REVIEW

The impact of personal and cultural beliefs on medication adherence of patients with chronic illnesses: a systematic review

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Background: Patients' adherence to therapeutic regimes may be influenced by subjective beliefs about chronic conditions. One of the challenges for health professionals in enhancing adherence is taking patients' understanding into account when giving health advice and/or providing medical treatment.

Purpose: This review aimed to evaluate the consequent effects of personal and cultural beliefs on medication adherence, in patients with chronic conditions such as hypertension, diabetes mellitus, chronic obstructive pulmonary disease and asthma.

Method: A systematic review methodology was used. PubMed, CINAHL, EMBASE and PsychINFO, databases were searched for relevant articles. The main terms analyzed were illness perceptions, health beliefs, cultural beliefs, chronic conditions and medication adherence.

Results: From 2,646 articles, 127 were retained for further assessment, and finally 25 met the inclusion criteria. A cross-sectional questionnaire survey research design was conducted in all included articles. Of these most (n=22) targeted hypertension or diabetes mellitus. A number of personal and cultural based factors were identified as being associated with adherence to medication regimes — 40% of articles (n=10) examined perception of illness, 20% (n=5) health literacy, 16% (n=4) cultural beliefs, 12% (n=3) self-efficacy, 16% (n=4) spiritual and religious beliefs, as well as 20% (n=5) illness knowledge. Statistically significant associations between medication adherence and these personal and cultural factors were found in 80% (n=20) of the included studies. However, the direction of associations varied between studies depending on the factor that was examined.

Conclusion: This review has evaluated the impact of personal and cultural factors on medication adherence and highlighted the gaps in literature regarding adherence. Further research is required to fully identify the associations between religious beliefs, control beliefs and illness knowledge and medication adherence.

Keywords: perception of illness, health beliefs, culture, medication adherence, diabetes mellitus, hypertension, asthma, chronic obstructive pulmonary disease

Introduction

Chronic illness is a significant worldwide health problem, with the numbers of people affected steadily increasing. World Health Organization (WHO) data show that uncontrolled hypertension rose from 600 million people to nearly one billion from 1980 to 2008 and in a similar period the number of people with diagnosed type 2 diabetes mellitus (DMT2) rose from 108 to 422 million. [1,2]

The treatment of chronic illnesses commonly includes the long-term use of pharmacotherapy. Although medications are effective in addressing chronic illnesses, their full

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benefits are often not realized due to lack of adherence. Levels of adequate adherence to diabetes (DMT2) and hypertension (HTN) treatment regimens vary widely with estimates from 36–93% for DMT2 and 30–70% for HTN.[3,4] Up to 50% of patients who are diagnosed with chronic obstructive pulmonary disease (COPD) fail to take medications as directed and many do not use inhalers effectively.[5] Similarly, it is estimated that 30–70% of asthma suffers are not adherent to preventative medications.[6] The consequences of non-adherence include; significant worsening of disease, treatment failure, increased hospitalizations and increased health care costs.[7]

Adherence is defined as the process by which patients take their medication as prescribed[8] Patients' acceptance of medical advice, including medication use, may be influenced by subjective beliefs about their health condition. Therefore, it is essential to take beliefs into account when giving health advice and/or providing medical treatment.[3] It has been shown that medication adherence is multi-faceted. Factors contributing to medication adherence include illness perceptions, health literacy, self-efficacy, cognitive abilities such as memory, coping and problem-solving skills, as well as psychosocial factors such as personal and cultural beliefs related to medication taking.[9]

Factors of concern to patients, regarding their illness, may be conceptualized as patients' illness perceptions. Leventhal and his colleagues proposed the common-sense model of illness representation to understand the processes by which people make sense of illness.[10] Illness perceptions are personal beliefs and expectations about an illness or somatic symptoms. The basic assumption underlying this model is that illness perceptions, along with "common sense," are used in interpreting the meaning of illness or somatic symptoms, deciding on a response, and evaluating the effectiveness of the response.[11]

Personal beliefs about illness include both cognitive and emotional representations. Cognitive beliefs include five core domains: (1) "identity" describes peoples' beliefs about the label of illness and symptoms, and sets out the targets for change (such as to eliminate symptoms); (2) "timeline" refers to people's perception of the duration of illness, including symptoms and recovery; (3) "consequences" refers to beliefs about the seriousness of the disease and the impacts on daily life; (4) "control" refers to perceptions about the amenability of the illness to being cured, prevented or treated; and (5) "causes" refers to people's perceptions of the possible causes of their condition. Emotional representations are the feelings that arise as a result of illness, such as anxiety and/or depression.[12]

In explaining health behaviors, social determinants such as spirituality and religiosity have been increasingly identified as impacting health and treatment.[7] Though often used interchangeably, spirituality and religiosity are separate, but related, concepts. While spirituality denotes an inner freedom to engage in faith and a relationship with a Supreme Being, such as God, religion refers to the outward adherence to highly prescribed beliefs, practices and rituals related to the Supreme Being, such as church attendance and associated activities.[13] Cultural beliefs, defined as "a set of behavioral patterns related to thoughts, manners and actions, which members of society have shared and passed on to succeeding generations"[14] may also influence the decision making of patients with chronic disease to take medication.[14] Acculturation has been defined as culture change that results from continuous contact between two distinct cultural groups; it also refers to changes in an individual whose cultural group is collectively experiencing acculturation.[15]

Health behaviors in the self-management of chronic diseases can also be affected by both health literacy and self-efficacy.[16] High health literacy, ie, "the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health"[17] and high self-efficacy, ie, "the belief in one's capacity to organize and execute the courses of action required to manage a prospective situation"[17] are more likely to have better adherence to self-care tasks and medication adherence.[18]

In this review, we update and expand an earlier review[9] to take into account findings from recent literature. Since 2006, a number of studies have been published which have examined illness perceptions conceptualized by the common sense model. Secondly, studies examining the impact of acculturation and religious beliefs on medication adherence have now also been published.

Although a number of systematic reviews on medication adherence have been conducted,[12,19–21] none of these has explored the relationship between medication adherence and personal and cultural beliefs of patients with chronic diseases such as HTN, COPD, asthma and DMT2. These chronic diseases are currently the most significant in terms of population health in first-world countries.

Methods
Search strategy
The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines[22] were followed. The

electronic databases (CINHAL, EMBASE, PsychINFO and PubMed) were systematically and extensively searched to identify the articles related to the effect of personal and cultural beliefs on medication adherence in chronically ill patients with HTN, DMT2, COPD and asthma. Outlined in Table 1 is the combination of search terms that were used to source the relevant literature. The search was conducted in August 2018, and rechecked in May 2019. This review is an update of a previously published systematic review;[9] therefore, limitations were placed around the search strategy, March 2006–December 2018.

Study selection

Studies that met the inclusion criteria were selected initially, based on screening the titles and abstracts by one researcher (W.S.). Copies of the full-text papers deemed potentially relevant by the first screening were subsequently, independently fully analyzed by two researchers (W.S. and I.S.); in cases of disagreement about inclusion, the third author (G.K.) was consulted and consensus was reached.

Inclusion criteria

Articles were included if: (1) they pertained to one of the four main chronic illnesses: DMT2, HTN, COPD or asthma; (2)

included a clear method of how medication adherence and beliefs were measured; and (3) addressed the association of beliefs and medication adherence.

Exclusion criteria

Articles were excluded if: (1) not peer-reviewed articles; (2) written in a language other than English; (3) focused on illnesses other than HTN, DMT2, COPD or asthma; (4) mentioned self-management behaviors, but not medication adherence; and (5) assessed the effect of medication beliefs on medication adherence.

Data extraction process

The data extracted from each eligible paper were synthesized and are presented in Tables 2–5. Table 2 shows a summary of major findings of the studies which examined the association of illness beliefs with medication adherence, Table 3 shows a summary of religious, cultural and personal and illness knowledge effects on medication adherence and Table 4 shows a summary of the impact of health literacy and self-efficacy on medication adherence.

Demographic characteristics and the tools used to measure beliefs and medication adherence are presented in Table 5.

Table 1 Review search terms and databases reviewed

Database	Search terms
PubMed	(Medication compliance OR medication taking behaviour OR medication adherence) AND (health beliefs OR religious beliefs OR common sense model OR self-efficacy OR illness perception OR health literacy OR ("Health Knowledge, Attitudes, Practice"[Mesh]) OR ("Culture"[Mesh])) AND (asthma OR diabetes mellitus OR chronic obstructive pulmonary disease OR hypertension) Limiters – published date: 01/03/2006–01/01/2019; journal articles
CINAHL with full text	Chronic obstructive pulmonary disease OR diabetes mellitus OR asthma OR hypertension AND medication adherence OR medication compliance OR medication persistence OR drug adherence OR drug compliance AND health beliefs OR illness perception OR patient beliefs OR cultural beliefs OR common sense model OR acculturation OR health knowledge OR health literacy OR self-efficacy OR religious beliefs Limiters – published date: 01/03/2006–01/01/2019
Embase	("chronic obstructive pulmonary disease" OR "diabetes mellitus" OR asthma OR hypertension) AND ("medication adherence" OR "medication compliance" OR "medication persistence" OR "drug adherence" OR "drug compliance") AND ("health beliefs" OR "illness perception" OR "patient beliefs" OR "cultural beliefs" OR "common sense model" OR acculturation OR "health knowledge" OR "health literacy" OR "self-efficacy" OR "religious beliefs") Limiters – published date: 2006–2019
PsychINFO	Chronic obstructive pulmonary disease OR diabetes mellitus OR asthma OR hypertension AND medication adherence OR medication compliance OR medication persistence OR drug adherence OR drug compliance AND health beliefs OR illness perception OR patient beliefs OR cultural beliefs OR common sense model OR acculturation OR health knowledge OR health literacy OR self-efficacy OR religious beliefs Limiters – Peer reviewed; published date: 01/03/2006–01/01/2019

Table 2 Summary of associations between illness perceptions and medication adherence

Study	Association between illness perceptions and medication adherence
Chen et al, 2011[30]	Significant association between illness perceptions variables and medication adherence: Medication adherence associated positively with treatment control and personal control (β=0.41, p<0.05). Medication adherence associated negatively with illness identity (β=0.23, p<0.05), and cause of illness (β= −0.25, p<0.05).
Ashur et al, 2015[31]	Significant association between Illness perceptions variables and medication adherence: Medication adherence associated positively with treatment control (p=0.04, OR=0.95, 95% CI=0.91–0.99). Medication adherence associated negatively with illness identity (p=0.008, OR=1.08, 95% CI=1.02–1.14).
Chen et al, 2009[29]	Significant associations between illness perceptions variables and medication adherence: Medication adherence associated positively with personal control (β=0.14, p<0.05) and treatment control (β=0.20, p<0.001). No significant association between illness identity and medication adherence (β= −0.09, p>0.05). No significant association between emotional representation of illness and medication adherence (β= −0.09, p>0.05). Medication adherence associated negatively with psychological cause of illness (β= −0.23, p<0.001) and illness consequences (β= −0.12, p<0.05).
Mann et al, 2009[4]	Significant associations were found between illness perceptions variables and medication adherence: Medication adherence associated positively with personal control (p=0.003). Medication adherence associated negatively with beliefs about illness consequences (p=0.03) and identity (p=0.002).
Jacobs et al, 2014[11]	Significant moderate associations were found between illness perceptions variables and medication adherence: Medication adherence associated negatively with beliefs about illness consequences (r=0.383, p<0.05). Medication adherence associated negatively with illness emotional representation (r=0.528, p<0.001).
Hsiao et al, 2012[3]	Significant associations between illness perceptions variables and the adherence: Medication adherence associated positively with positive beliefs with regard to timeline, consequences and emotional responses (p<0.05) Medication adherence associated negatively with personal control (p<0.05).
Saarti et al, 2016[32]	No significant association between illness perceptions and medication adherence (p=0.52, OR=1.0, CI=0.9–1.0).
Krauskopf et al, 2015[5]	No significant association between illness identity (p=0.46), consequences (p=0.15), personal control (p=0.76), timeline of illness (p=0.79) with medication adherence. Negative association between emotional representation of illness and medication adherence (p=0.001)
Rajpura & Nayak, 2014[25]	Positive association between threatening perceived illness burden and medication adherence (r=0.332, p<0.001).
Aflakseir, 2012[34]	Significant association between illness perceptions variables and the adherence: Medication adherence associated positively with illness timeline (p<0.05). Medication adherence associated negatively with illness consequences (p<0.05).

Risk of bias in individual studies

To ascertain the validity of eligible cross-sectional studies, each study was assessed for the following eight components based on the checklist for quasi-experimental studies (non-randomized experimental studies):[23] (1) clearly defining the criteria for inclusion in the sample; (2) detailed description of the study subjects and the setting; (3) validity and reliability of ways measuring the exposure; (4) criteria used for measurement of the condition; (5) identifying confounding factors; (6) strategies to deal with confounding factors; (7) validity and reliability of the outcomes measures and (8) appropriate statistical analyses used.

Results
Article selection

The literature search located 2,642 articles; hand searching retrieved four additional references. Subsequently, 937 duplicates were removed, and the titles and abstracts of the remaining 1,673 articles were reviewed. 127 articles were directly related to the aims of this review. A further detailed review of the full-text articles resulted in elimination of additional 102

Table 3 Association of other factors and beliefs on medication adherence

Study	Religious beliefs	Cultural beliefs	Illness knowledge/personal perceptions
Eh et al, 2016[40]		Negative association between strong beliefs in the superiority of traditional Chinese medicines and medication adherence (β=−0.19, p=0.02). Positive correlation between acculturation and medication adherence β=0.25, p=0.004)	
Li et al, 2006[27]		Negative association between susceptibility and medication adherence (OR=3.77, 95% CI 1.19–12.01). Negative association between strong beliefs in the superiority of Chinese herbs and medication adherence (OR=2.2, 95% CI=1.02–4.81). Negative association between lower perceived benefit of Western medications for hypertension and medication adherence (OR=2.78, 95% CI=1.13–6.84). Negative association between longer length of stay in the United States and medication adherence (OR=2.48, 95% CI=1.12–5.50)	
Chiu et al, 2014[37]		Negative association between using traditional herbal medicines and medication adherence	Significant positive association between patients' understanding of the disease and medication adherence (p<0.01)
Albargawi et al, 2017[33]	Significant positive association between religious beliefs and medication adherence (p=0.04)		
Kretchy et al, 2013[7]	Spiritual beliefs negatively associated with medication adherence (p=0.02), whereas no association with religious beliefs (p=0.47)		
Nazir et al, 2016[36]			Positive association between patients' knowledge about DMT2 and medication adherence (r=0.04, p<0.05)
Ku & Kegels, 2015[35]			Positive association between illness knowledge and self-management practices, and medication adherence (p=0.007)
Small et al, 2012[24]			No association between diabetic knowledge and medication adherence

(*Continued*)

Table 3 (Continued).

Study	Religious beliefs	Cultural beliefs	Illness knowledge/personal perceptions
Abel et al, 2017[13]	There was a non-significant correlation between medication adherence and the four spiritual/religious variables: Attending church/religious services (p= 0.08) Praying (p= 0.43) Reading Bible/religious material (p= 0.19) Strength of spiritual beliefs (p=0.54)		
Jankowska et al, 2016[38]			Positive significant association between medication adherence and high level of illness knowledge (β=0.208; p=0.001).
Tailakh et al, 2016[28]		Acculturated participants were more adherent to medications and physical activity and had better blood pressure control.	

Abbreviation: DMT2, type 2 diabetes mellitus.

articles. We selected a final set of 25 articles that met the inclusion criteria. For article screening and the exclusion process, please see the PRISMA Flow Chart (Figure 1).

Characteristics of selected studies

All studies selected were cross-sectional and included surveys. Most of the studies were focused on patients diagnosed with DMT2 (44%, 11/25) or HTN (44%, 11/25). An additional two studies were conducted in patients with asthma, and only one study focused on COPD. Illness perception was the most frequently investigated belief reported in 42% (8/19) of the studies.

Eleven of the studies were conducted in the United States of America,[4,5,11,13,16,18,24–28] three in Taiwan,[3,29,30] four in Middle-Eastern countries (Lebanon, Libya, Saudi Arabia and Iran),[31–34] one in the Philippines,[35] one in Pakistan,[36] one in Ghana,[7] one in unspecified Asian countries,[37] one in Poland,[38] one in Thailand[39] and one in Australia.[40] A number of personal- and cultural-based factors were identified as being associated with adherence to medication regimes. These included; perception of illness, health beliefs and literacy, cultural beliefs, spiritual and religious beliefs, as well as illness knowledge.

Risk of bias across studies

All the studies provided clear, detailed and specific inclusion criteria to recruit study participants and provided a specific diagnosis for the participants. Both the exposure and the outcome were measured in valid and reliable ways; reliable and valid questionnaires (Cronbach's alpha =0.6–0.79) have been used in all the included studies. Confounding factors were identified and addressed in 24 studies. Although convenience samples were used in all the studies, representativeness of the sample was described as one of the limitations in most of the included articles, and most also reported that generalization of results might be limited.

Findings of individual studies
Perception of illness

Nine studies investigated the role of beliefs related to emotional and cognitive domains of chronic illnesses on medication adherence.[3–5,11,29–32,34] These beliefs were found to be associated with medication adherence in seven studies.[3–5,11,29–31] One study reported that medication adherence was affected only by the patients' evaluation of the process of taking medication, its short-term

Table 4 Association of health literacy and self-efficacy on medication adherence

Study	Health literacy	Self-efficacy
Ku & Kegels, 2015[35]		Positive association identified between perceived self-efficacy and all four self-management practices (diet $p<0.001$, medication adherence $p=0.004$, health care provider consultation $p<0.001$ and exercise $p<0.001$)
Shiyanbola et al, 2017[26]	No direct relationship with medication adherence; however, mediated other factors related to medication adherence, such as illness perception ($\beta=0.20$, $p=0.002$) and medication beliefs ($\beta=-0.156$, $p=0.014$)	Significant positive association between self-efficacy and adherence ($\beta=0.486$, $p<0.001$)
Soones et al, 2017[18]	Directly associated positively with medication adherence ($\beta=0.089$, $p<0.001$) and indirectly mediated by medication concerns ($\beta=0.03$, $p=0.002$).	
Huang et al, 2018[16]	No significant association with diabetes medication adherence ($\beta=-0.04$, $p=0.59$).	Significant positive association between self-efficacy and adherence ($\beta=0.53$, $p<0.001$)
Wannasirikul et al, 2016[39]	Directly associated positively with medication adherence ($\beta=0.08$, $p<0.05$), and indirectly mediated by literacy ($\beta=0.17$, $p<0.05$) and cognitive ability ($\beta=0.02$, $p<0.05$)	

effects and the longer term outcomes associated with taking it (Table 2).[32]

Five studies described beliefs that related medication adherence to control beliefs (personal and/or treatment control).[3,4,29–31] These beliefs were significantly and positively associated with medication adherence in four studies,[4,29–31] and negatively associated in only one study, which found that patients who felt unable to control their blood pressure were more adherent to medications (Table 2).[3]

Five studies explored beliefs about illness identity.[4,5,29–31] A negative association with medication adherence was found in three studies, which suggested that patients who experience more symptoms may perceive less ability to control their illness (Table 2).[4,30,31] Two studies found no significant association between illness identity and medication adherence (Table 2).[5,29]

Five studies examined the association of beliefs related to illness consequences with medication adherence.[3,4,11,29,34] A negative association was found in four studies[4,11,29,34] whereas one study found a positive correlation.[3] Three studies mentioned beliefs about the timeline of illness.[3,29,34] Two studies demonstrated negative association with medication adherence,[3,29] whereas one study found that patients who believe that diabetes is a chronic illness have higher level of adherence[34] (Table 2).

Two studies found an association of perceived causes of illnesses and adherence.[29,30] More casual attributions to

psychological factors and less attribution to causality of risk factors were negatively associated with medication adherence (Table 2).[29,30] Cause was associated positively with illness identity; individuals who reported more symptoms tend to seek more causal attributions, perceived the illness to be more negative and less controllable, and therefore were less likely to adhere to medication.[30]

Four studies explored the effect of emotional representations of illness on medication adherence,[3,5,11,29] and three of them found that negative emotional representations correlated negatively with medication adherence[3,5,11] (Table 2), whereas no significant association was found in the fourth study (Table 2).[29]

One study provided insights into how illness perceptions and burden relate to medication adherence. Findings suggested positive significant association between medication adherence and the threatening view of illness, whereas there was a negative association with a greater perceived burden of illness (Table 2).[25]

Cultural beliefs

Four studies investigated the influence of cultural beliefs on adherence and self-management (Table 3).[27,28,37,40]

Participants in one study who had stronger beliefs in the effectiveness of Traditional Chinese Medication and traditional Chinese health beliefs were found to be less likely to be acculturated and less adherence to self-management and medication.[40] Another study focusing on Arab Americans

Table 5 Measurement tools used for beliefs and medication adherence

Bibliography	Chronic condition	Demographics characteristics					Measurement of beliefs	Measurement of medication adherence
		Age (Mean)	Gender Male N (%)	Female N (%)	Participants origin/ cultural groups	Illness duration (mean)		
Krauskopf et al., 2015,[5] USA	COPD	62–74	62 (33)	126 (67)	English- & Spanish-speaking patients in New York	N/A	Brief Illness Perceptions Questionnaire[46] and Beliefs about Medications Questionnaire[47]	Medication Adherence Rating Scale (MARS)[48]
Hsiao et al, 2012,[3] Taiwan	HTN	53.8	78 (66.7)	39 (33.3)	Taiwanese in Taiwan	N/A	Illness Perception Questionnaire – revised[29]	Hypertensive Patient's Drug Adherence Questionnaire[49]
Saarti et al,2016,[32] Lebanon	HTN	>18	59 (50.4)	58 (49.6)	Lebanese patients in Lebanon	7.8	Brief Illness Perception Questionnaire[46] and Treatment Satisfaction Questionnaire for medication[50]	8-item Morisky Medication Adherence Scale[51]
Chen et al, 2011,[30] Taiwan	HTN	65.2	214 (60.3)	141 (39.7)	Taiwanese patients in Taiwan (ethnic Chinese)	10.45	Illness Perception Questionnaire – Revised[29]	Medication Adherence Inventory and the Inventory of Adherence to Self-Management[21]
Ashur et al, 2015,[31] Tripoli	DMT2	54.4	215 (41.1)	318 (58.9)	Libyan patients in Tripoli	9.4	Illness Perception Questionnaire – Revised[29]	8- Items Morisky Medication Adherence Scale[51]
Soones et al., 2017,[18] USA	Asthma	67	70 (16.2)	363 (83.3)	Elderly patients from New York in USA	31.4	Brief Illness Perceptions Questionnaire,[46] Beliefs about Medications Questionnaire[4] and Short Test of Functional Health Literacy in Adults[52]	Medication Adherence Rating Scale (MARS)[48]
Chen et al, 2009,[29] Taiwan	HTN	>18	166 (59.9)	111 (40.1%)	Taiwanese patients in Taiwan	10.46	Illness perception questionnaire – Revised[29]	Medication Adherence Inventory and the Inventory of Adherence to Self-Management[21]
Jacobs et al 2014,[11] USA	DMT2	54.6	20 (50)	20 (50)	Lumbi Indian tribe in USA	9.9	Illness Perceptions Questionnaire – Revised[29]	Morisky Medication Adherence Scale (old version)[51]
Rajpura & Nayak, 2014,[25] USA	HTN	>55	75 (64.1)	42 (35.9)	American elderly	>7 years	Brief Illness Perception Questionnaire[46] Beliefs of Medication Questionnaire[47]	Morisky Medication Adherence Scale (old version)[51]
Mann et al, 2009,[4] USA	DMT2	57	49 (32)	102 (68)	English- and Spanish-speaking patients in New York/USA	13.0	Brief-Illness Perception Questionnaire[46] Beliefs about Medicines Questionnaire[47]	Morisky Medication Adherence Scale (old version)[51]

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Table 5 (Continued).

Bibliography	Chronic condition	Demographics characteristics				Participants origin/ cultural groups	Illness duration (mean)	Measurement of beliefs	Measurement of medication adherence
		Age (Mean)	Gender						
			Male N (%)	Female N (%)					
Shiyanbola et al, 2017,[26] USA	DMT2	58.7	74 (42.5)	100 (57.5)		American patients in USA	9.6	Beliefs in Medicines Questionnaire,[47] Brief-Illness Perceptions Questionnaire[46] and Newest Vital Sign[53]	8- Items Morisky Medication Adherence Scale[51]
Ku & Kegels, 2015,[35] Philippines	DMT2	62.8	227 (41.3)	322 (58.7)		Filipino patient in Philippines	7.0	Brief Diabetes Knowledge Test, the Diabetes Knowledge Questionnaire, and Diabetes Care Profile survey questionnaire[54–56]	Medical records review
Nazir et al, 2016,[36] Pakistan	DMT2	50.8	222 (56.6)	170 (43.4)		Pakistani patients in Pakistan	5.58	Michigan Diabetes Knowledge Test[57]	Urdu version of Morisky Medication Adherence Scale[58]
Chiu 2014,[37] Asia	Asthma	53.0	402 (38.2)	651 (61.8)		Asian patients in China, Korea, Malaysia, Taiwan, Thailand and Vietnam	11.4	Asthma Control Test, and the Standardized Asthma (AQLQ-S)[59] Quality of Life Questionnaire[60]	8-Items Morisky Medication Adherence Scale[51]
Small et al, 2012,[24] USA	DMT2	>18	261 (69.1)	116 (30.9)		English-speaking patients in southeastern United State	N/A	Diabetes Knowledge Questionnaire[55]	Morisky Adherence Scale (old version)[61]
Albargawi et al, 2017,[33] Kingdom of Saudi Arabia	DMT2	49	18 (60)	12 (40)		Saudi patients in KSA	N/A	Arabic version of form C of the multidimensional health locus of control scale[62]	The Arabic version of the revised and expanded summary of diabetes self-care activities scale[62]
Eh et al, 2016,[40] Australia	DMT2	62.9	62 (44.6)	77 (55.4)		Chinese in Australia	12.5	Level of acculturation.[63] Beliefs in TCM and Western medicine; Chinese health beliefs[64]	Chinese version of Morisky Medication Adherence Scale[65]
Kretchy et al, 2013,[7] Ghana	HTN	57.10	74 (37.25)	125 (62.75)		Ghanaian patients in Ghana	≤10	Spiritual Perspective Scale[66] and Duke Religion Index[67]	8-Items Morisky Medication Adherence Scale[51]
Li et al, 2006,[43] USA	HTN	70.6	100 (50)	100 (50)		White American VS African American in USA	N/A	Four-item instrument that assessed each dimension of Hall's framework of patient trust in the physician[68]	Self-reported (Patients were asked to respond to a single question)

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Table 5 (Continued).

Bibliography	Chronic condition	Demographics characteristics			Participants origin/ cultural groups	Illness duration (mean)	Measurement of beliefs	Measurement of medication adherence
		Age (Mean)	Gender					
			Male N (%)	Female N (%)				
Abel et al.0.2017,[13] USA	HTN	19–60	–	80 (100)	Black women in USA	N/A	Nine spiritual/religious questions developed by the investigator[69]	14-item Hill-Bone Compliance to High Blood Pressure Therapy scale[70]
Aflakseir, 2012,[34] Iran	DMT2	40.7	22 (22)	78 (78)	Iranian patients in Iran	9.5	Illness perception questionnaire – Revised[29]	Medication Adherence Rating Scale[48]
Huang et al, 2018,[16] USA	DMT2	58.7	74 (42.5)	100 (57.5)	English-speaking patients in a Midwestern state in USA	9.6	Newest Vital Sign[53] and Self-Efficacy for Appropriate Medication Use Scale[71]	8-Items Morisky Medication Adherence Scale[51]
Jankowska et al, 2016,[38] Poland	HTN	32–90	109 (46.8)	124 (53.2)	Poland patients in Poland	11.75	Hypertension Knowledge Level Scale[72]	8-Items Morisky Medication Adherence Scale[51]
Tailakh et al, 2016,[28] USA	HTN	29–74	34 (73.9)	12 (26.1)	Arabs in USA	N/A	The Asian American Multidimensional Acculturation Scale[73]	8-Items Morisky Medication Adherence Scale[51]
Wannasirikul et al, 2016,[39] Thailand	HTN	60–70	145 (24.2)	455 (75.8)	Elderly patients in Sa Kaeo in Thailand	7.2	Functional, communicative and critical health literacy scale[74]	Adherence to Refills and Medications Scale[71]

Abbreviations: DMT2, type 2 diabetes mellitus; HTN, hypertension; N/A, not available.
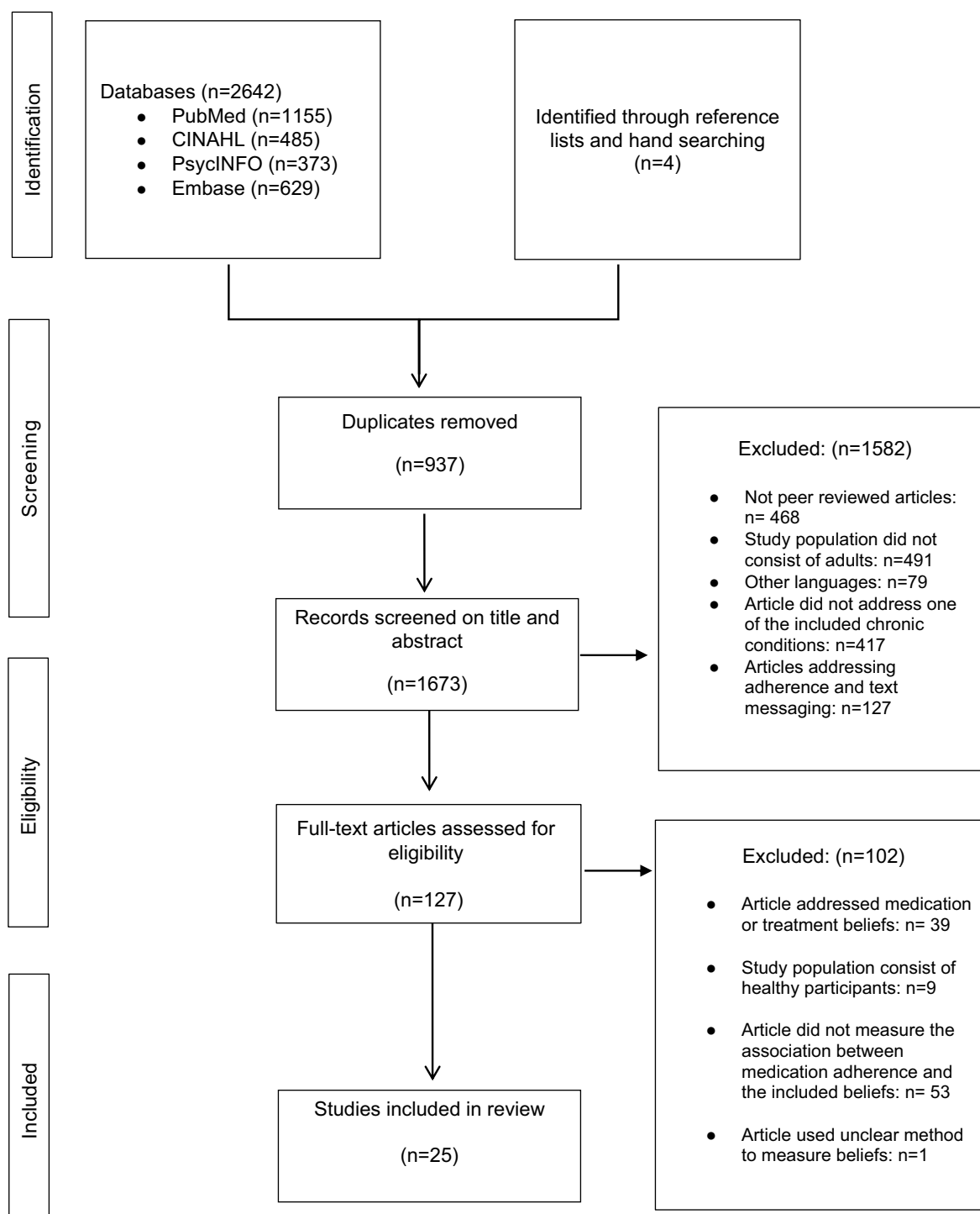
Figure 1 PRISMA flow chart of the literature search and study selection.

in the USA found that those with high level of acculturation were most likely to be adherent to antihypertensive medications.[28] Four cultural factors, lower perceived susceptibility in general, higher perceived benefits of Chinese herbs, lower perceived benefits of Western medications and a longer duration of residence in the Western country investigated in another study, were associated with medication non-adherence in the case of hypertension. Chinese immigrants who believed that hypertension had an influence on their personal lives (perceived susceptibility in general) were more compliant with anti-hypertensive medications (Table 3).[27] Another study investigated Asian patients'

asthmatic perceptions, behaviors and the association with medication adherence in China, Korea, Malaysia, Taiwan, Thailand and Vietnam. Patients with low adherence were more likely to believe that using traditional herbal medicines is safer than inhalers.[37]

Religious/spiritual beliefs

Four studies examined religious beliefs,[7,13,31,33] and two mentioned the contribution of spiritual beliefs to medication adherence and self-management (Table 3).[7,13]

Two studies conducted in the Middle-East examined the role of the Islamic religion.[31,33] A study carried out in Saudi Arabia found that people who reported that they can follow their medication regimen, and perceived that God controls their health and illness, were found to have good adherence to taking their medication[33] (Table 3). The most common perceived cause of DMT2 in a Libyan study was found to be Allah's will (86.6%).[31] In a study from Ghana, hypertensive patients, 90% of whom were Christians, exhibited high levels of both spirituality and religiosity. However, spirituality, not religiosity, was associated significantly with medication non-adherence (Table 3). The authors suggested that some patients would risk not taking their medications while anticipating divine healing outcomes.[7] Another study carried out in the USA, focusing on Christian black women, found that attending church, praying and reading Bible/religious material, and having strong spiritual beliefs were not significantly associated with medication adherence[13] (Table 3).

Knowledge and personal perceptions about illness

Five studies examined the concept of illness knowledge and personal perceptions of chronic illnesses (Table 3).[24,35–38] In a study that illuminated patients' perceptions of asthma management as well as the current status of asthma control and adherence in the participating Asian countries, adherence was significantly associated with patients' self-reported understanding of asthma, inhaler techniques and with patients' acceptance of inhaler medicines in terms of benefits, safety, convenience and cost. Better adherence was associated with better understanding of the disease.[37] In line with these findings, two of the studies that focused on DMT2,[35,36] and one focused on HTN[38] reported that having the essential knowledge about the condition and the care for the condition was associated with a higher level of confidence of people with illness in their ability to perform self-care and medication adherence (Table 3).

In contrast to previous findings related to knowledge and adherence, a study which examined the relationship between emotional coping and DMT2 knowledge, medication adherence and self-care behaviors in adults with DMT2 identified no significant associations with medication adherence and DMT2 knowledge. However, being active in communicating the emotional experience was positively related to self-care behaviors, and negatively with medication adherence.[24]

Self-efficacy

Perceived self-efficacy was the lone significant factor identified to be common among four self-care management behaviors (diet, medication adherence, health care provider consultation and exercise) in a study that measured factors potentially associated with self-management practices of people with DMT2.[35] The significant association between self-efficacy and adherence was also mentioned in two other studies that examined health literacy in patients with DMT2. Self-efficacy was found to be correlated positively with medication adherence (Table 4).[16,26]

Health literacy

Four studies illustrated the impact of health literacy on medication adherence (Table 4).[16,18,26,39] In two studies, health literacy was found to have no direct association with medication adherence,[16,26] but it had a significant moderator effect on the relationship between adherence and medication concerns and illness perceptions in one study.[26] However, in two studies, health literacy was found to have a direct effect as well as indirect effect on adherence, mediated by medication concerns in one study,[18] and cognitive ability or literacy in the second one[39] (Table 4). Across all health literacy levels, there was a significant negative association between threatening illness perceptions and medication adherence. For individuals with low and moderate health literacy, increased levels of threatening illness perceptions resulted in a sharp decline in medication adherence.[18,26]

Discussion

The findings of the majority of research papers included in this systematic review have demonstrated a significant relationship between illness perceptions and other beliefs and medication adherence, in patients with the selected chronic conditions. However, the direction of associations was not consistent amongst studies. Figure 2 presents a conceptual framework which has been adapted from two studies,[26,30] and modified by the authors, to identify the associations of negative illness representation, the cause of illness, religiosity and cultural beliefs, and beliefs with regard to the control, self-efficacy and knowledge of medication adherence as

identified in this review. We have also included the mediating effects of health literacy. Although this framework is not presenting the relationships of mediating effects between these beliefs, in fact these may exist.

Control of illness was the most significant predictor of a favorable outcome;[30] patients who believed in their own ability to control illness, and had strong confidence in treatment reported better medication adherence in many studies.[4,25,29–31] Although one study reported a negative association between patients' beliefs about their control of illnesses and medication adherence,[3] this discrepancy may be attributed to the fact that patients of this study had high numbers of symptoms and negative emotional responses towards their illness. Different characteristics of the samples, such as household incomes, educational levels or locus of control may have contributed as well; however, these were not reported.

Perception of a lower ability to control a health threat may imply an ineffectiveness of one's behavioral actions, or cognitive and emotional changes in illness representations because of somatic experiences. Higher control is associated with lower anxiety, lower avoidance/denial of coping strategies and positive reappraisal.[30]

Illness perceptions are influenced by somatic and symptomatic information that patients receive from health care professionals and the satisfaction with the information received. Once patients report symptoms after a diagnosis, inconsistency between symptom attributions of patients and health professionals may arise. Eventually, patients may adopt the perspective of professionals, but they will continue to try to understand their symptom experience based on personal perceptions, not the illness entity, and create more barriers to adherence to therapeutic regimens.[29] Therefore, it is important prior to and during treatment to assess patients' views about their illness, symptoms, treatments and also their satisfaction with information received.[41]

Although two studies found no association between medication adherence and illness symptoms,[5,29] a number of points may explain this inconsistency; the high educational level of the participants, and the fairly stable disease progression among patients who have long history of illness (diagnosed for more than 10 years). Evidence from the literature demonstrates that newly diagnosed patients with illness were more likely to drop out of treatment if they perceived the disease to be acute or experienced symptoms upon their first clinical visit.[30] Additionally, adherence to medication is related to the particular condition. An asymptomatic nature of a disease, as well as clinical improvement, reduces patient motivation to take medications as prescribed.[8]
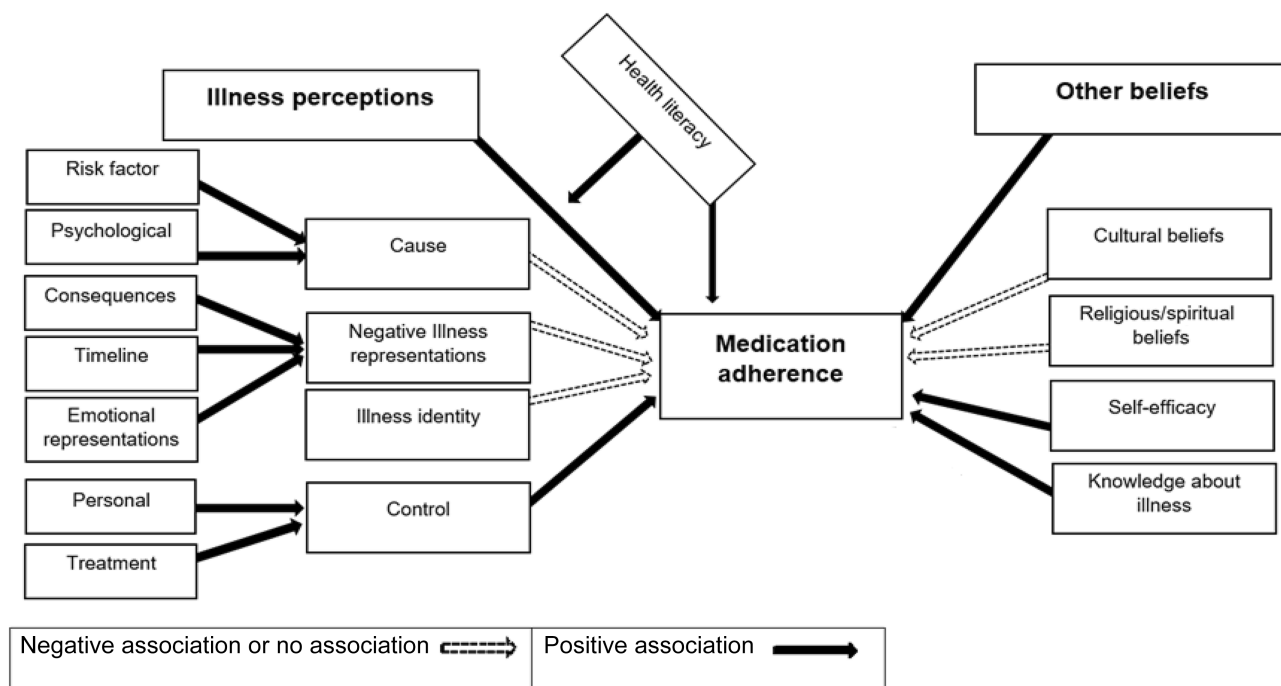

Figure 2 Conceptual model to illustrate the effect of illness perceptions and other beliefs on medication adherences.
Note: Data from these studies.[26,30]

Other beliefs such as spiritual, religious and cultural beliefs were demonstrated in this systematic review to have a significant effect on medication adherence. Spirituality and religiosity are increasingly identified as impacting health and treatment.[7] Cultural influences may have direct impact on patient's adherence via perceptions of health and disease management. The health beliefs and cultural values of the culturally and linguistically diverse populations may differ from Western medical beliefs.[40]

Individuals vary within a group in their acculturation strategies (both their attitudes and actual behaviors) leading to variable behavioral repertoires. Thus, from this perspective, there is no expectation of one single acculturation pattern, but of highly variable strategies and outcomes that lead to variably successful long-term adaptations.[42]

Factors that contributed to medication adherence can be classified as modifiable and non-modifiable factors. Age, gender and ethnicity are some of the non-modifiable factors that can affect medication adherence. Personal and cultural beliefs discussed above are difficult to modify in patients who have chronic illnesses; however, these patients are amendable to counseling by health care providers; hence, patients' perceptions of their illness should be a target for intervention to enhance adherence to medications.

Patient trust in physicians is another modifiable factor, and an important facilitator of self-efficacy, and plays an important role in a patient's ability to maintain medication adherence.[43] Physician communication training focused on positive and empathic communication can improve patient satisfaction, adherence and trust.[44]

Several clinical implications can be drawn from this systematic review. Understanding patients' pre-existing perceptions of illness before giving new information is required. In this way, health care professionals and patients have the opportunity to recognize gaps, confusions and misconceptions in the patient's perceptions.[41] In addition, patients need to be educated about their illness, symptoms and medications. Health care providers play a major role in that regard, and a collaborative care approach can facilitate the education of patients about the benefits of medications and the importance of their continuous use.[36] Health care providers should take into account the impact of religious and cultural background on health beliefs to provide sensitive care to diverse ethnic populations to achieve better medication adherence.

We also suggest that patients with negative illness perceptions and low health literacy may benefit from practical interventions, such as psycho-educational and cognitive-behavioral interventions. Interventions focusing on illness perceptions should first consider the individuals' numeracy skills by assessing in clinical settings, how well patients understand the implications of their blood sugar measurements, blood pressure results and practicalities of medication dosing, etc. Understanding the patients' numeracy skills will then allow for a more tailored approach to using simple and plain language to communicate their treatment during counseling.[26]

To improve comprehension and subsequent adherence, techniques should be tailored to the patient and context and may include using familiar language and pictures, contextualizing facts and behaviors, or providing audio or print materials.[18]

Poorer medication adherence in less acculturated patients might relate to their traditional health beliefs as well as ineffective communication with health care providers due to language barriers.[40] We suggest that migrant patients need to learn the language of countries in which they resettle. In addition, migrants may often be best able to integrate themselves into the receiving society when they receive help, encouragement and tangible support resources from members of the local community.[45]

Non-adherence should not be perceived as only the patients' responsibility. On the contrary, social factors (such as social support, economic factors, etc.), health care-related factors (eg, barriers to health care and quality of provider–patient communication), condition characteristics, as well as therapy-related factors (such as patient friendliness of the therapy) play an important role in addressing adherence.[8]

Limitations

There were some limitations in the current review; some of the selected studies in this review used self-reports method to measure adherence, different tools were used to measure beliefs and also most of studies participants were recruited from a small geographic region, so findings of these studies may not be generalizable. A particular strength of the present review was our inclusiveness. We extended the previous review by examining illness perception according to the common-sense model, included the impact of knowledge, religiosity and spirituality, in a number of the most prevalent chronic conditions. In addition, we excluded the studies with insufficient methodological details.

Conclusion

This review showed a significant positive or negative association between personal and cultural beliefs and medication adherence. Illness perceptions and other beliefs may influence the actions of the individual and negatively or positively affect his or her health and taking medication.

This review draws attention to enhancing medication adherence amongst chronically ill patients, by changing their beliefs, illness perceptions and managing their negative emotional responses, and also gives an insight to the need for additional studies related to the impact of personal beliefs, acculturation and religion, on medication adherence to clarify the unexpected direction of association on medication adherence. In addition, this review highlights the gap in literature regarding studies which investigated the impact of different beliefs on medication adherence for patients diagnosed with COPD and/or asthma.

Health care providers need to understand the impact of illness perceptions, cultural and other beliefs on patients' adherence levels so that they can implement appropriate strategies to enhance adherence.

Disclosure

The authors report no conflicts of interest in this work.

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