Are Religions "Healthy"? A Review on Religious Recommendations on Diet and Lifestyle

Katerina O. Sarri, Siobhan Higgins and Anthony G. Kafatos

INTRODUCTION

The debate over religions and their putative health benefits has attracted both scientific and popular interest. However, it is only during the past two decades that well-designed studies have been conducted and the relationship between religious beliefs or practices and different kinds of physical illness, mortality and mental health have been studied (Mathews et al., 1998; Koenig, 2001b). In fact, the number of articles presenting original research on the relationship between religion, spirituality and health has increased six-fold and now exceeds 1200 (Koenig, 2000; Koenig, 2001b).

A large number of up to date studies have shown that disease prevalence, incidence and mortality differ from one population to another. This is partly attributed to their differences in lifestyle, dietary habits and other specific characteristics that are influenced to a great extent by their religious traditions and practices (Armstrong et al., 1983; Jarvis and Northcott, 1987; Shaper, 1987; Savage and Harlan, 1991; Hughes et al., 1996)

Religion has been an important factor in shaping beliefs in the past. A recent study of outpatients found that patients who were religious adherents were more likely to hold beliefs that could affect health-care choices than those with no adherence to any religion (Ehman et al., 1999).

Therefore, the assessment of the determinants of dietary and other health behaviours in cultural and religious groups can provide significant information on the interactive consequences of social, environmental and biological influences on disease prevalence and outcome.

METHODS

In this review, Medline, PubMed, and OVID online database searches have been performed, using all combinations of religion/ religiosity/ spirituality/ Muslims/ Christians/ Orthodox/ Protestants/ Jews/ Seventh-Day Adventists/ Buddhists/ Amish/ Catholics/ Mormons/ Jehovah's witnesses/ cancer / coronary/ heart/ cardiovascular/ chronic/ stroke/ atherosclerosis/ diabetes mellitus/ obesity/ body composition/ blood lipids/ risk factors. Additional articles have been retrieved by scrutinizing reference lists of published articles.

The following inclusion criteria have been used:

- Studies on the most widely known religions (Christians, Muslims, Jews, Seventh-Day Adventists, Buddhists) have been included.
- Studies published from 1993 onwards. However, for the religious groups of Jews and Buddhists no articles fulfilling the inclusion criteria were published after 1993. Therefore, the most recently published articles have been included.
- The search included all types of studies, but only epidemiological studies were found.
- Only studies reporting on original data have been included in the table.
- Only articles on the direct and indirect effect of religious dietary and lifestyle doctrines on health outcomes have been included. Articles that deal with risk factors or health outcomes of a specific religious group without taking into consideration the impact of the religious practices on those health outcomes have not been included.

Tables 1-5 summarized the selected literature used on the effects of selected religions on health outcomes.

RELIGIOUS FOOD PRACTICES

For many religions, ritual and ceremony surrounding food can provide nourishment for the spirit as well as for the body. As with national groups, religious groups derive their distinct identity in part from special foodways.

The religious dietary restrictions may include what foods are allowed to be consumed, what to eat on certain days of the year, what time of day to eat, how to prepare food and when and how long to fast (Fieldhouse, 1986).

For instance, devout Seventh-day Adventists are non-smokers, they drink little alcohol and coffee and they mostly practice a lacto-ovo vegetarian diet.

On the other hand, the majority of Hindus and Buddhists eat no meat, fish, seafood, eggs and dairy products (with the exception of milk) at all, while the adherents of Judaism and Islam are forbidden to consume pork, its' products and all carnivorous animals if not slaughtered and prepared in the appropriate way (Brooks, 2004).

Moreover, Muslims abstain from food and drink in daylight hours during the month of Ramadan. Although Ramadan fasting is a very strict religious rule, some special groups of people such as elderly persons in poor health, pregnant and nursing women, menstruating women, sick people, travelers and individuals doing hard labour are exempted (Brooks, 2004).

Finally, the Catholic Church used to prohibit meat on Fridays, while the Orthodox Christian Church recommends a total of 180-200 days of fasting per year including three major fasting periods: the Nativity Fast, Easter Lent and the Assumption (Rosen, 1997; Mahan and Escott Stump, 1998). Overall, the Orthodox Christian Church prohibits the consumption of meat, dairy products, olive oil, and occasionally fish on fasting days, while seafood is allowed in all fasting periods.

Although food is an important part of religious observance in many different religions, the role of food in religious practices varies among individuals and communities, and not all members of a religion follow the same food practices.

IMPACT OF SELECTED RELIGIONS ON HEALTH OUTCOMES

In this review, 19 of the most recent studies are presented (Tables 1-5), two of which (Ogata et al., 1984; Pan et al., 1993) were also reviewed by Shatenstein et al., (Shatenstein and Ghadirian, 1998). Their overall aim was to investigate the association between religiosity and the onset of, or recovery from, a broad range of medical conditions. Although the all-inclusive evidence is suggestive of a causal association, it is not however conclusive.

EVIDENCE ON MUSLIMS

Out of the 10 studies presented in Table 1, 5 were performed in healthy subjects (Maislos et al., 1993; el Ati et al., 1995; Adlouni et al., 1997; Adlouni et al., 1998; Maislos et al., 1998; Temizhan et al., 2000), 1 in patients with stroke (Akhnan et al., 2000), 3 in hospitalised patients with acute coronary heart disease (CHD) events (Temizhan et al., 1999) and 1 in hyperlipidaemic patients (Akanji et al., 2000).

Ramadan fasting reduced blood lipids in 3 (Maislos et al., 1993; Adlouni et al., 1997; Adlouni et al., 1998; Temizhan et al., 2000) out of the 5 studies that looked into this effect. In particular, Maislos et al. (1993) found that a single evening meal during Ramadan reduces the ratios of total cholesterol (TC):HDL cholesterol and LDL:HDL cholesterol ($p<0.001$), while it increases significantly HDL cholesterol and apo A-1, the main protein component of HDL cholesterol, suggesting that this change of eating behaviour during Ramadan might be responsible for these beneficial effects. However, no effect was found on other blood lipids such as total cholesterol, LDL, VLDL and triglycerides.

It is noteworthy that during Ramadan, fasting TC was reduced by 7.9%, triglycerides by 30%, LDL by 11.7% and HDL was increased by 14.3% (Adlouni et al., 1997; Adlouni et al., 1998). All these changes were statistically significant and were maintained for one month after the end of Ramadan. As with Maislos et al. (1993) Adlouni et al. (1997; 1998) also found a significant increase of post-Ramadan apo A-1 by 11.8%.

The remaining two studies found no overall difference in levels of blood lipids before, during or after the month of Ramadan fasting with the exception of increased apo A-1 levels and apo A-1: apo B ratio (Akanji et al., 2000), as well as increased levels of post-Ramadan HDL cholesterol, which returned to its initial levels after 4 weeks (Maislos et al., 1998).

Similar to the above, the findings on body weight were also inconsistent. Table 1 shows that four out of 6 studies concluded that Ramadan fasting had no impact on body weight (Maislos et al., 1993; el Ati et al., 1995; Maislos et al., 1998; Akanji et al., 2000) or body composition (el Ati et al., 1995). However, this was difficult to interpret since reported physical activity was reduced (Maislos et al., 1993; el Ati et al., 1995), and energy intake was unchanged during Ramadan (el Ati et al., 1995; Afifi, 1997; Maislos et al., 1998). Contrary to these findings, Temizhan et al. (2000) and Adlouni et al. (1997; 1998) found significant reductions in body weight after Ramadan fasting, with the changes being greater in men than in women of middle socio-economic status (Temizhan et al., 2000). Nevertheless, the increase of total energy intake during Ramadan found by Adlouni et al. (1997; 1998) cannot explain the reductions in body weight.

Dietary information was collected in only 4 studies (Maislos et al., 1993; el Ati et al., 1995;

Table 1: Muslims and health outcomes

Author	*Religious group*	*Country – Type of study*	*Sample size*	*Dietary characteristics*	*Outcomes measured*	*Results - Statistics*
Akanji *et al.* (2000)	Muslims	Kuweit Longitudinal study	64 (33m, 31f) stable hyperlipidaemic adults (47.9± 10.7y).	Ramadan fasting.	Pre- and post-Ramadan lipid and lipoprotein profiles.	Significantly increased post-Ramadan Apo A-1 (male p=0.01, female p<0.005), apo B (male p<0.05) +apoA-1/Apo B ratio (male p<0.05). No changes in weight and blood lipids (TC, LDL, HDL, TGs) and uric acid.
Temizhan *et al.* (1994)	Muslims	Ankara	1655 Hospitalized patients with acute CHD events (58.6±11.7y)	Ramadan fasting	Effect of Ramadan fasting on CHD patients, as compared to pre- and post-	No difference in mortality rates between the periods (p>0.05). No difference in the distribution of acute CHD events between the periods (p>0.05).
Akhan *et al.* (2000).	Muslims	Turkey (Isparta) Cross-sectional	1579 patients with stroke	Ramadan fasting	Ramadan periods Effects of Ramadan fasting on stroke incidence	The incidence of stroke during the month of Ramadan was similar to that of all the remaining months. Mean age at onset of stroke was not different for Ramadan and other months of the year.
Temizhan *et al.* (2000)	Muslims	Turkey Longitudinal study	52)27f, 25m) healthy vlunteers (33±10y).	Ramadan fasting	Effect of Ramadan fasting on blood lipid levels.	Post-Ramadan total cholesterol, TGs, LDL, VLDL, and BMI were significantly decreased in both men and women (p<0.01, p<0.05, p<0.05, p<0.05, p<0.05, respectively), although in women the differences were greater. Similarly, HDL and blood glucose were increased (p<0.05, p<0.001, respectively).
Adlouni *et al.* (1997, 1998)	Muslims	Morocco Longitudinal study	32 healthy male volunteers (25-50y of age).	Ramadan fasting	Effect of Ramadan fasting on lipid and lipoprotein metabolism.	As compared to pre-Ramadan levels, during Ramadan total cholesterol, TGs, LDL and body weight decreased (p<0.001, p<0.001, p<0.0001, p<0.01 respectively), while HDL and apo A-1 increased (p<0.001, p<0.01 respectively). All the changes maintained for 1 month. During Ramadan, total energy intake increased (p<0.05), carbohydrate and protein intake increased by 1.4% and 0.4% respectively. Fat intake (of total energy) decreased by 0.7%, SFA intake decreased (p<0.05), while MUFA and PUFA intake was increased (p<0.05).
Maislos *et al.* (1998)	Muslims	Israel Longitudinal study	22 subjects fasting in Ramadan vs 16 non-fasting subjects (20-45y of age).	Ramadan fasting	Effect of a single evening meal on plasma lipids and lipoproteins.	Plasma HDL increased by 23% (p<0.001) at the end of Ramadan fasting. All the other lipoproteins were not affected. Intakes of total energy, SFA and dietary cholesterol were similar before and during Ramadan.

Table 1: Contd.....

Author	*Religious group*	*Country – Type of study*	*Sample size*	*Dietary characteristics*	*Outcomes measured*	*Results - Statistics*
Maislos *et al.* (1993)	Muslims	Israel Longitudinal study	24 healthy subjects (18-45y of age).	Ramadan fasting	Effect of a single evening meal on plasma lipids and lipoproteins.	HDL was increased by 30% at the end of Ramadan ($p<0.005$), while total cholesterol, TGs, LDL, VLDL did not change. Apo A-1 increased ($p<0.0001$), and the ratios TC/HDL and LDL/HDL decreased ($p<0.001$). Body weight did not change and physical activity was reduced.
el Ati *et al.* (1995)	Muslims	Tunisia Longitudinal study	16 healthy women (25-39y of age).	Ramadan fasting.	Effect of Ramadan fasting on anthropometric and metabolic variables.	Body weight, body composition and daily energy intake remained unchanged. The composition of the diet changed as total fat intake and animal protein increased, while carbohydrate intake decreased during Ramadan fasting. Energy expenditure and plasma insulin levels were decreased ($p<0.05$).
Chamsi-Pasha *et al*. (2004)	Muslims	Saudi Arabia Longitudinal study	86 outpatients (54m, 32f) with heart disease (17-84 y of age)	Ramadan fasting	Effect of Ramadan fasting on patients with cardiac disease.	86% of the subjects completed the fasting, 78% reported no change in their symptoms, 8% reported improvement and 11.6% reported worsening of their symptoms. No significant change in hematological or biochemical parameters.
Al Suwaidi *et al*. (2004)	Muslims	Qatar Cross-sectional study	20.856 patients with coronary syndromes	Ramadan fasting	Effect of Ramadan fasting on the incidence of AMI and unstable angina (UA).	No significant difference of the incidence of AMI or UA during Ramadan as compared to the rest of the year. Patients admitted to the hospital after Ramadan were more likely to smoke more cigarettes per day ($p<0.001$) compared to before or during Ramadan fasting.

Maislos et al., 1998). Maislos et al. (1998) described the difficulties of assessing individual intake during the Ramadan due to the nature of the fasting and the traditions that follow it. However, by using direct observation the authors found no changes in the intakes of total energy, saturated fat and dietary cholesterol during the Ramadan as compared to pre-fasting periods. Contrary to the above, Adlouni et al. (1997, 1998) found that during Ramadan there was a significant change of diet composition, such as an increase of total energy intake, as well as carbohydrate, protein and monounsaturated fatty acids (MUFA) intake, while total fat and saturated fat intake were significantly decreased. This increase in protein and fat intake was also reported in the study by el Ati et al. (1995), who, on the other hand, found no changes of total energy prior and during Ramadan fasting, while carbohydrate intake was reduced.

It needs to be mentioned, though, that the inconsistency of the findings regarding the beneficial role of Ramadan fasting on lipoprotein levels, weight and diet composition could be due to the fact that the month of Ramadan is not a strict fasting period, since Muslims are allowed to eat all kinds of foods from dust till dawn, to the small sample sizes of the studies, to the use of indirect measures of energy intake and expenditure, and to the different socio-economic status of the subjects in each study.

Finally, Ramadan fasting had no adverse effect on CHD events (Temizhan et al., 1999), mortality rates (Temizhan et al. 1999), or stroke incidence (Akhan et al., 2000) as compared to the remaining months of the year.

On the whole, some studies on Muslims suggested that Ramadan is favourable with respect to lipids and lipoprotein metabolism, while none of them showed a negative effect either on blood lipids, body weight or other risk factors for chronic diseases. On top of that, it is suggested that during the month of Ramadan stable hyperlipidaemic subjects have lower risk to develop CHD due to their increased levels of apo A1, apo A1/apoB and apo A1/HDL ratios (Akanji et al., 2000), while patients with stable cardiac disease face no detrimental effects by fasting in Ramadan (Chamsi-Pasha and Ahmed, 2004).

EVIDENCE ON SEVENTH-DAY ADVENTISTS

There are more than 230 reports associating Adventists from several parts of the world with various medical conditions (Fraser, 1999b). The reason why this is the case is that Adventists, as explained previously, do not smoke, drink no alcohol, and have very distinctive dietary habits.

Four of the most recent studies that relate Seventh-Day Adventism with risk factors for vascular diseases are presented in this paper (Table 2). Three of the studies were cross-sectional (Famodu et al., 1998; Alexander et al., 1999; Brathwaite et al., 2003), while the one cohort study presented (Fraser, 1999a) is possibly the largest cohort study ever conducted in Seventh-day Adventists to date including a cohort of almost 35,000 subjects (29.5% VEGs, 21.2% semi-VEGs, 49.2% non-VEGs) that were followed for approximately 12 years.

As shown in Table 2 non-vegetarian Seventh-Day Adventists were two times more likely to suffer from hypertension and diabetes, and had increased risk for rheumatoid arthritis and rheumatism by 50% when compared to vegetarian Seventh-Day Adventists (Fraser, 1999a). In addition, non-vegetarian Seventh-Day Adventists were more likely to have colon and prostate cancer by 88% and 54%, respectively than vegetarian Seventh-Day Adventists (Fraser, 1999a). However, prevalence of other types of cancer such as breast, uterine and lung cancer did not differ between the two groups (Fraser, 1999a). These findings were also replicated when the same population was compared to an external reference population (Mills et al., 1994). Furthermore, obesity and men's risk of fatal ischemic heart disease were related to meat consumption (Fraser, 1999a).

In a similar study by Famodu et al. (1998) vegetarian Seventh-Day Adventists had lower CVD risk factors than non-vegetarian Seventh-Day Adventists (Fraser, 1999a) (Table 2). They also had significantly lower levels of blood lipids, body weight, and dietary intakes of protein, saturated fat intake and dietary cholesterol as compared to lacto-ovo-vegetarians and non-vegetarians. The findings of an older study by Nieman et al. (1989) were similar. However, the substantially small sample size in both studies and the use of food frequency questionnaires in the study by Famodu et al. (1998) diminish the strength of these findings.

A very recent study conducted in Barbados Island also showed that self-reported vegetarian and semi-vegetarian Seventh-Day Adventists were leaner and had less risk of hypertension and diabetes as compared to non-vegetarian adherents (Brathwaite et al., 2003). These findings were greater for those who followed a vegetarian or semi-vegetarian diet for more than 5 years. However, no dietary composition data were collected and the impact of

Table 2: Seventh Day Adventists and Health Outcomes

Author	*Religious group*	*Country – Type of study*	*Sample size*	*Dietary characteristics*	*Outcomes measured*	*Results - Statistics*
Alexander *et al.* (1999)	Hispanic Seventh-Day Adventists vs Hispanic Catholics	United States (Denver, Colorado) Cross-sectional study	74 (38f, 36m) Seventh-day Adventists, (42±1.5y of age) vs 45 (27f, 22m) Catholics (44±2.2y of age).	Seventh-Day Adventists: low-fat, high dietary fiber and complex carbohydrate, semi-vegetarian diet. Catholics: typical omnivorous diet.	Risk factors for CVD and Type 2 diabetes such as dietary micronutrient composition, body composition, blood lipids, glucose, insulin, serum vitamin E, plasma ascorbic acid.	Seventh-Day Adventists had: ▪ Higher intake of dietary fiber ($p<0.001$), carbohydrates ($p<0.01$). Lower intakes of protein ($p<0.01$), total fat ($p<0.05$), SFA ($p<0.05$), dietary cholesterol ($p<0.005$). ▪ Lower BMI ($p<0.0001$) and WHR ($p<0.01$). ▪ Lower insulin and glucose concentration ($p<0.01$ and $p<0.001$ respectively). ▪ Higher HDL ($p<0.005$), lower TG ($p<0.005$) and lower LDL/HDL ratio ($p<0.05$). ▪ Higher plasma ascorbic acid ($p<0.05$) There were no differences in serum vitamin E, total energy intake and micronutrients.
Brathwaite *et al.* (2003)	Seventh-Day Adventists	Barbados Island Cross-sectional study	407 subjects (37.6% female, 62.4% male).	Self-reported VEGs & semi-VEGs (consumption of meat, poultry < 1d/wk) vs Non-VEGs.	Diabetes, hypertension, obesity, dietary status.	Non-vegetarians had a 70% increased risk of being obese (OR, 1.70; 95% CI: 1.02-2.83). Constant lower prevalence rates of diabetes and hypertension in all types of VEGs as compared to non-VEGs (hypertension: 24.3% VEGs vs 28.2% non-VEGs, diabetes: 9% VEGs vs 11.3% non-VEGs).
Famodu *et al.* (1998)	Seventh-Day Adventists (Black African)	Nigeria Cross-sectional	Vegetarians (n=8), Semi-vegetarians (n=28), non-vegetarians (n=40). 18-60y of age	VEGs: no meat, eggs, dairy. No alcohol, smoking and caffeinated beverages. LOV: no meat, but eat dairy and eggs. NON-VEGs: mixed diet	Association of diet with hypercholesterolaemia and hypertriglyceridaemia as a risk factor for vascular diseases.	VEGs had lower intakes of protein, SFA and dietary cholesterol as compared to the other two groups ($p<0.05$). Fiber intake was higher in VEGs ($p<0.01$) versus in SEMI-VEGs ($p<0.05$). VEGs had lower BMI and waist circumference than SEMI-VEGs ($p<0.05$) and NON-VEGs ($p<0.001$). VEGs had lower serum cholesterol and TGs ($p<0.05$) than NON-VEGs. No significant differenced in blood pressure and blood glucose among the 3 groups.
Fraser *et al.* (1999a)	Seventh-Day Adventists (non-Hispanic white)	USA (California) Cohort study 1976-1988.	Total sample 34.192 men and women >25y of age.	VEGs (29.5%): no fish,meat, poultry. SEMI-VEGs (21.2%): eat fish and poultry <1time/week NON-VEGs (49.2%): mixed diet	Association of diet with chronic diseases.	As compared to VEGs, NON-VEGs were more likely to have hypertension (male AOR, 2.23; 95% CI:1.96-2.52, $p=0.0001$, and female AOR, 2.24; 95% CI:2.05-2.44, $p=0.0001$), diabetes (male AOR, 1.97; 95% CI:1.56-2.47, $p=0.0001$, and female AOR, 1.93; 95% CI:1.65-2.25, $p=0.0001$), rheumatoid arthritis (male AOR, 1.50; 95% CI:1.16-1.95, $p=0.005$, and female AOR, 1.57; 95% CI:1.35-1.83, $p=0.0001$) and rheumatism (male AOR, 1.48; 95% CI:1.31-1.68, $p=0.0001$, and female AOR, 1.61; 95% CI:1.49-1.75, $p=0.0001$).

Table 2: Contd.....

Author	*Religious group*	*Country – Type of study*	*Sample size*	*Dietary characteristics*	*Outcomes measured*	*Results - Statistics*
						Obesity, as measured by BMI, increased as meat consumption increased (p=0.0001). The risk of fatal IHD was related to beef consumption in men (p<0.0001) Foods that predicted risk of IHD were nuts and whole-grain bread. Colon and prostate cancer were more common among the NON-VEGs as compared to VEGs (AOR, 1.88; 95% CI: 1.24-2.87, and AOR 1.54; 95% CI: 1.05-2.26, respectively). Other types of cancer like breast, uterine and lung were not statistically different between the two groups.

Table 3. Orthodox Christians and health outcomes

Author	*Religious group*	*Country – Type of study*	*Sample size*	*Dietary characteristics*	*Outcomes measured*	*Results - Statistics*
Sarri *et al.* (2003, 2004)	Orthodox Christians	Greece (Crete) Longitudinal study	120 healthy volunteers (60 strict fasters – (42±12y of age vs 60 controls –) (38±9y of age).	Orthodox Church dietary doctrines that involve ~200 days of various types of fasting.	Effect of Orthodox Christian fasting on blood lipids and obesity.	Compared to controls, fasters had decreased end-fasting total cholesterol, LDL and BMI (p<0.001), and decreased LDL/HDL ratio (p<0.05). Compared to controls, fasters had decreased end-fasting energy intake (p<0.05), decreased SFA, dietary cholesterol, total fat, trans f.a and protein intakes (p<0.001), increased end-fasting dietary fibre (p<0.001) and folate intake (p<0.05), and increased consumption of fruit and vegetables (p<0.001).
Kafatos *et al.* (2000)	Orthodox Christians	Greece (Crete) Longitudinal study	Diet A: Cretan males participating in the 7 Countries Study (n-15). Diet B: Cretan adolescents (n=not specified). Diet C: Christian Orthodox Nun (n=1)	Diet A: traditional Mediterranean diet (7 Countries Study) Diet B: adolescents' diet Diet C: Orthodox Nun's diet (during fasting period)	Describe different types of Cretan diets.	Compared to Diet A and B, Diet C (Christian Orthodox nun) was higher in fruit, vegetables end legumes intakes. Also it was higher in total energy, vitamin B6, fiber and antioxidant intakes. However, it was lower in sfa and dietary cholesterol.

religiosity on health and diet was not analyzed. In this context, the authors recommended that the data should be further analysed and the level of religiosity of the subjects should be taken into consideration.

Finally, Alexander et al. (1999) found that semi-vegetarian Seventh-Day Adventists had lower levels of several risk factors for CVD and Type 2 diabetes when compared to Catholic omnivores. Although total energy intake did not differ between the two populations, Seventh-Day Adventists ate less dietary fat and more dietary fiber than the Catholics, while their blood lipid profile was also better and they weighed less (Table 2). These differences could be attributed to the increased consumption of fruits and vegetables and the limited consumption of flesh foods, which is related to a more favorable CVD risk factor profile than an omnivorous diet. However, it needs to be mentioned that the small sample size and the fact that all the subjects were volunteers might have biased the results.

Nevertheless, Seventh-day Adventists either vegetarians or not seem to have lower risk of nutrition related chronic degenerative diseases when compared to the average population (Harman and Parnell, 1998).

EVIDENCE ON ORTHODOX CHRISTIANS

There is a lack of studies on Orthodox Christians' dietary habits and their potential impact on health. Table 3 presents the only two studies that were found.

In one of their studies, Kafatos et al. (2000) reported that the Orthodox Christian nun's diet, which was chemically analysed, was significantly higher in fiber and antioxidant intakes and lower in saturated fat and dietary cholesterol intakes as compared to adolescents and adults of the same region (Table 3). This study, however, did not report on any health outcomes since it was part of a larger study regarding the validity of a dietary database.

One step further was the study by Sarri et al. (2003, 2004), who focused on the impact of the adherence to the religious rituals of the Orthodox Christian Church to health (Table 3). In fact, this is the only study performed and published to date. Sarri et al. (2003, 2004) suggested that following the fasting regimes laid down by the Greek Orthodox Church significantly decreased blood lipid levels and body weight and ensured a healthier dietary profile, which could subsequently reduce the chances of suffering from heart disease. Furthermore, strict Orthodox Christians followed a healthier lifestyle in respect of smoking, where only 4% of them smoked regularly compared to 55% of the controls, and drinking alcohol, where strict Orthodox Christians consumed two times less amount of alcoholic drinks throughout the whole year than the controls (Sarri et al. 2004). In addition, it was found that the fasting rituals of the Orthodox Christian Church do not adversely influence iron status or increase the risk of iron deficiency anaemia (Sarri et al., 2005). However, these findings cannot be extrapolated to all Orthodox Christians, since the sample size was small, no power calculation was used and all the subjects were volunteers. Still, the findings showed that the Orthodox Christian diet might have positive health effects and could be used as a proxy for future studies.

Furthermore, Chliaoutakis et al. (2002), showed that Orthodox Christian religiosity was positively associated with 'healthful nutrition', personal hygiene, increased physical activity and feelings of relaxation and life satisfaction.

The beneficial effects of the Orthodox Christian lifestyle were also highlighted by Professor Cannon in a recent editorial (2004). The author pointed out the weakness of the Seven-Countries Study, which was the kick-off of the traditional Mediterranean food systems, in examining the fasting practices of the Cretan study participants in the 1960's, which were undoubtedly a key determinant of the dietary habits of that time. Professor Aravanis, responsible for carrying out the Seven Countries Study in Greece, who stated, in a personal communication that we had with him, that 60% of the Cretan study participants fasted regularly in all fasting periods, also verified this (Sarri et al., 2005).

EVIDENCE ON JEWISH

Similar to Orthodox Christians, there are also very few studies on Jewish people. Due to this paucity of data, Table 4 presents only one study that fulfilled most of the inclusion criteria, as it is explained in the methods section (Friedlander et al., 1985, 1987).

In a group of Jewish adolescents, religious observance was associated with favorable levels of plasma lipids and lipoproteins. Orthodox Jews, who did not consume dairy and meat products together, had certain constraints on food-buying habits and on eating out, had a better lipid profile and lower mean body mass index than secular Jews (Table 4) (Friedlander et al., 1985, 1987). These differences were attributed at least partly to the traditional

Table 4: Jews and health outcomes

Author	*Religious group*	*Country – Type of study*	*Sample size*	*Dietary characteristics*	*Outcomes measured*	*Results - Statistics*
Friedlander *et al.* (1985, 1987)	Jews	Jerusalem	673 teenagers 17-18 yrs of age.	Secular Jews consume more total fat, SFA and fewer carbohydrates than orthodox Jews who are less exposed to cultural changes and are more constrained on consuming food outside the home.	Lifestyle differences (smoking, dietary habits, blood lipid levels) between orthodox and secular Jews	Secular Jews had higher prevalence of smoking, higher levels of plasma cholesterol ($p<0.05$), TGs ($p<0.05$), and LDL ($p<0.05$), and lower HDL (statistically non-significant). Children's environment was the strongest predictor for TC, TGs and HDL ($p\leq 0.01$). Secular Jews consumed more total fat ($p<0.05$), SFA ($p<0.05$) and fewer carbohydrates ($p<0.05$) than orthodox Jews.

Table 5: Buddhists and health outcomes

Author	*Religious group*	*Country – Type of study*	*Sample size*	*Dietary characteristics*	*Outcomes measured*	*Results - Statistics*
Ogata *et al.* (1984)	Zen Buddhist priests	Japan Cohort study with a follow up of 23 years (1955-1978)	4352 Japanese male Zen priests (all ages).	Traditional Japanese diet	Mortality rates.	Low all-cause mortality ($p<0.001$). Compared with the general Japanese male population, Zen priests smoke less, eat less meat and fish and live in less polluted areas. Drinking habits are similar in the two populations.
Pan *et al.* (1993)	Buddhists	China Longitudinal study	55 young Chinese Buddhist VEGs vs 59 Chinese medical students (20-30y old).	Buddhist vegetarian diet	Plasma lipids, apolipoproteins, glucose, uric acid, haemostatic factors	Vegetarian Buddhists had lower BMI ($p<0.05$), plasma cholesterol (only in men $p<0.05$), glucose ($p<0.05$), uric acid ($p<0.05$), apolipoprotein A-1: B ratio ($p<0.05$). No effects were found on haemostatic factors (fibrinogen, factor VIIc, factor VIIIc, plasminogen). Vegetarian Buddhists' diet is high in carbohydrates ($p<0.05$) and PUFA ($p<0.05$), while it is low in SFA and MUFA ($p<0.001$).

lifestyle and dietary habits of the Orthodox Jews, who consumed less saturated fat and more carbohydrates than their secular counterparts (Friedlander et al., 1985). Although the authors concluded that religiosity is a determinant of lipid and lipoprotein concentrations, it needs to be mentioned that the distribution of religiosity in the study's sample did not reflect the underlying population distribution in Jerusalem. Additionally, the limited age range of the study's population does not allow extrapolation of the findings to the wider population, while the paucity of dietary data and other information on environmental and psychosocial factors limits the understanding of the findings.

EVIDENCE ON BUDDHISTS

Zen Buddhists were known for their strict discipline and ascetic exercise since they used to be strict vegans and abstain from drinking and smoking, and other social behaviours. However, nowadays their dietary habits and lifestyle are more flexible. Ogata et al. (Ogata et al., 1984) found lower mortality from tuberculosis, hypertensive diseases, cerebrovascular diseases, cancer of the respiratory organs and cancer of the lung in a group of Zen Buddhists as compared to the general population (Table 5). Additionally, Zen Buddhists ate meat and fish less frequently and vegetables more frequently than their counterparts, although no analytical dietary data was available. However, as stated by the authors, there could be a selection bias since Zen priests have to be physically and mentally healthy in order to be able to undergo the necessary strict training process (Ogata et al., 1984).

In another study by Pan et al. (1993) where plasma lipids and other haemostatic factors were compared between Chinese Buddhist vegetarians and Chinese omnivores, it was found that Buddhists had significantly lower levels of plasma cholesterol, uric acid and glucose, while no differences were found in other haemostatic factors (Table 5). As regards their dietary patterns, Buddhists' diet was significantly lower in total fat and protein by 7% and 3% respectively, significantly lower in SFA and MUFA, and higher in PUFA intake, and, finally, higher in carbohydrates by 10% as compared to their omnivore counterparts.

Overall, the beneficial health effects found in Buddhists' diet cannot be solely attributed to their religious adherence. Vegetarianism and healthy lifestyle, followed by Zen priests, are known to be health promoting irrespective of religion. Thus, the findings described above are not surprising.

EVIDENCE ON OTHER RELIGIONS

The Amish is a religious group that intentionally tries through their religious beliefs and practices to stay away from the modern world and all the developmental changes that occur. There are no systematic studies on their dietary patterns and their potential effects on health. However, one study by Fuchs et al. (1990) showed that Amish people, compared to a non-Amish population, had lower prevalence of circulatory diseases and hypertension and lower mortality rates. This study was based on telephone interviews, which enhances the chances of response bias.

Another religious group that has drawn little 'scientific attention' within the context of this review is the Catholics. This is because Catholics do not tend to follow any specific religious dietary practices or lifestyle. Even the abstinence from meat on Fridays that used to be kept is now abandoned. Nevertheless, a cohort study with a follow-up of more than 20 years which was conducted in Glasgow in Scotland, showed that Irish Catholic migrants had poorer health, higher psychological distress scores, and higher prevalence of disabilities and impairments as compared to non-Catholics (Abbotts et al., 1997). In addition, Catholics were shorter, had higher waist-to-hip ratios, and were more likely to be current smokers. However, these findings were mostly associated with the subjects' poor socio-economic status rather than their religious dietary practices, and with the fact that minority groups are usually at some disadvantage with respect to their equal opportunities to a healthy lifestyle.

On the contrary, a study on Korean Americans (Kim et al., 2000) concluded that participants that did not belong to any religion or had a non-Christian background were 16.5 times more likely to smoke cigarettes compared to Christians.

Lastly, there were no published dietary studies to date among Mormons or Jehova's witnesses. Both religious groups follow very strict dietary doctrines, proving in this way their spirituality (Brooks, 2004), they avoid smoking and drinking alcohol, while Mormons abstain from drinking tea, coffee or any other drinks containing caffeine (Brooks, 2004). Nevertheless, Mormons have been found to experience lower mortality from chronic diseases than the general population (Jarvis, 1977), while, on the other hand, Jehova's witnesses' religiously

instigated refusal of blood transfusions can have life threatening effects.

CAUSAL PATHWAYS

There are a number of pathways by which a causal association between religiosity and physical health might operate.

To start with, adherence to a religion is one of the most predominant factors in shaping behaviours. The dietary restrictions and the prohibitions against unhealthy habits such as smoking and drug use, as well as the encouragement for adopting healthy behaviours like regular exercise can result in lower rates of chronic diseases or even greater life expectancy (Hummer et al., 1999; Koenig et al., 1999). For example, the Orthodox Christian Church prohibits the consumption of meat, dairy products, fats and olive oil in almost all fasting days. These restrictions lead to decreased total energy intake, total fat and saturated fat intake, which in their turn cause reductions in blood lipid levels, body weight and blood pressure (Sarri et al, unpublished data).

Another study (Reindl Benjamins and Brown, 2004) also showed that religious involvement was associated with significantly greater use of preventative care services, while other studies related religiousness with the promotion of health-promoting behaviours such as healthy diet, exercise, avoidance of alcohol, smoking and drug use, and adolescent contraceptive use (Chatters, 2000; Chliaoutakis et al., 2002).

Another causal pathway suggested is the enhanced social support that people receive when engaged in religious practices, which could be associated with health-related behaviours (Oman and Reed, 1998; Oman and Thoresen, 2002)

RELIGIOSITY AND MENTAL HEALTH

As well as a link between religion and physical health, mental health may also benefit from religious adherence. In fact, a systematic review of research on religion and mental health from the 20th century found a mainly beneficial association (Koenig, 2001). In respect of fear, anxiety or depression most of the studies showed lower rates among those religiously involved (Koenig, 2001), while the findings on religious activity and its association with the occurrence of suicide is not conclusive yet (Nisbet et al., 2000; Mueller et al., 2001).

Besides, religiousness is found to enhance coping with mental and physical illness, disability and other stressful events, which is of great importance to clinical practice (Chatters, 2000; Oman and Thoresen, 2002; van Olphen et al. 2003; Koenig et al. 2004). A study by Koenig et al. (1998) indicated that, contrary to positive religious coping, negative religious and nonreligious coping were related to poorer physical health, poorer quality of life and greater depression.

The Cretan study on Greek Orthodox Christians found that only 15.8% of the study participants were categorically depressed (Sarri et al. unpublished data) using the Beck Depression Inventory. There were no differences between Orthodox Christian strict adherents and controls- the classification was based on the subjects' fasting practices- showing that spirituality is homogeneous in Orthodox Christians and it is irrelevant to their dietary habits.

Although, the benefits of religious adherence are widely promoted, there is sufficient evidence to prove that religious adherence could also have harmful effects on health (Levin, 1994). The reasons for that would be the avoidance of health services and the exclusive dependence on clerical treatment. Furthermore, religious adherence can generate negative feelings, which, in their turn, could lead to disruption of mental tranquility and have negative physical consequences (Levin et al.,1987).

LIMITATIONS AND METHODOLOGICAL PROBLEMS IN RELIGIOUS STUDIES

Both religion and health are multidimensional terms. Religions involve several behaviours, attitudes, traditions, beliefs, values, public and private activities. On the other hand, health involves a vast range of disease states and physical or mental indicators. Additionally, the relationship of a specific religious factor to health outcomes varies across different social classes, races, ethnicities, ages and regions. Therefore, any approach to studying religions and their impact on health must necessarily leave out some aspects that are important (Peterson, 2001).

As far as research on religion and health is concerned, there are several methodological issues that need to be improved. Firstly, measuring religiousness is very complicated and there is always risk of overlooking some aspects of a religion that might have a direct effect on health (Chatters, 2000).

Another important issue is the correct selection of samples as regards their age, nationality and social class. All these factors can influence the magnitude

of the religious effect on health. In addition, the use of specific models is suggested for the correct analysis of this kind of data (Chatters, 2000).

Equally significant is the choice of study design. The retrospective collection of data in cross-sectional studies is a great barrier in determining the magnitude of the religious effect. This could be overcome by employing and designing prospective studies, though expensive and time-consuming, while there is need for clinical trials of spiritual interventions on health outcomes (Chatters, 2000).

Lastly, religious studies are also subject to publication bias (Matthews et al., 1998). The fact that only studies with statistically significant findings are published limits our overall understanding on the true magnitude of the effect that religious dietary practices could have on health status. However, this is a limitation that most research studies are exposed to.

In this review the lack of a definite causal association could be due to the fact that all of the studies presented were either cohort, cross-sectional or longitudinal, while no randomized control trials were found up to date. The cross-sectional studies collected the dietary information retrospectively by using food-frequency questionnaires and 24h dietary recalls, which were inappropriate for assessing the exact dietary intake of the period of interest and lacked sensitivity to detect true differences. Few of the studies missed out information on different things such as dietary intake and composition (Friedlander et al., 1987; Maislos et al., 1993). Furthermore, the studies varied regarding sample sizes, age ranges of the subjects, and in all studies the subjects volunteered to participate, which could possibly bias the results. The adjustment for confounding factors is clearly stated in only three of the studies (Pan et al., 1993; Fraser, 1999a; Sarri et al., 2003, 2004) while none of the studies stated an a priori hypothesis and thus their statistical power is unknown.

It needs to be mentioned, that there are insufficient or no studies on the effects of religions on some health outcomes such as osteoporosis, diabetes, atherosclerosis, nutrient deficiencies and others.

CONCLUSION

In conclusion, the evidence presented so far indicated a strong relationship between religious adherence to dietary doctrines and health, either physical or mental. Overall, it was shown that the dietary restrictions, with the exception of strict vegetarianism (vegan diet), of most of the religions might be substantially effective in preventing, treating or controlling a disease. Other aspects of religions, such as mental support, increased social activity and promotion of healthy behaviours, could also have beneficial effects on health, while, on the other hand, medical observances such as the refusal of blood transfusions by Jehova's witnesses or negative religious coping could be detrimental.

Religious adherence cannot be imposed to anyone for ethical and moral reasons and, thus, randomized controlled cross-over trials could not be conducted so as to test the causal association between religion and health. However, a vast number of independent randomized control studies have shown that all the healthy behaviors promoted by religions such as vegetarianism, periodic avoidance of meat, fats and dairy products and adoption of a healthy lifestyle, have substantial health promoting effects.

Despite the fact that the role of religion in health has been largely ignored up to now, the existing evidence is very promising and highlights the importance of considering this new approach in the planning and implementation of dietary intervention studies in order to warrant their effectiveness.

REFERENCES

Abbotts, J., Williams, R., Ford, G., Hunt, K. and West, P.: Morbidity and Irish Catholic descent in Britain: an ethnic and religious minority 150 years on. *Soc. Sci. Med.,* **45:** 3-14 (1997).

Adlouni, A., Ghalim, N., Benslimane, A., Lecerf, J.M. and Saile, R.: Fasting during Ramadan induces a marked increase in high-density lipoprotein cholesterol and decrease in low-density lipoprotein cholesterol. *Ann. Nutr. Metab.,* **41:** 242-249 (1997).

Adlouni, A., Ghalim, N., Saile, R., Had, N., Parra, H.J. and Benslimane, A.: Beneficial effect on serum apo AI, apo B and Lp AI levels of Ramadan fasting. *Clin. Chim. Acta.,* **271:** 179-189 (1998).

Afifi, Z.E.: Daily practices, study performance and health during the Ramadan fast. *J. R. Soc. Health.,* **117:** 231-235 (1997).

Akanji, A.O., Mojiminiyi, O.A. and Abdella, N.: Beneficial changes in serum apo A-1 and its ratio to apo B and HDL in stable hyperlipidaemic subjects after Ramadan fasting in Kuwait. *Eur. J. Clin. Nutr.,* **54:** 508-513 (2000).

Akhan, G., Kutluhan, S. and Koyuncuoglu, H.R.: Is there any change of stroke incidence during Ramadan? *Acta. Neurol. Scand.,* **101:** 259-261 (2000).

Alexander, H., Lockwood, L.P., Harris, M.A. and Melby, C.L.: Risk factors for cardiovascular disease and diabetes in two groups of Hispanic Americans with differing dietary habits. *J. Am. Coll. Nutr.,* **18:** 127-136 (1999).

Armstrong, B.K., Margetts, B.M., Masarei, J.R. and Hopkins, S.M.: Coronary risk factors in Italian migrants to Australia. *Am. J. Epidemiol.,* **118:** 651-658 (1983).

Brathwaite, N., Fraser, H.S., Modeste, N., Broome, H. and King, R.: Obesity, diabetes, hypertension, and vegetarian status among Seventh-Day Adventists in Barbados: preliminary results. *Ethn. Dis.,* **13:** 34-39 (2003).

Brooks, N.: Overview of religions. *Clin. Cornerstone,* **6:** 7-16 (2004).

Cannon, G.: Out of the Christmas box. *Pub. Health Nutr.,* **7:** 987-990 (2004).

Chamsi-Pasha, H. and Ahmed, W.H.: The effect of fasting in Ramadan on patients with heart disease. *Saudi Med. J.,* **25:** 47-51 (2004).

Chatters, L.M.: Religion and health: public health research and practice. *Annu. Rev. Public Health,* **21:** 335-367 (2000).

Chliaoutakis, J.E., Drakou, I., Gnardellis, C., Galariotou, S., Carra, H. and& Chliaoutaki, M.: Greek Christian Orthodox Ecclesiastical lifestyle: could it become a pattern of health-related behavior? *Prev. Med.,* **34:** 428-435 (2002).

Ehman, J.W., Ott, B.B., Short, T.H., Ciampa, R.C. and Hansen-Flaschen, J.: Do patients want physicians to inquire about their spiritual or religious beliefs if they become gravely ill? *Arch. Intern. Med.,* **159:** 1803-1806 (1999).

el Ati, J., Beji, C. and Danguir, J.: Increased fat oxidation during Ramadan fasting in healthy women: an adaptative mechanism for body-weight maintenance. *Am. J. Clin. Nutr.,* **62:** 302-307 (1995).

Famodu, A.A., Osilesi, O., Makinde, Y.O. and Osonuga, O.A.: Blood pressure and blood lipid levels among vegetarian, semi-vegetarian, and non-vegetarian native Africans. *Clin. Biochem.,* **31:** 545-549 (1998).

Fieldhousse, P.: *Food and Nutrition: Customs and Culture,* pp. 111. Croom Helm, London (1986).

Fraser, G.E.: Associations between diet and cancer, ischemic heart disease, and all-cause mortality in non-Hispanic white California Seventh-day Adventists. *Am. J. Clin. Nutr.,* **70:** 532S-538S (1999a).

Fraser, G.E.: Diet as primordial prevention in Seventh-Day Adventists. *Prev. Med.,* **29:** S18-23 (1999b).

Friedlander, Y., Kark, J.D., Kaufmann, N.A. and Stein, Y.: Coronary heart disease risk factors among religious groupings in a Jewish population sample in Jerusalem. *Am. J. Clin. Nutr.,* **42:** 511-521 (1985).

Friedlander, Y., Kark, J.D. and Stein, Y.: Religious observance and plasma lipids and lipoproteins among 17-year-old Jewish residents of Jerusalem. *Prev. Med.*, **16:** 70-79 (1987).

Fuchs, J.A., Levinson, R.M., Stoddard, R.R., Mullet, M.E. and Jones, D.H.: Health risk factors among the Amish: results of a survey. *Health Educ. Q.,* **17:** 197-211 (1990).

Harman, S.K. and Parnell, W.R.: The nutritional health of New Zealand vegetarian and non-vegetarian Seventh-day Adventists: selected vitamin, mineral and lipid levels. *N. Z. Med. J.,* **111:** 91-94 (1998).

Hughes, C.K., Tsark, J.A. and Mokuau, N.K.: Diet-related cancer in Native Hawaiians. *Cancer,* **78:** 1558-1563 (1996).

Hummer, R.A., Rogers, R.G., Nam, C.B. and Ellison, C.G.: Religious involvement and U.S. adult mortality. *Demography,* **36:** 273-285 (1999).

Jarvis, G.K.: Mormon mortality rates in Canada. *Soc. Biol.,* **24:** 294-302 (1977).

Jarvis, G.K. and Northcott, H.C.: Religion and differences in morbidity and mortality. *Soc. Sci. Med.,* **25:** 813-824 (1987).

Kafatos, A., Verhagen, H., Moschandreas, J., Apostolaki, I. and Van Westerop, J.J.: Mediterranean diet of Crete: foods and nutrient content. *J. Am. Diet. Assoc.,* **100:** 1487-1493 (2000).

Kim, K.K., Yu, E.S., Chen, E.H., Kim, J., Brintnall, R. and Vance, S.: Smoking behavior, knowledge, and beliefs among Korean Americans. *Cancer Pract.,* **8:** 223-230 (2000).

Koenig, H.G., Pargament, K.I. and Nielsen, J.: Religious coping and health status in medically ill hospitalized older adults. *J. Nerv. Ment. Dis.,* **186:** 513-521 (1998).

Koenig, H.G., Hays, J.C., Larson, D.B., George, L.K., Cohen, H.J., McCullough, M.E., Meador, K.G. and Blazer, D.G.: Does religious attendance prolong survival? A six-year follow-up study of 3,968 older adults. *J. Gerontol. A. Biol. Sci. Med. Sci.* **54:** M370-376 (1999).

Koenig, H.G.: religion, spirituality, and medicine: application to clinical practice. *J.A.M.A.,* **284:** 1708 (2000).

Koenig, H.G.: Religion and medicine II: religion, mental health, and related behaviors. *Int J. Psychiatry. Med.,* **31:** 97-109 (2001a).

Koenig, H.G.: Religion, spirituality, and medicine: how are they related and what does it mean? *Mayo Clin. Proc.,* **76:** 1189-1191 (2001b).

Koenig, H.G., George, L.K. and Titus, P.: Religion, spirituality, and health in medically ill hospitalized older patients. *J. Am. Geriatr. Soc.,* **52:** 554-562 (2004).

Levin, J.S. and Schiller, P.L.: Is there a religious factor in health? *J. Relig. Health*, **26:** 9-36 (1987).

Levin, J.S.: Religion and health: is there an association, is it valid, and is it causal? *Soc. Sci. Med.,* **38:** 1475-1482 (1994).

Mahan, K. and Escott Stump, S.: *Krause's Food, Nutrition & Diet Therapy* (1998).

Maislos, M., Khamaysi, N., Assali, A., Abou-Rabiah, Y., Zvili, I. and Shany, S.: Marked increase in plasma high-density-lipoprotein cholesterol after prolonged fasting during Ramadan. *Am. J. Clin. Nutr.,* **57:** 640-642 (1993).

Maislos, M., Abou-Rabiah, Y., Zuili, I., Iordash, S. and Shany, S.: Gorging and plasma HDL-cholesterol—the Ramadan model. *Eur. J. Clin. Nutr.,* **52:** 127-130 (1998).

Matthews, D.A., McCullough, M.E., Larson, D.B., Koenig, H.G., Swyers, J.P. and Milano, M.G.: Religious commitment and health status: a review of the research and implications for family medicine. *Arch. Fam. Med.,* **7:** 118-124 (1998).

Mills, P.K., Beeson, W.L., Phillips, R.L. and Fraser, G.E.: Cancer incidence among California Seventh-Day Adventists, 1976-1982. *Am. J. Clin. Nutr.,* **59:** 1136S-1142S (1994).

Mueller, P.S., Plevak, D.J. and Rummans, T.A.: Religious involvement, spirituality, and medicine: implications for clinical practice. *Mayo Clin. Proc.,* **76:** 1225-1235 (2001).

Nieman, D.C., Underwood, B.C., Sherman, K.M., Arabatzis, K., Barbosa, J.C., Johnson, M. and Shultz, T.D.: Dietary status of Seventh-Day Adventist vegetarian and non-vegetarian elderly women. *J. Am. Diet. Assoc.,* **89:** 1763-1769 (1989).

Nisbet, P.A,, Duberstein, P.R., Conwell, Y. and Seidlitz, L.: The effect of participation in religious activities on suicide versus natural death in adults 50 and older. *J. Nerv. Ment. Dis.,* **188:** 543-546 (2000).

Ogata, M., Ikeda, M. and Kuratsune, M.: Mortality among Japanese Zen priests. *J. Epidemiol. Comm. Health,* **38:** 161-166 (1984).

Oman, D. and Reed, D.: Religion and mortality among the community-dwelling elderly. *Am. J. Pub.Health,* **88:** 1469-1475 (1998).

Oman, D. and Thoresen, C.: 'Does religion cause health': Differing Interpretations and Diverse Meanings. *J. Health Psychol.,* **7:** 365-380 (2002).

Pan, W.H., Chin, C.J., Sheu, C.T. and Lee, M.H.: Hemostatic factors and blood lipids in young Buddhist vegetarians and omnivores. *Am. J. Clin. Nutr.,* **58:** 354-359 (1993).

Peterson, G.: Religion as orienting worldview. *Zygon,* **36:** 5-19 (2001).
Reindl Benjamins, M. and Brown, C.: Religion and preventative health care utilization among the elderly. *Soc. Sci. Med.,* **58:** 109-118 (2004).
Rosen, S.: *Diet for Trascendence: Vegetarianism and the World Religions*. Torchlight Publishing (1997).
Sarri, K.O., Tzanakis, N.E., Linardakis, M.K., Mamalakis, G.D. and Kafatos, A.G.: Effects of Greek orthodox christian church fasting on serum lipids and obesity. *B.M.C. Public Health,* **3:** 16 (2003).
Sarri, K.O., Linardakis, M.K., Bervanaki, F.N., Tzanakis, N.E. and Kafatos, A.G.: Greek Orthodox fasting rituals: a hidden characteristic of the Mediterranean diet of Crete. *Br. J. Nutr.,* **92:** 277-284 (2004).
Sarri, K.O., Kafatos, A.G., Higgins, S.: Is religious fasting related to iron status in Greek Orthodox Christians? *Br. J. Nutr.,* **94:** 198-203 (2005).
Sarri, K.O. and Kafatos, A.G.: The Seven Countries Study in Crete: Olive Oil, Mediterranean diet or fasting? *Public Health Nutrition J.,* **8(6):** 666 (2005).
Savage, P.J. and Harlan, W.R.: Racial and ethnic diversity in obesity and other risk factors for cardiovascular disease: implications for studies and treatment. *Ethn. Dis.,* **1:** 200-211 (1991).
Shaper, A.G.: Environmental factors in coronary heart disease: diet. *Eur. Heart. J.,* **8: Suppl E**, 31-38 (1987).
Shatenstein, B. and Ghadirian, P.: Influences on diet, health behaviours and their outcome in select ethnocultural and religious groups. *Nutrition,* **14:** 223-230 (1998).
Temizhan, A., Donderici, O., Ouz, D. and Demirbas, B.: Is there any effect of Ramadan fasting on acute coronary heart disease events? *Int. J. Cardiol.,* **70:** 149-153 (1999).
Temizhan, A., Tandogan, I., Donderici, O. and Demirbas, B.: The effects of Ramadan fasting on blood lipid levels. *Am. J. Med.,* **109:** 341-342 (2000).
van Olphen, J., Schulz, A., Israel, B., Chatters, L., Klem, L., Parker, E. and Williams, D.: Religious involvement, social support, and health among African-American women on the east side of Detroit. *J. Gen. Intern. Med.,* **18:** 549-557 (2003).

Abbreviations
TC : Total Cholesterol
HDL : High-Density Cholesterol
LDL : Low-Density Cholesterol
TGs : Triglycerides
CHD : Coronary Heart Disease
IHD : Ischemic Heart Disease
MUFA : Mono-Unsaturated Fatty Acids
PUFA : Poly-unsaturated Fatty Acids
SFA : Saturated Fatty Acids
BMI : Body mass index
VEGs : Vegetarians
LOV : Lacto-ovo-Vegetarians
AOR : Adjusted Odds Ratio
CI : Confidence Interval

KEYWORDS Religion. Diet. Health. Fasting

ABSTRACT The evidence supporting a relationship between religion, either in terms of lifestyle or diet, and physical health has increased substantially in the recent past. Particular interest is paid to how specific dietary religious patterns can influence health status positively in terms of incidence and prevalence of chronic diseases and their risk factors. From reviewing the available information in this area, it is concluded that some religions, such as Orthodox Christianity and Seventh-Day Adventism, prescribe both dietary or lifestyle doctrines, such as avoiding alcohol and smoking and encouraging physical activity, which promote health and could prevent the development of a number of diet-related diseases. However, it is suggested that it is these healthy behaviors themselves that are responsible for the health benefits found within religious groups and not just the adherence to a specific religion. Nevertheless, other religions, such as Hinduism, Buddhism and Jehova's witness, either promote strict vegetarianism, which could become life-threatening leading to megaloblastic anemia or severe iron deficiency anemia, or prescribe specific medical observances that could have harmful effects. Furthermore, religious practices usually encourage the use of preventative care services, while spirituality enhances coping with mental and physical illnesses.

Authors' Addresses: **Katerina Sarri,** Preventive Medicine and Nutrition Clinic, Department of Social Medicine, Faculty of Medicine, University of Crete, P.O Box 2208, Iraklion 71003, Crete, GREECE.
Telephone: 0030-2810-394595, *Fax:* 0030-2810-394604, *E-mail:* katsarri@med.uoc.gr
Siobhan Higgins, Division of Developmental Medicine (Human Nutrition Section), University of Glasgow, UNITED KINGDOM.
E-mail: Siobhan.Higgins@clinmed.gla.ac.uk
Anthony G. Kafatos, Department of Social Medicine, University of Crete, School of Medicine, P.O Box 2208, Iraklion 71003, Crete, GREECE
E-mail: kafatos@med.uoc.gr