



# Framing diabetes public health information during Ramadan – a newspaper content analysis

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## Abstract

**Objective:** To evaluate health-related messages in printed media pertaining to diabetes care in Qatar during Ramadan.

**Methods:** Qatar national newspapers (Arabic and/or English) published 6 weeks prior to and 4 weeks during Ramadan 2012 were reviewed. Health-related content was identified and characterized according to four different categories including presence of messages pertaining to both diabetes and Ramadan. Articles describing diabetes and Ramadan combined were further evaluated according to specific features of prominence (surrogates for perceived reader importance). Newspapers were grouped by language, and volume and content of coverage were compared between groups.

**Results:** A total of 1 467 newspaper issues published during the 2012 review period (781 in Arabic and 686 in English) were analysed. Health-related articles appeared consistently throughout the study period, but few were specifically diabetes-related (66/1095 [6%] Arabic articles versus 34/1250 [2.7%] English articles;  $P = 0.008$ ). Only 34/1095 (3.1%) Arabic and 23/1 250 (1.8%) English ( $P = 0.05$ ) articles pertaining specifically to diabetes management during Ramadan were published. Twenty/34 (59%, Arabic) and 6/23 (26%, English) were published in high prominence positions.

**Conclusions:** Opportunity exists to augment the relatively low coverage of diabetes health-related messages in print media during Ramadan.

## Keywords

Diabetes mellitus, fasting, newspapers, public health

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## Introduction

Diabetes is recognized as a global epidemic affecting approximately 415 million people worldwide.<sup>1</sup> A 2006 World Health Organisation survey reported that regions

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with the highest prevalence are found in Gulf Cooperation Council countries and estimates of diagnosed diabetes in Qatar have ranged from 12% (for all residents) to 17% (among the Qatari population only).<sup>2,3</sup> Effective disease management is important, as significant diabetes-related long-term complications contribute to vascular disease (cardiac, cerebral, peripheral) and detrimental effects on the eyes, kidneys, and nervous system.<sup>4</sup>

An additional consideration for patients with diabetes in Qatar includes disease management during fasting periods, in particular the Muslim holy month of Ramadan, during which participants fast from dawn to sunset. No food, drink or oral medications are permitted during Ramadan, and fasting during the day is followed with celebratory feasts in the evening, beginning with Iftar (breaking of the fast after sunset) and finishing with Suhur, the pre-dawn meal. Many people enjoy the spiritual atmosphere and those who cannot fast may feel they miss a great deal, however, in patients with diabetes, fasting increases the risk of hypoglycaemic and hyperglycaemic episodes, diabetic ketoacidosis, and other potentially life-threatening metabolic complications that can lead to hospitalization and other poor outcomes.<sup>4</sup> Although the Qur'an exempts the sick from fasting, a large proportion of patients with diabetes in the Middle East (as many as 40% with type 1 diabetes and 80% with type 2 diabetes) participate in the Ramadan fast.<sup>5</sup>

While there are serious health risks associated with fasting in patients with diabetes, appropriate health education may improve patient safety during the Ramadan fasting period.<sup>4</sup> Patients with diabetes who do intend to fast are advised to contact their health-care provider as much as 2 months in advance, for a medical assessment and to prepare a treatment strategy.<sup>6</sup> In some cases, several determinants of diabetes outcomes during Ramadan lie within the control of the

individual (i.e. managing activity, diet, and dose administration), therefore it may be considered important to assess the nature of public health promotion and information in the lay press, as these are modifiable factors that may influence patient behaviours. Indeed, messages in print, radio, television, and increasingly in social media can reach people in large numbers, and impact public perceptions, knowledge and behaviours.<sup>7</sup> Health-related information in mass media is known to raise awareness of diseases, conditions and health risk factors, for example, in breast cancer screening, obesity and skin cancer prevention.<sup>8-10</sup> In these and other instances, the media can also serve as a vehicle to influence health policy priorities by controlling the amounts, location, and nature of topic coverage certain issues receive.<sup>11</sup> This agenda-setting hypothesis has been examined extensively in the areas of, for example, organ donation, human immunodeficiency virus/acquired immune deficiency syndrome, and smoking bans.<sup>12-14</sup> Media campaigns have been demonstrated to reach target audiences with diabetes and to induce appropriate physician-consultation responses,<sup>15</sup> however, there is no published research regarding health article analysis in the Middle East, or an evaluation of mass media delivery of public health messages for fasting patients with diabetes anywhere.

In the present study, printed media content was analysed to systematically investigate health-related messages regarding diabetes care associated with the holy month of Ramadan in Qatar.

## Materials and methods

This retrospective study, conducted at Qatar University, Doha, Qatar between April and December 2012, considered all Qatar national printed newspapers in circulation during Ramadan 2012: four printed in Arabic (Al Watan, Al Raya, Al Sharq,

Al Arab) and three printed in English (Gulf Times, The Peninsula, Qatar Tribune). The main review period encompassed issues published during 6 weeks leading up to and 4 weeks during the 2012 Ramadan fast (between May and July 2012), with additional analyses of a sample of newspapers printed during the 2014 Ramadan fast (between May and July 2014). All print issues were visually scanned cover-to-cover including articles, advertisements and supplements. Issues that did not contain any content broadly related to health were excluded. Newspaper issue article content for inclusion into the study was characterized according to: (1) a health topic, but not related to diabetes or Ramadan; (2) a health topic related to Ramadan, but not diabetes; (3) a health topic related to diabetes, but not Ramadan; and (4) a health topic related to diabetes and Ramadan combined.

Articles that described diabetes and Ramadan combined were then evaluated according to day of the week, newspaper section and page on which they appeared; size and position on the page; and any accompanying photograph or other visual image. Further categorization assessments of these articles included the article topic

(event promotion, health service announcement, or health education or advice); evidence of any contribution by an opinion maker; and overall tone of the message communicated. A selection of these variables considered to contribute to reader attraction were used to establish article prominence using a 4-point scale for each of six criteria as previously described, where 0 = lowest prominence, and 3 = highest prominence (Table 1).<sup>16</sup> Prominent articles were defined as those scoring  $\geq 15$ . Finally, the content of any articles relating health education or advice to diabetes patients during Ramadan were further qualitatively analysed for medical accuracy compared with current guideline recommendations, by systematic means adapted by prior researchers (Table 2).<sup>4,6,17,18</sup>

Three graduate students for Arabic language content and one undergraduate student for English language content were trained to serve as primary coders for designated newspapers. To ensure inter-coder reliability, another researcher recoded a random sample of 15% of the newspaper issues. Any discrepancies identified were evaluated and resolved through consensus with the senior author team (KW, RM).

**Table 1.** Variables used to generate a prominence index score for newspaper content relating to diabetes and Ramadan combined, in 6 weeks leading up to and 4 weeks during Ramadan 2012.<sup>16</sup>

Variable	Definition (score)
Front page	Article found on front page of a newspaper section (yes = 3; no = 2)
Section	Section in which the article was published (main = 3; other = 2)
Headline size	Small ( $\leq 0.60$ cm = 0); medium ( $> 0.60$ to $\leq 1.3$ cm = 1); large ( $> 1.3$ to $\leq 2$ cm = 2); very large ( $> 2$ inches = 3)
Item location	Placement of the start of the title or top of article/figure/picture (left above fold = 3; right above fold = 2; left below fold = 1; and right below fold = 0). Right and left scoring was reversed for Arabic newspapers
Column centimetres	Length of the column in cm (including figures, tables, photos). Each column of the article is measured (length $\times$ width, cm <sup>2</sup> ), and scored ( $> 36 = 3$ ; $12.7-36 = 2$ ; $\leq 12.7 = 1$ )
Photograph	Photograph or other visual included with article (yes = 3; no = 2)

Prominent articles were defined as those scoring  $\geq 15$  (out of a possible score range of 7–18).

**Table 2.** Items assessed during qualitative analyses of newspaper content relating to diabetes and Ramadan combined, in 6 weeks leading up to and 4 weeks during Ramadan 2012.

Item	Outcome (Yes/No)
Is the headline a fair reflection of the article?	
Does the article cite an affiliated organization?	
Does the article cite a journal?	
Does the article provide adequate background information?	
Does the article compare statistics?	
Are the statistics misused or misrepresented?	
Does the article have the potential to cause undue harm or optimism?	
Does the article generalize from laboratory-based/animal studies to humans without explicitly stating so?	
Does the article give information consistent with reported medical guidelines?	

To augment the timeliness of the review, a sample of newspaper issues during Ramadan 2014 were also selected for analysis. The issues of all newspapers on one randomly selected day for each of the 6 weeks leading up to (29 May–28 June) and during Ramadan (29 June–28 July) in 2014 were reviewed in the same way as the 2012 newspapers.

**Statistical analyses**

Data are presented as frequencies and proportions (*n* [%]) and were analysed using SPSS software, version 22 (SPSS Inc., Chicago, IL, USA) for Mac. The 2012 and 2014 data were analysed separately. The volume of reports was compared between Arabic and English newspapers and across the four article categories (health topic not related to diabetes or Ramadan; health topic

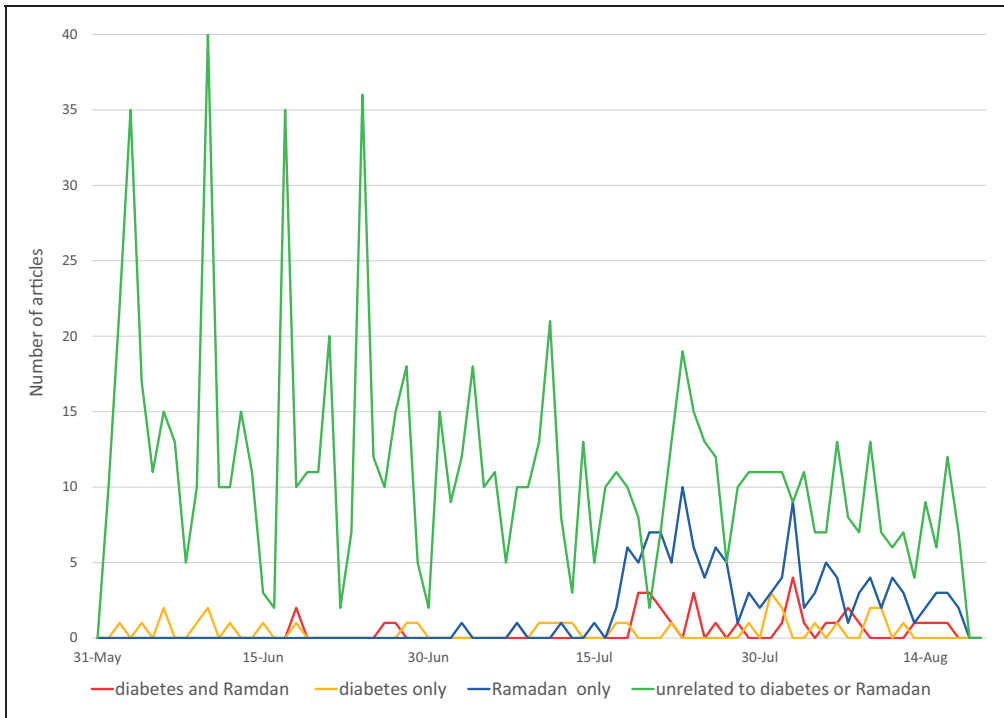
related to Ramadan, but not diabetes; health topic related to diabetes, but not Ramadan; or health topic related to diabetes and Ramadan combined) using  $\chi^2$ -test for proportions. Inter-coder reliability was determined by calculating intra-class correlations using a two-way mixed model (absolute agreement type). A *P*-value <0.05 was considered statistically significant.

**Results**

A total of 1 467 newspaper issues published during the 2012 review period (781 Arabic and 686 English) were analysed. Hardcopies or online access to issues of one Arabic newspaper (Al Sharq) were not available for the 2012 study period, therefore it was excluded from the present study. Articles pertaining to the management of any health-related concern during Ramadan that were published over the 2012 review period are depicted in Figures 1 and 2.

Health-related articles appeared consistently throughout the 2012 review period, but few were related to diabetes specifically (66/1 095 [6%] Arabic versus 34/1 250 [2.7%] English, *P* = 0.008)

A total of 34/1 095 (3.1%) and 23/1 250 (1.8%; *P* = 0.05) articles pertaining specifically to diabetes management during Ramadan 2012 were published in Arabic and English newspapers, respectively (Table 3). A similar proportion between Arabic and English articles relating to diabetes management during Ramadan were published during the 6-week period leading up to Ramadan 2012 (4/34 [11.8%] Arabic and 3/23 [13%] English), and these peaked in the last two weeks of Ramadan (15/34 [44.1%] Arabic and 16/23 [69.6%] English). Twenty out of 34 (59%) Arabic and 6/23 (26%) English articles were published in high prominence positions in its respective issue (prominence scores,  $\geq 15$ ); only 1 English and 6 Arabic high prominence articles appeared in the first week of Ramadan



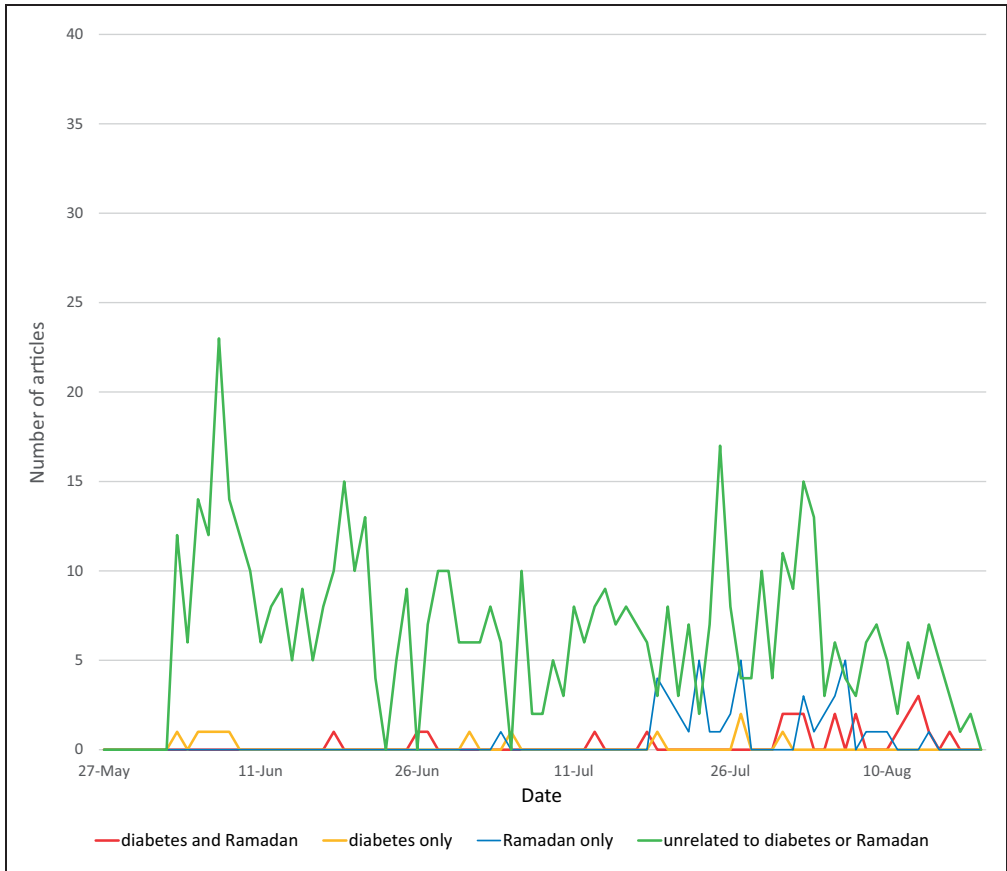
**Figure 1.** Distribution of health-related articles in newspapers published in Arabic in 6 weeks leading up to and 4 weeks during Ramadan 2012.

(and 2 Arabic articles appeared in the 4 weeks prior to Ramadan).

Qualitative assessment of the 34 Arabic and 23 English language articles identified as having both diabetes and Ramadan-related content showed the following article types: a health service announcement (2 Arabic and 6 English); promotion of a diabetes and Ramadan-themed event with an educational component (7 Arabic and 3 English) and without an educational component (4 Arabic and 4 English); a program advertisement entitled ‘Action on Diabetes’ (4 Arabic only); features with health education or advice relating to diabetes during Ramadan (17 Arabic and 10 English). Information in these articles offering health education or advice was largely consistent with available evidence and widely held recommendations.<sup>4,6,18</sup> For example, a

number of articles in the 6 weeks leading up to Ramadan 2012 (6/17 Arabic and 8/10 English) identified high risk patients with diabetes who should not fast (including pregnant women, children and patients with Type 1 diabetes). In these same articles, patients with diabetes were additionally reassured that self-monitoring of blood glucose during the day was acceptable (and encouraged). More interviews with opinion leaders (religious, medical [endocrinologists], organizational [head of Qatar Diabetes Association] and governmental representatives [head of Ministry of Health]) were found among the Arabic articles (11/34 Arabic versus 6/23 English).

Inter-coder reliability testing did not indicate any discrepant findings among the independent coders (intra-class correlation, 0.82).



**Figure 2.** Distribution of health-related articles in newspapers published in English in 6 weeks leading up to and 4 weeks during Ramadan 2012.

**Table 3.** Newspapers with articles with diabetes and Ramadan-related health content published in Qatar in 6 weeks leading up to and 4 weeks during Ramadan 2012.

English (n = 23)		Arabic (n = 34)	
Gulf Times	n = 9, 39%	Al Arab	n = 17, 50%
Qatar Tribune	n = 8, 35%	Al Raya	n = 12, 35%
The Peninsula	n = 6, 26%	Al Watan	n = 5, 15%

Data presented as n (%) prevalence.

Analysis of a random sample of 10 newspaper issues published during Ramadan 2014 found five newspapers (50%) with articles relating to diabetes and Ramadan: two were found in Al Watan (Arabic) describing the annual telephone hotline for diabetes queries, and describing fasting benefits for overweight patients with diabetes; one was found in Al Raya (Arabic) describing an online website for diabetes education during Ramadan; and two were found in Qatar Tribune (English) describing diabetes screening activities within gas and oil companies in conjunction with the upcoming Ramadan.

## Discussion

The present findings report the first evaluation of public health messages for fasting patients with diabetes published in the literature. Overall, specific coverage of diabetes and Ramadan was similarly low ( $\leq 6\%$  of all health-related articles) in both Arabic and English newspapers, however, of these, articles with high prominence were more frequently found in Arabic newspapers. One reason for this discrepancy might be that a number of these reports were articles of interviews with subjects conducted in Arabic. It may be opined that most patients with diabetes observing Ramadan would be Native-Arabic speakers (and hence readers), however Qatar is a multicultural country with a significant population of Muslims with non-Arabic first languages (e.g. dialects of India, Indonesia, Malaysia, sub-Saharan African nations).<sup>19</sup> English media may be the only way to reach these populations, in addition to first-language English expatriates, and therefore the only meaningful source of local health information. Unlike in the Arabic newspapers, no English reports were found that contained any interviews with religious leaders who could reassure fasting patients with diabetes about the use of insulin or self-monitoring of blood glucose (whereby patients must prick their finger to obtain a small blood sample).<sup>20</sup>

Mass media is an established vehicle to transmit public health information and has a two-fold objective: to increase the amount of specific health information and to draw the attention of a target audience. Campaign planners anticipate that sufficient and appropriately framed message exposure will ultimately contribute to modification of (collective) individuals' health behaviours.<sup>21</sup> The actual utility of mass media in this regard has been well examined with mixed results. Reviews have documented the effectiveness of traditional media (print [newspapers, magazines, pamphlets]; radio;

television; and social marketing [billboards with health messages]) for public health interventions and communication,<sup>22–26</sup> and the specific parameters of such benefits have been described.<sup>27</sup> A systematic review of 62 articles found that most public health media campaigns were able to reach a significant proportion of the intended audience.<sup>27</sup> Among studies evaluating campaign influence on behaviours, approximately half showed improvement in outcomes such as organ donation; lifestyle modification (healthier eating habits); health screening actions and other preventative measures (infectious diseases testing and smoking cessation rates).<sup>27</sup>

The public's preferred sources of health information have also been found to vary widely. While television and the internet rate consistently high, their use depends on the age group and type of health decision being considered.<sup>27</sup> Conventional formats of mass media for public health education have undergone a transformation, and electronic platforms, namely social media, have emerged as influential tools to engage record numbers of people with excellent potential target audience reach and community engagement findings,<sup>27,28</sup> but few studies have evaluated behaviour change. Effective social media would move from basic information dissemination to tailored messages for diverse audiences who could then participate and contribute to the wider digital community of providers and users.<sup>27,28</sup> The relevance of conventional media for mass communication of health messages is perhaps questionable in the Middle East, in particular for Qatar, which has among the highest household uptake of mobile technology in the world.<sup>29</sup> As such, projects such as 'mDiabetes', whereby advice is communicated by text directly to mobile phone users, have promising implications for public health messaging.<sup>30</sup> Social media may have better reach to effectively communicate health messages in the Middle

East region, however, a strong newspaper presence has been demonstrated to persist in the region (ranking second after television in Qatar) as the trusted news source, and it is noteworthy that diabetes coverage is relatively low out of all health-related coverage.<sup>31,32</sup>

The Middle East is not unlike other regions with crowded media environments regarding public health agenda. Nationally (and indeed regionally), diabetes issues in Qatar are competing with other public health concerns including smoking, cancer, obesity, and traffic fatalities.<sup>33</sup> Although a chronic non-communicable disease, recommendations for diabetes management during fasting periods in Ramadan seek to prevent acute patient complications and associated stresses to healthcare services.<sup>4,6</sup> Diabetes is a priority condition under the country's National Health Strategy, with goals to improve public health governance and wellness promotion through media awareness campaigns, however, the present study revealed that appropriate diabetes-related print media coverage during Ramadan is relatively low out of all health-related articles, and may represent a missed opportunity.<sup>33</sup> Public health-sector approaches to all preventative and management aspects of diabetes and associated infrastructure are urgently needed for the Middle East region, and particularly Gulf Cooperation Council countries, where rapid lifestyle change has contributed to rising diabetes prevalence and resultant health-system burden.<sup>34</sup>

Multilingual coverage is recommended regarding newspapers that form part of a multimedia awareness strategy, due to the large population of non-Arabic speaking Muslim diabetes patients in the Middle East. In the authors' opinion, coverage to promote awareness among diabetes patients intending to fast in the month leading up to and during Ramadan represents a finite 8-week period that may minimize risk for message exhaustion. Not only should

messages be designed to attract attention, but include salient advice. Existing programs, such as the Qatar Diabetes Association telephone 'hotline', which is in place during Ramadan, can provide coverage tailored to answer health questions that are commonly posed by members of the public with diabetes in Qatar.<sup>35</sup> Finally, a supportive environment and opportunities must be in place for patients with diabetes to obtain appropriate medical consultation and guidance.<sup>21,34,36</sup>

The results of the present study may be limited by several factors. First, the main study period covered Ramadan in 2012, and newspaper media coverage of diabetes and Ramadan-related content may vary from year to year. The purposeful random sampling of diabetes coverage during Ramadan 2014 did identify articles in half of the screened newspapers compared with approximately 3% of screened newspapers during Ramadan 2012. Secondly, regarding comparisons between Arabic and English language publications, although article prominence was defined according to criteria employed by prior researchers, any possible size difference between English and Arabic script was not taken into account. A more appropriate measure may have been obtained using word count to complement the prominence scoring according to article dimensions. In addition, the coders used to analyse Arabic newspapers were different from those used to code English newspapers, thus the coding framework was not fixed. Thirdly, only locally published newspapers were included. Qatar is a pluralistic society where residents may have access to diabetes education through other print media, however, obtained coverage would unlikely take into account promotion of care services specific to the country. For example, non-Arab and non-English speakers may be reading newspapers originating elsewhere, but imported to Qatar. Since the present study is the first known content analysis of



diabetes and Ramadan-related coverage in the Middle East or elsewhere, there was no benchmark with which to compare. Future research should further explore the optimal message framing for health awareness of diabetes patients during Ramadan (e.g. focusing on either the gains [benefits] or losses [costs] of fasting without medical support) and if any observed measurable change in public behaviour and outcome could be associated with such media coverage.

In conclusion, diabetes patient self-care is an important factor in fasting safely, although for some high risk patient groups, fasting should not be performed. A content analysis of Arabic and English newspapers in Qatar yielded very little coverage of diabetes pertaining to public education regarding disease management during Ramadan. Opportunity exists to augment health messages in the print media for patients with diabetes in advance-of and during Ramadan.

### Author's Note

We would like to inform that one of the authors' of this research Dr. Robert Meeds has now left Qatar University. He is presently associated with College of Communications, California State University, Fullerton, USA.

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### Declaration of conflicting interests

The authors declare that there is no conflict of interest.

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### References

1. International Diabetes Federation. IDF Diabetes Atlas, <http://www.diabetesatlas.org> (2009, accessed 9 June 2016).
2. Fraser Chanpong G. Qatar 2006 WHO World Health Survey. In: *Proceedings of the 1st International Primary Health Care Conference*, Doha, Qatar, 1–4 November 2008, conference presentation.
3. Bener A, Zirie M, Janahi IM, et al. Prevalence of diagnosed and undiagnosed diabetes mellitus and its risk factors in a population-based study of Qatar. *Diabetes Res Clin Pract* 2009; 84: 99–106.
4. Hussanein M. How to achieve safer Ramadan fast. *Br J Diabetes Vasc Dis* 2010; 10: 246–250.
5. Salti I, Bénard E, Detournay B, et al. A population-based study of diabetes and its characteristics during the fasting month of Ramadan in 13 countries: results of the epidemiology of diabetes and Ramadan 1422/2001 (EPIDIAR) study. *Diabetes Care* 2004; 27: 2306–2311.
6. Al-Arouj M, Assaad-Khalil S, Buse J, et al. Recommendations for management of diabetes during Ramadan: update 2010. *Diabetes Care* 2010; 33: 1895–1902.
7. Peng W and Tang L. Health content in Chinese newspapers. *J Health Commun* 2010; 15: 695–711.
8. Martinson BE and Hindman DB. Building a health promotion agenda in local newspapers. *Health Educ Res* 2005; 20: 51–60.
9. Dixon H, Warne C, Scully M, et al. Agenda-setting effects of sun-related news coverage on public attitudes and beliefs about tanning and skin cancer. *Health Commun* 2014; 29: 173–181.
10. Boles M, Adams A, Gredler A, et al. Ability of a mass media campaign to influence knowledge, attitudes, and behaviors about sugary drinks and obesity. *Prev Med* 2014; 67(Suppl 1): S40–S45.
11. Ahmed R and Bates BR. *Health communication and mass media: an integrated approach to policy and practice*. Burlington, VT USA: Gower Publishing Company, 2013.
12. Bardhan NR. Accounts from the field: a public relations perspective on global AIDS/HIV. *J Health Commun* 2002; 7: 221–244.

13. Quick BL, Meyer KR, Kim DK, et al. Examining the association between media coverage of organ donation and organ transplantation rates. *Clin Transplant* 2007; 21: 219–223.
14. Sato H. Agenda setting for smoking control in Japan, 1945–1990: influence of the mass media on national health policy making. *J Health Commun* 2003; 8: 23–40.
15. Schade CP and McCombs M. Do mass media affect Medicare beneficiaries' use of diabetes services? *Am J Prev Med* 2005; 29: 51–53.
16. Granner ML, Sharpe PA, Burroughs EL, et al. Newspaper content analysis in evaluation of a community-based participatory project to increase physical activity. *Health Educ Res* 2010; 25: 656–667.
17. Robinson A, Coutinho A, Bryden A, et al. Analysis of health stories in daily newspapers in the UK. *Public Health* 2013; 127: 39–45.
18. Hui E, Bravis V, Hassanein M, et al. Management of people with diabetes wanting to fast during Ramadan. *BMJ* 2010; 340: c3053.
19. Snoj J. Population of Qatar. *BQ magazine*, <http://www.bq-magazine.com/economy/2013/12/population-qatar> (18 December 2013, accessed 12 January 2015).
20. Beshyah SA. Fasting during the month of Ramadan for people with diabetes: medicine and Fiqh united at last. *IJMBS* 2009; 1: 58–60.
21. Randolph W and Viswanath K. Lessons learned from public health mass media campaigns: marketing health in a crowded medial world. *Ann Rev Pub Health* 2004; 25: 419–437.
22. Rimer BK and Gierisch JM. Public education and cancer control. *Semin Oncol Nurs* 2005; 21: 286–295.
23. Noar SM. A 10-year retrospective of research in health mass media campaigns: where do we go from here? *J Health Commun* 2006; 11: 21–42.
24. Hornik R and Kelly B. Communication and diet: an overview of experience and principles. *J Nutr Educ Behav* 2007; 39: S5–S12.
25. Glik DC. Risk communication for public health emergencies. *Annu Rev Public Health* 2007; 28: 33–54.
26. Abrams LC and Maibach EW. The effectiveness of mass communication to change public behavior. *Annu Rev Public Health* 2008; 29: 219–234.
27. Newbold KB and Campos S. Media and social media in public health messages: a systematic review. *MIEH*, <http://www.mcmaster.ca/mihe/documents/publications/Social%20Media%20Report.pdf> (2011, accessed 10 March 2015).
28. Heldman AB, Schindelar J and Weaver JB. Social media engagement and public health communication: implications for public health organizations being truly “social”. *Public Health Rev* 2013; 35: 1–18.
29. DOHA News Team. Report: Mobile phone penetration in Qatar more than 2.5 times the global average, and rising. *DOHA News*, 22 October 2012, <http://dohanews.co/report-mobile-phone-penetration-in-qatar-more-than-2-5/> (accessed 26 May 2015).
30. World Health Organization. Mobile phones help people with diabetes to manage fasting and feasting during Ramadan, <http://www.who.int/features/2014/mobile-phones-diabetes-ramadan/en/> (June 2014, accessed 28 May 2015).
31. Dennis EE, Martin JD and Wood R. Media use in the Middle East, 2013: An eight-nation survey by Northwestern University in Qatar, <http://menamediasurvey.northwestern.edu/> (2013, accessed 18 January 2015).
32. Meeds R. Changing roles of traditional and online media as trusted news sources in Qatar and their relationships with perceived important issues and interest in politics. *J Middle East Media* 2015; 11: 34–61.
33. Qatar National Health Strategy 2011–2016. Caring for the future. Executive summary, <http://www.nhsq.info/app/media/2908> (accessed 10 December 2014).
34. Klautzer L, Becker J and Mattke S. The curse of wealth - Middle Eastern countries need to address the rapidly rising burden of diabetes. *Int J Health Policy Manag* 2014; 2: 109–114.
35. Toumi H. Qatar diabetics to receive full assistance in Ramadan. *Gulf News*, 18 July 2011, p.7.
36. Maryon-Davis A. Using the mass media to promote health. *InnovAiT* 2012; 5: 767–773.