium	17 mcg/ inhalation	2 inhalations QID PRN	Tiotropium	8 mcg	In 1 dose	RSFDA , MOHDF
80	Indapamide	1.25- 5 mg	In 1 dose	Indapamide	1.25- 5 mg	In 1 dose	RSFDA , MOHDF
81	Irbesartan	150- 300 mg	In 1 dose	Irbesartan	150- 300 mg	In 1 dose	RSFDA , MOHDF
82	Isosorbide Dinitrate	10- 240 mg (at least 8 hour washout period to avoid Nitrate Tolerance)	Divided in 3 doses	Isosorbide Dinitrate SR	20-120 mg (at least 8 hour washout period to avoid Nitrate Tolerance)	Divided in 2-3 doses	RSFDA , MOHDF
83	Isradipine	5-20mg	Divided in 2 doses	Isradipine SR	5-20 mg	In 1 dose	RSFDA , MOHDF
84	Itraconazole	400 mg	Divided in 2 doses	Itraconazole	400 mg	Divided in 2 doses	RSFDA , MOHDF
85	Ketoconazole	200- 400 mg	In 1 dose	Ketoconazole	200- 400 mg	In 1 dose	RSFDA , MOHDF
86	Labetalol HCl	200- 1200 mg	Divided in 2 doses	Labetalol HCl	200- 1200 mg	Divided in 2 doses	RSFDA , MOHDF
87	Lacosamide	200-400 mg	Divided in 2 doses	Lacosamide	200-400 mg	Divided in 2 doses	RSFDA
88	Lamotrigine	100-500 mg	Divided in 2 doses	Lamotrigine	100-500 mg	Divided in 2 doses	RSFDA , MOHDF
89	Lanzoprazole	15- 30 mg	In 1 dose	Lanzoprazole	15- 30 mg	In 1 dose	RSFDA , MOHDF
90	Leflunomide	10- 20 mg	In 1 dose	Leflunomide	10- 20 mg	In 1 dose	RSFDA , MOHDF
91	Levetiracetam	1000-3000 mg	Divided in 2 doses	Levetiracetam	1000-3000 mg	Divided in 2 doses	RSFDA , MOHDF
92	Levofloxacin	500 mg	In 1 dose	Levofloxacin	500 mg	In 1 dose	RSFDA , MOHDF
93	Linagliptin	5 mg	In 1 dose	Linagliptin	5 mg	In 1 dose	RSFDA , MOHDF
94	Lisinopril	5- 40 mg	In 1 dose	Lisinopril	5- 40 mg	In 1 dose	RSFDA , MOHDF
95	Loratadine	10 mg	In 1 dose	Loratadine	10 mg	In 1 dose	RSFDA , MOHDF
96	Losartan	25- 100 mg	Divided in 1-2 doses	Losartan	25- 100 mg	Divided in 1-2 doses	RSFDA , MOHDF
97	Mebendazole	100 mg	2 times	Mebendazole	100 mg	2 times	RSFDA , MOHDF
98	Meloxicam	7.5-15 mg	In 1 dose	Meloxicam	7.5-15 mg	In 1 dose	RSFDA , MOHDF
99	Metformin plain	850-1000 mg 500 mg	in 1-2 dose in 3 doses	Metformin plain	850-1000 mg 1000-500	in 1-2 dose in 1-2 dose	RSFDA , MOHDF
100	Metformin XL	1000-2000	In 1 dose	Metformin XL	1000-2000	In 1 dose	RSFDA , MOHDF
101	Methyldopa	250- 2000 mg	In 2 divided doses	Methyldopa	250-2000mg	In 2 divided doses	RSFDA , MOHDF
102	Metolazone	1.25-5 mg	in 1 dose	Metolazone	1.25-5 mg	in 1 dose	RSFDA , MOHDF

103	Metopralol Succinate SR	50- 400 mg	Divided in 1-2 doses	Metopralol sccinate SR	50- 400 mg	Divided in 1-2 doses	RSFDA , MOHDF
104	Metoprolol Tartrate	50-200 mg	Divided in 1-2 doses	Metoprolol	50-300 mg	Divided in 1-2 doses	RSFDA , MOHDF
105	Minocycline	50-100 mg	1-2 times	Minocycline	50-100 mg	1-2 times	RSFDA , MOHDF
106	Minoxidil	2,5-40 mg	Divided in 1-2 doses	Minoxidil	10-40 mg	Divided in 1-2 doses	RSFDA , MOHDF
107	Montelukast	10 mg	In 1 dose	Montelukast	10 mg	In 1 dose	RSFDA , MOHDF
108	Moxifloxacin	400 mg	In 1 dose	Moxifloxacin	400 mg	In 1 dose	RSFDA , MOHDF
109	Nadolol	20-320 mg	In 1 dose	Nadolol	20-320 mg	In 1 dose	RSFDA , MOHDF
110	Nalidixic Acid	500-1000 mg	4 times	Norfloxacin Ciprofloxacin	400-800 mg 250-750mg	2 times 2 times	RSFDA , MOHDF
111	Naproxen	500-1000mg	Divided in 1-2 doses	Naproxen	500-1000mg	Divided in 1-2 doses	RSFDA , MOHDF
112	Nebivolol	5-40 mg	In 1 dose	Nebivolol	5-40 mg	In 1 dose	RSFDA
113	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
114	Nifedipine SR	30-90 mg	In 1 dose	Nifedipine SR	30-90 mg	In 1 dose	RSFDA , MOHDF
115	Nifedipine	10-120 mg	Divided in 3 doses	Nifedipine SR	20-120 mg	Divided in 1-2 doses	RSFDA , MOHDF
116	Nitrofurantoin	50-100 mg	4 times	Norfloxacin	400 mg	2 times	RSFDA , MOHDF
117	Norfloxacin	400 mg	2 times	Norfloxacin	400 mg	2 times	RSFDA , MOHDF
118	Ofloxacin	400 mg	2 times	Ofloxacin	400 mg	2 times	RSFDA , MOHDF
119	Olmesartan	20-40 mg	In 1 dose	Olmesartan	20-40 mg	In 1 dose	RSFDA , MOHDF
120	Olanzapine	10-20 mg	In 1 dose	Olanzapine	10-20 mg	In 1 dose	RSFDA , MOHDF
121	Omeprazole	20-40 mg	Divided in 1-2 doses	Omeprazole	20-40 mg	Divided in 1-2 doses	RSFDA , MOHDF
122	Oxcarbazepine	900-2400 mg	Divided in 2 doses	Oxcarbazepine	900-2400 mg	Divided in 2 doses	RSFDA , MOHDF
123	Paliperidone	6-12 mg	In 1 dose	Paliperidone	6-12 mg	In 1 dose	RSFDA , MOHDF
124	Pantoprazole	40 mg	In 1 dose	Pantoprazole	40 mg	In 1 dose	RSFDA , MOHDF
125	Paroxetine	10-20 mg	In 1 dose	Paroxetine	10-20 mg	In 1 dose	RSFDA , MOHDF
126	Phenobarbital	90-150 mg	In 2-3 dose	Phenobarbital	90-150 mg	In 2 dose	RSFDA , MOHDF
127	Pheynetion	300-400 mg (Blood Level 10-20 mcg/ml)	Divided in 1-3 doses	Pheynetion	300-400 mg (Blood Level 10-20 mcg/ml)	In 1 dose	RSFDA , MOHDF
128	Pindolol	10-60 mg	Divided in 2 doses	Pindolol	10-60 mg	Divided in 2 doses	RSFDA
129	Piroxicam	10-20 mg	In 1 dose	Piroxicam	10-20 mg	In 1 dose	RSFDA
130	Posaconazole	400 mg	2 times	Posaconazole	400 mg	2 times	RSFDA , MOHDF
131	Pravastatin	20-40 mg	In 1 dose	Pravastatin	20-40 mg	In 1 dose	RSFDA , MOHDF
132	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
133	Pregabalin	150-600 mg	Divided in 2-3 doses	Pregabalin	150-600 mg	Divided in 2 doses	RSFDA , MOHDF
134	Perindopril	4-8 mg	In 1-2 doses	Perindopril	4-8 mg	In 1-2 doses	RSFDA , MOHDF
135	Propranolol HCl	40-480 mg	Divided in 2-3 doses	Propranolol HCl (LA)	40-480 mg	In 1 dose	RSFDA , MOHDF
136	Quinapril HCl	5-80 mg	Divided in 1-2 doses	Quinapril HCl	5-80 mg	Divided in 1-2	RSFDA , MOHDF
137	Ramipril	1.25-20 mg	In 1-2 doses	Ramipril	1.25-20 mg	In 1-2 doses	RSFDA
138	Ranitidine	150 mg 300 mg	2 times In 1 dose	Ranitidine	300 mg	In 1 dose	RSFDA , MOHDF

139	Rabeprazole	20 mg	In 1 dose	Rabeprazole	20 mg	In 1 dose	RSFDA
140	Rivaroxaban	20 mg	In 1 dose	Rivaroxaban	20 mg	In 1 dose	RSFDA , MOHDF
141	Risperidone	4-8 mg	In 1 dose	Risperidone	4-8 mg	In 1 dose	RSFDA , MOHDF
142	Rosuvastatin	10-40 mg	In 1 dose	Rosuvastatin	10-40 mg	In 1 dose	RSFDA , MOHDF
143	Salmetrol 21 Mcg/ puff	2 puff	2 times	Salmetrol 21 Mcg/ puff	2 puff	2 times	RSFDA , MOHDF
144	Sertraline	25-100 mg	In 1 dose	Sertraline	25-100 mg	In 1 dose	RSFDA , MOHDF
145	Simeprevir	150 mg	In 1 dose	Simeprevir	150 mg	In 1 dose	RSFDA , MOHDF
146	Simvastatin	20-40 mg	In 1 dose	Simvastatin	20-40 mg	In 1 dose	RSFDA , MOHDF
147	Sotalol	40-160 mg	Divided in 2 doses	Sotalol	40-160 mg	Divided in 2 doses	RSFDA , MOHDF
148	Sofosbuvir	400 mg	In 1 dose	Sofosbuvir	400 mg	In 1 dose	RSFDA , MOHDF
149	Ledipasvir + Sofosbuvir	90+400 mg	In 1 dose	Ledipasvir + Sofosbuvir	90+400 mg	In 1 dose	RSFDA , MOHDF
150	Sparfloxacin	400 mg loading then 200 mg	In 1 dose	Sparfloxacin	400 mg loading then 200 mg	In 1 dose	RSFDA
151	Spironolactone	12.5-100 mg	Divided in 1-2 doses	Spironolactone	12.5-100 mg	Divided in 2 doses	RSFDA , MOHDF
152	Sulindac	200-400 mg	Divided in 2 doses	Sulindac	200-400 mg	Divided in 2 doses	RSFDA
153	Telmisartan	40-80 mg	In 1 dose	Termisartan	40-80 mg	In 1 dose	RSFDA , MOHDF
154	Terazosin HCl	1-20 mg	In 1 dose	Terazosin HCl	1-20 mg	In 1 dose	RSFDA , MOHDF
155	Terbinafine	250 mg	In 1 dose	Terbinafine	250 mg	In 1 dose	RSFDA , MOHDF
156	Theophylline Plain	Depend on the salt (Blood Level 10-20) mcg/ml)	Divided in 3 doses	Theophylline SR	Depend on the salt (Blood Level 5-15) mcg/ml)	Divided in 2 doses	RSFDA , MOHDF
157	Telmisartan	40-80 mg	In 1 dose	Telmisartan	40-80 mg	In 1 dose	RSFDA , MOHDF
158	Tinzaparin	175 IU/kg SC daily	In 1 dose	Tinzaparin	175 IU/kg SC daily	In 1 dose	RSFDA , MOHDF
159	Topiramate	200-400 mg	Divided in 2 doses	Topiramate	200-400 mg	Divided in 2 doses	RSFDA , MOHDF
160	Torsemide	5-20 mg	Divided in 1-2 doses	Torsemide	5-20 mg	Divided in 1-2 doses	RSFDA , MOHDF
161	Triameterene	50-150 mg	In 1-2 diveded dose	Triameterene	50-150 mg	In 1-2 diveded dose	RSFDA , MOHDF
162	Trandolapril	1 mg	In 1 dose	Trandolapril	1 mg	In 1 dose	RSFDA
163	Trovafloxacin	200 mg	In 1 dose	Trovafloxacin	200 mg	In 1 dose	RSFDA
164	Trifluoperazine	2-10 mg	2 times	Trifluoperazine	2-10 mg	2 times	RSFDA , MOHDF
165	Valporic Acid	1000-3000 mg (Blood Level 40-100 mcg/ml)	Divided in 2-3 doses	Valporic Acid	1000-3000 mg (Blood Level 40-100 mcg/ml)	Divided in 2doses	RSFDA , MOHDF
166	Valsartan	80-320 mg	In 1 dose	Valsartan	80-320 mg	In 1 dose	RSFDA , MOHDF
167	Verpamil HCl	40-480 mg	Divided in 3 doses	Verpamil HCl (SR)	90-480 mg	Divided in 1-2 doses	RSFDA , MOHDF
168	Vigabatrin	3 GM	Divided in 2 doses	Vigabatrin	3 GM	Divided in 2 doses	RSFDA , MOHDF
169	Voriconazol	400 mg	Divided in 2 doses	Voriconazol	400 mg	Divided in 2 doses	RSFDA , MOHDF
170	Zonisamide	100-600 mg	In 1-2 dose	Zonisamide	100-400 mg	In 1-2 dose	RSFDA
171	*Twice daily dose can be taken on 30-60 min after sunset (*Iftar*) time or 30-60 min before sundown (*Suhoor*) time. and RSFDA: The Drug had been registered in Saudi Food and Drug Authority, MOHDF: The Drug is Ministry of Health Drug Formulary						

doses to equivalent and two or single dose during fasting. We also tried oral medications and those that are listed in the MOH formulary from each group of common diseases presented earlier. The table regimen suggested guiding the prescriber or pharmacist of switching medication from regular days to Ramadan days without breakfasting. The healthcare provider should revise the list of approved indications for each country registered and review the patient's condition and other comorbid diseases, for instance, renal or hepatic failure. The table suggested for patients with healthy kidney and liver function. The table of drug therapy during Ramadan can be used for future clinical trials to validate the suggestion

in the regimen. The table can be used to prevent medications errors during prescribing, including intake of multiple doses during the night, not around the clock or day. The medications therapy during the holy month of Ramadan may help the healthcare care provider to treat the patient during Ramadan with close monitoring of the disease and patient. The healthcare providers need to have programs specifically for the month of Ramadan where counseling, medication and doses are altered for a better outcome. The medications list should be updated regularly at all healthcare institution at MOH in the KSA.

CONCLUSION

Most of the Muslim patients wish to fast during the holy month of Ramadan. The majority of patients were ready to break their fast in order to follow the medication regimen, whereas the other stopped taking medications regularly. The all healthcare providers and among pharmacist adopted the system of medications during regular days to appropriate doing therapy during the holy medications month of Ramadan. After an extensive review of the literature, the authors came up with the suggested drug therapy during Ramadan. The healthcare professionals can use it with patients who wish to fast during Ramadan. The suggestion table needs a randomized clinical trial to validate it. The drug therapy list should be updated regularly during the holy month of Ramadan.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest.

ABBREVIATIONS

DM: diabetes mellitus; **SFDA:** Saudi Food and Drug Authority; **MOH:** Ministry of Health; **KSA:** Kingdom of Saudi Arabia; **USA:** United State of America; **RPC:** Ramadan Pharmaceutical Care; **GAPC:** General Administration of Pharmaceutical Care.

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