

Role of Medication Beliefs on Medication Adherence in Hypertensive Middle Eastern Refugees and Migrants in Australia

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

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26

27 **Abstract**

28

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

37

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

44

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

53 “accepting” beliefs reported the highest adherence to medication and those holding “skeptical”
54 beliefs reported the lowest adherence.

55

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

61 Keywords: Medication beliefs; concerns; necessity; medication adherence; migrants;
62 refugees, Middle-Eastern

63

64

65 **1. Background**

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

79

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

84

85 Theoretical models of patient behaviour can be useful in designing interventions to improve
86 medication adherence (Kucukarslan, 2012). One model that has shown promise for identifying
87 potential targets for interventions is the Necessity–Concerns Framework (Tibaldi et al., 2009),
88 which is a multidimensional theory that posits relationships between two separate
89 dimensions—patients’ necessity beliefs and concerns regarding medication, and an outcome
90 (medication adherence) (Phillips, Diefenbach, Kronish, Negron, & Horowitz, 2014) .This

91 suggests that patients weigh up their perceived personal need for treatment against their
92 concerns about potential adverse effects of treatment when deciding whether or not to adhere
93 to medications (Tibaldi et al., 2009). Thus, medication adherence will be greater when the
94 difference between patients' beliefs in the necessity of the medication exceed their concerns
95 (Phillips et al., 2014). The Beliefs about Medicines Questionnaire (BMQ-specific) has two
96 subscales to assess patients' perceived need for treatment (necessity) and their concerns
97 about potential adverse effects (concerns) (Jimenez et al., 2017; Tibaldi et al., 2009). A
98 relatively recent meta-analysis (Rob Horne et al., 2013) , has described how beliefs about
99 medicines determined through the BMQ are correlated to medication adherence in a number
100 of chronic illnesses, including hypertension, and reported that medication adherence was
101 correlated positively with necessity beliefs, and negatively with concern, across the majority
102 of included studies.

103

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

111

112 According to the 1951 Convention relating to the Status of Refugees (the 1951 Refugee
113 Convention) a refugee is a person who relocates from their "country of nationality or habitual
114 residence, has a well-founded fear of persecution because of his (sic) race, religion,
115 nationality, membership of a particular social group or political opinion, and is unable or
116 unwilling to avail themselves of the protection of that country, or to return there, for fear of
117 persecution" (Parliament of Australia, 2016). Often the terms 'migrant', and 'refugee' are used
118 interchangeably, and both migrants and refugees have been considered as a single

119 population, and considered under the same umbrella (Shahin, Stupans, & Kennedy, 2018).
120 However, each has an explicit legal definition that distinguishes one from the other (Mumford,
121 2016). Refugees forced to leave their countries of origin because of a direct threat of
122 persecution or death, and can't safely return home, whereas migrants face no such
123 impediment to returning to their country of origin as they choose to move mainly to improve
124 their lives by finding work, or in some cases for education, family reunion, or other reasons
125 (Edwards, 2016).

126

127 It has been reported in the literature that migrants and refugees have an elevated prevalence
128 of medical diseases, such as hypertension. Although, both these populations may have similar
129 difficulties during the resettlement processes, a number of factors distinctly differentiate the
130 social and personal lives of refugees and migrants. These factors may include: the intentions
131 and motivations for migration, the impediments to returning back to home countries, having a
132 control over their lives through migration, and taking into account the damaging effect of
133 persecution on their education, employment, and socioeconomic status (Shahin et al., 2020).
134 Therefore, these two different populations might evolve different beliefs about their
135 medications. Thus, it is important to have a well-founded understanding of how Middle Eastern
136 refugees and migrants perceive their prescribed medicine, and how these beliefs about
137 medicines may impact medication adherence.

138

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

142 According to the findings of the meta –analysis described above (Rob Horne et al., 2013),
143 only two studies examined the association between medication adherence and medication
144 beliefs in Middle Eastern population (Aflakseir, 2012; Fawzi et al., 2012). However, neither of
145 these two studies examined adherence and medication beliefs in hypertension, also neither
146 evaluated refugees' population, or the differences between refugees and migrants. Medication

147 adherence was correlated positively with necessity beliefs, and negatively with concern in
148 these two studies (Aflakseir, 2012; Fawzi et al., 2012).

149

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

157

158 **2. Materials and methods**

159 **2.1 Study design and setting**

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

168 **2.2 Study participants**

169 Study participants have been reported and published previously. Throughout the 10-month
170 recruitment period, attendees at Adult Migrant English Program centres and the community

171 groups, were approached and invited to consider participating in the study. A poster including
172 the survey link was published in some Facebook Arabic interest gathering groups in Australia
173 (Shahin et al., 2020). Participants were invited to take part in the study if they were aged 30
174 years or older, diagnosed with hypertension, and had migrated to Australia from one of the 22
175 countries in the Middle East, as refugees or migrants. Refugee or migrant status was identified
176 through a survey question which asked participants to describe how they arrived to Australia.
177 The choices were: “*refugee*,” “*work*,” “*studying*,” “*economic reasons*” “*any other reason*”.
178 Migrants were defined as those participants who selected any choices of other than “*refugee*”.

179

180 **2.3 Development of questionnaire**

181 The self-administered questionnaire consisted of 21 items divided into four sections. The first
182 section comprised socio-demographic information including; age, gender, place of birth,
183 migration status, education level, and occupation. In the second section, participants were
184 asked to identify whether they had one or more than one of eight significant chronic conditions
185 as categorised by the Australian Institute of Health and Welfare. These conditions included;
186 arthritis, asthma, back pain and associated problems, cancer, cardiovascular disease (such
187 as hypertension, coronary heart disease and stroke), chronic obstructive pulmonary disease
188 (COPD), diabetes and mental health conditions (Australian Institute of Health and Welfare,
189 2016).

190 In sections three and four, validated and reliable questionnaires were used to assess
191 medication adherence (Morisky, Green, & Levine, 1986) and medication beliefs (R. Horne &
192 Weinman, 1999). Medication adherence was measured using the four-item Medication
193 Adherence Questionnaire (MAQ) that assesses both intentional and unintentional non-
194 adherence. The scale is scored 1 point for each “no” and 0 points for each “yes”. Patients were
195 described as adherent (if the total score was four) or non-adherent (if the total score was less
196 than 4) (Khan, Shah, & Hameed, 2014). This questionnaire was selected because it has been
197 used across many chronic illnesses, such as cardiovascular disease, and has demonstrated

198 adequate predictive validity and good reliability (Mann, Ponieman, Leventhal, & Halm, 2009).
199 The psychometric properties have been reported to range from adequate (Brooks et al., 1994;
200 Morisky et al., 1986) to high (Erickson, Coombs, Kirking, & Azimi, 2001).
201 Beliefs regarding medications were measured using Beliefs about Medicine Questionnaire
202 (BMQ). The BMQ-specific is a 10-item questionnaire that comprised of two scales; a 5-item
203 necessity scale that assesses perceived personal need for the medication (*necessity*), and a
204 5-item concerns scale that assesses common concerns about potential adverse effects such
205 as dependence, adverse effects, or accumulation effects (*concerns*). Participants indicate how
206 much they agree with a series of statements on a five point scale from *strongly agree* to
207 *strongly disagree*. Subscales scores were calculated as mean item scores. Higher scores
208 indicate a stronger endorsement of the construct being measured (Tibaldi et al., 2009).
209 Following the *necessity concerns framework* posited by Horne and colleagues, the difference
210 between *necessity* and *concern* subscale scores was calculated in order to evaluate the
211 patient-perceived, cost-benefit, analysis of medication adherence (Jimenez et al., 2017).

212

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

219

220

221 **2.4 Sample size**

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

225 **2.5 Data analysis**

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

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

242 A multiple mediation model in which necessity and concern mediate the association between
243 migration status (refugee or migrant) and medication adherence was tested as presented in
244 Figure 1. In order to analyse the model and determine the confidence interval for the indirect
245 effect, bootstrapping (5,000 samples) was applied using the SPSS PROCESS macro (Hayes,
246 2012). This process does not require the indirect effect to be normally distributed, therefore is
247 preferred to the Sobel's test (Sobel, 1986) (Preacher & Hayes, 2008). If the 95% bias-
248 corrected confidence interval does not include zero, the indirect effect is statistically significant.
249 Confounding factors that were significantly associated with medication adherence were
250 entered in the mediation analysis as covariates.

251 Based on the empirical and theoretical framework (Aikens, Nease, Nau, Klinkman, &
252 Schwenk, 2005), cluster analysis was conducted to examine the differences between refugees
253 and migrants medication beliefs, and to examine the association of these clusters with
254 medication adherence. Firstly, four groups were generated by splitting the scores from
255 necessity and concerns items at the median; subsequently, participants were categorized,
256 according to Horne and his colleagues (R. Horne, Parham, Driscoll, & Robinson, 2009), into
257 one of four subgroups according to their attitudes towards medication; Skeptical (low
258 necessity, high concerns), Ambivalent (high necessity, high concerns), Indifferent (low
259 necessity, low concerns), and Accepting (high necessity, low concerns). Following this,
260 associations between adherence rates and the four belief groups were examined in both
261 groups, and differentiated using Chi-square tests, and analysis of variance.

262

263 **3.1 Participants demographics and clinical characteristics**

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

273

274 **3.2 Participants beliefs about medications and medication adherence**

275 Significant differences were found between refugees and migrants with regards to
276 medication adherence and beliefs about medicines (Table 2). Refugees had

277 substantially lower adherence than migrants with a large effect size ($p=0.0001$, $d= 0.81$), and
278 they reported a significantly lower level of necessity beliefs with a medium effect size
279 ($p=0.0001$, $d=0.48$). Refugees also demonstrated significantly higher concern beliefs about
280 medicines than migrants with a large to very large effect size ($p=0.0001$, $d=1.04$). Importantly,
281 the association between necessity and concern beliefs was low ($r=-0.20$, $p=0.02$),
282 indicating that concern beliefs are not strongly contingent upon necessity beliefs. This
283 confirms that necessity and concerns beliefs lie on different continua.

284

285 **3.3 Association between demographics characteristics, medication beliefs and** 286 **medication adherence**

287 Participants who reported higher levels of education were more likely to adhere to medications
288 (refugees: $r=0.24$, $p=0.003$; migrants: $r=0.29$, $p= 0.001$).

289 Medication beliefs were correlated with adherence in both groups (Table 3). *Necessity* beliefs
290 for taking medications were positively associated with medication adherence in refugees, ($r=$
291 0.4 , $p= 0.0001$) and migrants ($r= 0.35$, $p=0.0001$). In contrast, participants who reported higher
292 level of *concerns* beliefs related to adverse effects, and addiction regarding prescribed
293 medicines showed negative association with medication adherence in refugees ($r= -0.34$,
294 $p=0.0001$) and migrants ($r= -0.5$, $p=0.0001$). Medication adherence was significantly
295 correlated with beliefs in the necessity of the medication when it exceeded concerns (refugees
296 $r=0.55$, $p=0.0001$ and migrants $r=0.6$, $p=0.0001$).

297

298 **3.4 Necessity and concern as mediators between migration status and illness** 299 **perceptions**

300 After adjusting for employment, comorbidity and educational level, the relationship between
301 migration status (refugee or migrant) and medication adherence was mediated by both

302 concern about and necessity of taking medication. The standardized regression coefficient
303 between migration status was statistically significant with necessity ($p = 0.004$), and concern
304 ($p = 0.0001$). Also, the standardized regression was statistically significant between status of
305 migration and medication adherence ($p = 0.0001$). We tested the significance of this indirect
306 effect using bootstrapping procedures. The unstandardized indirect effect for necessity was
307 0.08, and the 95% confidence interval ranged from 0.03 to 0.12, and for concern 0.16 and the
308 95% confidence interval ranged from 0.10 to 0.23. Thus, the indirect effect was statistically
309 significant (see Table 4 & Figure 1).

310

311 **3.4 Cluster analysis**

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

321

322 **4. Discussion**

323 This is the first study to explain the relationship between medication adherence and
324 medication beliefs in Australia using multiple mediation modelling, and also to differentiate
325 between Middle Eastern refugees and migrants regarding their beliefs about medicine and
326 medication adherence.

327

328 This study identified significant differences between Middle Eastern refugees and migrants.
329 Migrants diagnosed with hypertension, have more positive beliefs about their medications than
330 refugees, believing that medications are necessary for their chronic illness, and hold less
331 concerns about the adverse effects and the possible dependency on medications. Also,
332 migrants reported significantly higher medication adherence levels than refugees from Middle
333 East.

334

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

340

341 Following from the findings of our study, interventions to improve medication adherence need
342 to focus on the 'skeptical' and 'ambivalent' clusters. The two clusters constitute of more than
343 70% of refugees, and 40% of migrants who have high concern beliefs about medicines.

344

345 The patients in the skeptical cluster were found to have the lowest level of medication
346 adherence, making the patients in this cluster a target for interventions that enhance
347 medication adherence. Concern beliefs about medicine need to be reduced in both refugee
348 and migrant groups and necessity beliefs need to be increased in refugees.

349

350 Though both skeptical and ambivalent patients are non-adherent, the type of interventions
351 needed for each group is different. Understanding the characteristics of each these clusters
352 for both refugees and migrants by healthcare providers may lead to appropriate interventions
353 for improving medication taking behaviours (Unni & Shiyabola, 2016).

354

355 The findings of the current study are also consistent to studies cited in the literature that have
356 reported that having high accepting beliefs, and low skeptical beliefs is associated with higher
357 medication adherence (Mann et al., 2009; Tibaldi et al., 2009).

358

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

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

370 Taking prescribed medications regularly is imperative to maintaining adequate blood pressure
371 control in most hypertensive patients, especially for refugees who have high levels of mortality
372 due to chronic illnesses (Amara & Aljunid, 2014). Refugees in this study reported suboptimal
373 adherence levels, highlighting the need for attention that may improve the overall quality of
374 life for these vulnerable individuals who arrive in Australia. Most refugees in this study came
375 from countries that are currently involved in war or conflict. These countries experience severe
376 disruptions of their health systems resulting in a high degree of uncertainty regarding the
377 safety of seeking healthcare services (Shahin et al., 2020). Moreover, patients are often
378 reluctant to share intentions to not take medications and concerns with health care providers,
379 and therefore providers need to create an encouraging, blame-free environment to allow
380 patients to describe their medication-taking behaviour (Bussell et al., 2017).

381 Social support plays an important role in determining treatment uptake, recovery and
382 adherence. Refugees who have been taken away from their friends and families, lack social
383 support and thus, lower medication adherence and poorer recovery is to be expected (Shahin
384 et al., 2018). Our previously reported data (Shahin et al., 2020) are consistent with literature
385 which show that Middle Eastern refugees have low educational level, a low socioeconomic
386 status (Gil-González et al., 2015; Hjelm, Bard, Nyberg, & Apelqvist, 2003; Hjelm, Nyberg,
387 Isacson, & Apelqvist, 1999; Njeru et al., 2016) and consequently a wide range of factors that
388 affect the quality of healthcare. These factors include education level, health literacy, income
389 level, employment status, insurance status and access to care (Roldan, Ho, & Ho, 2018).

390

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

405

406 There is evidence that indicates educational interventions change migrants' and refugees'
407 concerns about medications and that this increases knowledge about hypertension and its

408 treatment (Unni & Shiyanbola, 2016). This study highlights also, the importance of
409 understanding the differences between refugees and migrants, and how each group has
410 different beliefs about their medications. Acquiring an awareness of each population's beliefs
411 about medicine may help healthcare providers to identify gaps in their own understanding and
412 the expectations of refugees and migrants about treatments. This may lead to the provision of
413 more optimal health care that meets the needs and expectations of each population (Shahin
414 et al., 2020).

415

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

425

426 **Conclusion**

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

435 **Declaration**

436 **Ethics approval and consent to participate**

437 Ethics approval for this study was obtained from RMIT University Ethics Committee, (SEHAPP
438 53-18).

439 **Consent for publication**

440 Not applicable.

441 **Availability of data and materials**

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

444 **Competing interests**

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

446 **Funding**

447 Not applicable

448 **Authors' contributions**

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

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

453 WC analysed and interpreted the data, revised the work.

454 IS reviewed drafts of the work, contributed to the conception and design of the work, and
455 revised the work.

456 All authors read and approved the final manuscript.

457

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460 women's social groups, and the administrators of the included Facebook groups, for assisting
461 in recruitment of participants.

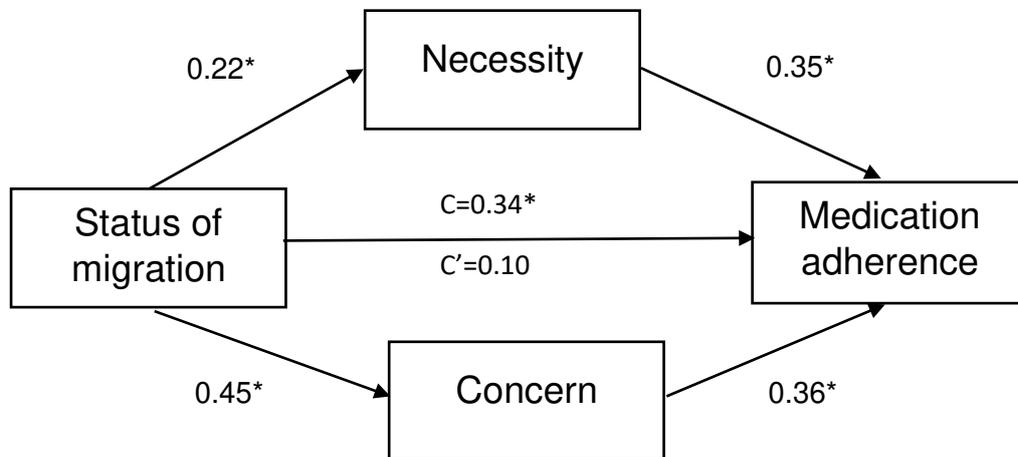
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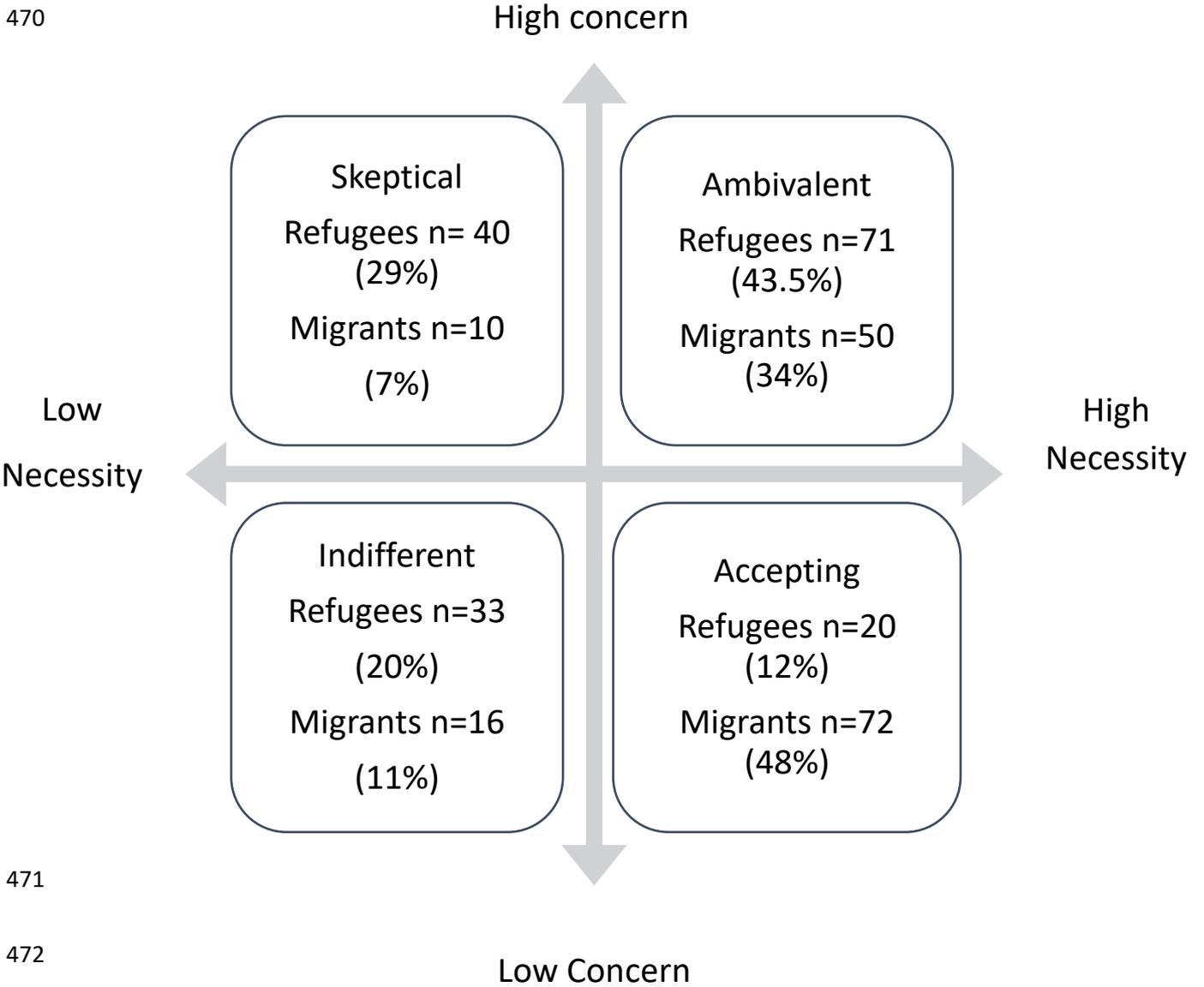
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465 Figure 1: Mediation effects of medication beliefs on the relationship between migration
466 status and medication adherence

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468 Figure 2: Distribution of migrants and refugees across each of the four medication
469 beliefs groups.



474 **Table 1. Demographics and clinical characteristics for refugees and migrants**
 475 **(n= 319) (Shahin et al., 2020)**

Variables		Refugee <i>n</i>	Migrant <i>n</i> =	χ^2 (<i>df</i>)	<i>p</i>
		= 168	152		
		<i>n</i> (%)	<i>n</i> (%)		
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 (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	2010-2015	55 (32.9%)	42 (28.2%)		
to Australia	2000-2010	33 (19.8%)	41 (27.5%)		
	Before 2000	21 (12.6%)	43 (28.9%)		
	Missing	1 (0.6%)	2 (1.3%)		
Co-	Having \geq 2 chronic	54 (32.1%)	35 (23.2%)	5.5 (1)	0.02
morbidities	illnesses				
	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	Iraq	83 (49.4%)	17 (11.2%)	-	,-
birth	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%)	-	-

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479 **Table 2. Comparisons of refugee and migrant medication beliefs, and**
480 **medication adherence**

	Refugee	Migrant	Cohen's d		
	<i>M(SD)</i>	<i>M(SD)</i>		<i>t(df)</i>	<i>p</i>
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

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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 effect
Status of migration	Adherence	Necessity	0.08	0.03-0.12	
Status of migration	Adherence	Concern	0.16	0.10-0.23	

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Figures

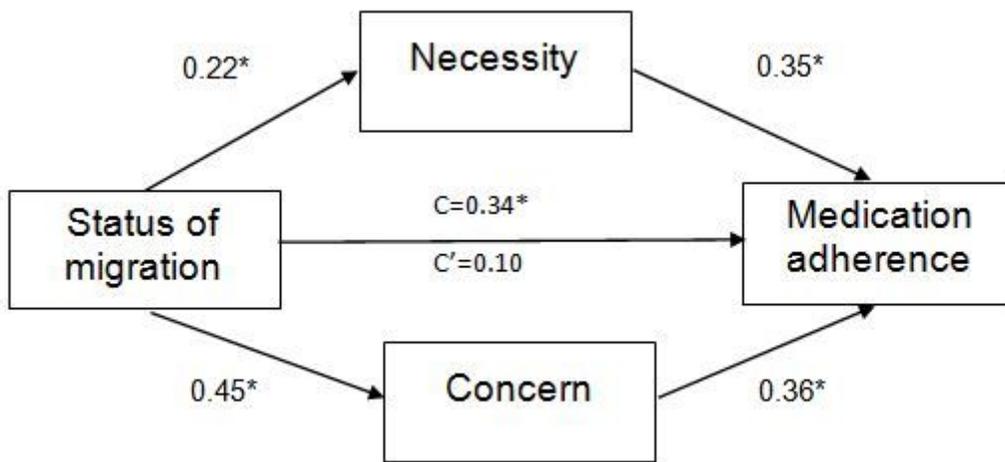


Figure 1

Mediation effects of medication beliefs on the relationship between migration status and medication adherence

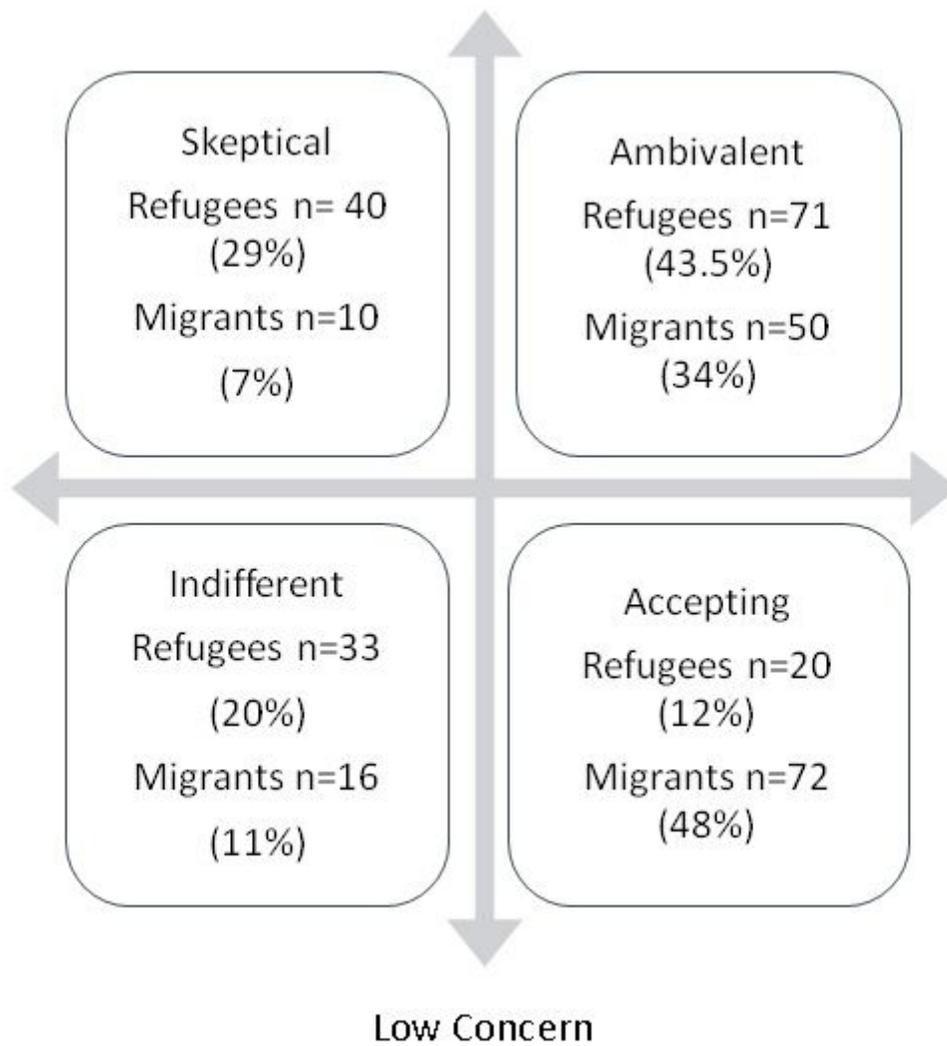


Figure 2

Distribution of migrants and refugees across each of the four medication beliefs groups.