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Just-world beliefs are associated with influenza vaccine intake intent in the United Arab Emirates: a cross-sectional study

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Although not a prime public health concern, seasonal influenza remains a challenge in the United Arab Emirates (UAE). This problem is augmented by the fact that the percentage of the population intending to take the yearly seasonal influenza vaccine is relatively low. The purpose of this study is to assess if vaccine knowledge and just-world beliefs have an impact on willingness to receive the seasonal influenza vaccine. The methodology relies on a multivariable logistic regression analysis establishing predictors of vaccine intake intent and parametric tests comparing variables across gender and ethnicity. Results come out showing that vaccine knowledge is not a significant predictor of seasonal influenza vaccine intake intent. However, general belief in the just world is a significant predictor of vaccine intake intent. This has important implications for the role of religion in curbing seasonal influenza vaccine hesitancy in the UAE. Given that just-world beliefs are linked to religiosity, public health authorities need to consider relying on religious leaders to exhort the faithful to take the vaccines by framing their exhortations in the context of just-world beliefs.

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Introduction

Religions have traditionally needed to address the philosophical problem of evil. The problem is expressed in Epicurus' well-known paradox: "Is God willing to prevent evil, but not able? Then he is not omnipotent. Is he able but not willing? Then he is malevolent. Is he both able and willing? Then whence cometh evil? Is he neither able nor willing? Then why call him God?" (Shen, 2014).

Many responses have been provided to this ancient problem from different religious traditions (Adams and Adams, 1990; Gellmann, 1992; Kaufman, 2005; Peterson, 1983; Saeedimehr, 2010; Tooley, 2019; Van Inwagen, 2006). But while many of these responses have been philosophically sophisticated, many people adhere to a rather rudimentary religious understanding: evil in the world is simply a punishment for sins (Harris et al., 2018; Stump, 1985). This corresponds with the concept of immanent justice: evil deeds are immanently punished (Maes, 1994).

While most religious doctrinal systems do not formally adhere to this understanding of the world, it can still be found in certain aspects of religious traditions. For example, *karma* in Dharmic religions refers to the connection between actions and results. While this doctrine typically appeals to deeds in previous lives to account for the circumstances of current life, it also has immanent applications, i.e., suffering is explained by actions done in this life (Harvey and Callan, 2014; Taylor et al., 2022).

In the Abrahamic religions, similar concepts of immanent justice are also occasionally found (Norenzayan, 2016; White et al., 2021). In Biblical literature, for example, it is stated that "the person who sins will die... the righteousness of the righteous will be upon himself, and the wickedness of the wicked will be upon himself" (Ezekiel 18:20). Some Muslims interpret this verse from the Qur'an as conveying a similar message: "Allah confounds whom He will, and guides to the Right Way whom He pleases" (6:39). While theologians of these religious traditions typically emphasize that justice will be served in the afterlife (either through divine judgment or through the reincarnation cycle) (Hafer and Rubel, 2015), many adherents to these religious traditions believe that outcomes in life neatly reflect actions.

This corresponds to what psychologists call the "just world hypothesis." As per Melvin Lerner's (1980) definition in his seminal study of this topic, "the 'belief in a just world' is an attempt to capture in a phrase one of the ways, if not the way, that people come to terms with-make sense out of-find meaning in, their experiences. We do not believe that things just happen in our world; there is a pattern to events that convey not only a sense of orderliness or predictability but also the compelling experience of appropriateness expressed in the typically implicit judgment, Yes, that is the way it should be."

Lerner was quite aware of the strong connection between religion and the just world hypothesis. As he explains, "the Western religions stress the relation between sin, doing harm to others, and suffering. Although the ultimate accounting is expected to take place in the next world and for eternity, there are strong themes running through the Judeo-Christian tradition which link signs of one's fate on earth with virtue and a state of grace" (Lerner, 1980). Similar themes are present in Islam, Hinduism, and Buddhism (Furnham and Procter, 1989). Unsurprisingly, previous research has found associations between adherence to just-world beliefs and religiosity (Kaplan, 2012; Rubin and Peplau, 1975; Zweigenhaft, 1985).

The just world hypothesis has been associated with various negative traits and behaviors. For example, studies have indicated that it is related to victim blaming (Van den Bos and Maas, 2009), especially in rape situations (Hayes et al., 2013; Pedersen and Strömwall, 2013; Strömwall et al., 2013; Valor-Segura et al., 2011). Other studies have shown associations between authoritarianism

(Connors and Heaven, 1987; Lambert et al., 1999) and demeaning attitudes towards the poor. In the realm of health, the just world hypothesis has also been associated with the stigma of cancer patients (Stahly, 1988), as well as STDs (Anderson, 1992; Furnham and Procter, 1992).

However, the just world hypothesis has also been associated with positive health effects. For example, one study found that belief in the just world is a buffer against anger (Dalbert, 2002a). Some research indicates that belief in the just world served as a protection against hopelessness in the wake of the COVID-19 pandemic (Kiral Ucar et al., 2022). Very few studies have been done on the possible association between belief in the just world and intent to take vaccines.

In this endeavor, it is also important to consider some background on the psychology and sociology of vaccine hesitancy as a general phenomenon. Vaccine hesitancy is a multidimensional phenomenon, but prior multi-national research suggests that there are particular axes that have an effect on people's hesitancy to receive vaccines. For example, various media studies report that in the age of social media, misinformation can spread rapidly; false claims and misconceptions about vaccines, their ingredients, and potential side effects can contribute to hesitancy (Garett and Young, 2021; Neely et al., 2022; Puri et al., 2020). Likewise, other studies indicate that some individuals may struggle to discern reliable sources from unreliable ones, leading them to believe inaccurate information about how vaccines work (Austin et al., 2023; Biasio, 2017; Melki et al., 2023).

Psychological research also suggests that people may perceive the risk of vaccination as greater than the risk of the disease itself, especially if the disease is rare or not well understood, and in turn, this may enhance vaccine hesitancy (Caserotti et al., 2021; Du et al., 2021; Martinelli and Veltri, 2021). It must also be admitted that in recent times transparency has been affected in some areas of the world, and in turn, distrust in government agencies and pharmaceutical companies can contribute to vaccine hesitancy; concerns about profit motives, lack of transparency, and perceived conflicts of interest can erode trust in the scientific community and the health care system (Goldenberg, 2021; Jennings, Stoker, Bunting et al., 2021; Jennings, Stoker, Willis et al., 2021; Trent et al., 2022). This mistrust frequently extends to medical professionals, and consequently, this affects the perceived credibility of vaccination recommendations (Lalumera, 2018; Nowak et al., 2021).

Some studies also document an interesting paradox: success in reducing or eliminating certain diseases through vaccination can lead to complacency; if a disease is no longer prevalent, individuals may underestimate its severity and the importance of vaccination (Barglow, 2021; Lu and Sun, 2022; Walsh et al., 2022). Furthermore, some individuals prefer to rely on natural immunity, believing that exposure to a disease is a more effective and safer way to build immunity (Ebrahimi et al., 2021; Kumar et al., 2016; Perry et al., 2020; Smith, 2017). These trends may be compounded by certain religious beliefs, as misinterpretations of religious doctrines or concerns about vaccine ingredients may contribute to hesitancy (Ladini and Vezzoni, 2022; Trangerud, 2023).

Research also suggests that limited access to healthcare services, including vaccination clinics, can contribute to hesitancy; socioeconomic factors, such as poverty and lack of education, may also play a role (M. S. Khan et al., 2021; McElfish et al., 2023; Paterson et al., 2016). Studies likewise indicate that some individuals may prioritize alternative or holistic health practices over conventional medicine; this can lead to resistance to vaccines perceived as artificial or unnecessary (Attwell et al., 2018; Fasce et al., 2023).

The problem to be approached in this study is whether the belief in the just world may be associated with the decision to receive the yearly seasonal influenza shot in the United Arab Emirates (UAE). In recent times, the UAE has made significant strides in healthcare and public health over the years, focusing on both preventive measures and advanced medical services (Al Habaishi and Ali, 2022; M. Khan et al., 2018; M. Khan et al., 2018). The UAE has a modern healthcare system with state-of-the-art facilities, hospitals, and clinics; both public and private healthcare sectors contribute to the overall healthcare services in the country (Aljasmí et al., 2022; Jabnoun and Juma AL Rasasi, 2005; Mahmood et al., 2016). Likewise, the UAE government has launched several initiatives to enhance public health; these include campaigns for preventive care, vaccination drives, and awareness programs on lifestyle diseases (Hamidi, 2015; Khan-saheb et al., 2016). As part of its public health policy, the UAE has implemented mandatory health insurance for all residents; this has helped in ensuring that individuals have access to medical services when needed and has contributed to the overall improvement of public health (Harichandran, 2023; E. Koornneef et al., 2017; E. J. Koornneef et al., 2012).

However, as with many other countries, the UAE has faced some problems in getting its population to fully receive vaccine shots as per the schedules recommended by the World Health Organization. During the COVID-19 pandemic, the UAE launched an extensive vaccination drive, aiming to achieve high vaccination coverage to protect its population. The government, along with healthcare authorities, has been actively promoting vaccination through awareness campaigns, public communications, and outreach efforts. These governmental efforts have been very efficient, but the greater challenge in terms of vaccine hesitancy may be the public's general attitude and some cultural constraints.

Due to the rise of conspiracy-mongering and misinformation in recent times, most governments approach the problem of vaccine hesitancy through education. The rationale is that knowledge of how vaccines work predicts their intake intent in the population. The research question of the study is as follows: does belief in the just world serve as a predictor of seasonal influenza vaccine intake intent? It is important to point out that while some people may intend to take the vaccine, that is not necessarily the same as accepting it because some professions are required to take the vaccine, and in that case, they intend to take it (strictly to meet some job requirements) but do not necessarily accept it. Secondary research questions are: (a) Are there gender differences in adherence to the just world hypothesis in the UAE? (b) are there ethnic differences in adherence to the just world hypothesis in the UAE?

If belief in the just world is indeed a predictive factor of seasonal influenza vaccine intake, then authorities must reconsider some of their strategies concerning vaccination efforts to focus not only on the dissemination of vaccine knowledge but also on cultivating particular attitudes that appeal to just-world beliefs. In this endeavor, religion may play an important role.

Methods

Participants. Research protocols were approved by an Institutional Review Board (IRB). Because of guidelines provided by authorities in the UAE, the IRB strongly discouraged directly asking participants about religious beliefs or religious adherence. This decision is on the grounds that the UAE pursues a program of religious tolerance because of its heterogeneous population, and asking religious questions is deemed too sensitive. Nevertheless, participants could be asked about just world beliefs.

Sampling was non-probabilistic, based on the willingness and availability to answer a survey. Participants were told their responses would be anonymous and were informed they could refuse to answer at any time. They were then asked to give informed consent.

The present study's inclusion criteria were confirmed by people over 18 years of age in the UAE of any religion or nationality, and consequently, it was expected that some participants would deem questions about religiosity too sensitive. For that reason, we opted to ask about issues that have a relationship with religious beliefs (such as the just world hypothesis) but not religion itself. Given the sensitive nature of religion in the UAE—and following the guidelines provided by the Institutional Review Board that assessed the survey—we took special care not to include questions related to religious issues. It is important to emphasize that religious issues are generally treated with sensitivity in the UAE, as it is a country that values religious tolerance and diversity (Lootah, 2021); research in this nation suggests that there are certain boundaries and regulations in place to maintain social harmony, and religious discussions are better circumvented by investigating topics that may be related, but not explicitly religious.

Exclusion criteria were not being a resident of the UAE and not being proficient in English. Responses were collected using three methods: direct link, QR codes, and face-to-face interaction. Responses were stored in Microsoft Forms. Admittedly, the choice of language may constitute a limitation of the present study. Proficiency in English in the UAE may align with liberal values, and this may have had a confounding effect. However, it is important to consider that the present study reaches out to all ethnic and national groups of residents in the UAE, and there is a very high level of linguistic diversity amongst such groups. Therefore, in order to reach all of them, the use of a lingua franca was necessary. Although Arabic is the official language of the UAE, English serves more as a lingua franca to the extent that it enables communication of all groups speaking other languages (Hindi, Urdu, Persian, Tagalog, Pashtu, Malayalam, etc.). Consequently, while the use of English in the present study may have been a limitation given its potential confounding effect in regard to adherence to liberal values, it also provided the opportunity to cover wider segments of the UAE population.

Measures. The survey was composed of four parts. First, demographic information was collected: age, gender, ethnicity, and educational level.

Gender was obtained by asking participants, "What is your gender?" with "Male/Female" alternatives. A binary model was preserved, given that the cultural context of the Arab region does not fit well into nonbinary alternatives, and the IRB advised against using a nonbinary alternative in this question.

Ethnicity was obtained by asking the participants, "Are you an Arab?" with "Yes/No" alternatives. As in many other ethnicities, it is not altogether clear who counts as an Arab. Occasionally, researchers use a religious criterion, mistakenly conflating Muslims and Arabs; this is clearly problematic, as there are plenty of non-Muslim Arabs and Non-Arab Muslims. More plausibly, researchers use a national criterion, assuming that people from Arab countries are Arabs. But this is also not satisfactory, as Arab countries may have non-Arab (Kurds, Berbers, etc.) populations, and many Arabs are now citizens of European and North American nations. Sometimes a linguistic criterion is also used, assuming that people whose first language is Arabic can be considered Arabs; but again, this is not entirely satisfactory, as in North Africa, there are people whose first language is Arabic yet belong to other ethnicities, and in Europe,

North America and the Gulf region there may be people who are considered Arab, yet do not have Arabic as their first language. Ultimately, in this study, we have decided to use self-identification, acknowledging that although it is probably the best criterion, it still has limitations.

Educational level was structured along a scale (1 = None; 2 = Primary school; 3 = Secondary School; 4 = College (undergraduate); 5 = College (graduate)). The following question was also asked: “Have you taken the seasonal influenza vaccine in the last 6 months, or do you intend to take it in the next 6 months?” with “Yes/No” as option for the “Vaccine Intake Intent” variable.

Second, a vaccine knowledge scale devised by Zingg and Siegrist (2012) was included. This is an instrument composed of 9 items, which assess subjects’ knowledge about how vaccines work. Items are arranged on a Likert scale from 1 (strongly disagree) to 5 (strongly agree), presenting true statements (e.g., “The immune system of children is not overloaded through many vaccinations”) and false statements (e.g., “Many vaccinations are administered too early so that the body’s own immune system has no possibility to develop”); false statements were scored reversely (1 = strongly agree; 5 = strongly disagree). The scale includes false statements, and those statements are reversely scored, as this is a relatively common procedure to ensure that participants are responding meaningfully.

Higher scores indicate a higher level of knowledge of how vaccines work. This scale has been validated in previous applications and is considered to have acceptable reliability (Andrade et al., 2022). In the present study, Cronbach’s alpha for this scale was 0.70. Cronbach’s alpha indicates the internal reliability of a questionnaire (i.e., how closely related a set of items are as a group), and a level above 0.70 is considered good reliability.

Third, the survey included the General Belief in a Just World Scale (GBJWS) (Dalbert et al., 1987). This is an instrument that assesses individuals’ attitudes towards justice in the world and the extent to which people deserve what they get. It includes 6 items (e.g., “I think basically the world is a just place”, “I think people try to be fair when making important decisions”). Subjects express their agreement with these statements on a Likert scale from 1 (strongly disagree) to 5 (strongly agree). No reversed items were included in this part of the survey, as the original validated scale did not include them in its design. Higher scores indicate a stronger general belief in a just world. The GBJWS has been validated in various cultural contexts (Dalbert, 1999), and it is considered to have acceptable reliability (Öcel, 2012). In the present study, Cronbach’s alpha was 0.75.

Fourth, the survey included the Personal Belief in a Just World Scale (PBJWS). This instrument assesses individuals’ attitudes toward their own situation vis-à-vis what they believe they deserve (Dalbert, 2009). It includes 7 items (e.g., “I believe that most of the things that happen in my life are fair”, “I think that important decisions that are made concerning me are usually just”). Subjects express their agreement with these statements on a Likert scale from 1 (strongly disagree) to 5 (strongly agree). No reversed items were included in this part of the survey, as the original validated scale did not include them in its design. Higher scores indicate a stronger personal belief in a just world. The PBJWS has been validated in various cultural contexts (Dalbert, 2002b), and it is considered to have acceptable reliability (De Caroli and Sagone, 2014). In the present study, Cronbach’s alpha was 0.77.

Statistical analyses. Independent, two-tailed Student’s *t*-test analyses were done with Vaccine Intake Intent as the grouping variable and Vaccine Knowledge, GBJWS, PBJWS, educational

level, and age as dependent variables. Given the large sample size ($n = 401$), normality assumptions were not necessary; homogeneity of variance assumptions was met (Levene’s test was calculated for each variable, and all *p*-values were above 0.05). Effect size (Cohen’s *d*) was also calculated.

χ^2 (Chi-square) analyses examining the independence between vaccine intake intent and ethnicity; and vaccine intake intent and gender were done.

In order to check for possible confounding factors, a multi-variable logistic regression model was done with Vaccine Intake Intent as the dependent variable and the following independent variables: gender, age, ethnicity, educational level, Vaccine Knowledge, GBJWS, PBJWS. Odds Ratio (OR) was calculated for each predictor.

Independent, two-tailed Student’s *t*-test analyses were done with ethnicity as the grouping variable and Vaccine Knowledge, GBJWS, and PBJWS as dependent variables. Given the large sample size ($n = 401$), normality assumptions were not necessary; homogeneity of variance assumptions was met (Levene’s test was calculated for each variable, and all *p*-values were above 0.05). Effect size (Cohen’s *d*) was also calculated.

Independent, two-tailed Student’s *t*-test analyses were done with gender as the grouping variable and Vaccine Knowledge, GBJWS, and PBJWS as dependent variables. Given the large sample size ($n = 401$), normality assumptions were not necessary; homogeneity of variance assumptions was met (Levene’s test was calculated for each variable, and all *p*-values were above 0.05). Effect size (Cohen’s *d*) was also calculated.

Spearman’s coefficient matrix was calculated for correlations across these variables: GBJWS, PBJWS, age, Vaccine Knowledge, and educational level. Spearman’s coefficient was selected over Pearson’s given that two of the variables assessed (GBJWS, PBJWS) are based on Likert scales, and as per the recommendations of most statisticians, correlations for variables with Likert scales should be calculated with Spearman’s coefficient (Murray, 2013; Norman, 2010), given that it is an interval level of measurement. The only assumption required of Spearman’s test is a monotonic relation. This assumption was verified by graphing the correlation plot; the assumption was met.

Power analysis was done to calculate the minimum sampling size for *t*-tests and Spearman’s correlation coefficients. Assuming a minimally interesting effect size of $\delta > 0.5$, minimum desired power of 0.8, and $\alpha < 0.05$, power analysis revealed that each group (gender; Vaccine Intake Intent: Yes/No) should consist of at least 64. 482 participants were approached. 401 returned complete answers, so the response rate was 83%. Of the 401, 114 reported vaccine intake intent, 281 were female, and 290 were Arabs. For Spearman’s correlations, assuming a minimally interesting effect size of $\delta > 0.3$, minimum desired power of 0.8, and $\alpha < 0.05$, power analysis revealed that the whole sample should consist of at least 84. Consequently, sampling size surpassed the recommended minimum as per power analyses. The probability of committing a type-II error was kept under 0.2.

Statistical significance was placed at $p < 0.05$. Analyses were done with Jamovi software.

Results

Descriptive results (*N*, mean, standard deviation) are presented in Table 1. Results are split on the basis of nominal variables (gender, ethnicity, Vaccine Intake Intent). Descriptive plot for Vaccine Intake Intent is presented in Fig. 1. Sample size was 401, 281 were women, and 290 were Arabs. 114 (28.4%) responded “Yes” in Vaccine Intake Intent. Descriptive plots split by ethnicity and gender for GBJWS and PBJWS are presented in Figs. 2 and 3, respectively.

Table 1 Descriptive results.

	Gender	Vaccine intake intent	Ethnicity	Age	Educational level	Vaccine knowledge	GBJWS	PBJWS	
N	Woman	No	Arab	156	156	156	156	156	
			Non-Arab	48	48	48	48	48	
		Yes	Arab	56	56	56	56	56	
			Non-Arab	21	21	21	21	21	
	Man	No	Arab	51	51	51	51	51	
			Non-Arab	32	32	32	32	32	
		Yes	Arab	27	27	27	27	27	
			Non-Arab	10	10	10	10	10	
Mean	Woman	No	Arab	21.4	4.01	30.3	24.1	23.9	
			Non-Arab	22.4	4	32.8	21.2	22.9	
		Yes	Arab	20.9	3.95	29.4	24.7	24.1	
			Non-Arab	26.1	4.05	32.4	24.1	24.8	
	Man	No	Arab	23.7	4.06	30.5	22.8	25.2	
			Non-Arab	25.6	4.09	31.2	21.9	24.6	
		Yes	Arab	25.9	4	30.4	24.2	24.7	
			Non-Arab	26.3	4.4	31.1	25	26.6	
	Median	Woman	No	Arab	20	4	30	24	25
				Non-Arab	20	4	32	21	24
			Yes	Arab	19	4	28.5	25	25
				Non-Arab	22	4	30	24	26
Man		No	Arab	20	4	30	22	26	
			Non-Arab	21.5	4	30	21	25.5	
		Yes	Arab	20	4	29	25	25	
			Non-Arab	28	5	32	25	27	
Standard deviation		Woman	No	Arab	5.25	0.368	4.14	3.72	3.77
				Non-Arab	6.26	0.505	4.66	4.73	4.54
			Yes	Arab	7.23	0.483	4.85	5.31	4.67
				Non-Arab	10.3	0.59	5.94	4.79	3.4
	Man	No	Arab	8.52	0.544	5.26	5.26	3.97	
			Non-Arab	11.4	0.53	5.52	4.36	3.3	
		Yes	Arab	11.2	0.877	6.08	4.69	3.82	
			Non-Arab	7.57	0.843	3.78	5.77	3.47	

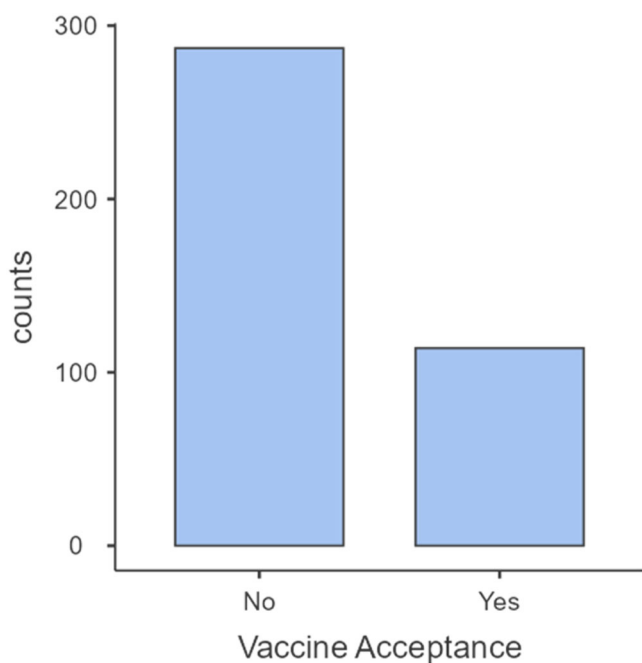


Fig. 1 Descriptive plot. Vaccine intake intent.

Student’s *t*-tests (and Cohen’s *d*) with Vaccine Intake Intent as grouping variable are presented in Table 2. Only GBJWS is a statistically significant predictor of Vaccine Intake Intent (“Yes” has higher mean than “No”), with a small effect size (Cohen’s *d* = -0.2937).

$\chi^2 = 0.0189$; $p = 0.89$ are the results obtained for the relation between Vaccine Intake Intent and ethnicity. $\chi^2 = 0.487$; $p = 0.485$. are the results obtained for the relation between Vaccine Intake Intent and gender.

Multivariable logistic regression model with Vaccine Intake Intent as a dependent variable is presented in Table 3. The model allows us to establish that after checking for confounding factors, the only significant predictor of Vaccine Intake Intent is GBJWS.

Student’s *t*-tests (and Cohen’s *d*) with Gender as a grouping variable are presented in Table 4. There is only a statistically significant difference in scores for PBJWS, but with a small effect, and men having a higher score (25.0 vs. 23.8).

Student’s *t*-tests (and Cohen’s *d*) with ethnicity as grouping variable are presented in Table 5. Ethnicity is a statistically significant predictor of GBJWS (Arabs have a higher score), with a small effect size (Cohen’s *d* = 0.3684). Ethnicity is also a statistically significant predictor of Vaccine Knowledge (Non-Arabs have a higher score), with a small effect size (Cohen’s *d* = -0.404).

Spearman’s correlation matrix is presented in Table 5. There is a moderate correlation between CBJWS and PBJWS, a weak negative correlation between Vaccine Knowledge and PBJWS, and a moderate correlation between educational knowledge and age.

Discussion

Seasonal influenza vaccine hesitancy in the UAE as compared to other nations. According to some reports, it is estimated that 3–5 million people are afflicted with a serious variant of seasonal influenza (Vincent et al., 2014). While it is not a major concern in

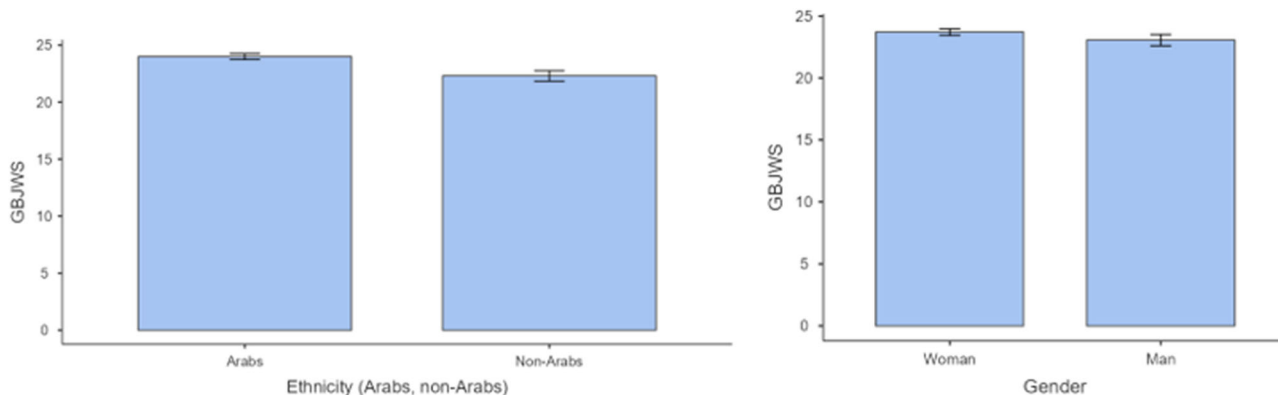


Fig. 2 Descriptive plot. GBJWS, split by ethnicity and gender.

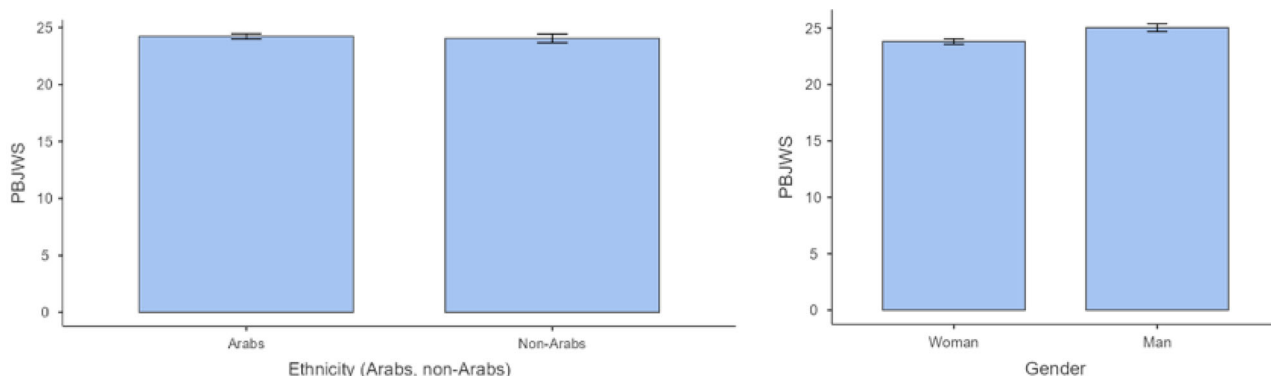


Fig. 3 Descriptive plot. PBJWS, split by ethnicity and gender.

Table 2 Independent, two-tailed Student's t-test.

	Statistic	p	Effect size (Cohen's d)
GBJWS	-2.653	0.008	-0.2937
Vaccine knowledge	0.938	0.349	0.1038
PBJWS	-1.3	0.194	-0.1439
Educational level	0.121	0.904	0.0134
Age	-1.23	0.219	-0.1362

Grouping variable: vaccine intake intent.

Table 4 Independent, two-tailed Student's t-test.

	Statistic	p	Effect size (Cohen's d)
Vaccine knowledge	-0.056	0.955	-0.00611
PBJWS	-2.8242	0.005	-0.30798
CBJWS	1.2712	0.204	0.13862

Grouping variable: Gender.

Table 3 Multivariable logistic regression model.

Predictor	Estimate	p	Odds ratio
Intercept	-1.2516	0.375	0.286
Age	0.0209	0.218	1.021
Gender—Women as reference level	0.171	0.499	1.186
Vaccine knowledge	-0.0174	0.465	0.983
PBJWS	-0.0113	0.744	0.989
GBJWS	0.0689	0.025	1.071
Educational level	-0.2621	0.302	0.769
Ethnicity—Arabs as reference level	0.0603	0.818	1.062

Dependent variable: Vaccine Intake Intent.

Table 5 Independent, two-tailed Student's t-test.

	Statistic	p	Effect size (Cohen's d)
Vaccine knowledge	-3.619	< .001	-0.404
PBJWS	0.399	0.69	0.0446
CBJWS	3.301	0.001	0.3684

Grouping variable: Ethnicity.

the UAE, there are still public health reasons to address this problem, especially considering that at the end of summer, influenza outbreaks are reported (Saeed, 2022). As per guidelines of the World Health Organization (WHO), the best preventive measure is effective vaccination programs (Medlock and Galvani, 2009), which should be administered on a yearly basis, given that

the immune system needs a constant boost, in anticipation of the risks brought forth by the seasonal changes (Dos Santos, 2019).

In this study, results come out showing that vaccination rates in the UAE are not at a sufficiently optimal level. Only 28% of respondents reported intent to take the vaccine jab. This number is still problematic, given that it may be below the needed threshold for herd immunity.

There is, therefore a need to address this issue in the UAE. This is especially concerning for patients with diabetes mellitus and other chronic diseases in the UAE. It is well-established that such conditions compromise immune responses, and therefore, those individuals are in special need of vaccination (Diepersloot et al.,

1990; Dos Santos et al., 2018; Goeijenbier et al., 2017). Prevalence of diabetes mellitus is a major epidemiological concern in the UAE (Alsafar et al., 2012; Baglar, 2013; Elemam et al., 2021; Razzak et al., 2018; Saadi et al., 2007), and consequently, any attempt to curb seasonal influenza in the UAE will ultimately have a major beneficial impact on the treatment of diabetes mellitus.

It is important to place these results in the wider context of how other Muslim countries face the problem of vaccine hesitancy. By and large, the situation in the UAE is similar to those of other nations where Islam is the predominant religion. For example, one study in Malaysia concludes that “appropriate steps that increase vaccine acceptance... are needed to address this issue and to foster more positive attitudes toward vaccination” (Lee et al., 2023).

The comparison with Malaysia is interesting to the extent that this nation has also had dramatic changes as a result of rapid industrialization and public health improvement in recent years, and it has also implemented an elaborate immunization program (Jafar et al., 2022a). It is important to consider how vulnerable groups in both nations are susceptible to greater vaccine hesitancy. For example, another study in Malaysia reports that “specific groups tend to become vaccine hesitancy such as unemployed, self-employed, students, male, single, level of education, and Muslim” (Jafar et al., 2022b), and other studies in the same nation indicate that vaccine hesitancy (particularly of COVID-19) have increased mortality rates (Ahmad et al., 2021). While these exact variables were not assessed in the present study, we can ascertain that those who are most vulnerable in societies are more likely to resist vaccine jabs, as indeed, the results of the present study indicate in the UAE.

It is also important to compare how vaccine hesitancy in the UAE compares to other nations in the Gulf Cooperation Council (GCC) area, as most of the policies are framed in that cultural context. One study informs that “vaccine hesitancy is prevalent among the public and healthcare workers in the Gulf Cooperation Council countries. There is a need to continually monitor perceptions and knowledge about vaccines and vaccination in these countries to better inform interventions to improve vaccine uptake in the sub-region” (Algabbani et al., 2023). Although the UAE tends to be at the higher end in markers of social progress amongst GCC nations, this is still reason for concern, as the GCC block as a whole (a set of countries that is very close to the UAE in terms of religion and culture) still needs improvement.

Research in GCC countries documents that there are various cultural factors at play that ultimately impact vaccine hesitancy (Andrade et al., 2022). While Islamic scholars generally support vaccination, misconceptions about vaccine ingredients, including concerns about porcine-derived gelatin or alcohol content, may lead to hesitancy (Alsuwaidi et al., 2023).

It must also be noted that trust in government and healthcare authorities varies across GCC countries and the Arab world at large (Albaity et al., 2023; Peretti-Watel et al., 2019); historical events, political instability, or corruption may contribute to skepticism regarding the safety and efficacy of vaccines. Furthermore, Arab media has not fully addressed the spread of fake news and misinformation, and this has contributed to vaccine hesitancy in the region (Biswas et al., 2022). It has also been established that in some Arab communities, there may be a preference for traditional or alternative medicine over Western medical practices, leading to skepticism about vaccines (Albaity et al., 2023; Elbarazi et al., 2021; Sallam et al., 2021).

Likewise, Arab societies are often characterized by strong social networks, and this is especially the case in GCC nations, given the legacies of tribal structures in the region. Peer influence and community opinions can significantly impact individual decisions

(Hajje, 2022; Moore et al., 2022; Turner et al., 2021). In this context, it is important to consider how fear of social stigma or rejection can influence vaccine decisions. Research shows that in the GCC context, individuals may hesitate to go against the prevailing views within their peer group, even if they have positive attitudes toward vaccination (Bizri et al., 2023; Jairoun et al., 2022). The desire to fit in and avoid judgment can contribute to vaccine hesitancy.

Indeed, the perception of what the majority within a peer group believes can impact individual decisions. If there is a perceived consensus within the peer network that questions the necessity or safety of vaccines, individuals may be more likely to adopt similar views. Religious authorities in GCC countries have great leverage on the population’s habits, and research suggests that if someone considered knowledgeable within a peer group expresses doubts about vaccines, others may be influenced by this perceived expertise, contributing to vaccine hesitancy (Bonnieve et al., 2021; Haensch et al., 2022). Peer groups are often integral to one’s sense of identity. If vaccine hesitancy becomes associated with a particular community or identity, individuals may be more likely to adopt hesitant attitudes to maintain a sense of belonging.

Furthermore, given the large influx of migrant workers coming from the wider MENA region, South Asia, Sub-Saharan Africa, and the Philippines, it is also important to consider the state of vaccine hesitancy in those regions, given that ultimately, those cultural patterns will also be partly incorporated to UAE national life due to migratory influx. Current research shows that in those countries show that efforts are being made to address vaccine hesitancy, especially in the context of COVID-19 vaccination campaigns; countries from the Arab world, South Asia, Africa, and the Philippines have been working on public health campaigns to promote vaccine acceptance; however, challenges such as misinformation, cultural beliefs, and access to healthcare resources could contribute to hesitancy in certain communities (Aborode et al., 2021; Ackah et al., 2022; Afolabi and Ilesanmi, 2021; Alam et al., 2023; Brackstone et al., 2022; Caple et al., 2021; Ennab et al., 2022; Hawlader et al., 2022; Mutombo et al., 2022; Qunaibi et al., 2021).

On the basis of the COVID-19 pandemic experience, previous research has focused on the conspiratorial aspects of vaccine hesitancy. In one systematic review, Pertwee et al. (2022) point out that major factors, “such as anxieties around the pace of technological change or feelings of political disempowerment, are not within the control of the medical community.” Therefore, even if significant steps are taken toward the development of vaccines, vaccine hesitancy still remains a larger psychosocial obstacle. Research suggests that the rise of populist politics in various regions of the world has facilitated the spread of conspiracy theories regarding vaccines (Bergmann, 2018). In the UAE, vaccine hesitancy is still a problem (Andrade et al., 2022), although not much attention has been paid to how conspiratorial thinking influences decisions to receive vaccines in the UAE.

Traditionally, the problem of vaccine hesitancy has been tackled via education, given that it is largely a disinformation problem. Prior research suggests that increased educational levels are related to greater intent of taking vaccine jabs (Navin et al., 2019). This also pertains to specific knowledge about vaccines (Montagni et al., 2020), and consequently, many governments throughout the world have embraced an educational effort in order to increase vaccination rates (Burke et al., 2019; Kernéis et al., 2017; Ropeik, 2013). This has been especially the case in the UAE (Ahamed et al., 2021; Nizam et al., 2022; Ortashi et al., 2013).

However, the results of this study suggest that in the UAE, technical education about how vaccines work is not a predictor of

vaccine intake intent for seasonal influenza. No statistically significant correlation was found between vaccine knowledge or educational level and vaccine intake intent.

A tentative explanation for these findings is that in the decision to get vaccinated, cognitive factors may not be very relevant. Prior work on conspiracy theories suggests that people embrace conspiratorial narratives largely due to emotional and situational factors (Douglas et al., 2020; Van Prooijen and Douglas, 2017) and not necessarily due to cognitive factors alone. For example, powerlessness and perceived discrimination are strong predictors of conspiratorial thinking (especially in relation to vaccines) (Coelho et al., 2022), regardless of actual technical knowledge about facts. Consequently, it is possible that the decision to get vaccinated against seasonal influenza may be influenced by specific social conditions in the UAE instead of knowledge about how vaccines work.

Interestingly, various studies have been done on vaccine hesitancy in other Middle Eastern nations (Galal et al., 2022; Sallam, 2021), and some studies have also assessed the level of vaccine knowledge in such populations (Alotaibi et al., n.d.; Gamaoun, 2018), but no substantial study has been done on the relationship between both variables in such nations. The results of the present study suggest that in the UAE, there is no significant relation, and future research ought to explore if such a relationship exists in other Middle Eastern nations.

Vaccine hesitancy and just-world beliefs. Prior research shows that the relationship between religion and vaccine hesitancy is complex. Some research suggests that rigid literalist traditions in various faiths incentivize vaccine hesitancy in many countries (Kanozia and Arya, 2021). This problem is made worse when particular religious groups seek exemption from vaccines due to their religious beliefs (Keshet and Popper-Giveon, 2021; Williams et al., 2021). Furthermore, when nationalist narratives are intertwined with religious concepts, vaccine hesitancy also increases (Corcoran et al., 2021).

However, research also shows that religious leaders play a key role in persuading communities to receive vaccination shots, and in that regard, so long as such leaders deliver the right message, religiosity can serve the purpose of curbing vaccine hesitancy. Indeed, in some cases, religious leaders have met that goal (Viskupič and Wiltse, 2022).

The results of the present study suggest that religiosity may play an unsuspected role in curbing vaccine hesitancy in the UAE. As mentioned above, the belief in the just world is firmly intertwined with religiosity. In turn, the present study shows that general belief in the just world is a significant predictor of seasonal influenza vaccine uptake, and this is further confirmed after controlling for possible confounding effects as per the multivariable logistic regression model.

A plausible theoretical explanation for this association is that to the extent that subjects accept that the world is a just place, well-being relies on a collective effort. Therefore, given that they perceive the world as just, they feel the duty to give back in return. Previous research shows that belief in the just world predicts harsh judgment on the poor and dispossessed (Sutton and Douglas, 2005; Verhaagen, 2022). But when it comes to vaccination, belief in the just world provides a different rationale: the subject is happy to contribute to herd immunity, given that in so doing, it is expected that the fairness of the universe will protect him or her in turn. The decision to receive the vaccine therefore operates under a conception of immanent justice, in which it is expected that the act of receiving the shot provides immediate assurance that the individual will be safe from the disease.

This may have the flip side of harshly judging those who do not receive the vaccine. There is evidence that belief in the just world primes individuals to blame COVID-19 patients for their own condition (Chung et al., 2023; Murakami et al., 2022). This is even more the case in discriminatory attitudes towards the unvaccinated (Bor et al., 2022).

Authoritarianism as a personality trait may also be at play. Reliance on authoritarian figures is associated with both religiosity (Lambert et al., 1999; Martin and Nichols, 1962) and belief in the just world (Lambert et al., 1998; Newton, 2012). Although conspiracy-mongering regarding vaccines has been rampant amongst some populist politicians (Kennedy, 2019), most governments have understood the need to properly administer vaccines and therefore have urged their constituents to take vaccines. Consequently, to the extent that those who uphold the just world hypothesis are more likely to accept commands from their leaders, they are also more likely to receive the vaccine if their leaders urge them to do so.

Ethnic differences. The present study indicates that in the UAE, Arabs have a stronger adherence to the just world hypothesis than non-Arabs, although the effect is small. This may be explained on account of the societal structure of the UAE. While many labor reforms have been in place, and significant government efforts have been made towards equality and integration of all ethnicities in this nation, it is still a fact that socio-economic positions reflect ethnic differences, with Arabs enjoying better positions than other ethnicities (Pasha-Zaidi, 2015; Vora, 2008; Warner and Moonesar, 2019; Zachariah et al., 2004). The bulk of the non-Arab population is made up of migrant workers from South Asia, Sub-Saharan Africa, and the Philippines, and these residents usually do jobs with less privileged positions. Given their perceived position in society, it is expected that they are less likely to accept the just world hypothesis to the extent that they believe they are not fully comfortable with the status they have been allotted in the social system. Other studies have also found that belief in the just world is lower amongst people who occupy lower positions in socio-economic hierarchies, whether on account of ethnicity (Davies, 1993; Furnham, 1985; Harding et al., 2020) or even physical attractiveness (Westfall et al., 2019).

However, although there are ethnic differences in the level of acceptance of the just world hypothesis and belief in the just world is a predictive factor of seasonal influenza vaccine intake intent, the results of the present study indicate that there are no statistically significant differences between ethnic groups, when it comes to intent to take the seasonal influenza vaccine. This suggests that in the decision to receive the vaccine, various other factors are at play, and they need to be explored in future studies (Table 6).

Age and gender considerations. The just world hypothesis is closely related to concepts of immanent injustice. Extensive research shows that notions of immanent justice are strongly present in the early phases of psychological development (Freeman and Daly, 1984; Jose, 1990; Karniol, 1980; Kister and Patterson, 1980; Medinnus, 1959), and consequently, age may be a predictive factor of belief in the just world. However, no such relationships are found in this study. A plausible explanation for this may be that age and belief in the just world are correlated, but only when children are considered. After the completion of the initial stages of psychological development (late adolescence), concepts of immanent justice and belief in the just world remain stable. Given that this study did not include children under 16, age does not come out as a predictive factor of belief in the just world.

In terms of gender, there is a statistically significant difference between men and women when it comes to PBJWS, but the effect is

Table 6 Spearman's correlation matrix.

		PBJWS	CBJWS	Vaccine knowledge	Age	Educational level
PBJWS	Spearman's rho	-				
	p-value	-				
CBJWS	Spearman's rho	0.487	-			
	p-value	<0.001***	-			
Vaccine knowledge	Spearman's rho	-0.069	-0.173	-		
	p-value	0.166	<0.001***	-		
Age	Spearman's rho	0.086	0.059	-0.046	-	
	p-value	0.085	0.235	0.362	-	
Educational level	Spearman's rho	0.032	0.077	-0.083	0.54	-
	p-value	0.525	0.124	0.098	<0.001***	-

***p < 0.001.

small. This is somewhat expected, as despite significant government efforts, some gender gap remains (Miller et al., 2017; Patterson et al., 2021). Very much as with ethnicity, groups with perceived lower positions tend to have weaker adherence to the just world hypothesis (Furnham and Procter, 1989; Saroglou and Pichon, 2009), and this applies to women. Indeed, similar results have been found in other studies. For example, in one of the first applications of belief in just world scales, Whatley (1993) reports that “there was a gender difference in the total scale scores, with men scoring significantly higher than women”, and this finding is also present in other studies (Ambrosio and Sheehan, 1990).

Nevertheless, it is important to note that while belief in the just world is lower amongst women, it bears no relation to their decision to receive the seasonal influenza vaccine shot. This may also account for the lack of any significant result when testing for any correlation between gender and intent to take the vaccine shot. To some extent, these are encouraging news, as it shows that in the UAE, women are not at a particularly higher risk of vaccine hesitancy. This may reflect the initiative of UAE authorities to narrow the gender gap across many dimensions, even if women still perceive the world to be less just than men do.

Limitations. Although this study's sample size met the minimum stipulations of the a-priori power analysis (and results yielded some significant correlations), future studies assessing correlations between vaccine intake intent and just world beliefs ought to include larger samples. Likewise, future studies ought to rely on stratified sampling making sure that representatives of all seven emirates in the UAE are included in order to arrive at more robust conclusions. The exclusion criteria as not having English proficiency may have had a confounding effect in regard to adherence to liberal values; future studies focusing on particular linguistic groups (in order to not rely on English as a lingua franca) ought to be done in order to overcome this limitation.

There was also an important limitation in the present study: the lack of direct assessment of religiosity and religious differences as variables in relationship to both just world beliefs and seasonal influenza vaccine intake intent. In part, this was due to the guidelines provided by the IRB (as the UAE authorities strongly discourage asking people about their religion), but future studies may need to attempt to circumvent this limitation.

Conclusion

While seasonal influenza vaccine hesitancy is not a prime public health concern in the UAE, some improvement is needed. As the COVID-19 pandemic has made evident worldwide, the problem

of vaccine hesitancy is related to conspiratorial thinking, misinformation, and lack of proper knowledge.

However, in the specific case of the UAE, the results of this study suggest that vaccine knowledge or even educational level are not significant predictors of seasonal influenza vaccine intake intent. This has important policy implications, as UAE authorities could consider that investing additional resources in these areas may not be necessary, especially if such resources can be directed towards more significant factors.

The present study shows that just world beliefs are one such factor. Greater adherence to just-world beliefs (especially on a general level) predicts greater willingness to receive the seasonal influenza vaccine shot. This is the case amongst both Arabs and non-Arabs, but the effect is more pronounced amongst the latter.

This finding has relevant implications, both for policy and for the general assessment of religion's role in curbing vaccine hesitancy. Given that the belief in the just world has long been associated with religiosity (on account of solutions to the philosophical problem of evil), one plausible indirect way of ultimately increasing seasonal influenza vaccine intake intent in the UAE is by relying on religious leaders to preach about the importance of receiving the seasonal influenza vaccine shot, and framing that rationale in connection to just world beliefs, as taught by the doctrines of the faiths they represent. Since the effect is more pronounced amongst non-Arabs, health authorities may focus their efforts on religious leaders who preach to non-Arab congregants.

This may ultimately also have effects on conditions that go beyond seasonal influenza. As mentioned above, patients with diabetes mellitus are at greater risk of immunosuppression and, therefore, are in greater need of vaccination shots. Previous research has shown that in many cultural contexts, religion can play a positive role in helping diabetic patients cope with their conditions; religion can also serve the purpose of instilling healthy behaviors among such patients (Amadi et al., 2016; Darvyri et al., 2018; Dewi et al., 2022; Sridhar, 2013). The role of religion in helping patients cope with diabetes can be further expanded in the UAE if religious leaders also use the rationale of just world beliefs in order to increase vaccine intake intent.

Data availability

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Author contributions

GA designed the study and wrote part of the article; AB collected data and wrote part of the article; DB collected data and wrote part of the article.

Competing interests

The authors declare no competing interests.

Ethical approval

The research was approved by the Institutional Review Board of Ajman University (UAE), # M-F-H-22-Feb, dated February 22, 2023.

Informed consent to participate

All participants were adults, and they all expressed consent to participate. Each participant scanned the QR code of the survey, and prior to answering the questions, participants had to answer affirmatively a question requesting their consent. In the question, it was stated that they could abandon the survey at any time and that the answers would remain anonymous at all times. In order to proceed to answer the rest of the questions, participants had to acknowledge that they expressed consent. Responses were collected in the period February–May 2023.

Additional information

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