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# The moderating effect of religiosity between climate change anxiety and death anxiety among a sample of Lebanese adults

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## Abstract

**Background** Acknowledging the increasing worry over climate change and its psychological effects, the aim of this research is to clarify the dynamics between religiosity, climate anxiety and death anxiety, seeking to figure out the way religiosity mitigates the psychological effects of existential anxieties and climate related anxiety.

**Methods** Using Google Forms, a questionnaire was developed and disseminated through a variety of messaging platforms, such as WhatsApp, Instagram, and Facebook Messenger. Through a snowball sampling technique, 763 participants were recruited in this cross-sectional during September 2023.

**Results** The subsequent variables were adjusted in the moderation analysis: age, gender, and place of living. The results suggested that religiosity levels moderated the association between climate anxiety and death anxiety (Beta = 0.02,  $t = 1.97$ ,  $p = .05$ , 95% CI 0.001, 0.035). At low, moderate, and high levels of religiosity, higher climate anxiety was significantly associated with more death anxiety. In addition, at low levels of climate anxiety, individuals with higher levels of religiosity (22.66) had more decreased levels of death anxiety compared to those with lower levels of religiosity (11.99). As climate anxiety levels increase, inverted patterns can be observed, with highly religious individuals showing higher levels of death anxiety than those with lower levels of religiosity. Overall, the relationship between climate anxiety and death anxiety was found to be weakest at low levels of religiosity and strongest at high levels of religiosity.

**Conclusion** Our findings suggest a possible beneficial effect of high religiosity at low levels of climate anxiety. This effect is reversed as climate anxiety starts to increase. Therefore, clinicians and policy-makers should bear in mind these complex interactions when designing strategies to mitigate mental health problems in the context of climate crisis.

**Keywords** Religiosity, Climate anxiety, Death anxiety, Lebanon

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## Introduction

The issue of climate change has emerged as one of the world's most serious and pressing issues today. Concerns about climate change are becoming more widespread; a previous study showed that a median of 54% of the countries polled believe it to be a very severe issue, and 85% believe it to be at least somewhat serious [1]. Given the inextricable relationship between climate change and the rising frequency of catastrophic and devastating weather events, this growing fear holds merit [2]. As the environment's apparent deterioration digs deeper into the global community, the concept of "climate anxiety" is erupting as a tangible sign of widespread uneasiness and discomfort [3]. There are different definitions of climate anxiety in the literature, including "difficult feelings because of the ecological crisis" [4], "apprehension and stress about anticipated threats to salient ecosystems" [5], and "a chronic fear of environmental doom" [6]. Indeed, emerging research has shown that high levels of climate anxiety are likely to trigger mental health problems, including anxiety disorders [7]. A systematic review by Boluda-Verdu et al. [8] found that climate anxiety is significantly linked to worse self-rated mental health, including increased symptoms of anxiety. Nevertheless, studies investigating latent mental health issues that may possibly emerge from climate anxiety are still scarce and our knowledge of the processes involved remains limited. The present study proposes to focus on the relationship and pathways linking climate anxiety and another specific form of anxiety that can be experienced when facing an inescapability of death or mortality salience, i.e. death anxiety [9].

### Death anxiety and climate change

Death anxiety, which has its roots in the fundamental human condition, remains a multidimensional phenomenon that humans of all cultures and religions encounter and occasionally struggle with [10, 11]. Death anxiety, although ubiquitous, is not static. Rather, it changes as people age, shaped by their experiences, cultural values, and social mores [12]. For instance, higher degrees of death anxiety could arise because of worries regarding the growing environmental catastrophe [13]. People's concerns about the environment are found to be strongly associated with anxiety of death [14]. Awareness about the climate crisis may face the individual with their own fragility and ineluctable mortality, contributing in turn to death anxiety [15]. Budziszewska & Jonsson [15] explored climate change-related concerns from an existential perspective through semi-structured interviews with affected Swedish patients who were under psychotherapy, and indicated that participants' accounts of climate anxiety were related to worries about climate change becoming "death-extended", "the death of humanity",

"existential crisis", and "increased mortality salience". Altogether, climate anxiety seems to worsen existential anxieties and worries about mortality [16]. Hence, individuals struggle in dealing with existential unease, which will then contribute to an increased death worry [3]. There appears an intricate connection between existential fears, environmental concerns, and mental wellness consequences, underlining the critical importance of targeting existential issues in both mental health interventions and climate change mitigation [16]. Hence, a good understanding of the mechanisms underlying the associations between climate anxiety and death anxiety are needed to prevent and reduce distress in those who are the most exposed to climate challenges and are at-risk for suffering from climate worries. To participate in advancing knowledge in their field, and based on the literature available, our study sought to examine the role of a potential mediator, i.e. religiosity, in the association between climate anxiety and death anxiety.

### Religiosity as a moderator between climate anxiety and death anxiety

Because religiosity is commonly used as an indicator of population health, involving mental health [17]\* has a significant and crucial influence on the way individuals perceive and understand death [11]. It has been suggested from a theoretical point of view that, by supplying reassurance of tangible and concrete eternity, religion may furnish a distraction from the fear of dying, thus decreasing anxiety related to death [1, 18]. Since the 70s, there has been empirical efforts to examine how religiosity relates to death anxiety. Results, however, have been mixed and inconclusive (for reviews, see Donahue (1985) [19] and Donovan (1994) [20]). Although some researchers pointed to lower death anxiety in more religiously committed people [21], [22], others could show no support for this finding [23], or even showed that levels of religiosity did not reduce or intensify death anxiety [24]. More recent studies have also led to inconsistent findings, reporting either positive [25], negative [26], or non-significant correlations [27]. Ellis et al. [28] reviewed 84 papers on the link between death anxiety and religiosity; they found a positive correlation in 27 studies, a negative correlation in 40 studies, and a lack of significant correlation in either direction in 41 studies. A more recent systematic review encompassing 100 studies observed an inverted-U relationship between religiosity and death anxiety, with death anxiety being at its lowest levels in both very religious and very non-religious people [29]. Similar controversies surround the relationship between religiosity and climate anxiety. There is some evidence to suggest that religiosity can serve as a protective factor against worry and anxiety [30]. Although some previous findings indicated that less anxiety of climate change is

linked to a stronger religious conviction [31], and certain researchers find a positive relationship between climate skepticism and religiosity [32], others suggest a less favorable outcome or even find no relationship at all [33]. However, to date, only limited understanding exists on the role of religiosity in facing anxiety caused by climate change and easing its detrimental effects on mental health. Another important consideration is that the majority of literature available was from western and Asian countries [20]. Given the evidence in favor of cultural variation in climate anxiety [34] and death anxiety [20], looking at the complex pathways linking climate anxiety, death anxiety, and religiosity in culturally and religiously diverse populations could help mental health practitioners in making informed decisions about climate distress interventions.

### The present study

Lebanon is a Middle-Eastern country with a well-known vulnerability to climate change, which is firstly due to its geographic location [35–38]. Indeed, the Middle-East region emerges as one of the hot spots for, aridity conditions, drought and worsening extreme heat under climate change [36]. Other factors also play a role in the increased vulnerability of the Lebanese to climate change consequences, such as the country's limited supply of land and water resources, as well as rising urbanization [39]. Furthermore, cross-cultural research has shown that Arab people, including Lebanese, exhibited higher levels of death anxiety than their counterparts from a Western context [40]. In light of the points mentioned above, this study aims to examine the moderating role of religiosity in the association between climate anxiety and death anxiety, for the first time, in a vulnerable population group of community adults from a Middle-Eastern country.

## Methods

### Study design

Using Google Forms, a questionnaire was developed and disseminated through a variety of messaging platforms, such as WhatsApp, Instagram, and Facebook Messenger. Through a snowball sampling, 763 participants were recruited in this cross-sectional in September 2023. In order to be eligible for participation, individuals needed to be Lebanese citizens residing in Lebanon and be 18 years old or older. Considering that an online survey was created for this study, internet access was a necessity, alongside a desire to partake in the research study. The study excluded participants who refused to answer the questionnaire. The assessment tools provided in the questionnaire were presented in a randomized order to mitigate any potential order-related biases. Participants were assured confidentiality and anonymity, while

agreeing to complete the questionnaire voluntarily without any form of compensation.

### Minimal sample size calculation

The G-power program was used to estimate a minimum sample size of 763 participants (F test, 5% multiple regressions, R [2] deviation from zero,  $\alpha$  error=5%, power=80%).

### Questionnaire and variables

The questionnaire took about fifteen minutes to complete, and it was sent in Arabic which is Lebanon's native language. It was composed of multiple sections: the sociodemographic details in the first section, including gender, along with age, place of living, marital status, education level, Household Crowding Index which is computed by dividing the entire number of residents in a home—apart from a newborn—by the total number of rooms—apart from the kitchen and bathrooms—in that home [41]. Concerning their perceived financial burden, participants were requested to provide an answer on one question “How much pressure do you feel with regard to your personal financial situation in general?” on a scale from 1 to 10, with 10 referring to overwhelming pressure. The second section of the questionnaire contained the following scales:

**Death Anxiety Scale**, validated in Arabic [42], is a reliable tool to assess individuals' anxiety regarding mortality. The 17 items on the Death Anxiety Scale are based on a Likert scale with five points, ranged from “totally disagree=1” to “totally agree=5” (e.g. Do you worry about dying? ; Does it bother you that you may die before you have done everything you wanted to do? ) [43]. Higher score translates an increased level of death anxiety [44] ( $\alpha=0.97 / \omega=0.97$ ).

**Central Religiosity Scale**, This instrument evaluated the importance and of religiosity in individuals [45]. This brief version has five items with ratings on a Likert scale of five (1=Never, 5=Very Often) (e.g. How often do you think about religious issues? ; To what extent do you believe that God or something divine exists? ). The more a person is committed to their religious beliefs, the greater the score of this scale. This version is also validated in Arabic with sound psychometric properties [46] ( $\alpha=0.97 / \omega=0.97$ ).

**Climate Anxiety Scale** is composed of 13 items and validated in Arabic [47]. This scale is used to measure people's psychological reactions to climate change. The cognitive impairment and functional impairment subscales make up the two subscales of the climate anxiety scale [48, 49]; Each topic is graded using a Likert scale that goes from “1” (strongly disagree) to “5” (strongly agree) (e.g., I have problems balancing my concerns about sustainability with the needs of my family) [49].

**Table 1** Sociodemographic and other characteristics of the sample (N = 763)

| Variable                                | N (%)            |
|---|------------------|
| Gender                                  |                  |
| Male                                    | 279 (36.6%)      |
| Female                                  | 484 (63.4%)      |
| Marital status                          |                  |
| Single                                  | 511 (67.0%)      |
| Married                                 | 252 (33.0%)      |
| Education                               |                  |
| Secondary or less                       | 149 (19.5%)      |
| University                              | 614 (80.5%)      |
| Place of living                         |                  |
| Urban                                   | 372 (48.8%)      |
| Rural                                   | 391 (51.2%)      |
|   | <b>Mean ± SD</b> |
| Age (years)                             | 28.57 ± 11.08    |
| Household crowding index (persons/room) | 1.15 ± 0.52      |
| Financial burden                        | 4.92 ± 2.38      |
| Climate anxiety                         | 25.48 ± 10.98    |
| Death anxiety                           | 35.30 ± 15.60    |
| Religiosity                             | 17.32 ± 5.33     |

**Table 2** Bivariate analysis of factors associated with death anxiety

| Variable          | Mean ± SD     | t      | df  | p            |
|-------------------|---------------|--------|-----|--------------|
| Gender            |               | -2.007 | 761 | <b>0.045</b> |
| Male              | 33.81 ± 14.94 |        |     |              |
| Female            | 36.16 ± 15.92 |        |     |              |
| Marital status    |               | 0.931  | 761 | 0.352        |
| Single            | 35.67 ± 15.65 |        |     |              |
| Married           | 34.55 ± 15.50 |        |     |              |
| Education         |               | -0.516 | 761 | 0.606        |
| Secondary or less | 34.70 ± 14.68 |        |     |              |
| University        | 35.44 ± 15.82 |        |     |              |
| Place of living   |               | 1.673  | 761 | 0.095        |
| Urban             | 36.26 ± 15.63 |        |     |              |
| Rural             | 34.38 ± 15.53 |        |     |              |

Numbers in bold indicate significant p values

Higher scores match higher degrees of climate anxiety ( $\alpha=0.97 / \omega=0.97$ ).

**Statistical analysis**

The SPSS software v25 was used to do the statistical analysis. Cronbach’s  $\alpha$  / McDonald’s  $\omega$  values were calculated for internal consistency. The death anxiety score was normally distributed since the skewness and kurtosis values were inside the  $-1$  and  $+1$  interval [50]. Two means were compared employing the Student’s t-test, and two continuous variables were correlated using the Pearson test. With PROCESS MACRO, the moderation analysis was carried out (an SPSS add-on) v.3.4 model 1 [51]. Interaction terms were probed by examining the association of climate anxiety with death anxiety at the mean, 1 SD

**Table 3** Correlations of continuous variables with death anxiety

|                             | 1       | 2     | 3      | 4     | 5        |
|-----------------------------|---------|-------|--------|-------|----------|
| 1. Death anxiety            | 1       |       |        |       |          |
| 2. Age                      | -0.05   | 1     |        |       |          |
| 3. Household crowding index | 0.001   | 0.02  | 1      |       |          |
| 4. Financial burden         | 0.001   | 0.09* | 0.11** | 1     |          |
| 5. Religiosity              | -0.12** | -0.01 | 0.09*  | 0.003 | 1        |
| 6. Climate anxiety          | 0.45*** | -0.04 | 0.05   | 0.01  | -0.18*** |

\* $p < .05$ ; \*\* $p < .001$

**Table 4** Moderating effect religiosity between climate anxiety and death anxiety (Nagelkerke  $R^2=0.215$ )

|  | Beta  | t     | p            | 95% CI       |
|--|-------|-------|--------------|--------------|
| Climate anxiety                            | 0.31  | 1.93  | 0.054        | -0.01; 0.63  |
| Religiosity                                | -0.54 | -2.32 | <b>0.021</b> | -1.01; -0.08 |
| Interaction climate anxiety by religiosity | 0.02  | 1.97  | <b>0.050</b> | 0.001; 0.04  |

\*indicates significant moderation; numbers in bold indicate significant p values

below the mean and 1 SD above the mean of the moderator (religiosity). All variables with a  $p < .25$  in the bivariate analysis were entered as confounding variables in the moderation model [52]. Statistics were considered significant when  $P < .05$ .

**Results**

**Sociodemographic and other characteristics of the sample**

This study involved 763 individuals, whose mean age was  $25.48 \pm 10.98$  years [min=18; max=82] and 63.4% females’ participation. Table 1 provides more sample descriptive statistics.

**Bivariate analysis of factors associated with death anxiety**

Tables 2 and 3 provide a summary of the findings from the bivariate analysis of the variables linked to death anxiety. According to the findings, women’s mean death anxiety scores were noticeably greater than men’s. Moreover, higher religiosity was notably related to less death anxiety, in contrast higher climate anxiety was strongly affiliated with higher death anxiety. Finally, higher religiosity was significantly associated with lower climate anxiety ( $r = -.18$ ;  $p < .001$ ).

**Moderation analysis**

The following variables have been accounted for the moderation analysis: age, gender, and place of living. The outcomes demonstrated that religiosity moderated the association between climate anxiety and death anxiety (Beta=0.02,  $t=1.97$ ,  $p=.05$ , 95% CI 0.001, 0.035) (Table 4). At low, moderate and high levels of religiosity, higher climate anxiety was significantly associated with

more death anxiety (Table 5; Fig. 1). In addition, at low levels of climate anxiety, individuals with higher levels of religiosity (22.66) had more decreased levels of death anxiety compared to those with lower levels of religiosity (11.99). As climate anxiety levels increase, inverted patterns can be observed, with highly religious individuals showing higher levels of death anxiety than those with lower levels of religiosity. Overall, the relationship between climate anxiety and death anxiety was found to be weakest at low levels of religiosity and strongest at high levels of religiosity (Fig. 1).

**Discussion**

This research looked into how religion could play a moderating role between death anxiety and climate anxiety across a group of Lebanese adults from the general population. The outcomes demonstrated that at low, moderate, and high levels of religiosity, higher climate anxiety was significantly associated with more death anxiety.

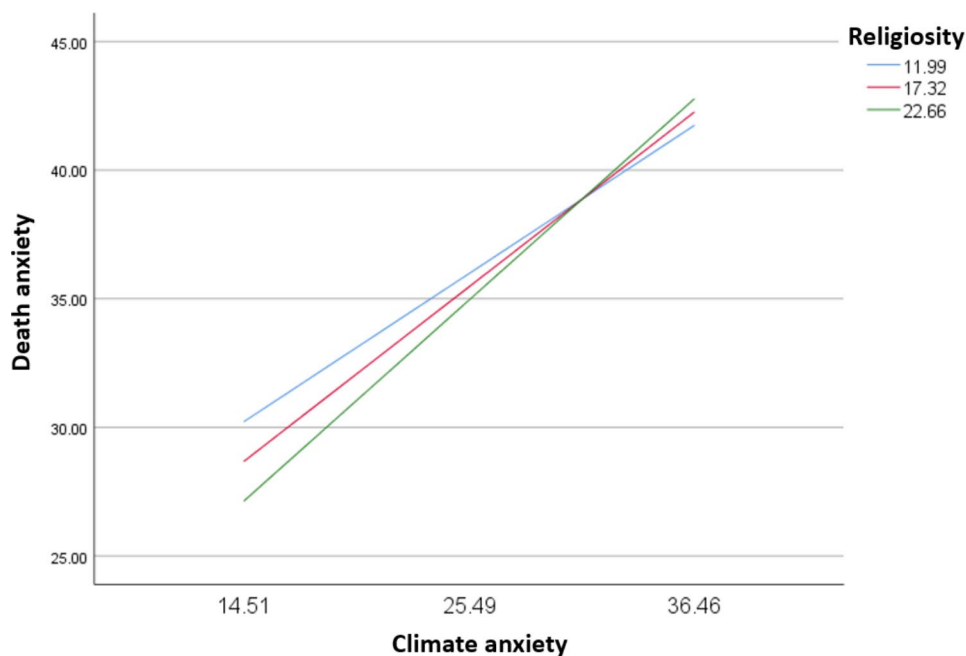
The correlation between death anxiety and climate anxiety has been found to be moderated by religiosity, according to our study. Thus, at all levels of religiosity, higher climate anxiety was strongly correlated with greater death anxiety. Looking more in depth into the moderation model, it appears that the relationship between climate anxiety and death anxiety is strongest at high levels of religiosity and weakest at low levels of religiosity. Additionally, patterns emerge suggesting that at low levels of climate anxiety, individuals with higher religiosity report lower death anxiety. However, as climate anxiety intensifies, this gap diminishes and even reverses

**Table 5** Conditional effects of the focal predictor (climate anxiety) at values of the moderator (religiosity)

| Mature religiosity | Beta | t     | p       | 95% CI     |
|--------------------|------|-------|---------|------------|
| Low (= 11.99)      | 0.52 | 7.739 | < 0.001 | 0.39; 0.66 |
| Moderate (= 17.32) | 0.62 | 13.12 | < 0.001 | 0.53; 0.71 |
| High (= 22.66)     | 0.71 | 10.74 | < 0.001 | 0.58; 0.84 |

Numbers in bold indicate significant p values

at the highest levels of climate anxiety. Direct comparison of our findings with previous literature is challenging, because the evidence for any correlational relationship between religiosity and death anxiety is widely debated and largely controversial [19], [53], [28]. Historically, fear of death has been considered the chief cause of religiosity from the theorists of religion perspective [54]. The Terror Management Theory posits that religiosity may offer both symbolic and literal immortality in the forms of afterlife belonging [54]. However, several empirical findings did not provide any support for these theories, reporting, in contrast, either no association (e.g., (Bakan et al. 2019) [27] or a negative correlation (e.g., (Marin 2019)) [26] between religiosity and death anxiety. Leming [ref] argued that religiosity can be both arousing and relieving for death anxiety. For example, religion can arouse fear if it evokes thoughts about judgment after death and divine punishment for committed sins, but religion can also relieve anxiety in people who expect life after death. Some researchers attempted to resolve these controversies by suggesting a curvilinear relationship, such that the direction of the association varies as the person becomes more or less religious: at the lowest



**Fig. 1** Interaction climate anxiety by religiosity on death anxiety

levels of religiosity, death anxiety may reduce irreligiosity, whereas at the highest levels of religiosity death anxiety can be at its lowest [28]. A systematic review posited that the relationship between religiosity and death anxiety follows an inverted-U pattern, with death anxiety being at its lowest levels in both very religious and very non-religious people [29].

On the other hand, the field of climate anxiety is evolving, but is still in its infancy. The relatively limited amount of research done in this area to date yielded mixed findings, showing negative [31], positive [32], or non-significant [33] links between climate anxiety and religiosity. Overall, our findings bring a new perspective to these relationships in a population and country shown to be vulnerable to both climate anxiety and death anxiety, and provide further support to previous literature that the role of religiosity is rather complex. Our moderation results suggest that religiosity could, at some extent, protect individuals from death anxiety, particularly when climate anxiety is still at low levels. However, religiosity seems to lose its protective role and to even exacerbate death anxiety at more severe levels of climate anxiety.

### **Clinical implications**

According to the World Health Organization, climate change is expected to cause around 250 000 additional deaths per year between 2030 and 2050, with substantial direct damage costs to health [55]. Given the expected exacerbations of the climate crisis and its subsequent psychological responses over the next years, it appears urgent to foster research in this area, particularly in people living in areas highly susceptible to climate change, such as Lebanon. Such research can help inform policy makers' decisions when preparing and responding to the climate crisis and its harmful effects on the population. The way that religiosity affects the relationship between climate anxiety and death anxiety appears to be complex. Our findings suggest a possible beneficial effect of high religiosity at low levels of climate anxiety. This effect is reversed as climate anxiety starts to increase. Therefore, clinicians and policy-makers should bear in mind these complex interactions when designing strategies to mitigate mental health problems in the context of climate crisis.

As our study is the first to explore the relationships between climate anxiety, religiosity and death anxiety, researchers are urgently called to replicate the study's model in other countries using experimental and longitudinal designs to capture causality. This could allow to build on and confirm our findings' applicability in other contexts, and will hopefully enable people's psychological readiness to face the challenges of climate change. An enhanced understanding the moderating effect of

religiosity between climate anxiety and death anxiety could aid in the development of personalized interventions [55].

### **Limitations**

There are few limitations to be aware of. Despite the fact that this study offers valuable information regarding the intricate relationship among death anxiety, climate anxiety and religiosity, the cross-sectional nature of the study limits the capacity to determine the causality or deduce longitudinal connections between the variables we are examining. More convincing evidence regarding the directionality of the observed connections could potentially be given through future studies using experimental or longitudinal techniques. Furthermore, the inclusion of self-reported measures enhances the likelihood of bias, such as recall bias, which might distort the collected data. Because participants can possibly misinterpret a question, there could be information bias, which would have lowered the reliability of an answer. The snowball sampling technique followed for the recruitment may introduce potential biases due to its non-random nature since participants who took the survey are likely to have similar social circles or religiosity background, which may introduce the moderator (religiosity) bias and possibly limit the generalizability of our results to the general population. Residual confounding bias is also possible since some factors (e.g. religion) were not considered in the survey.

### **Conclusion**

To sum up, this study delivers a substantial contribution to our comprehension of the complex associations between climate anxiety, death anxiety and religiosity. In addition, it highlights the complexities of behavioral mechanisms that underpin the way individuals' respond to existential hazards. The recognition of the enduring impact of climate anxiety on individuals and its potential link with death anxiety highlights the urgency of providing interventions that could enhance the well-being of individuals facing the anxiety evoked by the threat of climate change. Through analyzing the moderating effect of religiosity, we have uncovered empirical proof suggesting that religiosity can be protective against death anxiety in some circumstances, when climate anxiety is low. However, religiosity seems to lose its protective property when climate anxiety increases. Lastly, examining a different population could help researchers and clinicians better understand the effect of religiosity on the associations detected since religious beliefs are heavily impacted by individual and contextual variables.

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### Author contributions

FFR, DM, SO and SH designed the study; JAJ drafted the manuscript; SH carried out the analysis and interpreted the results; SEK, MD and FS collected the data; RH and all authors reviewed the paper for intellectual content; all authors reviewed the final manuscript and gave their consent.

### Funding

None.

### Data availability

The datasets generated and/or analysed during the current study are not publicly available but are available from the corresponding author on reasonable request.

### Declarations

#### Ethics approval and consent to participate

The research protocol underwent a thorough evaluation and received approval from the School of Pharmacy at the Lebanese International University Ethics and Research Committee (protocol approval number: 2023RC-021-LIUSOP). This study was done in accordance with the Declaration of Helsinki. All participants provided their written informed consent before taking part and retained the option to withdraw from the survey at any point before submission.

#### Consent for publication

Not applicable.

#### Competing interests

The authors declare no competing interests.

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