Role of medication beliefs on medication adherence in hypertensive Middle Eastern refugees and migrants in Australia.

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Abstract

Background: Adherence to medication is essential in some patients for achieving treatment control in hypertension. Medication beliefs is one of the personal modifiable factors that has been recognised to influence medication adherence in different populations. However, there is no published research to confirm the relationship between medication beliefs and medication adherence in Middle Eastern refugees and migrants in Australia. These two different groups may develop different beliefs about their medications that lead to different medication taking behaviours. Understanding the possible differences in beliefs may have a significant impact on enhancing medication adherence in these groups.

Design: 320 Middle Eastern refugees and migrants with hypertension were approached via various social groups in Australia and asked to complete Arabic versions of the Beliefs about Medicine Questionnaire (BMQ) and the Medication Adherence Questionnaire. BMQ scores (necessity and concerns scales) were classified as "accepting", "indifferent", "ambivalent" or "skeptical". Multiple mediation modelling was applied to examine the role of necessity and concerns scales as mediators between migration status and medication adherence.

Results: There were significant associations between medication adherence and medication beliefs scores (necessity and concerns scales) (p=0.0001). Necessity, and concern were mediators in the relationship between migration status and medication adherence. Significant differences were found between refugees and migrants for medication adherence and medication beliefs. Refugees were likely to have less necessity, and more concern beliefs than migrants. They were also less likely to adhere to medications. Almost 30% of refugees could be classified as skeptical and 40% as ambivalent. In contrast, 50% of migrants had accepting beliefs, and around 35% held ambivalent beliefs. Refugees and migrants with
“accepting” beliefs reported the highest adherence to medication and those holding “skeptical” beliefs reported the lowest adherence.

**Conclusion:** Medication beliefs are potentially modifiable and are reasonable targets for clinical interventions designed to improve medication adherence. Understanding these beliefs and the likely differences between refugees and migrants is crucial to provide specific and targeted advice to each group independently in order to improve medication adherence and overall health.

Keywords: Medication beliefs; concerns; necessity; medication adherence; migrants; refugees, Middle-Eastern
1. Background

Essential hypertension is an epidemic affecting approximately a quarter of all adults worldwide (Chen, Tsai, & Chou, 2011) with high mortality and morbidity when not treated or adequately controlled, especially in vulnerable populations (Pesantes et al., 2015). In 2015, 5.8% of the total burden of disease in Australia was due to high blood pressure (AIHW, 2019). The effective control of hypertension requires patients to adopt and maintain a healthy lifestyle and take medication regularly (Shahin, Kennedy, Cockshaw, & Stupans, 2020). However, medication non-adherence constitutes a significant obstacle to hypertension care worldwide with a prevalence between 20% and 50% (Nafradi, Galimberti, Nakamoto, & Schulz, 2016). In Australia, the mean non-adherence to antihypertensive therapy is about 15% (Carvalho & Santos, 2019). Poor adherence is considered a major problem and is associated with suboptimal clinical outcomes, increased emergency-room visits, and hospitalizations all of which contribute to an increased burden on the health care system (Lemay, Waheedi, Al-Sharqawi, & Bayoud, 2018).

Effective strategies for the treatment of hypertension should include a good understanding of the barriers to medication adherence. Patient-related characteristics such as health literacy, health beliefs and satisfaction with health care are potentially modifiable factors that may influence patient adherence to medication (Al-Ruthia et al., 2017).

Theoretical models of patient behaviour can be useful in designing interventions to improve medication adherence (Kucukarslan, 2012). One model that has shown promise for identifying potential targets for interventions is the Necessity–Concerns Framework (Tibaldi et al., 2009), which is a multidimensional theory that posits relationships between two separate dimensions—patients’ necessity beliefs and concerns regarding medication, and an outcome (medication adherence) (Phillips, Diefenbach, Kronish, Negron, & Horowitz, 2014). This
suggests that patients weigh up their perceived personal need for treatment against their concerns about potential adverse effects of treatment when deciding whether or not to adhere to medications (Tibaldi et al., 2009). Thus, medication adherence will be greater when the difference between patients’ beliefs in the necessity of the medication exceed their concerns (Phillips et al., 2014). The Beliefs about Medicines Questionnaire (BMQ-specific) has two subscales to assess patients’ perceived need for treatment (necessity) and their concerns about potential adverse effects (concerns) (Jimenez et al., 2017; Tibaldi et al., 2009). A relatively recent meta-analysis (Rob Horne et al., 2013), has described how beliefs about medicines determined through the BMQ are correlated to medication adherence in a number of chronic illnesses, including hypertension, and reported that medication adherence was correlated positively with necessity beliefs, and negatively with concern, across the majority of included studies.

The management of hypertension adds a new demand to already existing daily life tasks, especially in vulnerable populations (Pesantes et al., 2015), such as refugees under stress after fleeing from their home countries to seek safety. Over the past years conflicts in some of Middle Eastern countries, such as Lebanon, Algeria, Sudan, Libya, Iraq, and Syria have contributed to the many hundreds of thousands of refugees seeking safety in neighbouring states and in more distant countries, such as Australia which has ranked as one of the top three resettlement countries in the world (Fábos, 2015).

According to the 1951 Convention relating to the Status of Refugees (the 1951 Refugee Convention) a refugee is a person who relocates from their “country of nationality or habitual residence, has a well-founded fear of persecution because of his (sic) race, religion, nationality, membership of a particular social group or political opinion, and is unable or unwilling to avail themselves of the protection of that country, or to return there, for fear of persecution” (Parliament of Australia, 2016). Often the terms ‘migrant’, and ‘refugee’ are used interchangeably, and both migrants and refugees have been considered as a single
population, and considered under the same umbrella (Shahin, Stupans, & Kennedy, 2018).

However, each has an explicit legal definition that distinguishes one from the other (Mumford, 2016). Refugees forced to leave their countries of origin because of a direct threat of persecution or death, and can’t safely return home, whereas migrants face no such impediment to returning to their country of origin as they choose to move mainly to improve their lives by finding work, or in some cases for education, family reunion, or other reasons (Edwards, 2016).

It has been reported in the literature that migrants and refugees have an elevated prevalence of medical diseases, such as hypertension. Although, both these populations may have similar difficulties during the resettlement processes, a number of factors distinctly differentiate the social and personal lives of refugees and migrants. These factors may include: the intentions and motivations for migration, the impediments to returning back to home countries, having a control over their lives through migration, and taking into account the damaging effect of persecution on their education, employment, and socioeconomic status (Shahin et al., 2020).

Therefore, these two different populations might evolve different beliefs about their medicines. Thus, it is important to have a well-founded understanding of how Middle Eastern refugees and migrants perceive their prescribed medicine, and how these beliefs about medicines may impact medication adherence.

Medication non-adherence in the Middle Eastern population was addressed in a systematic review, and estimated to be 48% in chronic illnesses, such as hypertension, diabetes and chronic obstructive pulmonary disease (Al-Qasem, Smith, & Cliffor, 2011).

According to the findings of the meta-analysis described above (Rob Horne et al., 2013), only two studies examined the association between medication adherence and medication beliefs in Middle Eastern population (Aflakseir, 2012; Fawzi et al., 2012). However, neither of these two studies examined adherence and medication beliefs in hypertension, also neither evaluated refugees’ population, or the differences between refuges and migrants. Medication
adherence was correlated positively with necessity beliefs, and negatively with concern in these two studies (Aflakseir, 2012; Fawzi et al., 2012).

To date, there has not been any research that has investigated the role of medication beliefs on medication adherence of Middle Eastern hypertensive refugees and migrants in Australia or indeed in other countries, or that has assessed the differences between these two groups regarding their beliefs about medications. The aim of this study was to explore the relationship between beliefs about medicine and adherence in Middle Eastern refugees and migrants in Australia, and also to assess the differences between both groups with regards to medication beliefs and adherence.

2. Materials and methods

2.1 Study design and setting

This study is a part of a larger cross-sectional study that was conducted in several non-profit organisations supporting refugees and migrants in Melbourne, Australia. The settings for the study were selected because they specialise in supporting Middle Eastern refugees and migrants. Facebook was also used to recruit refugees and migrants through Arabic community groups that included large populations of Middle Eastern refugees and migrants who were sharing their experiences and interests via these groups. The recruitment process, and data collection were previously reported (Shahin et al., 2020). Ethics approval for this study was obtained from RMIT University Ethics Committee, (SEHAPP 53-18).

2.2 Study participants

Study participants have been reported and published previously. Throughout the 10-month recruitment period, attendees at Adult Migrant English Program centres and the community
groups, were approached and invited to consider participating in the study. A poster including the survey link was published in some Facebook Arabic interest gathering groups in Australia (Shahin et al., 2020). Participants were invited to take part in the study if they were aged 30 years or older, diagnosed with hypertension, and had migrated to Australia from one of the 22 countries in the Middle East, as refugees or migrants. Refugee or migrant status was identified through a survey question which asked participants to describe how they arrived to Australia. The choices were: “refugee,” “work,” “studying,” “economic reasons” “any other reason”.

Migrants were defined as those participants who selected any choices of other than “refugee”.

2.3 Development of questionnaire

The self-administered questionnaire consisted of 21 items divided into four sections. The first section comprised socio-demographic information including; age, gender, place of birth, migration status, education level, and occupation. In the second section, participants were asked to identify whether they had one or more than one of eight significant chronic conditions as categorised by the Australian Institute of Health and Welfare. These conditions included; arthritis, asthma, back pain and associated problems, cancer, cardiovascular disease (such as hypertension, coronary heart disease and stroke), chronic obstructive pulmonary disease (COPD), diabetes and mental health conditions (Australian Institute of Health and Welfare, 2016).

In sections three and four, validated and reliable questionnaires were used to assess medication adherence (Morisky, Green, & Levine, 1986) and medication beliefs (R. Horne & Weinman, 1999). Medication adherence was measured using the four-item Medication Adherence Questionnaire (MAQ) that assesses both intentional and unintentional non-adherence. The scale is scored 1 point for each “no” and 0 points for each “yes”. Patients were described as adherent (if the total score was four) or non-adherent (if the total score was less than 4) (Khan, Shah, & Hameed, 2014). This questionnaire was selected because it has been used across many chronic illnesses, such as cardiovascular disease, and has demonstrated
adequate predictive validity and good reliability (Mann, Ponieman, Leventhal, & Halm, 2009). The psychometric properties have been reported to range from adequate (Brooks et al., 1994; Morisky et al., 1986) to high (Erickson, Coombs, Kirking, & Azimi, 2001).

Beliefs regarding medications were measured using Beliefs about Medicine Questionnaire (BMQ). The BMQ-specific is a 10-item questionnaire that comprised of two scales; a 5-item necessity scale that assesses perceived personal need for the medication (necessity), and a 5-item concerns scale that assesses common concerns about potential adverse effects such as dependence, adverse effects, or accumulation effects (concerns). Participants indicate how much they agree with a series of statements on a five point scale from strongly agree to strongly disagree. Subscales scores were calculated as mean item scores. Higher scores indicate a stronger endorsement of the construct being measured (Tibaldi et al., 2009). Following the necessity concerns framework posited by Horne and colleagues, the difference between necessity and concern subscale scores was calculated in order to evaluate the patient-perceived, cost-benefit, analysis of medication adherence (Jimenez et al., 2017).

The questionnaires were available in English language and were translated to Arabic language by a bilingual researcher whose first language was Arabic, and then they were back-translated to English by another bilingual researcher. The original questionnaires were compared with the back-translated version by two researchers whose first language was English. No significant differences or changes in meaning were detected and hence the translated questionnaires were used in the study.

2.4 Sample size

The sample size of 222 participants was calculated using the Gpower* software, based on 95% confidence intervals, medium effect size (0.3) and a power of 80%. (111 in each group).
2.5 Data analysis

Data were analysed using the IBM Statistical Package for the Social Sciences software (Ver. 26) for Windows. The internal reliability of MAQ was assessed using Kuder-Richardson's coefficient (KR20), which measures internal consistency of questionnaires employing dichotomous items ("The SAGE Encyclopedia of Communication Research Methods," 2017) ($\alpha =0.76$). The internal reliability of the BMQ scale was assessed using Cronbach’s $\alpha$. Reliability coefficients were 0.94 and 0.90 for necessity and concerns respectively. The Cronbach’s $\alpha$ for both scales of the original English version of the BMQ was 0.76 (Robert Horne, Weinman, & Hankins, 1999).

Descriptive statistics including frequencies, percentages, means and standard deviations were calculated for participants’ socio-demographics characteristics and all dependent variables. Socio-demographics characteristics for this sample have been published previously (Shahin et al., 2020), and are reproduced here in Table 1. Associations of independent and dependent variables for the two groups were examined using Chi-square tests, and differences between the two groups were examined using t-tests. Bivariate associations for dependent variables were examined using Pearson’s correlations ($r$). A two-tailed significance level of $p<0.05$ was used to evaluate all statistical analyses.

A multiple mediation model in which necessity and concern mediate the association between migration status (refugee or migrant) and medication adherence was tested as presented in Figure 1. In order to analyse the model and determine the confidence interval for the indirect effect, bootstrapping (5,000 samples) was applied using the SPSS PROCESS macro (Hayes, 2012). This process does not require the indirect effect to be normally distributed, therefore is preferred to the Sobel's test (Sobel, 1986) (Preacher & Hayes, 2008). If the 95% bias-corrected confidence interval does not include zero, the indirect effect is statistically significant. Confounding factors that were significantly associated with medication adherence were entered in the mediation analysis as covariates.
Based on the empirical and theoretical framework (Aikens, Nease, Nau, Klinkman, & Schwenk, 2005), cluster analysis was conducted to examine the differences between refugees and migrants medication beliefs, and to examine the association of these clusters with medication adherence. Firstly, four groups were generated by splitting the scores from necessity and concerns items at the median; subsequently, participants were categorized, according to Horne and his colleagues (R. Horne, Parham, Driscoll, & Robinson, 2009), into one of four subgroups according to their attitudes towards medication; Skeptical (low necessity, high concerns), Ambivalent (high necessity, high concerns), Indifferent (low necessity, low concerns), and Accepting (high necessity, low concerns). Following this, associations between adherence rates and the four belief groups were examined in both groups, and differentiated using Chi-square tests, and analysis of variance.

3.1 Participants demographics and clinical characteristics

A total of 320 participants were recruited: 168 refugees, and 152 migrants. All participants were born in the Middle East, and there were slightly more women than men in both groups. The highest proportion of refugees were from Iraq and Syria. Significant differences between refugees and migrants regarding demographics and clinical characteristics were found (Table 1), which have been discussed elsewhere (Shahin et al., 2020). Broadly, differences reflect the characteristics expected in these groups. Refugees had lower levels of education ($\chi^2 = 40.57$, $p = 0.0001$), reported more co-morbid conditions ($\chi^2 = 5.5$, $p=0.02$), were more likely unemployed ($\chi^2 = 38.35$, $p = 0.0001$), and were significantly older than migrants ($\chi^2 = 20.78$, $p = 0.001$).

3.2 Participants beliefs about medications and medication adherence

Significant differences were found between refugees and migrants with regards to medication adherence and beliefs about medicines (Table 2). Refugees had
substantially lower adherence than migrants with a large effect size (\(p=0.0001, \, d=0.81\)), and they reported a significantly lower level of necessity beliefs with a medium effect size (\(p=0.0001, \, d=0.48\)). Refugees also demonstrated significantly higher concern beliefs about medicines than migrants with a large to very large effect size (\(p=0.0001, \, d=1.04\)). Importantly, the association between necessity and concern beliefs was low (\(r=-0.20, \, p=0.02\)), indicating that concern beliefs are not strongly contingent upon necessity beliefs. This confirms that necessity and concerns beliefs lie on different continua.

3.3 Association between demographics characteristics, medication beliefs and medication adherence

Participants who reported higher levels of education were more likely to adhere to medications (refugees: \(r=0.24, \, p=0.003\); migrants: \(r=0.29, \, p=0.001\)). Medication beliefs were correlated with adherence in both groups (Table 3). Necessity beliefs for taking medications were positively associated with medication adherence in refugees, (\(r=0.4, \, p=0.0001\)) and migrants (\(r=0.35, \, p=0.0001\)). In contrast, participants who reported higher level of concerns beliefs related to adverse effects, and addiction regarding prescribed medicines showed negative association with medication adherence in refugees (\(r=-0.34, \, p=0.0001\)) and migrants (\(r=-0.5, \, p=0.0001\)). Medication adherence was significantly correlated with beliefs in the necessity of the medication when it exceeded concerns (refugees \(r=0.55, \, p=0.0001\) and migrants \(r=0.6, \, p=0.0001\)).

3.4 Necessity and concern as mediators between migration status and illness perceptions

After adjusting for employment, comorbidity and educational level, the relationship between migration status (refugee or migrant) and medication adherence was mediated by both
concern about and necessity of taking medication. The standardized regression coefficient between migration status was statistically significant with necessity ($p = 0.004$), and concern ($p = 0.0001$). Also, the standardized regression was statistically significant between status of migration and medication adherence ($p = 0.0001$). We tested the significance of this indirect effect using bootstrapping procedures. The unstandardized indirect effect for necessity was 0.08, and the 95% confidence interval ranged from 0.03 to 0.12, and for concern 0.16 and the 95% confidence interval ranged from 0.10 to 0.23. Thus, the indirect effect was statistically significant (see Table 4 & Figure 1).

3.4 Cluster analysis

K mean cluster analysis showed that medication beliefs were distributed into four subtypes shown in Figure 2. Migrants were significantly more likely to hold accepting beliefs than refugees, who were likely significantly more likely to hold skeptical or ambivalent beliefs ($\chi^2 = 67.3, p = 0.0001$). Analysis of variance showed medication adherence was significantly higher in refugees holding Accepting beliefs than in those holding Ambivalent ($p = 0.0001$, 95% CI 0.5-2.4), or Skeptical beliefs ($p = 0.04$, 95% CI 0.01-1.98). Migrants who reported accepting beliefs were significantly more likely to adhere to prescribed medications than those holding skeptical ($p = 0.0001$, 95% CI 0.6-2.37), ambivalent ($p = 0.0001$, 95% CI 0.7-1.89), and/or indifferent beliefs ($p = 0.001$, 95% CI 0.56-2.7).

4. Discussion

This is the first study to explain the relationship between medication adherence and medication beliefs in Australia using multiple mediation modelling, and also to differentiate between Middle Eastern refugees and migrants regarding their beliefs about medicine and medication adherence.
This study identified significant differences between Middle Eastern refugees and migrants. Migrants diagnosed with hypertension, have more positive beliefs about their medications than refugees, believing that medications are necessary for their chronic illness, and hold less concerns about the adverse effects and the possible dependency on medications. Also, migrants reported significantly higher medication adherence levels than refugees from Middle East.

The clusters formed in this analysis and the results are consistent with the categories formed by Horne and colleagues in their analysis of the necessity-concerns framework (R. Horne et al., 2009). The evaluation of these clusters and their association with medication adherence in both refugees and migrants is fundamental to developing specific and targeted interventions for both these groups.

Following from the findings of our study, interventions to improve medication adherence need to focus on the ‘skeptical’ and ‘ambivalent’ clusters. The two clusters constitute of more than 70% of refugees, and 40% of migrants who have high concern beliefs about medicines. The patients in the skeptical cluster were found to have the lowest level of medication adherence, making the patients in this cluster a target for interventions that enhance medication adherence. Concern beliefs about medicine need to be reduced in both refugee and migrant groups and necessity beliefs need to be increased in refugees.

Though both skeptical and ambivalent patients are non-adherent, the type of interventions needed for each group is different. Understanding the characteristics of each these clusters for both refugees and migrants by healthcare providers may lead to appropriate interventions for improving medication taking behaviours (Unni & Shiyanbola, 2016).
The findings of the current study are also consistent to studies cited in the literature that have reported that having high accepting beliefs, and low skeptical beliefs is associated with higher medication adherence (Mann et al., 2009; Tibaldi et al., 2009).

Studies from Middle East are limited regarding medication beliefs and medication adherence. Our findings are consistent with those from a study conducted in Kuwait (Lemay et al., 2018), that reported low adherence was associated with high concerns beliefs.

Medication beliefs may be modified with health care interventions and advice. These beliefs also, are potentially influenced by various personal characteristics that may derive from culture and religion (Al-Ruthia et al., 2017). Patients’ cultural beliefs about medication-taking are also factors contributing intentional medication non-adherence (Bussell, Cha, Grant, Schwartz, & Young, 2017). Health care providers should be encouraged to recognize confusion and misconceptions about medications in patients from different cultures and to provide sensitive care to people from diverse ethnic backgrounds to achieve better medication adherence (Shahin, Kennedy, & Stupans, 2019).

Taking prescribed medications regularly is imperative to maintaining adequate blood pressure control in most hypertensive patients, especially for refugees who have high levels of mortality due to chronic illnesses (Amara & Aljunid, 2014). Refugees in this study reported suboptimal adherence levels, highlighting the need for attention that may improve the overall quality of life for these vulnerable individuals who arrive in Australia. Most refugees in this study came from countries that are currently involved in war or conflict. These countries experience severe disruptions of their health systems resulting in a high degree of uncertainty regarding the safety of seeking healthcare services (Shahin et al., 2020). Moreover, patients are often reluctant to share intentions to not take medications and concerns with health care providers, and therefore providers need to create an encouraging, blame-free environment to allow patients to describe their medication-taking behaviour (Bussell et al., 2017).
Social support plays an important role in determining treatment uptake, recovery and adherence. Refugees who have been taken away from their friends and families, lack social support and thus, lower medication adherence and poorer recovery is to be expected (Shahin et al., 2018). Our previously reported data (Shahin et al., 2020) are consistent with literature which show that Middle Eastern refugees have low educational level, a low socioeconomic status (Gil-González et al., 2015; Hjelm, Bard, Nyberg, & Apelqvist, 2003; Hjelm, Nyberg, Isacsson, & Apelqvist, 1999; Njeru et al., 2016) and consequently a wide range of factors that affect the quality of healthcare. These factors include education level, health literacy, income level, employment status, insurance status and access to care (Roldan, Ho, & Ho, 2018).

Language is one major barrier for refugees in general practice. Refugees have a specific complexity to their health and social care needs. However, because of their limited English language they are less likely to engender empathic response from doctors, establish rapport in these relationships, receive sufficient information about their health or participate in decision making. Moreover, they are unable to communicate full details of their medical and social history (MacFarlane, Glynn, Mosinkie, & Murphy, 2008). Therefore, they might be directed to gain information from their relatives, or friends who are diagnosed with the same illnesses, or maybe from Arabic websites that list all the potential indications and adverse effects of medications. This may exacerbate refugees’ concerns about taking medications, making it difficult to understand the likely risks and possible benefits. During medical appointments Arabic speaking refugees might benefit from receiving consumer medicine information sheets in Arabic, designed specifically for those with low-language literacy levels. Information sheets should include the common adverse effects and emphasize the benefits of taking medication to augment the medical counselling sessions.

There is evidence that indicates educational interventions change migrants’ and refugees’ concerns about medications and that this increases knowledge about hypertension and its
treatment (Unni & Shiyanbola, 2016). This study highlights also, the importance of understanding the differences between refugees and migrants, and how each group has different beliefs about their medications. Acquiring an awareness of each population’s beliefs about medicine may help healthcare providers to identify gaps in their own understanding and the expectations of refugees and migrants about treatments. This may lead to the provision of more optimal health care that meets the needs and expectations of each population (Shahin et al., 2020).

This study has some limitations, due to the cross-sectional design, and self-report measures used to assess both medication adherence and medication beliefs. Self-reporting adherence might not be accurate due patients’ poor memory and overestimation of adherence. However, more than 50% of the participants in this study reported low levels of adherence suggesting that overestimation was not a major limitation in this study. The assessment of the validity of the Arabic versions of the questionnaires was beyond the scope of the current study. However, the English versions have been validated (Robert Horne et al., 1999) and the translation process used in this study showed there was no loss of meaning and the internal consistency of the Arabic version was very high (see results section).

**Conclusion**

Medication beliefs have a significant impact on medication adherence. Healthcare providers need to understand the differences between refugees and migrants regarding their necessity and concern beliefs about medicines, and adherence prior to providing counselling, and medical advice. This study highlights the need for tailored interventions for each cluster of beliefs, and to understand the characteristics of these clusters, to provide optimal healthcare advice and counselling. This study also gives an insight to the need for future intervention studies to promote medication adherence amongst vulnerable patients, by reducing concerns and increasing necessity beliefs.
Declaration

Ethics approval and consent to participate

Ethics approval for this study was obtained from RMIT University Ethics Committee, (SEHAPP 53-18).

Consent for publication

Not applicable.

Availability of data and materials

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

Competing interests

The authors declare that they have no competing interests in this section.

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Not applicable

Authors’ contributions

WS collected the sample, organised the data, analysed and interpreted the data using SPSS, and wrote the first draft of the manuscript.

GK reviewed drafts of the work, contributed to the conception and design of the work, and revised the analyses of the data and the work.

WC analysed and interpreted the data, revised the work.

IS reviewed drafts of the work, contributed to the conception and design of the work, and revised the work.
All authors read and approved the final manuscript.

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Figure 1: Mediation effects of medication beliefs on the relationship between migration status and medication adherence
Figure 2: Distribution of migrants and refugees across each of the four medication beliefs groups.
Table 1. Demographics and clinical characteristics for refugees and migrants (n= 319) (Shahin et al., 2020)

| Variables           | Refugee n | Migrant n | $\chi^2 (df)$ | p   |
|---------------------|-----------|-----------|---------------|-----|
|                     | n (%)     | n (%)     |               |     |
| Age                 |           |           |               |     |
| 30 – 40             | 23 (13.8%)| 29 (19.2%)| 20.78(3)      | 0.001|
| 41-50               | 35 (21%)  | 59 (39.1%)|               |     |
| Above 50            | 108       | 60 (39.7%)| (64.7%)       |     |
| Missing             | 2 (1.2%)  | 3 (1.98%) |               |     |
| Sex                 |           |           |               |     |
| Male                | 83 (49.4%)| 64 (42.4%)| 1.58(1)       | 0.20 |
| Female              | 85 (50.6%)| 87 (57.6%)|               |     |
| Education           |           |           |               |     |
| Lower secondary     | 88 (53.7%)| 42 (28.4%)| 40.57(4)      | 0.0001|
| Higher secondary    | 41 (25 %) | 26 (17.6%)|               |     |
| Diploma             | 7 (4.3%)  | 18 (12.2%)|               |     |
| Bachelor            | 22 (13.4%)| 34 (23 %) |               |     |
| Higher than bachelor| 6 (3.7%)  | 28 (18.9%)|               |     |
| Missing             | 4 (2.3%)  | 3 (1.98%) |               |     |
| Occupation          |           |           |               |     |
| Home/Not working    | 139 (84.8%)| 84 (55.6%)| 38.35(2)      | 0.001|
|                     | (84.8%)   |           |               |     |
| Self-employer       | 4 (2.4%)  | 31 (20.5%)|               |     |
| Governmental/private| 21 (12.8%)| 36 (23.8%)|               |     |
| Missing             | 4 (2.3%)  | -         |               |     |
| 2015-2018           | 58 (34.7%)| 23 (15.4%)| 24.35(3)      | 0.0001|
| Arrival year to Australia | 2010-2015 | 55 (32.9%) | 42 (28.2%) |
|---------------------------|-----------|------------|------------|
| 2000-2010                 | 33 (19.8%)| 41 (27.5%) |
| Before 2000               | 21 (12.6%)| 43 (28.9%) |
| Missing                   | 1 (0.6%)  | 2 (1.3%)   |
| Co-morbidities            |          |            |            |
| Having ≥ 2 chronic illnesses | 54 (32.1%)| 35 (23.2%)| 5.5 (1) | 0.02 |
| Diabetes Mellitus         | 61 (39.4%)| 38 (25.7%)| 6.44 (1) | 0.01 |
| Mental illness            | 12 (7.4%) | 3 (2%)     | 4.98 (1) | 0.03 |
| COPD                      | 7 (4.2%)  | 6 (4%)     | 0.01 (1) | 0.9  |
| Asthma                    | 16 (10.3%)| 14 (9.5%)  | 0.06 (1) | 0.8  |
| Back pain                 | 57 (35.4%)| 42 (28%)   | 1.96 (1) | 0.16 |
| Arthritis                 | 42 (26.3%)| 36 (24.2%)| 0.18 (1) | 0.67 |
| Country of birth          |          |            |            |
| Iraq                      | 83 (49.4%)| 17 (11.2%)| -         | -    |
| Syria                     | 54 (32.1%)| 18 (11.8%)| -         | -    |
| Lebanon                   | 17        | 45 (29.6%)| -         | -    |
| (10.12%)                  |           |            |            |
| Egypt                     | 3 (1.8%)  | 18 (11.8%)| -         | -    |
| Morocco                   | 2 (1.2%)  | 11 (7.23%)| -         | -    |
| Jordan                    | NA        | 13 (8.55%)| -         | -    |
| Algeria                   | 1 (0.6%)  | 5 (3.3%)   | -         | -    |
| Kuwait                    | NA        | 9 (6.3%)   | -         | -    |
| Emirates                  | NA        | 4 (2.8%)   | -         | -    |
| Saudi Arabia              | NA        | 4 (2.8%)   | -         | -    |
| Other Arab countries      | 6 (3.6%)  | 8 (5.3%)   | -         | -    |
Table 2. Comparisons of refugee and migrant medication beliefs, and medication adherence

|                         | Refugee  | Migrant  | Cohen’s d | t(df)    | p      |
|-------------------------|----------|----------|-----------|----------|--------|
|                         | M(SD)    | M(SD)    |           | t(df)    |        |
| Necessity beliefs       | 17.8 (5.5) | 20.2 (4.4) | 0.48      | 4.2 (308) | 0.0001 |
| Concern beliefs         | 18.9 (4.4) | 13.7 (5.5) | 1.04      | 8.7 (277) | 0.0001 |
| Medication adherence    | 1.36 (1.4) | 2.5 (1.4)  | 0.81      | 7.26 (305) | 0.0001 |
Table 3. Correlations between medication adherence scores and other variables in refugees and migrants

|       | 1     | 2  | 3    | 4    | 5   | 6    | 7    | 8    | 9    | 10   |
|-------|-------|----|------|------|-----|------|------|------|------|------|
| 1. Adherence | 1.00  | 0.40* | -0.34* | 0.52* | 0.06 | 0.10 | 0.14 | 0.24* | -0.09 | -0.11 |
| 2. Necessity | 0.35* | 1.00 | -0.26* | 0.84* | -0.08 | -0.04 | -0.14 | 0.18 | -0.11 | -0.09 |
| 3. Concern | -0.50* | -0.21 | 1.00 | -0.75* | -0.06 | -0.08 | 0.15 | -0.16 | -0.05 | 0.24* |
| 4. Necessity-Concern | 0.58* | 0.700* | -0.85* | 1.00 | 0.001 | 0.02 | -0.15 | 0.23 | -0.05 | -0.23* |
| 5. Age | -0.00 | -0.15 | 0.12 | -0.15 | 1.00 | 0.07 | 0.06 | -0.21 | 0.08 | 0.17 |
| 6. Gender | -0.02 | 0.11 | -0.00 | 0.04 | -0.02 | 1.00 | -0.49 | -0.14 | 0.25* | 0.16 |
| 7. Employment | 0.13 | 0.11 | -0.35 | 0.33 | -0.03 | -0.50* | 1.00 | -0.08 | -0.12 | -0.21 |
| 8. Education | 0.26* | -0.00 | -0.14 | 0.10 | -0.35* | -0.09 | 0.22 | 1.00 | -0.17 | -0.17 |
| 9. Arrival year | -0.11 | -0.11 | 0.22 | -0.20 | 0.46* | 0.15 | -0.21 | -0.34* | 1.00 | -0.10 |
| 10. Comorbidity | 0.04 | 0.27 | -0.01 | 0.15 | 0.27* | 0.07 | 0.002 | -0.18 | 0.18 | 1.00 |

Note: Correlations for refugees above the diagonal; Correlations for Migrants Below the diagonal; * indicates p < 0.05; employment coded dichotomously.
Table 4: Bootstrap analyses of the magnitude and statistical significance of indirect effect

| Independent Variable | Dependent variable | Mediator variable | Unstandardized indirect effect | 95% CI (lower and upper) mean indirect effect |
|----------------------|--------------------|-------------------|-------------------------------|-----------------------------------------------|
| Status of migration  | Adherence          | Necessity         | 0.08                          | 0.03-0.12                                     |
| Status of migration  | Adherence          | Concern           | 0.16                          | 0.10-0.23                                     |
References:

Aflakseir, A. (2012). Role of illness and medication perceptions on adherence to medication in a group of Iranian patients with type 2 diabetes. *J Diabetes, 4*(3), 243-247.

AIHW. (2019). High blood pressure. Retrieved from https://www.aihw.gov.au/reports/risk-factors/high-blood-pressure/contents/high-blood-pressure

Aikens, J. E., Nease, D. E., Jr., Nau, D. P., Klinkman, M. S., & Schwenk, T. L. (2005). Adherence to maintenance-phase antidepressant medication as a function of patient beliefs about medication. *Ann Fam Med, 3*(1), 23-30. doi:10.1370/afm.238

Al-Qasem, A., Smith, F., & Cliffor, S. (2011). Review: Adherence To Medication Among Chronic Patients In Middle Eastern Countries: Review Of Studies. *Eastern Mediterranean Health Journal, 17*, 357-358.

Al-Ruthia, Y., Hong, S., Graff, C., Kocak, M., Solomon, D., & Nolly, R. (2017). Examining the relationship between antihypertensive medication satisfaction and adherence in older patients. *Research in Social and Administrative Pharmacy, 13*(3), 602-613.

Amara, A. H., & Aljunid, S. M. (2014). Noncommunicable diseases among urban refugees and asylum-seekers in developing countries: a neglected health care need. *Globalization and Health, 10*, 24-24. doi:10.1186/1744-8603-10-24

Australian Institute of Health and Welfare. (2016). Australia's health 2016. Retrieved from https://www.aihw.gov.au/getmedia/666de2ad-1c92-4db3-9c01-1368ba3c8c98/ah16-3-3-chronic-disease-comorbidities.pdf.aspx

Brooks, C. M., Richards, J. M., Kohler, C. L., Soong, S. J., Martin, B., Windsor, R. A., & Bailey, W. C. (1994). Assessing adherence to asthma medication and inhaler regimens: a psychometric analysis of adult self-report scales. *Med Care, 32*(3), 298-307. doi:10.1097/00005650-199403000-00008

Bussell, J. K., Cha, E., Grant, Y. E., Schwartz, D. D., & Young, L. A. (2017). Ways Health Care Providers Can Promote Better Medication Adherence. *Clinical diabetes : a publication of the American Diabetes Association, 35*(3), 171-177. doi:10.2337/cd016-0029

Carvalho, A. S., & Santos, P. (2019). Medication Adherence In Patients With Arterial Hypertension: The Relationship With Healthcare Systems' Organizational Factors. *Patient preference and adherence, 13*, 1761-1774. doi:10.2147/PPA.S216091
Chen, S., Tsai, J., & Chou, K. (2011). Illness perceptions and adherence to therapeutic regimens among patients with hypertension: a structural modeling approach. *Int J Nurs Stud, 48*(2), 235-245. doi:10.1016/j.ijnurstu.2010.07.005

Edwards, A. (2016). UNHCR viewpoint: ‘Refugee’ or ‘migrant’ – Which is right? Retrieved from http://www.unhcr.org/news/latest/2016/7/55df0e556/unhcr-viewpoint-refugee-migrant-right.html

Erickson, S. R., Coombs, J. H., Kirking, D. M., & Azimi, A. R. (2001). Compliance from self-reported versus pharmacy claims data with metered-dose inhalers. *Ann Pharmacother, 35*(9), 997-1003. doi:10.1345/aph.10379

Fábos, A. (2015). Refugees in the Arab Middle East: Academic and Policy Perspectives. *Domes, 24*(1), 96-110. doi:10.1111/dome.12056

Fawzi, W., Mohsen, M. Y. A., Hashem, A. H., Moussa, S., Coker, E., & Wilson, K. C. (2012). Beliefs about medications predict adherence to antidepressants in older adults. *International psychogeriatrics, 24*(1), 159-169.

Gil-González, D., Carrasco-Portiño, M., Vives-Cases, C., Agudelo-Suárez, A. A., Castejón Bolea, R., & Ronda-Pérez, E. (2015). Is health a right for all? An umbrella review of the barriers to health care access faced by migrants. *Ethnicity & Health, 1*-19. doi:10.1080/13557858.2014.946473

Hayes, A. F. (2012). PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling [White paper]. In.

Hjelm, K., Bard, K., Nyberg, P., & Apelqvist, J. (2003). Religious and cultural distance in beliefs about health and illness in women with diabetes mellitus of different origin living in Sweden. *Int J Nurs Stud, 40*(6), 627-643.

Hjelm, K., Nyberg, P., Isacsson, A., & Apelqvist, J. (1999). Beliefs about health and illness essential for self-care practice: a comparison of migrant Yugoslavian and Swedish diabetic females. *J Adv Nurs, 30*(5), 1147-1159. doi:10.1046/j.1365-2648.1999.01167.x

Horne, R., Chapman, S. C. E., Parham, R., Freemantle, N., Forbes, A., & Cooper, V. (2013). Understanding Patients’ Adherence-Related Beliefs about Medicines Prescribed for Long-Term Conditions: A Meta-Analytic Review of the Necessity-Concerns Framework. *PLoS One, 8*(12), e80633. doi:10.1371/journal.pone.0080633
Horne, R., Parham, R., Driscoll, R., & Robinson, A. (2009). Patients’ attitudes to medicines and adherence to maintenance treatment in inflammatory bowel disease. *Inflamm Bowel Dis, 15*(6), 837-844. doi:10.1002/ibd.20846

Horne, R., & Weinman, J. (1999). Patients’ beliefs about prescribed medicines and their role in adherence to treatment in chronic physical illness. *J Psychosom Res, 47*(6), 555-567. doi:10.1016/S0022-3999(99)00057-4

Horne, R., Weinman, J., & Hankins, M. (1999). The beliefs about medicines questionnaire: The development and evaluation of a new method for assessing the cognitive representation of medication. *Psychology & Health, 14*(1), 1-24. doi:10.1080/08870449908407311

Jimenez, K., Vargas, C., Garcia, K., Guzman, H., Angulo, M., & Billimek, J. (2017). Evaluating the Validity and Reliability of the Beliefs About Medicines Questionnaire in Low-Income, Spanish-Speaking Patients With Diabetes in the United States. *Diabetes Educ, 43*(1), 114-124. doi:10.1177/0145721716675740

Khan, M. U., Shah, S., & Hameed, T. (2014). Barriers to and determinants of medication adherence among hypertensive patients attended National Health Service Hospital, Sunderland. *J Pharm Bioallied Sci, 6*(2), 104-108. doi:10.4103/0975-7406.129175

Kucukarslan, S. N. (2012). A review of published studies of patients’ illness perceptions and medication adherence: Lessons learned and future directions. *Res Social Adm Pharm, 8*(5), 371-382. doi:https://doi.org/10.1016/j.sapharm.2011.09.002

Lemay, J., Waheedi, M., Al-Sharqawi, S., & Bayoud, T. (2018). Medication adherence in chronic illness: do beliefs about medications play a role? *Patient preference and adherence, 12*, 1687-1698. doi:10.2147/ppa.S169236

MacFarlane, A., Glynn, L. G., Mosinkie, P. I., & Murphy, A. W. (2008). Responses to language barriers in consultations with refugees and asylum seekers: a telephone survey of Irish general practitioners. *BMC Family Practice, 9*, 68-68. doi:10.1186/1471-2296-9-68

Mann, M., Ponieman, D., Leventhal, H., & Halm, A. (2009). Predictors of adherence to diabetes medications: the role of disease and medication beliefs. *J Behav Med, 32*(3), 278-284. doi:10.1007/s10865-009-9202-y
Morisky, D. E., Green, L. W., & Levine, D. M. (1986). Concurrent and predictive validity of a self-reported measure of medication adherence. *Med Care, 24*(1), 67-74. doi:10.1097/00005650-198601000-00007

Mumford, W. (2016). What is the difference between asylum seekers, refugees and economic migrants? Retrieved from https://www.sbs.com.au/news/dateline/explainer/what-difference-between-asylum-seekers-refugees-and-economic-migrants

Nafradi, L., Galimberti, E., Nakamoto, K., & Schulz, P. J. (2016). Intentional and Unintentional Medication Non-Adherence in Hypertension: The Role of Health Literacy, Empowerment and Medication Beliefs. *J Public Health Res, 5*(3), 762. doi:10.4081/jphr.2016.762

Njeru, J., Formea, C., Osman, A., Goodson, M., Hared, A., Capetillo, G., . . . Wieland, M. (2016). Diabetes knowledge, attitudes and behaviors among Somali and Latino Immigrants. *Journal of Immigrant & Minority Health, 18*(6), 1432-1440. doi:10.1007/s10903-015-0335-5

Parliament of Australia. (2016). Refugee resettlement to Australia: what are the facts? Retrieved from https://www.aph.gov.au/About_Parliament/Parliamentary_Departments/Parliamentary_Library/pubs/rp/rp1617/RefugeeResettlement#_Toc461022121

Pesantes, M. A., Lazo-Porras, M., Abu Dabrh, A. M., Ávila-Ramírez, J. R., Caycho, M., Villamonte, G. Y., . . . Miranda, J. J. (2015). Resilience in Vulnerable Populations With Type 2 Diabetes Mellitus and Hypertension: A Systematic Review and Meta-analysis. *The Canadian journal of cardiology, 31*(9), 1180-1188. doi:10.1016/j.cjca.2015.06.003

Phillips, L. A., Diefenbach, M. A., Kronish, I. M., Negron, R. M., & Horowitz, C. R. (2014). The necessity-concerns framework: a multidimensional theory benefits from multidimensional analysis. *Ann Behav Med, 48*(1), 7-16. doi:10.1007/s12160-013-9579-2

Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behav Res Methods, 40*(3), 879-891.

Roldan, P. C., Ho, G. Y., & Ho, P. M. (2018). Updates to adherence to hypertension medications. *Curr Hypertens Rep, 20*(4), 34. doi:10.1007/s11906-018-0830-x

The SAGE Encyclopedia of Communication Research Methods. (2017). doi:10.4135/9781483383141

Shahin, W., Kennedy, G. A., Cockshaw, W., & Stupans, I. (2020). The role of refugee and migrant migration status on medication adherence: Mediation through illness perceptions. *PLOS ONE, 15*(1), e0227326. doi:10.1371/journal.pone.0227326
Shahin, W., Kennedy, G. A., & Stupans, I. (2019). The impact of personal and cultural beliefs on medication adherence of patients with chronic illnesses: a systematic review. *Patient preference and adherence, 13*, 1019-1035. doi:10.2147/PPA.S212046

Shahin, W., Stupans, I., & Kennedy, G. (2018). Health beliefs and chronic illnesses of refugees: a systematic review. *Ethnicity & health*, 1-13.

Sobel, M. E. (1986). Some New Results on Indirect Effects and Their Standard Errors in Covariance Structure Models. *Sociological Methodology, 16*, 159-186. doi:10.2307/270922

Tibaldi, G., Clatworthy, J., Torchio, E., Argentero, P., Munizza, C., & Horne, R. (2009). The utility of the Necessity--Concerns Framework in explaining treatment non-adherence in four chronic illness groups in Italy. *Chronic Illn, 5*(2), 129-133. doi:10.1177/1742395309102888

Unni, E., & Shiyanbola, O. O. (2016). Clustering medication adherence behavior based on beliefs in medicines and illness perceptions in patients taking asthma maintenance medications. *Curr Med Res Opin, 32*(1), 113-121. doi:10.1185/03007995.2015.1105204