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ORIGINAL PAPER

Religiosity and Beliefs About the Transmission of Cancer, Chemotherapy, and Radiation Through Physical Contact in Saudi Arabia

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Abstract

We examined relationships between religiosity and Saudi cancer patients' beliefs about the spread of cancer, chemotherapy, and radiation therapy through close physical contact. Surveyed were 64 patients seen in university oncology clinics. Assessed were beliefs about the spread of cancer and its treatments, along with religious, demographic, social, psychological, and cancer-related characteristics. Greater religiosity was related to older age, non-Saudi nationality, less anxiety, earlier cancer stage, and greater time since initial diagnosis. Non-significant trends suggested that religious practices were associated with less, but intrinsic religious beliefs with more concern about contagiousness, although the findings were limited by low statistical power.

Keywords Religiosity · Cancer · Chemotherapy · Radiation therapy · Contagiousness

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Background

The diagnosis of cancer is a frightening one that affects both patients and family members who often care for them. Persons in some cultures and ethnic groups may not have an adequate understanding of the cause or course of cancer and therefore may not be sure whether their cancer or its treatment poses a threat to others as well, particularly their loved ones. While patients today often receive plenty of education about their cancers, this may not always occur (Krouwel et al. 2015). The combination of lack of education and the uncertain etiology of some cancers may give rise to doubts about whether the cancer or its treatments can be spread to others during close physical contact, sexual, or otherwise.

If cancer patients believe or are unsure of whether cancer or its treatments might spread to others during close physical contact (sexual or otherwise), such beliefs may cause patients to avoid any physical contact with a spouse and other loved ones, leading to a lack of support for the treatment and consequently non-compliance (or possibly marital conflict or divorce). Concerns over the contagiousness of disease and effects on the marital relationship have been most thoroughly studied in HIV-positive individuals or people with AIDS, and such concerns may be particularly common among those who are more religious (Bishop et al. 1991). For example, an early study by Bouton et al. (1989) found that religious conservatives tended to be particularly fearful of AIDS, influencing their behavior toward family members. Such concerns, however, are not limited to fear of contracting or spreading HIV/AIDS.

Religiosity has also more generally been associated with fear of contamination, obsessive–compulsive disorder (OCD), and scrupulosity (Inozu et al. 2018). In fact, contamination obsession is the most common subtype of OCD, and has been reported to be higher among certain religious groups due to issues related to purity, particularly among Muslims (Arip et al. 2018; Inozu et al. 2018). Thus, cultural and religious beliefs may influence concerns over contamination and the contagiousness of illnesses other than HIV/AIDS, including cancer, sometimes inappropriately but also appropriately in some cases (Feder 2016).

While most cancers cannot be spread like an infection nor transmitted from one person to another through physical contact, exceptions to this rule have long been known in both animals (Burny et al. 1988) and humans (Beral 1974; Kinlen 2004; Welsh 2011), especially for those with weakened immune systems (Stein et al. 2008). This also applies to certain cancer treatments such as chemotherapy and radiation therapy, particularly when radioactive materials (such as seeds or ribbons) are implanted into cancer sites and for a time give off radiation that could adversely affect pregnant women or small children. Confusion among patients about this, then, should not be surprising even when given adequate information. Certain ethnic and cultural groups may be at higher risk of such beliefs about the spread of cancer or cancer treatments, due to their educational level or certain cultural beliefs and traditions (Lannin et al. 2002; Barton-Burke and Gustason 2007). Research has shown that questions about the transmissibility of cancer may be particularly common in the Middle East (Eftekhar and Yarandi

2004; Shaheen et al. 2011; Mellon et al. 2013; Al-Maweri et al. 2014), where one of those cultural factors that influences belief and behavior is religiosity.

In Saudi Arabia, religion guides and structures almost every aspect of life from the time people rise in the morning to say their first set of prayers to evening time when they say their last (Koenig and Al Shohaib 2017). As noted above, the highly religious may experience greater scrupulosity and more obsessions with contamination (Freud 1907; Abramowitz et al. 2004; Besiroglu et al. 2014) which could lead to obsessive beliefs about infecting others with cancer or exposing them to chemotherapy or radiation. While fears of contamination may be more common among Muslims who are highly religious, due to issues related to purity (as with many other religions), the opposite may also be true with regard to concerns about the contagiousness of diseases such as cancer, particularly in Saudi Arabia. Those with low religious involvement may be alienated from the highly religious Saudi Arabian population that surrounds them, resulting in strange beliefs that differ from those around them. These individuals may have less social contact with others because they are less religiously active, and may have more depression, anxiety, and lower self-esteem (Koenig and Al Shohaib 2017), risk factors that could increase beliefs about the contagiousness of cancer or be the result of such fears (Smith and Nave 2007).

An exhaustive review of the literature turned up no systematic research on the relationship between religiosity and beliefs about the spread of cancer or its treatments through close physical contact. For that reason, we decided to examine the relationship between religiosity, potential risk factors, and beliefs about the possible transmissibility of cancer, chemotherapy, and radiation (from radiation therapy) during close physical contact. We have already reported the prevalence of and risk factors for beliefs about cancer transmission in Saudi Arabia (Al-Wassia et al. 2018). Here, we examine relationships with religiosity.

Objectives

The purpose of this study was to examine the relationship between religiosity and cancer patients' beliefs about the possible spread of cancer, chemotherapy, and radiation (from radiation therapy) through close physical contact others. We hypothesized that greater religiosity would be related to lower levels of demographic, social, psychological, cancer-related and physical health risk factors, which in turn would help to explain the relationship between religiosity and belief that cancer, chemotherapy, and radiation (from radiation therapy) can be transmitted to others, whether that relationship be positive or negative.

Methods

Design Study methods and procedures have been reported elsewhere (Al-Wassia et al. 2018), although will be summarized here. Between January 1 and December 31, 2017, a questionnaire was administered to 70 cancer patients waiting for their

outpatient appointment in the oncology clinics of King Abdulaziz University Hospital. Inclusion criteria were: (1) ages 18–85, (2) a cancer diagnosis documented by an oncologist, (3) able to communicate without significant difficulty, and (4) married.

Procedure A list of patients scheduled to be seen in the clinic each day was developed, and trained interviewers (residents and medical students) approached patients on the list as they arrived in the clinic. After briefly explaining the study, the interviewer obtained written informed consent and gave them the questionnaire to complete in a private setting. The questionnaire was self-administered, although interviewers were available to respond to questions about the survey if necessary. Approval for this study was provided by the King Abdulaziz University Unit of Biomedical Ethics Research Committee (No. 177-15).

Questionnaire

The study questionnaire was made up of sections that asked about demographic information, religious involvement, social support (social networks size, quality of marriage), psychological characteristics (anxiety, depression, self-esteem, obsessions with contamination, personal and family psychiatric history), and cancer-related characteristics (type of cancer, stage of cancer, time since cancer was diagnosed, family history of cancer, treatment received, length of treatment) and physical health (physical functioning). Also assessed were beliefs about the transmissibility of cancer, chemotherapy, and radiation from radiation therapy during close physical contact (sexual and non-sexual).

Demographics Demographic information included age (years), gender, education (on 1–6 scale from illiterate to post-graduate degree), nationality (Saudi vs. non-Saudi), current employment status (yes vs. no), and annual income (on 1–6 scale from < 10,000 SAR to > 200,000 SAR).

Religious Involvement Religious involvement was assessed using the 13-item Muslim Religiosity Scale (MRS; Koenig et al. 2014). Each item is rated from 1 to 5 with higher scores indicating greater religiosity. The scale consists of two subscales: a 10-item religious practices scale (e.g., "How often do you read or recite the Qur'an or other religious literature in your home?") and a 3-item intrinsic religious beliefs scale (e.g., "In my life, I experience the presence of Allah/God"). The internal reliability alpha for the full scale in Saudi medical patients is 0.68 (religious practices subscale = 0.64, intrinsic beliefs subscale = 0.93) (Al-Zaben et al. 2015a, 2015b). Principal components analysis of the full scale reveals two factors with eigenvalues above 1.0 (factor 1 = 2.58; factor 2 = 1.63). Intrinsic beliefs subscale items load heavily on factor 1 and religious practices subscale items on factor 2. Two-week test–retest reliability is high (intra-class correlation coefficient = 0.96) (Al-Zaben et al. 2015a). In the present sample, the internal reliability alpha was 0.63 for the overall scale (0.65 for religious practices subscale and 0.58 for the intrinsic beliefs subscale). The MRS has face validity in that the items on the intrinsic beliefs subscale tap into the strong emphasis that Muslims place on faith in God (Shahada), and the practices subscale assesses the remaining four pillars of Islam (prayer, charity, fasting, and pilgrimage) (Koenig and Al Shohaib 2017).

Social Network Size Social network size (SNS) was assessed using the 4-item version of the Duke Social Support Index (Koenig et al. 1993). This subscale, developed specifically for use in chronically ill adults, differs from the full scale in not containing the social interaction, subjective support, and instrumental support subscales (Landerman et al. 1989). The internal reliability alpha in the present sample was 0.64.

Quality of Marriage The 6-item Quality of Marriage Index (QMI) assesses the "essential goodness of a relationship." The statements are rated on a scale from 1 (very strong disagreement) to 7 (very strong agreement) producing a theoretical score range from 6 to 42 (higher scores indicating higher marital quality). Internal reliability of the QMI as reported in the original validation study ranged from 0.91 to 0.97 (Norton 1983). In the present sample, internal reliability (Cronbach's alpha) was also high (0.96).

Anxiety and Depression Symptoms of anxiety and depression were assessed using the Hospital Anxiety and Depression Scale (HADS; Zigmond and Snaith 1983). The 14-item HADS is made up of seven items that measure anxiety symptoms (HADS-A) and seven items that measure depressive symptoms (HADS-D). The internal reliability of these two subscales is high ($\alpha = 0.85$ for the anxiety subscale, $\alpha = 0.84$ for the depression subscale). The HADS has a 2-factor solution that is consistent with the two subscales above (Gough and Hudson 2009). The alpha for the two subscales in the present population was 0.82 for the anxiety subscale and 0.70 for the depression subscale.

Self-esteem The standard measure of self-esteem used in psychological and behavioral research is the 10-item Rosenberg Self-Esteem Scale (SES; Rosenberg 1965). The SES assesses the person's global self-worth by measuring both positive and negative feelings about the self. Items are rated on a 4-point scale from strongly agree (1) to strongly disagree (4), producing a score that ranges from 10 to 40. In a community sample of 503 adults, the SES had an internal reliability alpha of 0.91 (Sinclair et al. 2010). The alpha in the present sample was lower but certainly acceptable (0.79).

Obsessions with Contamination The Yale–Brown Obsessive–Compulsive Scale (Y-BOCS) was used to measure obsessions with contamination (Goodman et al. 1989). A specific subscale of this measure assesses obsessive symptoms specific to an area of concern. This was applied in the present study to obsessive thoughts related to "the transmission of cancer." First, participants were asked whether they had any concerns that they may have either now or in the past infected someone else with their cancer. Response options for this question were "no, never" (0), "yes, in past" (1), and "yes, current" (2). Five questions were then asked about how many *hours per day* were spent on thoughts or concerns regarding such contamination, interference with daily life caused by such thoughts, distress over such thoughts, efforts made to stop the thoughts, and attempts to gain control over the thoughts. Each of the five questions was rated on a 0–4 scale from "complete control" (0) to "no control or incapacitating" (4). Responses to these five items were summed to produce an "obsessions with contamination scale" (OCS) that ranged from 0 to 20. Patients who reported "no" (0) to the first question indicating they did not have concerns in the past or currently about infecting someone with their cancer were

automatically scored a 0 on the OCS. The scales' internal consistency here was high (0.90 = standardized alpha).

Psychiatric History A prior history of psychiatric problems was assessed with five questions adapted from the Duke Depression Evaluation Schedule (1994) that asked about being diagnosed with psychiatric illness, visiting a psychiatrist for any reason, being admitted to a psychiatric hospital, being prescribed psychiatric medication, or having a problem with alcohol or drugs. A family history of psychiatric problems was also determined by asking whether any first-degree relative had a history of mental or emotional problems. Possible responses to all questions were either yes (1) or no (0). For personal psychiatric history, the five items were summed to create a history of psychiatric problems (HPP) scale ranging from 0 to 5 ($\alpha = 0.72$ in this sample).

Cancer-Related Characteristics Cancer type, stage (on 1–5 scale from localized to widespread metastasis), time since diagnosis (years), type of treatment received, duration of treatment (months), and family history of cancer were assessed. Overall physical functioning (PF) was measured by a 10-item subscale of the SF-36 (Ware and Sherbourne 1992). Response options for each question ranged from 1 (limited a lot from doing activity) to 3 (not limited at all). Scores to items on the SF-36 are typically transformed to range from 25 to 100, and this was done here using the following algorithm: 1 = 25/10, 2 = 50/10, and 3 = 100/10, with higher scores indicating better functioning (Ware and Sherbourne 1992). Internal reliability of the scale in this sample was 0.92.

Beliefs About Cancer Transmissibility Three scales were used to assess the primary outcomes in this study, i.e., cancer patients' beliefs about the transmissibility of cancer, chemotherapy, and radiation (from radiation therapy) during sexual or non-sexual physical contact. Items were generated by the authors (a radiation oncologist and three psychiatrists) through an iterative process until a consensus was reached. The Contagious Cancer (CC) scale was composed of three questions that examined beliefs about the spread of cancer through close physical contact: (1) "Do you think your cancer can spread like an infection?"; (2) "Do you think your cancer can spread to your spouse if you have sexual contact (e.g., kissing or having sex)?"; and "Do you think your cancer can spread to your spouse if you have non-sexual physical contact (e.g., hugging or physical touch)?" The Contagious Chemotherapy (CChT) scale was made up of two questions: (1) "If you receive chemotherapy, do you think it can spread to your spouse if you have sexual contact?" and (2) "If you receive chemotherapy, do you think it can spread to your spouse if you have non-sexual physical contact?" The Contagious Radiation Therapy" (CRT) scale was composed of two questions: (1) "If you receive radiation therapy, do you think the radiation can spread to your spouse if you have sexual contact?" and (2) "If you receive radiation therapy, do you think the radiation can spread to your spouse if you have non-sexual physical contact?"

Response options for all items ranged from 1 to 5: "No, definitely not" (1), "No, not likely" (2), "Unsure" (3), "Yes, maybe" (4), and "Yes, definitely" (5). Responses were summed for each scale to produce a score ranging from 3 to 15 for the CC scale and 2–10 for the CChT and CRT scales. The internal reliability alphas for these scales in the present sample were acceptable (0.82 for CC, 0.67 for CChT, and

0.82 for CRT), and all items had strong face validity in terms of content (i.e., made common sense). The scores for all scales were also combined to form an overall contagiousness scale ($\alpha = 0.87$).

Missing Values

When calculating the scale scores above, missing responses to questions were handled as follows. If at least two-thirds of items on a scale were answered, the average of those responses was substituted for the missing value (done in 19% of cases for MRS, 3% for SNS, 3% for QMI, 0% for HADS-A, 2% for HADS-D, 17% for SES, 0% for OCS, 2% for HPP, 3% for PF, 3% for CC, 0% for CChT, 0% for CRT). In 82% (27 of 33 instances in which this was one), only one substitution was done, in 15% (5 of 33) two substitutions were made, and in 3% (1 of 33) three substitutions were made (the latter for the 10-item SES).

Statistical Analyses

Variable means, ranges, standard deviations, percentages, and counts were calculated using descriptive statistics (Table 1). Bivariate correlations with religiosity were examined using Pearson correlation and Student's *t* test (Table 2). Hierarchical linear regression was used to identify the independent correlation between religiosity, covariates, and beliefs about the transmission of cancer, chemotherapy, and radiation from radiation therapy (combined scale). Given the small sample size, data reduction techniques were used to minimize the number of covariates in each model. First, demographic factors were added to a model predicting religiosity (Model 1), then social factors were added (Model 2), then psychological factors (Model 3), then cancer-related characteristics (Model 4), and finally the combined cancer/treatment transmission score was added (Model 5). Only variables significant at $p < 0.15$ were carried forward from one model to the next. This procedure was first done for religious practices and then repeated for intrinsic religiosity and for overall religiosity. The final models included only those variables in Model 5 above with $p < 0.15$ (Table 3). Given the multiple comparisons, significance level was set at an alpha level of 0.01 and trend findings between 0.01 and 0.10. SAS (version 9.4; SAS Institute Inc., Cary, North Carolina) was the software used for all statistical tests.

Results

Interviewers approached 70 cancer patients, all of whom agreed to fill out the questionnaire. One participant did not complete the questions on beliefs about cancer transmissibility and five did not complete the religiosity scale, and so were not included in the analysis, leaving 64 patients in the final sample. Participant characteristics are described in Table 1. Approximately half of participants were female, almost two-thirds had not graduated from high school, and the majority (52.6%) lived on yearly income of < 10,000 SAR (about $2,700). Lung cancer

Table 1 Participant characteristics

	% (*n*)	Mean (SD) (range) (*n*)
Demographics		
Age (years)		49.3 (14.0) (27–97) (60)
Gender (female)	48.4 (31)	
Education (high school graduate or higher)	39.7 (25)	
Nationality (Saudi)	71.4 (45)	
Employment status (employed)	50.0 (31)	
Income (≥ 10,000 SAR/year)	47.4 (27)	
Social characteristics		
Social Network Size		12.1 (6.0) (0–25) (64)
Quality of Marriage Index		37.0 (6.5) (14–42) (63)
Psychological characteristics		
Depressive symptoms (HADS-D)		4.2 (2.9) (0–11) (52)
Anxiety symptoms (HADS-A)		3.8 (3.6) (0–14) (52)
Self-esteem		32.8 (4.5) (23–40) (65)
Obsessions of contamination		0.67 (2.02) (0–10) (52)
Past psychiatric history (yes)	7.8 (4)	
Family psychiatric history (yes)	5.9 (3)	
Cancer/treatments spread thru physical contact	39.1(25)	
Cancer characteristics/physical function		
Cancer type (lung)	42.9 (27)	
Stage (spread to lymph nodes or beyond)	49.0 (24)	
Time since cancer diagnosis (years)		2.6 (3.9) (0–20) (62)
Treatment (radiotherapy)	67.2 (43)	
Months of treatment		9.8 (13.0) (0–69) (56)
Family history of cancer (yes)	29.7 (19)	
Physical functioning (SF-36)		65.4 (25.2) (25–100) (63)

SAR Saudi riyal, *HADS* Hospital Anxiety and Depression Scale

(42.9%, $n=27$) was the most frequent diagnosis, followed by cancer of the colon or rectum (17.5%, $n=11$), white blood cell or lymphatic cancers (11.1%, $n=7$), uterine or vaginal cancers (7.95, $n=5$), skin/muscles/bone (4.8%, $n=3$), brain/spinal cord cancers (4.8%, $n=3$), and other cancer (mouth, nasopharynx, etc.) (7.9%, $n=5$). Many participants (39.1%, 25 of 64) indicated they either believed or were uncertain about whether their cancer or its treatment could spread to others through physical contact (Al-Wassia et al. 2018).

The average overall religiosity (MRS) score was 55.1 (SD = 4.9) with a possible score ranging from 13 to 65. The average score on the religious practices subscale was 40.5 (SD = 4.7) with a possible score range from 10 to 50. The average score on the intrinsic religious beliefs subscale was 14.6 (SD = 0.97) with possible score range from 3 to 15. In other words, this was a very religious sample with little variation, especially with regard to intrinsic beliefs (not unexpected for

Table 2 Bivariate correlations between participant characteristics and religiosity ($n = 64$)

	Religious Prac r/mean (SD)	Religious IR r/mean (SD)	Total MRS r/mean (SD)
Demographics			
Age (years)	0.24[T]	0.19	0.27[T]
Gender			
Female	40.7 (4.8)	14.5 (1.2)	55.2 (4.9)
Male	40.3 (4.6)	14.6 (0.7)	54.9 (4.9)
Education (1–6)	0.00	0.04	0.01
Nationality			
Saudi	39.6 (4.8)[T]	14.4 (1.1)[T]	54.1 (5.0)[T]
Non-Saudi	42.4 (3.7)	14.8 (0.5)	57.3 (3.7)
Employment status			
Employed	41.5 (4.3)	14.6 (0.8)	56.1 (4.7)
Not employed	39.7 (5.1)	14.5 (1.2)	54.2 (5.1)
Income (1–6)	0.03	0.15	0.06
Social characteristics			
Social Network Size	0.24[T]	−0.07	0.22[T]
Quality of Marriage Index	0.13	0.04	0.14
Psychological characteristics			
Depressive symptoms (HADS-D)	−0.20	0.10	−0.18
Anxiety symptoms (HADS-A)	0.21	−0.27[T]	0.15
Self-esteem	0.08	0.05	0.09
Obsessions of contamination	−0.22	0.15	−0.19
Past psychiatric history scale (0–5)	0.08	0.08	0.09
Family psychiatric history			
Yes	39.3 (5.5)	15.0 (0.0)*	54.3 (5.5)
No	40.4 (4.8)	14.5 (1.0)	54.9 (4.9)
Cancer-related characteristics			
Cancer type			
Lung	41.7 (4.7)[T]	14.3 (1.3)	56.0 (4.9)
Other	39.6 (4.6)	14.7 (0.6)	54.4 (4.9)
Cancer stage (1–5)	−0.33[T]	0.02	−0.32[T]
Time since cancer diagnosis (years)	0.28[T]	0.02	0.27[T]
Treatment			
Radiation therapy	40.2 (4.8)	14.4 (1.1)[T]	54.6 (5.0)
Surgery/chemotherapy	41.1 (4.6)	14.9 (0.5)	56.0 (4.6)
Months of treatment	0.22	0.15	0.24[T]
Family history of cancer			
Yes	39.9 (5.2)	14.7 (0.6)	54.7 (5.3)
No	40.7 (4.5)	14.5 (1.1)	55.2 (4.7)
Physical functioning (SF-36)	0.00	−0.21[T]	−0.05
Beliefs about cancer/treatment transmission			
Cancer contagious	−0.20	0.20	−0.15

Table 2 (continued)

	Religious Prac r/mean (SD)	Religious IR r/mean (SD)	Total MRS r/mean (SD)
Chemotherapy contagious	−0.21	0.21[T]	−0.16
Radiation from radiation therapy contagious	−0.11	0.15	−0.08
Overall contagiousness	−0.20	0.21[T]	−0.15

HADS Hospital Anxiety/Depression Scale, *Prac* Practices, *IR* intrinsic religious beliefs, *MRS* Muslim Religiosity Scale

r = Pearson correlation; means (standard deviation) compared by Student's *t* test; [T]$0.01 < p \leq 0.10$, *$p < 0.01$

Table 3 Multivariate associations between religiosity and beliefs about cancer/treatment transmission

	Religious practices	Intrinsic religiosity	Overall religiosity
Demographics	B (SE)	B (SE)	B (SE)
Age (years)	–	–	–
Gender (female)	–	–	–
Education	–	–	–
Nationality (Saudi)	–	–	–
Employment (employed)	–	–	–
Income	–	–	–
Social characteristics			
Social Network Size	–	–	–
Quality of Marriage Index	–	–	–
Psychological characteristics			
Depressive symptoms (HADS-D)	–	0.08 (0.05)	–
Anxiety symptoms (HADS-A)	0.33 (0.18)[T]	−0.16 (0.04)*	–
Self-esteem	–	–	–
Obsessions of contamination	–	–	–
Past psychiatric history scale	–	–	–
Family psychiatric history (yes)	–	–	–
Cancer-related characteristics			
Cancer type (lung)	–	–	–
Stage	–	–	–
Time since cancer diagnosis (years)	–	–	–
Treatment (radiation therapy)	–	–	–
Months of treatment	–	0.03 (0.01)[T]	–
Family history of cancer (yes)	–	–	–
Physical functioning (SF-36)	–	–	–
Beliefs about cancer/treatment transmission			
Overall contagiousness	−0.22 (0.12)[T]	0.05 (0.03)[T]	−0.14 (0.12)
Model R-Square (*n*)	0.10[T] (52)	0.31* (45)	0.02 (64)

HADS Hospital Anxiety and Depression Scale, *SD* standard deviation

[T]$0.01 < p < 0.10$, *$p \leq 0.01$

Muslim cancer patients, most of whom were likely relying on religious beliefs to cope).

Correlations with Religiosity

Bivariate correlations between religiosity, risk variables, and the primary outcomes (cancer, chemotherapy, radiation, and overall contagiousness) are presented in Table 2. Greater religiosity was related to older age, non-Saudi nationality, less anxiety (IR only), a positive past psychiatric history (IR only), earlier cancer stage, longer time since initial cancer diagnosis, and treatment with surgery or chemotherapy (as opposed to radiation therapy) (IR only). A weak relationship ($r=0.21$, $p=0.09$) was found between IR and overall belief that cancer, chemotherapy, or radiation therapy could be spread by physical contact. For belief in the spread of chemotherapy, this weak relationship was in the opposite for religious practices (less belief in spread) ($r=-0.21$, $p=0.10$) compared to IR (greater belief in spread) ($r=0.21$, $p=0.09$). Multivariate analyses (Table 3) confirmed that overall belief in the contagiousness of cancer, chemotherapy, or radiation therapy was weakly related to religiosity overall, but in opposite directions depending on dimension of religiosity assessed ($B=-0.22$, SE $=0.12$, $p=0.08$, for religious practices, and $B=+0.05$, SE $=0.03$, $p=0.07$, for IR). Statistical power, however, was low due to a reduced sample size in these analyses.

Discussion

This is the first report, to our knowledge, on the relationship between religious beliefs/practices and beliefs about the spread of cancer and its treatments through close physical contact. Culture and tradition in Saudi Arabia, largely grounded on Islamic religious beliefs, affect all aspects of life including beliefs about disease, disease treatments, and disease consequences, especially as they apply to close family relationships. As noted earlier, research has shown that beliefs about the transmission of cancer through close physical contact are surprisingly common among some ethnic groups (Lannin et al. 2002; Wong-Kim et al. 2003; Mellon et al. 2013) and in many areas of the world including Middle Eastern countries such as Jordan (Hassona et al. 2015) and, as we have discovered, in Saudi Arabia as well (Al-Wassia et al. 2018). A complex web of interaction likely exists between factors that influence how religious beliefs affect attitudes regarding cancer, its treatment, and its effects on others within the family. This may be one reason for the relatively weak relationships found here between religiosity and beliefs about transmission of cancer and cancer treatment (besides the low statistical power in this study to detect such relationships).

Also interesting is the possibility that different aspects of religiosity may have the opposite effect on beliefs about the contagiousness of cancer or treatments. Although the relationships detected here were only statistical trends, they suggest that frequency of religious *practices* may lower the likelihood of having such beliefs

about cancer, whereas strong intrinsic religious *beliefs* may actually promote concerns in this regard. On the one hand, as noted by Sigmund Freud over a century ago (Freud 1907) and others since then (Abramowitz et al. 2004; Besiroglu et al. 2014), religiosity may be associated with obsessive beliefs and practices, which could lead to obsessive concerns about the transmission of cancer and its treatments to loved ones. In our initial report from this study, we found evidence that greater obsessions with contamination may be in some way related to concerns about contaminating others with one's cancer (Al-Wassia et al. 2018). On the other hand, religiosity has been well known to help people cope with concerns over health problems (including cancer), and close to 70% of research in Muslim populations reports significant inverse relationships between anxiety and religiosity (Koenig and Al Shohaib 2014) (similar to what we found here in both bivariate and multivariate analyses for intrinsic religiosity). While we did not find here that religion affected beliefs about the contagiousness of cancer and its treatments, it is plausible that religiosity (beliefs or practices) could in a larger sample be found to do so in a stressed religious population like cancer patients in Saudi Arabia. One thing is clear. Future research that includes larger sample sizes will be needed before anything definitive can be said about the relationship between religiosity and beliefs about the transmission of cancer, chemotherapy, or radiation from close physical contact.

Clinical Implications

The questions raised here are more than simply academic ones. Indeed, they have direct clinical implications in terms of how to address exaggerated concerns about the spread of cancer or its treatments through sexual or non-sexual contact. Such concerns are largely unfounded given that cancer is almost never spread through close physical contact, nor is chemotherapy, and radiation can affect others only immediately after radiation sources are implanted in the body (Snyder 2018). Such beliefs, however, may adversely affect social relationships—particularly with a spouse on whom the cancer patient may depend for support and even direct physical care. In a deeply religious household, as commonly found in Muslim Saudi families, the influence of religious beliefs and practices on such concerns may be very important, and from a clinical standpoint, may influence whether patients comply with cancer treatments. Patients may choose to stop chemotherapy or radiation therapy because of such concerns, allowing their cancer to progress and spread within their own bodies.

Islam teaches the importance of caring for one's physical body (Qur'an 5:32; Sahih al-Bukhari 7:71), and the Prophet Muhammad himself is said to have sought medical treatment when ill (Sahih al-Bukhari 7:71, verse 602). Thus, for devout Muslims, religious teachings like these may help to counteract neurotic notions about the spread of cancer or its treatment that may adversely affect both family relationships and willingness to undergo treatment for the cancer. Bearing this in mind, educational interventions may be developed that include an emphasis on religious teachings that promote care for the body and maintenance of close physical contact in personal relationships with family members. Such interventions could

help to increase both the quality of life and the length of life for cancer patients, particularly in religious areas of the world like Saudi Arabia.

Limitations

The present study has both many limitations and many strengths that affect the interpretation of results and the generalization of the findings. First, this was a convenience sample of cancer outpatients recruited from a single hospital in Jeddah, Saudi Arabia. Second, since being married was an inclusion criterion, the results apply only to cancer patients in a marital relationship. Third, the small sample size and incomplete data reduce the study's statistical power to detect relationships between religious involvement and beliefs about the contagiousness of cancer and its treatment. Fourth, the cross-sectional nature of the weak relationships identified here prevents any causal inferences in terms of direction of effect (i.e., religiosity affecting beliefs about cancer transmission vs. beliefs about cancer transmission affecting religiosity).

Despite weaknesses, this study also has a number of strengths that cannot be ignored. First, the outcome studied here (beliefs about the spread of cancer and its treatments) was assessed using scales with strong face validity and internal consistency. Second, many participant characteristics were assessed using well-tested psychometrically proven multi-item scales (e.g., social network, marriage quality, symptoms of depression and anxiety, feelings about the self, obsessions having to do with contamination, and questions on physical functioning). Third, as noted above, this is the first study on the possible impact of religiosity in Saudi Arabia (or anywhere else in the world for that matter) on cancer patients' beliefs about the transmission of cancer or its treatments during close physical contact.

Conclusions

Examining a highly religious sample of cancer patients in Saudi Arabia, this study found that religious practices and intrinsic religious beliefs may be weakly correlated with beliefs about the contagiousness of cancer, chemotherapy, and/or radiation from radiation therapy. The effects of frequent religious practices appeared to be in the opposite direction (reducing such beliefs) compared to the effects of strong intrinsic religiosity (increasing such beliefs). These findings are limited by their cross-sectional nature and the fact they are based on statistical trends only, possibly due to low statistical power to detect such effects. Nevertheless, the findings here may help to guide future studies that include larger samples and follow cancer patients over time to determine whether religiosity affects such beliefs about cancer or beliefs about cancer affect religiosity. The questions posed here are not simply academic ones, as they have direct clinical implications for cancer patients' quality of life, social support, and compliance with treatments in this part of the world.

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References

Abramowitz, J. S., Deacon, B. J., Woods, C. M., & Tolin, D. F. (2004). Association between Protestant religiosity and obsessive–compulsive symptoms and cognitions. *Depression and Anxiety, 20*(2), 70–76.

Al-Maweri, S. A., Addas, A., Tarakji, B., Abbas, A., Al-Shamiri, H. M., Alaizari, N. A., et al. (2014). Public awareness and knowledge of oral cancer in Yemen. *Asian Pacific Journal of Cancer Prevention, 15*(24), 10861–10865.

Al-Wassia, R., Al-Zaben, F., Sehlo, M. G., & Koenig, H. G. (2018). Is cancer or its treatments contagious? Beliefs of cancer patients in Saudi Arabia. *Psycho-Oncology*, in submission.

Al-Zaben, F., Khalifa, D. A., Sehlo, M. G., Al-Shohaib, S., Binzaqr, S. A., Badreg, A. M., et al. (2015a). Religious involvement and health in dialysis patients in Saudi Arabia. *Journal of Religion and Health, 54*(2), 713–730.

Al-Zaben, F., Sehlo, M. G., Khalifa, D. A., & Koenig, H. G. (2015b). Test–retest reliability of the Muslim religiosity scale: Follow-up to "religious involvement and health among dialysis patients in Saudi Arabia". *Journal of Religion and Health, 54*(3), 1144–1147.

Arip, A. A. M., Sharip, S., & Rosli, A. N. M. (2018). Islamic integrated exposure response therapy for mental pollution subtype of contamination obsessive-compulsive disorder: A case report and literature review. *Mental Health, Religion and Culture*. https://doi.org/10.1080/13674676.2018.1436047.

Barton-Burke, M., & Gustason, C. J. (2007). Sexuality in women with cancer. *Nursing Clinics of North America, 42,* 531–554.

Beral, V. (1974). Cancer of the cervix: A sexually transmitted infection? *Lancet, 1*(7865), 1037–1040.

Besiroglu, L., Karaca, S., & Keskin, I. (2014). Scrupulosity and obsessive compulsive disorder: The cognitive perspective in Islamic sources. *Journal of Religion and Health, 53*(1), 3–12.

Bishop, G. D., Alva, A. L., Cantu, L., & Rittiman, T. K. (1991). Responses to Persons with AIDS: Fear of Contagion or Stigma? 1. *Journal of Applied Social Psychology, 21*(23), 1877–1888.

Bouton, R. A., Gallaher, P. E., Garlinghouse, P. A., Leal, T., Rosenstein, L. D., & Young, R. K. (1989). Demographic variables associated with fear of AIDS and homophobia. *Journal of Applied Social Psychology, 19,* 885–890.

Burny, A., Cleuter, Y., Kettmann, R., Mammerickx, M., Marbaix, G., Portetelle, D., et al. (1988). Bovine leukaemia: Facts and hypotheses derived from the study of an infectious cancer. *Veterinary Microbiology, 17*(3), 197–218.

Duke Depression Evaluation Schedule. (1994). *Center for the study of depression in later life*. Durham, NC: Department of Psychiatry, Duke University Medical Center.

Eftekhar, Z., & Yarandi, F. (2004). Knowledge and concerns about cancer in patients with primary gynecologic cancers. *Asian Pacific Journal of Cancer Prevention, 5*(2), 213–216.

Feder, Y. (2016). Contamination appraisals, pollution beliefs, and the role of cultural inheritance in shaping disease avoidance behavior. *Cognitive Science, 40*(6), 1561–1585.

Freud, S. (1907). Obsessive actions and religious practices. *Standard Edition, 9,* 115–127.

Goodman, W. K., Price, L. H., Rasmussen, S. A., et al. (1989). The Yale-Brown obsessive compulsive scale. *Archives of General Psychiatry, 46,* 1006–1011.

Gough, K., & Hudson, P. (2009). Psychometric properties of the Hospital Anxiety and Depression Scale in family caregivers of palliative care patients. *Journal of Pain and Symptom Management, 5,* 797–806.

Hassona, Y., Scully, C., Abu Ghosh, M., Khoury, Z., Jarrar, S., & Sawair, F. (2015). Mouth cancer awareness and beliefs among dental patients. *International Dental Journal, 65*(1), 15–21.

Inozu, M., Kahya, Y., & Yorulmaz, O. (2018). Neuroticism and religiosity: The role of obsessive beliefs, thought-control strategies and guilt in scrupulosity and obsessive–compulsive symptoms among Muslim undergraduates. *Journal of Religion and Health*. https://doi.org/10.1007/s10943-018-0603-5.

Kinlen, L. (2004). Infections and immune factors in cancer: The role of epidemiology. *Oncogene, 23*(38), 6341–6348.

Koenig, H. G., & Al Shohaib, S. (2014). *Health and well-being in Islamic societies (see Table 7.2)*. New York, NY: Springer.
Koenig, H. G., & Al Shohaib, S. (2017). *Islam and mental health: Beliefs, research, and clinical applications*. Amazon: CreateSpace.
Koenig, H. G., Al-Zaben, F., Khalifa, D. A., & Al Shohaib, S. (2014). Measures of religiosity, Chapter 19. In G. J. Boyle, D. H. Saklofske, & G. Mathews (Eds.), *Measures of personality and social psychological constructs* (pp. 533–564). San Diego, CA: Academic Press (Elsevier).
Koenig, H. G., Westlund, R. E., George, L. K., Hughes, D. C., & Hybels, C. (1993). Abbreviating the Duke Social Support Index for use in chronically ill older adults. *Psychosomatics, 34,* 61–69.
Krouwel, E. M., Nicolai, M. P. J., van Steijn-van Tol, A. Q. M. J., Putter, H., Osanto, S., Pelger, R. C. M., et al. (2015). Addressing changed sexual functioning in cancer patients: A cross-sectional survey among Dutch oncology nurses. *European Journal of Oncology Nursing, 19*(6), 707–715.
Landerman, R., George, L., Campbell, R., & Blazer, D. (1989). Alternative models of the stress buffering hypothesis. *American Journal of Community Psychology, 17,* 625–642.
Lannin, D. R., Mathews, H. F., Mitchell, J., & Swanson, M. S. (2002). Impacting cultural attitudes in African-American women to decrease breast cancer mortality. *American Journal of Surgery, 184*(5), 418–423.
Mellon, S., Gauthier, J., Cichon, M., Hammad, A., & Simon, M. S. (2013). Knowledge, attitudes, and beliefs of Arab-American women regarding inherited cancer risk. *Journal of Genetic Counseling, 22*(2), 268–276.
Norton, R. (1983). Measuring marital quality: A critical look at the dependent variable. *Journal of Marriage and the Family, 45*(1), 141–151.
Rosenberg, M. (1965). *Society and the adolescent self-image*. Princeton, NJ: Princeton University Press.
Shaheen, R., Slanetz, P. J., Raza, S., & Rosen, M. P. (2011). Barriers and opportunities for early detection of breast cancer in Gaza women. *Breast, 20*(Suppl 2), S30–S34.
Sinclair, S. J., Blais, M. A., Gansler, D. A., et al. (2010). Psychometric properties of the Rosenberg self-esteem scale: Overall and across demographic groups living within the United States. *Evaluation & Health Professions, 33,* 56–80.
Smith, G. E., & Nave, C. S. (2007). Illness transmission mode and perceiver personality: Factors affecting stigmatized perceptions of patients and sexual illness. *Social Behavior and Personality, 35*(6), 853–860.
Snyder, J. (2018). *Can your cancer treatment be hazardous to others? Cleveland clinic*. Retrieved from https://health.clevelandclinic.org/2015/01/can-your-cancer-treatment-be-hazardous-to-others/. Accessed Jan 10, 2018.
Stein, L., Urban, M. I., O'Connell, D., Yu, X. Q., Beral, V., Newton, R., et al. (2008). The spectrum of human immunodeficiency virus-associated cancers in a South African black population: Results from a case-control study, 1995–2004. *International Journal of Cancer, 122*(10), 2260–2265.
Ware, J. E., Jr., & Sherbourne, C. D. (1992). The MOS 36-item short-form health survey (SF-36): I. Conceptual framework and item selection. *Medical Care, 30*(6), 473–483.
Welsh, J. S. (2011). Contagious cancer. *The Oncologist, 16,* 1–4.
Wong-Kim, E., Sun, A., & DeMattos, M. C. (2003). Assessing cancer beliefs in a Chinese immigrant community. *Cancer Control, 10*(5 suppl), 22–28.
Zigmond, A. S., & Snaith, R. P. (1983). The hospital anxiety and depression scale. *Acta Psychiatrica Scandinavica, 67*(6), 361–370.