

Religion and spirituality as predictors of patient-reported outcomes in adults with congenital heart disease around the globe[☆]

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ABSTRACT

Aims: Religion and spirituality can be resources for internal strength and resilience, and may assist with managing life's challenges. Prior studies have been undertaken primarily in countries with high proportions of religious/spiritual people. We investigated (i) whether being religious/spiritual is an independent predictor of patient-reported outcomes (PROs) in a large international sample of adults with congenital heart disease, (ii) whether the individual level of importance of religion/spirituality is an independent predictor for PROs, and (iii) if these relationships are moderated by the degree to which the respective countries are religious or secular.

[☆] All authors take responsibility for all aspects of the reliability and freedom from bias of the data presented and their discussed interpretation.

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Methods and results: APPROACH-IS was a cross-sectional study, in which 4028 patients from 15 countries were enrolled. Patients completed questionnaires to measure perceived health status; psychological functioning; health behaviors; and quality of life. Religion/spirituality was measured using three questions: Do you consider yourself religious or spiritual?; How important is religion, spirituality, or faith in your life?; and If religious, to what religion do you belong?. The country level of religiosity/secularity was appraised using data from the Gallup Poll 2005–2009. General linear mixed models, adjusting for patient characteristics and country differences were applied. Overall, 49.2% of patients considered themselves to be religious/spiritual. Being religious/spiritual and considering religion/spirituality as important in one's life was positively associated with quality of life, satisfaction with life and health behaviors. However, among patients living in more secular countries, religion/spirituality was negatively associated with physical and mental health.

Conclusion: Religiosity/spirituality is an independent predictor for some PROs, but has differential impact across countries.

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1. Introduction

In a 2017 editorial in the Journal of the American Medical Association, Tyler VanderWeele and colleagues contended that “Modern day clinicians regularly overlook dimensions of spirituality when considering the health of others or even themselves” [1]. Religion or spirituality can be resources for internal strength and resilience. Indeed, some people look for strength and solace through a deeper connection with a universal spirit, and can find this by being part of religious communities and practices [1]. Research has found that religion/spirituality is associated with better mental health [2], better self-management among patients with chronic diseases [3], and higher levels of happiness [4]. In other words, religion/spirituality is an important social determinant of health [5]. However, most prior studies have been undertaken in countries with a high proportion of people who are religious or spiritual, and where religion/spirituality has an important place in society, such as the United States of America, United Kingdom, Kuwait or Iran [4]. In more secular countries, the impact of religion/spirituality seems to be different than in highly religious countries [3]. Hence, to attain a better understanding of the relationship between religion/spirituality and health outcomes, this association needs to be investigated in international samples, including patients coming from both religious and more secular countries [6,7]. In the present study, we investigated (i) if being religious/spiritual is an independent predictor of patient-reported outcomes (PROs) in a large international sample of adults with congenital heart disease (CHD), (ii) whether the individual level of importance of religion/spirituality, in other words the centrality of religion/spirituality in one's life, is an independent predictor for PROs, and (iii) if these relationships are moderated by the general level of religiosity/secularity in the respective countries.

2. Methods

2.1. Design and setting

The present study is part of the “Assessment of Patterns of Patient-Reported Outcomes in Adults with Congenital Heart disease – International Study” (APPROACH-IS), which is a cross-sectional, observational study in 15 countries from 5 continents: Argentina, Australia, Belgium, Canada, France, India, Italy, Japan, Malta, Norway, Sweden, Switzerland, Taiwan, the Netherlands, and the United States of America (USA) [8]. The study was carried out in accordance with the Code of Ethics of the World Medical Association (Declaration of Helsinki) for experiments involving humans and was approved by the institutional review board of the University Hospitals Leuven/KU Leuven, Belgium (the coordinating center) as well as the local institutional review boards of participating centers when required. All participants provided written informed consent. The rationale, design, and methods of APPROACH-IS have been detailed in a related methods paper [8].

2.2. Study population

Patients were eligible to participate if they met the following inclusion criteria: (i) diagnosis of CHD, defined as a structural abnormality of the heart or intra-thoracic great vessels that is present at birth and actually or potentially of functional significance [9]; (ii) 18 years of age or older; (iii) diagnosis established before adolescence; (iv)

continued follow-up at a CHD center or included in a national/regional registry; and (v) physical, cognitive, and language capabilities required to complete self-report questionnaires. Patients were ineligible if they had: (i) prior heart transplantation or (ii) primary pulmonary hypertension [8]. Patients who met the inclusion criteria were mailed a package comprised of the questionnaires or were given them during an outpatient clinic visit. Data were collected from April 2013 through March 2015.

2.3. Variables and measurement

The set of self-report questionnaires was constructed to assess four PRO domains: (i) perceived health status using the 12-item Short Form Health Survey [10] and the EuroQOL-5D Visual Analog Scale [11]; (ii) psychological functioning using the Hospital Anxiety and Depression Scale [12]; (iii) health behaviors (i.e., dental hygiene, sports participation, the use of alcohol, tobacco, and/or drugs) using the Health Behavior Scale–Congenital Heart Disease [13]; and (iv) quality of life using a Linear Analog Scale [14]; and the Satisfaction With Life Scale [15]. Expanded definitions of the domains as applied in APPROACH-IS as well as the interpretation of scores for the individual questionnaires have been provided previously [16]. Details on the questionnaires, the translations and the psychometric properties are provided in the APPROACH-IS methods paper [8].

Religion/spirituality was measured using three questions: 1. “Do you consider yourself religious or spiritual?” (yes/no); 2. “On a scale from 0 to 10, how important is religion, spirituality, or faith in your life?” (0 = not important; 10 = very important); and 3. “If religious, to what religion do you belong?” No a priori definitions of religion/spirituality were provided to the patients.

To appraise the degree to which the 15 participating countries were religious or secular, we used data from the Gallup World Poll 2005–2009. The Gallup World Poll is a continual cross-sectional survey of the adult population in >150 countries, using randomly selected, nationally representative samples comprising about 1000 persons per country [17]. From 2005 to 2009, the Gallup World Poll sampled 455,104 persons from 154 nations [18]. All samples are nationally representative of the population aged 15 years or older [18]. Surveyed persons were asked “Is religion an important part of your daily life?” (yes/no) [18]. The proportion of people in the general population who indicated that religion was important in their daily life as found in the Gallup Poll 2005–2009 is provided in Online Table 1.

2.4. Statistical analyses

Continuous PRO data are presented as means and standard deviations if normally distributed, and as medians and interquartile ranges (IQR) if not normally distributed. Categorical variables are presented as absolute numbers and percentages. Univariable two-group analyses (e.g., being religious/spiritual or not) were performed using Student's *t*-test. Bivariate correlations were tested by calculating Spearman's correlation coefficient.

To investigate whether religion/spirituality was an independent predictor of PROs, we computed multivariable General Linear Mixed Models (GLMM), adjusting for age, sex, marital status, educational level, employment status, disease complexity, NYHA class (fixed effects), and for unmeasured country differences (random effect). Furthermore, we evaluated if the country's level of religiosity/secularity (Gallup Poll) moderates the relationship between religion/spirituality and PROs by adding the Gallup data as an interaction term in the GLMM (Gallup * religion/spirituality). Simple slope analysis allowed us to identify secular, moderately religious and highly religious countries. Data analysis was performed using IBM SPSS Statistics for Windows, version 25 (Armonk, NY: IBM Corp.). Tests were two-tailed and $p < 0.05$ was used as level of significance. In order to calculate the magnitude of the difference between religious and non-religious patients, we calculated effect sizes. For continuous variables, an effect size for the Wilcoxon test was calculated by $r = Z/\sqrt{n}$, where Z is the normal approximation of the Wilcoxon test statistic – that is the Mann–Whitney U . For categorical variables, Cohen's w was calculated. The cut-offs for Cohen's w and r were as follows: 0.1–0.3 = small difference; 0.3–0.5 = moderate difference; and >0.5 = large difference.

Table 1
Demographic and medical background variables in adults with congenital heart disease according to self-identification as religious/spiritual.

Variables	Religious/spiritual persons	Non-religious/non-spiritual persons	p-Value	Effect size
Sex: women	1124/1927 (58.3%)	934/1992 (46.9%)	<0.001 [§]	w = 0.82
Median age in years	32 (IQR 25–43)	31 (IQR 25–40)	0.004 [§]	r = -0.0457
Educational level			0.007 [§]	w = 0.20
Less than high school	112/1916 (5.8%)	100/1984 (5.0%)		
High school	777/1916 (40.6%)	880/1984 (44.4%)		
College degree	449/1916 (23.4%)	385/1984 (19.4%)		
University degree	578/1916 (30.2%)	619/1984 (31.2%)		
Patient-reported New York Heart Association functioning			<0.001 [§]	w = 0.63
Class I	951/1889 (50.3%)	1132/1969 (57.5%)		
Class II	674/1889 (35.7%)	671/1969 (34.1%)		
Class III	163/1889 (8.6%)	115/1969 (5.8%)		
Class IV	101/1889 (5.3%)	51/1969 (2.6%)		
Complexity of heart defect			0.107 [§]	w = 0.07
Simple	472/1936 (24.4%)	540/1998 (27.0%)		
Moderate	949/1936 (49.0%)	969/1998 (48.5%)		
Complex	515/1936 (26.6%)	489/1998 (24.5%)		

[§] Chi-Square test.

[¶] Mann-Whitney U test.

3. Results

3.1. Self-identification as religious/spiritual

In APPROACH-IS, 4028 patients were enrolled, with a median age of 32 years and 53% were women [16, 19]. Overall, 49.2% (1936 out of 3934) of the patients considered themselves to be religious or spiritual. These patients were more likely to be female, slightly older, in worse functional classes, and had a slight tendency to higher education compared to those who were not religious or spiritual (Table 1). For sex and functional class, the difference between the two groups was large. There was no significant differences between the 2 groups regarding complexity of the heart defect.

A large inter-country variation was observed in the proportion of patients who considered themselves religious or spiritual. Countries with the highest proportions of religious/spiritual patients were Argentina (84.4%), Malta (84.3%), USA (76.8%) and India (72.4%) (Fig. 1, panel A). Lower proportions of patients who considered themselves religious/spiritual were found in Japan (18.9%), Sweden (26.2%), France (30.8%) and Norway (31.8%). The distribution of the religions in included patients across the 15 countries is presented in Online Table 2.

3.2. Centrality of religion/spirituality in one's life

Among patients who considered themselves religious or spiritual, variation in the level of importance of religion, spirituality or faith in their life was observed (Fig. 1, panel B). On a scale from 0 to 10, a large majority (85%) of religious/spiritual patients selected a score of 5 or higher; further, 29% chose the highest score of 10 (Fig. 1, panel B). The mean religion/spirituality importance scores by country are shown in Online Table 2, demonstrating that religion/spirituality/faith was most important to patients from Argentina (6.7), Malta (6.6) and the United States (6.2). Patients from Japan (1.0), Sweden (1.6) and Norway (1.7) considered religion/spirituality less important in their lives.

3.3. Religion/spirituality as predictor of PROs and moderating effects of country level

Univariable analyses indicated that patients who considered themselves religious or spiritual had lower levels of physical (PCS) and mental health (MCS), worse self-rated health status (EQ-VAS), more anxiety (HADS-A), but higher satisfaction with life (SWLS) (Online Table 3). When looking at the level of importance that patients assigned to religion/spirituality in their life, we found that the more

important religion/spirituality was for patients, the lower the levels of physical (PCS) and mental health (MCS), the more anxiety (HADS-A), but the better the quality of life (LAS QOL) and satisfaction with life (SWLS) (Online Table 4).

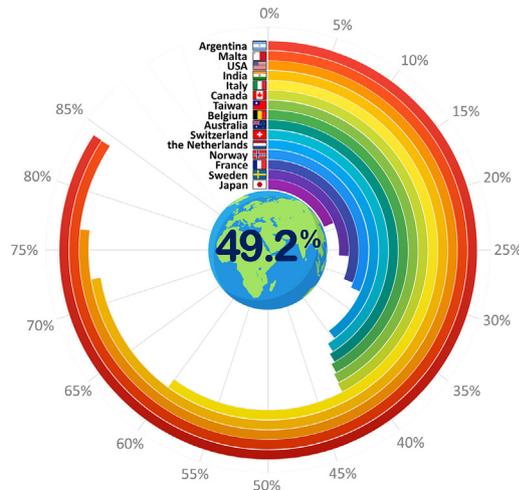
Multivariable GLMM, adjusting for patient characteristics and unmeasured country differences, revealed that being religious/spiritual was a predictor for better health behaviors, better quality of life (LAS QOL), and a higher satisfaction with life (SWLS) (Table 2). Health behaviors, however, were also predicted by country level of religion/spirituality (Gallup Poll), such that patients living in secular countries generally showed better health behaviors than patients from religious countries. A significant interaction effect was found for mental health (MCS) (Table 2), indicating that the relationship between being religious/spiritual and mental health was moderated by the country level of religiosity/secularity. More specifically, among patients living in secular or moderately religious countries, mental health was better in those who were not religious/spiritual compared to those who were religious/spiritual (Online Fig. 1, panel A). In highly religious countries, no difference in mental health was found among religious versus non-religious patients.

Higher patient scores for the importance of religion/spirituality in their lives, when adjusted for patient characteristics and unmeasured country differences, predicted lower physical health (PCS), more anxiety (HADS-A), better health behaviors, better quality of life (LAS QOL), and higher satisfaction with life (SWLS) (Table 3). Also in these analyses, health behaviors were better in patients from more secular countries. Interaction effects were found for physical (PCS) and mental health (MCS), and for depression (HADS-D). More specifically, the negative relationship between the importance of religion/spirituality and physical and mental health was only observed in patients living in secular and moderately religious countries, and not in those from highly religious countries (Online Fig. 1, Panel B, C and D).

4. Discussion

The relationship between religion/spirituality and health outcomes remains poorly understood. This may reflect the fact that studies on the differential impact of religion/spirituality across different countries or cultures are scarce [6]. Within the field of cardiology, to the best of our knowledge, published studies do not exist. Since APPROACH-IS investigated PROs in adults with CHD from 15 countries in 5 continents using a uniform methodology, the APPROACH-IS dataset provides a unique opportunity to scrutinize the relationship between religion/spirituality and PROs across countries. Our analyses indicate that religion/spirituality is associated with both positive and negative health outcomes above and beyond patient characteristics, yet also that it sometimes depends on

A) Proportion of patients with congenital heart disease who consider themselves religious or spiritual



B) The self-reported relative importance of religion, spirituality or faith in the lives of patients with congenital heart disease

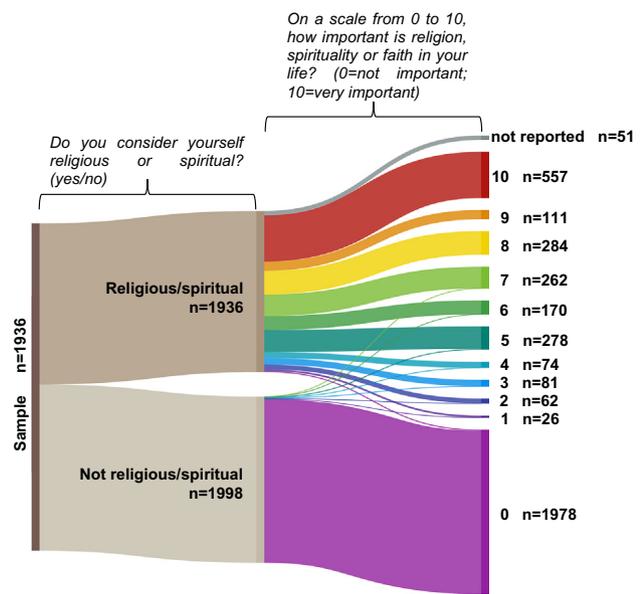


Fig. 1. The level of religiosity/spirituality in patients with congenital heart disease from 15 countries.

the general level of religion/spirituality among citizens in the respective countries. More specifically, patients who are religious or spiritual and who consider religion/spirituality important to their lives seem to have a better quality of life and higher satisfaction with life, independent of their country or their individual characteristics. Religion/spirituality was also a positive predictor for healthy behaviors, although health behaviors were overall better in more secular countries. A negative association between religion/spirituality and physical and mental health, including anxiety and depression, was identified. The association with depression, however, it was only found in secular and moderately religious countries as opposed to highly religious countries. This finding indicates that the relationships between religion/spirituality and PROs are complex and, in part, moderated by the general level of religiousness in countries. The relationship between religiosity and negative feelings, and variation according to country of residence, has previously been noted [18].

A positive relationship between religion/spirituality and quality of life has been reported in prior studies [4, 18, 20]. Although a worldwide study found that there is a differential relationship between religion and well-being in countries with good life circumstances compared to those countries that are worse of [18], a recent meta-analysis did not confirm that this relationship was dependent upon the country of residence [4]. Furthermore, studies have found a beneficial effect of

religious and spiritual interventions, such as praying in groups or meditation, as a complementary therapy in terms of quality of life [21]. The fact that the association between religion/spirituality and quality of life and satisfaction with life was not only found for a dichotomous assessment of being religious/spiritual, but also for the extent to which patients consider religion/spirituality important in their lives, suggests that there may be a certain “dose-response” relationship [1, 5].

A recent literature review outlined vast evidence for the positive relationship between religion/spirituality and health behaviors [22], which the present findings have confirmed. However, those results should be interpreted in light of our finding that better health behaviors are generally more common in more secular countries. Hence, it could be assumed that the potential benefit of religion/spirituality with respect to health behaviors is more pronounced in religious countries than in secular countries, although no interaction effect was detected in the present study. One possible mechanism to account for the relationship between religion/spirituality and health behaviors is that being religious promotes formal participation in religious communities and practices, which in turn may enhance social integration that fosters healthy behaviors and provides social support [1, 5]. Positive health behaviors are believed to be the mediating factor for why religion/spirituality and its practices are associated with a lower mortality

Table 2

Multivariable General Linear Mixed Models with self-identification as religious/spiritual as a predictor of PROs, adjusted for patient characteristics and unmeasured country differences and moderated by country level of general religiosity/secularity.

		PCS	MCS	EQ-VAS	HADS-A	HADS-D	Total health risk score	LAS QOL	SWLS
Main effect	Being religious/spiritual								
	Yes	-0.9 (0.5)	-0.7 (0.6)	-0.2 (0.5)	0.2 (0.1)	-0.07 (0.1)	-1.4 (0.6)	1.2 (0.5)	0.8 (0.2)
	No	#	#	#	#	#	#	#	#
Main effect	Country level of religiosity/secularity (Gallup poll)	-1.2 (1.0)	0.1 (0.6)	0.5 (0.5)	0.1 (0.2)	0.2 (0.2)	3.1 (1.1)	0.4 (0.7)	0.2 (0.3)
Moderator	Being religious/spiritual * country level	-0.2 (0.3)	-0.8 (0.3)	-0.3 (0.3)	0.04 (0.06)	0.04 (0.06)	-0.03 (0.3)	-0.3 (0.3)	-0.1 (0.1)

Values in table are Estimates (SE), adjusted for demographic and medical patient characteristics namely age, sex, marital status, educational level, employment status, disease complexity, and functional status (NYHA class); #=reference; PCS=Physical Component Summary; MCS=Mental Component Summary; EQ-VAS=EuroQol 5 Dimensions-Visual Analog Scale; HADS-A=Hospital Anxiety and Depression Scale – Anxiety; HADS-D=Hospital Anxiety and Depression Scale – Depression; LAS QOL=Linear Analog Scale Quality of Life; SWLS=Satisfaction with Life Scale; For clarity, the demographic and medical predictors are not reported in this table, since they have been reported in detail previously.(16)

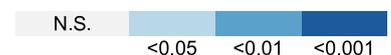
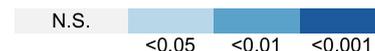


Table 3

Multivariable General Linear Mixed Models with centrality of religion/spirituality as a predictor of PROs, adjusted for patient characteristics and unmeasured country differences and moderated by country level of general religiosity/secularity.

		PCS	MCS	EQ-VAS	HADS-A	HADS-D	Total health risk score	LAS QOL	SWLS
Main effect	Importance of religion/spirituality (scale 0-10)	-0.7 (0.3)	-0.5 (0.3)	0.1 (0.3)	0.2 (0.07)	-0.02 (0.06)	-0.9 (0.3)	0.9 (0.3)	0.4 (0.1)
Main effect	Country level of religiosity/secularity (Gallup poll)	-1.3 (1.0)	-0.07 (0.6)	0.4 (0.5)	0.1 (0.2)	0.2 (0.2)	3.2 (1.1)	0.2 (0.7)	0.2 (0.3)
Moderator	Importance of religion/spirituality * country level	0.6 (0.3)	1.5 (0.3)	0.5 (0.3)	-0.1 (0.07)	-0.1 (0.06)	0.005 (0.3)	0.5 (0.3)	0.2 (0.1)

Values in table are Estimates (SE), adjusted for demographic and medical patient characteristics namely age, sex, marital status, educational level, employment status, disease complexity, and functional status (NYHA class); PCS=Physical Component Summary; MCS=Mental Component Summary; EQ-VAS=EuroQol 5 Dimensions-Visual Analog Scale; HADS-A=Hospital Anxiety and Depression Scale – Anxiety; HADS-D=Hospital Anxiety and Depression Scale – Depression; LAS QOL=Linear Analog Scale Quality of Life; SWLS=Satisfaction with Life Scale; For clarity, the demographic and medical predictors are not reported in this table, since they have been reported in detail previously.(16)



[5, 23]. Nonetheless, it may seem counterintuitive that religion/spirituality was positively associated with health behaviors and negatively related with physical functioning. Based on this observation, one might presume that health behaviors and physical functioning are inversely related. However, previous APPROACH-IS analyses indicated this was not the case [16]. This observation thus highlights the complex relationships between religiosity/spirituality with PROs that would benefit from future mixed-methods inquiry to understand.

In the present study, we found a negative relationship between religion/spirituality and physical and mental health. With the exception of anxiety, this relationship was moderated by the religiosity/secularity level of the country, such that this negative relationship was only found for patients in secular countries and not in religious countries. A similar observation was made in another international cohort study, where people who held a religious or spiritual understanding of life had a higher incidence of depression, but the relationship varied by country [6]. Our study expands on such findings [6] by identifying a moderating effect of the religiosity/secularity level in the country as a whole on the relationship between individual religion/spirituality level and mental health.

4.1. Methodological considerations

With this study, we contributed to the current body of knowledge by investigating the differential impact of religion/spirituality on PROs. We relied on a sound research methodology and conceptualization of PROs [8, 24]. Nonetheless, our findings should be interpreted in light of certain limitations [8, 16, 19]. First, APPROACH-IS is a cross-sectional study, and thus causality between religion/spirituality and PROs or the directionality of the associations could not be determined [8]. Indeed, it could be that the relationship is bidirectional, given that it is plausible that physical and mental health influence religion/spirituality pursuits [25]. More precisely, patients who are experiencing significant health problems may be more likely to actively seek solace in religion/spirituality. Indeed, a large-scale study in >400,000 individuals around the globe found that people living in difficult circumstances, both at individual and country level, had greater religiosity [18]. Future studies should look more into the direction of effect and causality. Second, for most participating countries, data from only one center was available. This limitation might hamper the representativeness of our sample [16, 19]. Third, a possible selection bias cannot be excluded, because patients who were physically or mentally incapable of completing the questionnaires were not represented in this study [8]. However, in the Swedish branch of APPROACH-IS, participants and non-participants were compared and only minor differences in demographic and clinical data were observed [26]. Fourth, due to the unbalanced distribution of religions within the APPROACH-IS sample (see Online Table 2), we were not able to properly investigate the differential impact on PROs of affiliating with a religion vs. considering oneself to be spiritual. For such a study, a more equal distribution of the

religions over all participating countries and separate questions regarding religiosity and spirituality would be needed. Most study participants identified with the Christian religion. As each religion has its own unique characteristics and perspectives (e.g., consideration of an afterlife), larger samples with purposeful sampling of other religions (e.g., Hinduism, Buddhism, Islam) are recommended. Such a study would also allow us to investigate what the illness perceptions are of people belonging to different religions [27]. Fifth, demographic and clinical differences were found between the cohort of patients that considered themselves to be religious/spiritual or not. However, by adjusting for patient factors in the GLMM, we accounted for these baseline differences. Sixth, we investigated the predictive role of being religious/spiritual and the level of importance that religion/spirituality has in one's life in different statistical models. It would have been interesting to assess whether PROs are predicted to greater extent by being religious or by the importance of religion/spirituality to the individual. However, due to multicollinearity between these two factors (Variance Inflation Factor > 5), we could not enter them into the same GLMM. Seventh, although we found evidence for a differential impact of religion/spirituality on PROs according to countries' general level of religiosity, we do not know the precise mechanism underlying this phenomenon. For example, we do not know whether there are unique characteristics of individuals who seek religious affiliation in a country in which it is less common. Eighth, we used the Gallup Poll 2005–2009 data to appraise the degree to which the participating countries were religious or secular, instead of the more recent 2015 Poll because the older version included three APPROACH-IS countries (Malta, Norway, Taiwan) that were not included in the later version. It should also be noted that the intraclass correlation between the 2005–2009 and 2015 versions was 0.964.

The relationship between religion/spirituality and health outcomes is complex and warrant future research. In this study, religion/spirituality was assessed using three questions. Future mixed-methods research is encouraged to investigate the psychosocial dimensions of religiosity/spirituality in more depth and the potentially complex relationship with quality of life. When the precise interrelationship is understood and the direction of effect is known, religious and spiritual interventions may find their way to healthcare [21, 28]. Spiritual care could become a service that is structurally offered to adults with congenital heart disease [29]. However, before implementing such interventions, the differential effect in the different countries should be borne in mind.

5. Conclusion

Self-identification as religious/spiritual and attributing a higher importance of religion/spirituality in one's life was positively associated with quality of life, satisfaction with life and health behaviors. However, among patients living in more secular countries, religion/spirituality was negatively associated with physical and mental health.

Hence, the present study highlighted the differential impact that religion/spirituality may have on health outcomes in various countries. Furthermore, our findings suggest that international studies ought to consider religion/spirituality when assessing potential predictors of PROs.

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Conflict of interest

None of the authors have a conflict of interest.

Registration

ClinicalTrials.gov: NCT02150603.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ijcard.2018.07.103>.

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