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Article

Does religious affiliation influence glycaemic control in primary care patients with type 2 diabetes mellitus?

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ABSTRACT

Background To determine the relationships between religiosity, religions and glycaemic control of type 2 diabetes mellitus (T2D).

Methods This is a cross-sectional study conducted at an urban, university-based, teaching outpatient clinic. Religiosity was assessed with the Beliefs and Values Scale (BV), which contains 20 items each with a Likert scale of five possible responses. The range of scores is 0 to 80, with a higher score indicating stronger religious belief. Glycaemic control was taken as the mean value of the latest three fasting plasma glucose (FPG) levels and HbA1c readings documented in each patient's case records.

Results A total of 212 patients participated (a response rate of 79%). Two-thirds were female, mean age was 62.7 (SD 10.8) years and mean duration of T2D was 11.7 (SD 6.7) years. The mean BV score was 57.4 (SD 10.97, CI 55.9, 59.0). Religiosity had a negative correlation with lower FPG (r = –0.15, p = 0.041) but no such correlation was found with HbA1c. Moslem religiosity had a significant negative correlation with HbA1c (r = –0.34, p = 0.007, n = 61) even after controlling for covariates. Christians and non-religious group had significantly lower mean rank HbA1c than other religions (p = 0.042).

Conclusions Those with higher religiosity amongst the Moslem population had significantly better glycaemic control. Patients who had church-going religions had better glycaemic control compared with those of other religions.

Keywords: glycaemic control, religion, religiosity, type 2 diabetes mellitus

Introduction

Worldwide, prevalence of T2D is progressively rising in a pandemic pattern. The International Diabetes Federation (IDF) predicts a 72% increase in the number of patients with diabetes from 189 million in 2000 to 224 million in 2025, and a 100% rise of the global cost of diabetes to USD $300 billions.[1] Similarly, in Malaysia the prevalence of T2D increased from 8.2% in the second National Health Morbidity Survey (NHMS) in 1996 to 14.9% in the third NHMS in 2006.[2] T2D often concurs with hypertension and hyperlipidaemia, and it leads to increased morbidity and mortality worldwide. Thus,

the IDF has classified diabetes as an 'international disaster'.

Religious activity or religiosity has been defined as the degree of participation in and adherence to the teaching and the organised activity of a particular religion.[3] Religious belief, on the other hand, is the fundamental belief system that could influence our ideas, values in life and ways of living. Many patients recognise the importance of religion in their own lives and would want physicians to take religious factors into account in their healthcare management.[4] Most British general practitioners and American family physicians recognise the positive impact of religiosity on their patients' health.[5,6] At the American Academy of Family Physicians meeting in October 1996, nearly all physicians were convinced that religious beliefs could heal illness and 75% of them believed that the prayers of others could promote recovery. In the past five years there has been a bull market type growth in the number of US medical schools and residency programs teaching spirituality.[6] The evidence for the positive effect of religiosity on health is gaining pace in the western medical world. It has been suggested that the biopsychosocial model of medicine might be replaced by the biopsychosocial–spiritual model.[7]

Despite this, evidence on religion and spirituality on health were scarce. Weaver *et al* reported that over a three-year period less than 1% of the quantitative studies published in the three major general medical journals (the *Journal of the American Medical Association*, *The Lancet* and the *New England Journal of Medicine*) measured some aspect of religion, spirituality or both.[8] Some studies have shown a positive effect of religious involvement and spirituality on physical and mental health.[9–12] More religious people had lower blood pressure, less hypertension, more compliance to treatment and follow-up and lower utilisation of health care.[4,13]

However, Obisesan *et al* have shown no significant associations between diabetes and metabolic risk factors such as serum lipids, dietary intake, prevalence of coronary heart disease and religiosity and/or spirituality.[14] Kouniakis *et al* have also reported poor diabetes control among Greeks who had T2D who were strong in their belief in life after death.[15] (However, a criticism of that study was that, although there was a statement about religiosity indicating a strong belief in life after death, there was no specific religion identified in the population.) Similarly, a study in Leeds, UK showed that Kashmiri Moslem men with diabetes mellitus had poor diabetes control because their overall attitude was to enjoy life and 'leave the rest to Allah'.[16]

Malaysia is a multi-ethnic society with people of different religions living in the same society. In 2007, nine out of 13 of Malaysia's national public holidays were related to religion. Despite the diverse religions in this country, there was a lack of research examining the possible relationship of religion and religiosity in T2D patients. It is important for primary care physicians to understand the potential effect of religions and religiosity on glycaemic control to facilitate care in these patients.

This study thus aimed to examine the relationship between religion, religiosity and glycaemic control of T2D patients.

Methods

This study was approved by the Medical Ethical Committee, University Malaya Medical Centre (UMMC), Malaysia. It was conducted from July to September 2006 at UMMC, a university based primary care clinic in Kuala Lumpur, Malaysia. A pilot study was carried out at the primary care clinic in the first two weeks of July 2006 for feasibility prior to the study proper. There were 24 completed questionnaires in the pilot study and these were included in the final analysis as there was no alteration of questionnaires following the pilot.

All T2D patients who received regular follow-up care during the study period were included. The records of eligible patients were tagged days before their appointment. On the day of patient attendance, we approached them for consent to participate in the study. A patient information sheet was given to them and they were given questionnaires in their preferred language. The questionnaire was self-administered for those who were literate, while a face-to-face interview was conducted for those who were illiterate. Confidentiality was assured.

Patients

The inclusion criteria were T2D patients who professed religiosity or non-affiliation with any religion for at least three years, aged 30 years old and above and under follow-up care with lecturers and senior family medicine postgraduate trainees. The affiliation or non-affiliation with religions for at least three years was set arbitrarily to allow for full integration and effect of the religiousness or non-religiousness of a patient's life. T2D patients were defined as patients with the following criteria documented in their case records: 1) diagnosis of diabetes mellitus according to the World Health Organization (WHO) criteria; or 2) currently on dietary control, oral antidiabetics or insulin for diabetes. An age of 30 years old and above was used in order to identify a cohort

of mature adults with relatively established and routine lifestyles. The inclusion of patients from the follow-up list of senior doctors aimed to reduce possible disparity in the standard of diabetes care. The exclusion criteria were current smokers or ex-smokers who had stopped smoking less than five years previously and patients who consumed excessive alcohol (>36 units in men and >24 units in women in a week) or had psychiatric disorders, end stage renal disease (ESRD), decompensated heart failure or a recent massive stroke that had led to loss of independence and/or dysphasia. We chose these exclusion criteria to control for potential effect on religiosity and glycaemic control of major events or debilitation of health.

Study questionnaires and instruments

A structured questionnaire was used to obtain demographic data such as age, gender, marital status, educational level, employment status, frequency of exercise per week, alcohol and cigarette consumption, religion and the duration of religious belief.

The Beliefs and Values Scale (BV) is used to measure religiosity for people from a broad range of social, ethnic and religious backgrounds.[17] It has high test–retest consistency (weighted Kappa >0.5) and its internal consistency is 0.94. It has 20 items, each with a Likert scale of five possible responses; strongly disagree (score 0) to strongly agree (score 4). The range of scores is 0 to 80. A high score indicates strong religious belief that has a great influence on a person's life. The questionnaire was translated into Malay and Mandarin using the forward and backward translation method. Permission to use the questionnaires was obtained from the authors.

Indicators of glycaemic control

Diabetes control was measured by the mean value of fasting plasma glucose (FPG) and HbA1c levels taken from the latest three documented readings within the last three years from the patient's record. The reason for using the latest three readings within the last three years was to allow for a time lapse for the possible effect of religiosity on a patient's glycaemic control. Data on height, weight and prescribed anti-diabetics were recorded.

Statistical analysis

Data were entered and analysed using SPSS version 17. All data were tested for normality. The Chi square test was used to test for possible differences in nominal variables while the student's *t*-test was used for continuous variables. The ANOVA test (analysis of variance) and the *post hoc* Scheffé test were used for comparison within groups of parametric data and the Kruskal–Wallis test for comparison of non-parametric data. Simple and partial correlations were determined for possible continuous relationship and a stepwise multiple linear regression analysis was performed to determine independent associations. The test of significance was two-tailed, with a p value of less than 0.05 set as statistically significant.

Results

We approached 275 patients; 238 were eligible, 37 were excluded and 50 declined. A total of 188 patients participated (a response rate of 79%) and adding the 24 participants from the pilot study, 212 patients' data were analysed. The reasons for refusal were as follows: not interested, too much time commitment, already taking part in research or fatigue.

Table 1 summarises the demography of the participants. The mean age was 62.7 (SD 10.8) years. Two-thirds were female, married and had secondary education or above. The three main ethnic groups were fairly evenly represented. Most were retirees and home managers. Chinese participants were significantly older (67.4 years) than Malay (59.1 years) and Indian (61.1 years; $F = 8.754$, df = 3, $p < 0.0001$).

The mean duration of the T2D of participants was 11.74 (SD 6.7) years and the mean body mass index was 26.6 (SD 4.79). There were 58 (27.4%) who exercised more than three times per week, 88 (41.5%) who exercised less than three times per week, 65 (30.7%) who did not do exercise at all and one who did not answer. There was a significant association between ethnic groups and exercising more than three times per week (Chinese 46.5%, Indian 34.5%, Malay 19%; $\chi^2 = 10.86$, df = 4, $p = 0.028$).

Islam was the most common religion participants professed, followed by Hinduism, Buddhism and Christianity. There were 11 (5.2%) patients who did not observe any specific religion; but of these 11, two claimed to be religious and one to be spiritual. All the Malay participants were Moslem, while the Chinese embraced a variety of religions other from Hinduism and 14.5% of Chinese did not observe a religion. The majority of Indians were Hindus.

Table 2 shows significant associations between BV scores and ethnic groups as well as religions ($F = 16.7$, $p<0.0001$ for both). *Post hoc* analysis showed

Table 1 Demography of participants ($n = 212$). Mean age 62.7 (SD 10.8)

Demography	Participants, *n* (%)
Female	139 (65.6)
Race	
Malay	68 (32.1)
Chinese	69 (32.5)
Indian	72 (34.0)
Other	3 (1.4)
Marital status	
Married/living with partner	151 (71.2)
Single/divorced/widow/ separated	58 (27.4)
Missing	3 (1.4)
Educational level	
None	15 (7.1)
Primary	53 (25.0)
Secondary	102 (48.1)
Tertiary (college)	42 (19.8)
Employment status	
Employed	46 (21.7)
Retiree/home manager	162 (76.4)
Unemployed	4 (1.9)

that the mean BV scores for Chinese were significantly lower than those for the Malays and the Indians. For BV scores and religions, post hoc analysis showed that the mean BV score of the Buddhists was significantly lower than that of the Moslems, the Christians, the Roman Catholics and the Hindus. In addition, atheists also had significantly lower BV scores than Moslems, Christians, Roman Catholics and Hindus.

The mean FPG was 9 mmol/l (SD 2.76, 95% CI 8.60–9.40); 17 (8%) participants achieved an FPG $\leq$6.0 mmol/l. The mean HbA1c level was 8.1% (SD 1.41, 95% CI 7.87–8.26); 50 (23.6%) participants had HbA1c levels $\leq$ 7%. There were no significant association found between ethnic groups and FPG, but a significant association was found between ethnic groups and HbA1c ($F = 5.491$, $p = 0.005$, df = 2). Scheffé *post hoc* analysis showed the mean HbA1c level of the Chinese was significantly lower than that of the Malays and the Indians.

BV score and glycaemic control

A significant, negative correlation was found between BV score and FPG ($r = –0.16$, $p = 0.029$, $n = 192$). However, no correlation was found between BV scores and HbA1c levels. Stepwise regression analysis showed BV score and FPG were independently associated after controlling for age, employ-

Table 2 Analysis of variance for BV scores by ethnic and religious groups

	Variable	*n*	Mean	Standard deviation	95% CI for mean		*F* statistic[a] (df)	*p*-value
					Lower band	Upper band		
Ethnicity	Malay	60	62.12	8.689	59.87	64.36	16.695 (2, 190)	<0.0001
	Chinese	64	51.73	11.669	48.82	54.65		
	Indian	69	58.75	10.393	56.26	61.25		
	Total	193	57.42	11.028	55.85	58.99		
Religious group	Does not observe a religion/atheist	11	41.18	11.669	33.34	49.02	16.673 (5, 187)	<0.0001
	Moslem	63	61.31	9.053	59.05	63.57		
	Buddhist	31	48.35	9.489	44.87	51.84		
	Hindu	50	58.56	9.251	55.98	61.13		
	Christian	27	60.11	8.069	56.92	63.30		
	Roman Catholic	11	63.45	10.949	56.10	70.81		
	Total	193	57.42	11.028	55.85	58.99		

[a] One-way ANOVA test

ment status and insulin use ($r^2 = 0.025$, $\beta = -0.157$ CI –0.07 to –0.004, $p = 0.029$).

Religions and glycaemic control

Table 3 shows that there was no significant association found between religions and FPG level but a significant association was seen between religions and HbA1c level. Christians, atheists, Roman Catholics and Buddists had lower mean rank HbA1c than other religions. Moslems had the highest mean rank HbA1c.

Religion-specific BV scores and glycaemic control

No significant correlation was found between religion-specific BV scores and glycaemic control except for amongst Moslems. A negative correlation was found between Moslems' BV score and HbA1c level ($r = -0.34$, $p = 0.007$). The correlation was still significant after controlling for the duration of diabetes ($r = -0.37$, $p = 0.007$).

Most atheists had good glycaemic control – 90.9% of them were Chinese and 54.5% were male. A total of 96.9% of the Buddhists were Chinese but their FPG and HbA1c profiles were no better than those of the Christians, who were 34.5% Indian (Table 3).

Discussion

Many participants were married, retired, elderly and female with a longer than ten-year history of T2D. Most were obese and only a quarter exercised more than three times per week. Mean diabetes control was poor.

We found religiosity had a negative correlation with FPG and was a predictor for FPG level. A higher BV score or religiosity was predictive of better FPG and hence short-term glycaemic control. However, we did not find any significant association between religiosity and HbA1c level. This was consistent with Smith *et al* who reported a significant association between Moral-Religious Emphasis, a measure of relationships between partners that emphasises moral and ethical issues and values, and lower blood glucose levels.[18] Swank *et al* have also shown that attendance at religious services and having regular contact with a religious leader were not associated with HbA1c levels.[19] It remains inconclusive why religiosity should be associated with FPG level, a short-term glycaemic measure, but not with HbA1c level, a longer-term measure of diabetes control.

However, religion was found to be significantly associated with HbA1c but not FPG level. Christians, atheists, Roman Catholics and Buddhists had significantly lower mean rank HbA1c when compared with other religions. A similar trend of findings was seen in FPG but was not significant. Christians had the lowest mean ranks for both FPG and HbA1c, while atheists had the second lowest. Most of the

Table 3 Kruskal–Wallis test on specific religions and T2D control

		n	Mean rank	Chi-square, df	*p*-value
FPG (mmol/l)	Does not observe a religion/atheist	11	86.32	5.248, 5	0.386
	Moslem	60	101.91		
	Buddhist	30	94.37		
	Hindu	49	99.44		
	Christian	27	75.52		
	Roman Catholic	11	87.23		
	Total	188			
HbA1c (%)	Does not observe a religion/atheist	11	79.77	11.536, 5	0.042
	Moslem	60	111.08		
	Buddhist	31	82.47		
	Hindu	49	99.52		
	Christian	27	77.46		
	Roman Catholic	11	80.73		
	Total	189			

atheists and Buddhists were Chinese but their FPG and HbA1c levels were higher than the Christians, of whom one-third were Indian. This is consistent with other studies in western countries that showed that church-going religion has positive associations with survival.[20]

We also found that despite the fact that Chinese were significantly older and less religious, they had the lowest mean HbA1c level among the three main ethnic groups, followed by the Indians and the Malays. This was consistent with a study in Singapore that found Chinese fared best among ethnic groups in their diabetes control.[21] It was unclear if Christian religion or Chinese ethnicity was the reason for better glycaemic control. However, Chinese were found to exercise more and were probably more health conscious. Therefore, having better glycaemic control could be due to religious belief or it could reflect a healthier lifestyle that may or may not be associated to religion. In addition, cultural differences, socioeconomic factors,[22] availability of healthcare facilities,[23] genetics and insulin sensitivity,[24] which this study did not look into, could influence glycaemic control. Culture, which is defined by the Bureau of Primary Health Care as 'the shared values, traditions, norms, customs, arts, history, folklore, and institutions of a group of people'[25] interact with socioeconomic factors to affect health behaviours.[26]

We also found Moslems had the highest mean rank for FPG and HbA1c compared to other religions and thus had poorer glycaemic control. Moslems believe in submitting to the will of Allah and thus they may not take as much care of their glycaemic control but may leave it to fate.[27] Naeem has also shown that diabetic Kashmiri men who were generally Moslem failed to self manage because of their couldn't care less attitude and belief.[16] However, within the Moslem group, those with higher religiosity were associated with lower HbA1c levels despite having significantly higher BMIs and lower frequency of exercise. This could be attributed to the effect of religiosity on glycaemic control as the will and motivation are important elements in successful diabetes self care.[28] It could also be attributed to the possible indirect effect of religious beliefs and practices on health and healthy behaviors.[29,30] These healthy behaviours include less smoking and lower alcohol consumption, physical activity and good eating habits.[31] Religious involvement may also function as a coping mechanism in response to a perceived stressor, which may reduce stress and despair and provide a sense of inner peace, contentment, life satisfaction, socioemotional support, crisis intervention resources and counselling.[32–35] Malaysia is a culture rich country and religions play an essential role in shaping the life of their followers. It is difficult to determine whether religion or culture determines one's health behaviour or glycaemic control, or rather whether it is the interplay between the two that shapes one's health behaviour.

We produced conflicting findings on religion and religiosity and glycaemic control in T2D. This study was limited by convenience sampling and the findings cannot be generalised. In addition, there could be bias in the exclusion of patients with addiction to smoking and alcohol. Nevertheless, it gives an insight into the possible relationship between religions and religiosity and glycaemic control that needs to be confirmed by further studies.

Conclusion

We found religiosity was associated with short-term but not long-term glycaemic control. Religion on the other hand was significantly associated with long-term but not short-term glycaemic control. Among the religious groups Christians had the lowest mean ranks for both FPG and HbA1c whilst of the ethnic groups the Chinese had the lowest HbA1C level. The reasons for these differences need to be ascertained in future studies.

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ETHICAL APPROVAL

This study was approved by the Medical Ethical Committee, University Malaya Medical Centre (UMMC), Malaysia.

CONFLICTS OF INTEREST

None.

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