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RESEARCH ARTICLE

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Insights into medication adherence among Jordanian patients with dyslipidemia: evaluating health literacy, well-being, and doctor-patient communication

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ABSTRACT

Background: This study aimed to assess medication adherence among Jordanian patients with dyslipidemia and evaluate the impact of health literacy, well-being, and doctor-patient communication on adherence in this population. Dyslipidemia is a prevalent condition that significantly increases the risk of cardiovascular diseases, and understanding the factors influencing medication adherence is crucial for improving patient outcomes.

Methods: An observational cross-sectional study was conducted from March to July 2023. A convenience sample of adult Jordanians diagnosed with dyslipidemia was surveyed in a tertiary hospital using validated scales: the

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Lebanese Medication Adherence Scale-14 (LMAS-14), the Doctor-Patient Communication Scale (DPC), the WHO well-being index, and the health literacy scale. Bivariate analysis and linear regression models were employed to analyze associations.

Results: Among 410 participants (mean age 58.62 ± 12.11 years), the mean scores were LMAS-14 (35.10), DPC (55.77), WHO well-being (47.53), and health literacy (38.96). Higher medication adherence was associated with older age ($B = 0.093$, $p = 0.049$), university education ($B = 2.872$, $p = 0.017$), prior surgery ($B = 2.317$, $p = 0.021$), medium income level ($B = 3.605$, $p = 0.006$), and better doctor-patient communication ($B = 0.166$, $p = 0.003$). Conversely, cigarette smoking ($B = -3.854$, $p = 0.001$) and health insurance ($B = -2.146$, $p = 0.039$) were linked to lower adherence.

Conclusion: The findings underscore the substantial interplay of socio-demographic and clinical factors affecting medication adherence. Enhanced public health interventions focusing on improving health literacy, communication quality, and addressing socio-economic conditions are vital for better adherence and patient outcomes in Jordan.

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KEYWORDS Dyslipidemia; medication adherence; health literacy; doctor patient communication; Jordan

Background

Dyslipidemia, one of the most common chronic diseases, increases the risk of atherosclerotic and cardiovascular diseases (ASCVD) due to abnormal accumulation of lipids (Berberich & Hegele, 2022). Dyslipidemia is divided into primary dyslipidemia triggered by genes, and secondary dyslipidemia developed due to environmental factors such as obesity and diabetes (Yuan et al., 2021). Despite the high prevalence of dyslipidemia worldwide, medication adherence is suboptimal, resulting in a massive economic impact of up to $19,000 per year per patient (Cutler et al., 2018; Naderi et al., 2012).

Medication adherence is defined by the World Health Organisation (WHO) as the degree to which a patient's behaviour corresponds with the agreed recommendations provided by their healthcare provider (HCP) (Al Qasem et al., 2011; Alvi et al., 2019). This concept signifies the collaborative effort between the patient and the HCP to enhance the quality of life and general health of the patient (Gellad et al., 2009; Jimmy & Jose, 2011). Despite the critical and vital role of long-term prescribing medications for the treatment of dyslipidemia, adherence is a significant challenge (Jimmy & Jose, 2011). Non-adherence to medications manifests in several forms, the most prominent of being non-fulfillment, non-persistence, and non-conformity (Jimmy & Jose, 2011). Non-fulfillment includes the failure to start a prescribed treatment; non-persistence involves stopping treatment without medical advice; and non-conformity refers to taking the medication incorrectly, such as in terms

of dosing (Jimmy & Jose, 2011; Zill et al., 2014). The reasons behind this issue are multifaceted. Among the various factors influencing adherence, health literacy and the quality of the patient-doctor relationship are key determinants (Al-Noumani et al., 2023). Adherence to medication among patients with dyslipidemia is strongly associated with a positive patient experience in addition to a good doctor-patient relationship according to a study conducted by Ho-Hyoun Yim et al. (Yim et al., 2021).

Health literacy is the level at which a patient can obtain, process, and understand health information needed to make a decision. Health literacy is vital to increase the utilisation of health services, decrease mortality, and reduce health costs. Low health literacy can lead to unhealthy lifestyle practice and low adherence to medications, which can subsequently increase the risk of dyslipidemia and cardiovascular diseases (Gurgel do Amaral et al., 2021). A systematic review and meta-analysis on health literacy in Iranian women found that enhancing health literacy significantly improves health behaviours and outcomes, emphasising the importance of targeted health literacy interventions (Tavakoly Sany et al., 2021).

Doctor-patient communication (DPC) is a crucial component of a patient's treatment journey and an essential skill for HCPs to possess (Sustersic et al., 2018). In this process, a physician's role extends to fostering positive motivations and engaging the patient in their treatments, which is crucial for patients who value a partnership approach and empathetic understanding from medical personnel (Świątoniowska-Lonc et al., 2020). An effective DPC must encompass core functions such as the exchange of information, support for the patient's self-management, effective handling of uncertainties and emotions, facilitating decision-making, and fostering a robust doctor-patient relationship (Zill et al., 2014). All of these functions are integral to enhancing both individualisation and centeredness in patient care (Zill et al., 2014). Actively engaging patients in the decision-making process can lead to less conflict and greater patient satisfaction (Thomson et al., 2005). Additionally, effective communication between physicians and patients is linked with improved psychological, somatic, and social health outcomes (Świątoniowska-Lonc et al., 2020). A randomised controlled trial demonstrated that communication skills training for physicians significantly improved health literacy and medical outcomes among patients with hypertension, underscoring the impact of effective DPC on patient health (Tavakoly Sany et al., 2020). The dynamics of the doctor-patient relationship are influenced by a multitude of factors, making it challenging to assess and regulate (Sustersic et al., 2018).

This is a novel and original study conducted in Jordan assessing factors such as DPC, health literacy, and health well-being, which were not studied before to evaluate the impact on medication adherence. A previous study conducted in Lebanon assessed medication adherence among patients with non-communicable diseases but did not evaluate the effects of DPC and HLS on

adherence to medication, which is considered a cornerstone in achieving optimal therapeutic benefits (Malaeb et al., 2023). Therefore, this study aims to assess medication adherence among Jordanian patients with dyslipidemia, in addition to evaluating the impact of health literacy, health well-being, and doctor-patient communication on medication adherence in this population.

Methods

Study design and study period

An observational cross-sectional study was conducted in Jordan, between March to July 2023, using an online survey in a tertiary hospital.

Eligibility criteria

The inclusion criteria for this study encompassed adults aged 18 years and above. Participants had to have a physician diagnosis of dyslipidemia and treated with at least one prescribed medication for dyslipidemia management. Conversely, the exclusion criteria included patients who were unwilling to provide informed consent and those with cognitive impairment or health conditions that hindered their independent participation in the survey without assistance.

Data collection procedure

The survey was developed using Google Forms, and data was collected by two researchers at a tertiary Hospital using convenient sampling method. A web link to the survey was disseminated by the research team on different communication and social media platforms, including WhatsApp, Facebook, Twitter, and Instagram. The survey was in Arabic, the official language of Jordan. At the survey's onset, participants were provided with a participant Information Statement (PIS) detailing the study's primary goal and the anticipated time required to complete the survey (approximately 10 min). The survey also emphasised that participation was entirely voluntary. A snowball sampling technique was employed, encouraging respondents to participate and further share the survey with others. To reduce potential response biases, participants independently completed the survey without any assistance from the researchers.

Sample size calculation

Using the Epi info software, with a 95% confidence interval, a standard deviation of 0.5, a margin of error of 5%, and a 33.3% prevalence of dyslipidemia

among the Jordanian population, the minimum sample size was calculated to be approximately 342 participants (AlMuhaidib et al., 2022; Suresh & Chandrashekara, 2012). We targeted a larger sample to consider for missing and invalid data.

Ethical consideration

The Institutional Review Board (IRB) approval was obtained before conducting the study. The ethical guidelines of the Declaration of Helsinki were adhered to in this investigation. All participants volunteered to be part of this study, and their responses were kept confidential. Prior to accessing the online survey, all participants provided written informed consent through an online consent form to participate in the research.

Study tool

Socio-demographic and clinical characteristics

The online survey covered the following criteria: Age, gender (male, female), body mass index (BMI, measured in kg/m^2), marital status (single, divorced, widowed, married), employment status (unemployed, student, retired, employed), work field (medical, non-medical), educational level (university degree or lower), and monthly income (No income, Less than 250 JOD, 251–500 JOD, 501–750 JOD, 751–1000 JOD, More than 1000 JOD). Additionally, it included household crowding index (HCI) which is calculated by dividing the total number of people living in a household by the total number of rooms available for accommodation, smoking status (cigarettes or e-cigarettes: yes, no; if yes, average number of cigarettes/e-cigarettes smoked per day and total duration of smoking in years), water-pipe smoking (Hookah: yes, no; if yes, average number of water-pipes smoked per day and total duration of smoking in years), history of any surgeries (yes, no), history of cardiovascular disease (yes, no), history of other diseases (yes, no), health insurance coverage (yes, no), and chronic medication use (yes, no).

Adherence to medications

The Lebanese Medication Adherence Scale-14 (LMAS-14), a scale validated in Arabic, was utilised in this study to assess adherence to dyslipidemia management (Bou Serhal et al., 2018). LMAS-14 evaluates occupational factors, which include forgetfulness during busy periods (such as intensive work or travel), whether the patient is invited to lunch or dinner, prohibitions on certain food items during the treatment period due to potential food-medication interactions, and delays in purchasing a new pillbox when the old one is emptied. Additionally, LMAS-14 examines psychological factors, such as experiencing any secondary effects, feeling clinically better or worse, and

behavioural changes that occur concurrently with improvements in laboratory exams. Factors of annoyance are also incorporated, including frustration overtaking numerous pills, the tedium of chronic treatment, and the experience of side effects. Lastly, LMAS-14 assesses economic factors, including the extent of health insurance coverage for medication costs and the expense of the medications themselves (Mroueh et al., 2018). The scale comprised 14 items, each scored on a 4-point Likert scale ranging from zero (most of the time – indicating lower adherence) to three (Never – indicating higher adherence). The following are some of the questions from the LMAS, 'Do you forget to take your medication when you are busy (intensive work or travel?)', 'Do you forget to take your medication?', 'Do you get late when it comes to buying your medication packs when they become empty?', and 'Do you stop taking your medication without consulting your doctor if you do not feel better during treatment period?'. The total LMAS-14 score was calculated by summing all the responses, ranging from 0 to 42 (Hallit et al., 2021), with higher scores indicating higher medication adherence. The scale's reliability in the study was high, as evidenced by Cronbach's alpha of 0.98 (Supplemental Table S1).

Doctor-patient communication

The Doctor Patient Communication (DPC) scale was used to quantitatively assess the quality and effectiveness of communication between doctors and patients (Sustersic et al., 2018). It consists of 15 items, each offering four possible answers: 'No', 'Possibly no', 'Possibly yes', and 'Yes'. These responses are rated on a Likert-type scale ranging from 1 to 4 points, with higher scores indicating higher communication between the patient and the doctor. The following are some of the questions from the DPC scale, 'Did the doctor listen to you carefully during the consultation?', 'Did the doctor allow you to talk without interrupting you?', 'Do you feel that the doctor understood you?', 'Did the doctor involve you in the decision-making?', and 'Did the doctor reply to all your expectations and concerns?'. The scale's reliability in the study was high, as evidenced by Cronbach's alpha of 0.98.

Quality of life

The WHO-5 Well-being Index (WHO-5) was used to assess the level of subjective psychological well-being of patients over the past two weeks. It comprises 5 items, each scored on a 6-point Likert scale, where 0 = 'At no time', 1 = 'Some of the time', 2 = 'Less than half the time', 3 = 'More than half the time', 4 = 'Most of the time', 5 = 'All of the time'. The following are some of the questions from the WHO-5 index, 'I have felt cheerful in good spirits', 'I have felt calm and relaxed', and 'My daily life has been filled with things that interest me'. The raw score is calculated by totalling the scores of the five answers and ranges from 0 to 25, with 0 representing the worst possible and 25 representing the best possible quality of life. To

obtain a percentage score, which ranges from 0 to 100, the raw score is multiplied by 4. On this scale, a percentage score of 0 indicates the worst possible quality of life, whereas a score of 100% indicates the best possible quality of life (Omani-Samani et al., 2019). The scale's reliability in the study was high, as evidenced by Cronbach's alpha of 0.988.

Health literacy

The Health Literacy scale (HLS) is an assessment tool designed to evaluate three distinct levels of health literacy. Functional literacy, the basic level, emphasises essential reading and writing skills necessary for effective daily functioning. The intermediate level, communicative literacy, involves more advanced abilities that enable active participation in daily activities, as well as understanding and interpreting various forms of communication and adapting to new information in changing environments. The highest level, critical literacy, entails advanced skills in critically analyzing information and applying this insight to control life events and situations more effectively. The HLS is composed of 16 items, categorised into three categories: functional, communicative, and critical literacy, all scored on a 5-point Likert scale (from 1: never to 4: always). The following are some of the questions from the HLS, 'How often are appointment slips written in a way that is easy to read and understand?', 'How often are appointment slips written in a way that is easy to read and understand?', 'How often are patient educational materials written in a way that is easy to read and understand?', and 'How often do you have difficulty understand written information your health care provider (like a doctor, nurse, nurse practitioner) gives you?'. The total score for each participant is calculated by summing the scores of these items, ranging from 16 to 64 points, with higher scores indicating better health literacy (Aoki & Inoue, 2017). In this study, the HLS-14 demonstrated strong reliability, as indicated by Cronbach's alpha value of 0.914. The questionnaires were initially in English and were then converted into Arabic, the commonly used local language, by proficient speakers in both English and Arabic. They were also adapted to be more applicable to the general populace.

Statistical analysis

All responses from the survey were downloaded from the Google Forms website and transferred to Microsoft Excel for organisation. The data were summarised and presented as mean ± standard deviation for continuous variables and frequency (percentage) for categorical variables. First, Cronbach's alpha coefficient was calculated to assess the internal consistency reliability of each of the four health-related scales used in this study. All assessed scales had an excellent internal consistency reliability score with a Cronbach's alpha score greater than 0.9 (Supplemental Table S1). Bivariate associations

were examined of each of the continuous outcome variables (LMAS-14 scores, DPC scores, WHO Well-being scores, and health literacy scores) with sociodemographic characteristics and medical history using t-tests, ANOVAs, and univariate linear regression models, as appropriate. Multiple linear regression models were conducted to assess the relationship of these predictors with each of the continuous outcome variables. Data cleaning and analyses were performed using Statistical Package for Social Sciences version 25.0. $p < 0.05$ indicates statistical significance.

Results

Sample socio demographic characteristics

A total of 410 individuals participated in the study. Their mean ± SD age was 58.62 ± 12.11 years and more than half of the sample were women (52.9%). The majority of participants were married (77.6%), employed in the non-medical field (92.2%), and had higher educational attainment, specifically a university degree (60.2%; Table 1).

Mean scores of the assessed health-related scales including LMAS-14, the DPC, WHO-5 Well-being index, and health literacy are presented in Figure 1.

Bivariate associations

LMAS-14 scale

Older individuals and those with higher educational attainment had significantly higher mean LMAS-14 scores compared to their younger counterparts ($B = 0.088$, $p = 0.034$) and those with lower educational levels (37.06 ± 8.18 vs 32.14 ± 11.91, $p < 0.001$; Table 2). Additionally, individuals who work in the medical field ($p = 0.015$), those without health insurance ($p = 0.005$), as well as those with medium monthly income ($p < 0.001$), had higher mean LMAS-14 scores than those in the non-medical work fields, with insurance coverage, and with low or high monthly incomes respectively. Higher mean DPC scores and health literacy scales were also significantly associated with higher mean LMAS-14 scores. On the contrary, a higher household crowding index was significantly linked with lower mean LMAS-14 scores ($B = -2.462$, $p = 0.003$; Table 2).

Doctor-patient communication scale

Individuals who work in the medical field vs non-medical field (57.94 ± 4.81 vs 55.58 ± 8.84, $p = 0.018$) and those with higher education vs low (56.50 ± 7.77 vs 54.65 ± 9.68, $p = 0.042$; Table 3) had significantly higher mean DPC scores. Having a history of cardiovascular diseases vs. no history (54.54 ± 10.11 vs 56.63 ± 7.27, $p = 0.022$) and a higher household crowding index ($B = -2.333$,

Table 1. Sample socio-demographics, medical history, and health-related measures.

Characteristics ($N = 410$)	Frequency n (%) or mean ± SD
Socio-demographics	
Age*, in years	58.62 ± 12.11
Gender	
Male	193 (47.1)
Female	217 (52.9)
Body mass index (BMI)*, kg/m^2	30.20 ± 5.80
Marital status	
Single/divorced/widowed	92 (22.4)
Married	318 (77.6)
Employment status	
Unemployed/student/retired	264 (64.4)
Employed	146 (35.6)
Work field	
Medical field	32 (7.8)
Non-medical field	378 (92.2)
Educational level, university degree	
No	163 (39.8)
Yes	247 (60.2)
Monthly Income	
Low (no income/ < 250 JOD)	109 (26.6)
Medium (250–1,000 SAR)	270 (65.9)
High (>1,000 SAR)	31 (7.6)
Household crowding index (HCI)*	1.00 ± 0.61
Lifestyle factors	
Smoker (cigarettes/E-cigarettes), yes	129 (31.5)
Smoker waterpipe (Hookah), yes	47 (11.5)
Alcohol intake, yes	32 (7.8)
Medical history	
Any previous surgeries, yes	244 (59.5)
History of cardiovascular disease, yes	170 (41.5)
History of other chronic diseases, yes	365 (89)
Health insurance, yes	262 (63.9)

*Missing data for the following variables: age ($n = 1$), BMI ($n = 5$).
Missing observations were **not included** in the percentages. JOD = Jordanian Dinar.

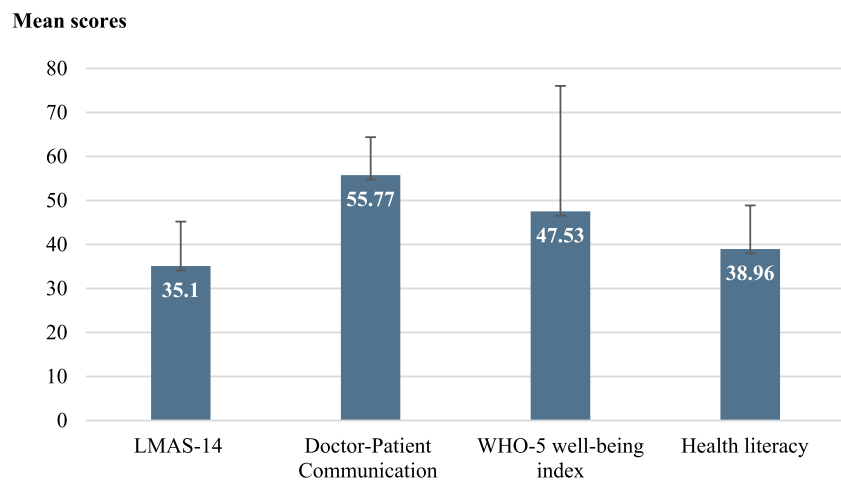

Figure 1. Mean scores of the assessed health-related scales in the sample.

Table 2. Associations of LMAS-14 scores with socio-demographics, medical history and other health-related measures.

	LMAS-14 score	
	Mean ± SD	*p*-value
Gender		0.994
Male	35.11 ± 10.46	
Female	35.10 ± 9.82	
Marital status		0.424
Single/divorced/widowed	35.85 ± 9.18	
Married	34.89 ± 10.37	
Employment status		0.167
Unemployed/student/retired	34.62 ± 10.71	
Employed	35.99 ± 8.89	
Work field		**0.015**
Medical field	38.47 ± 7.59	
Non-medical field	34.82 ± 10.25	
Educational level, university level		**<0.001**
No	32.14 ± 11.91	
Yes	37.06 ± 8.18	
Monthly Income		<0.001
Low	31.22 ± 11.90	
Medium	36.62 ± 8.83	
High	35.55 ± 10.46	
Smoking (cigarettes or E-cigarettes)		**0.059**
No	35.78 ± 9.57	
Yes	33.64 ± 11.09	
Smoking water-pipe (Hookah)		0.127
No	34.90 ± 10.42	
Yes	36.72 ± 7.21	
Alcohol intake		0.832
No	35.07 ± 10.12	
Yes	34.47 ± 10.23	
Any previous surgeries		0.195
No	34.30 ± 11.08	
Yes	35.66 ± 9.38	
History of cardiovascular disease		0.178
No	35.67 ± 10.20	
Yes	34.31 ± 9.96	
History of other diseases		0.078
No	37.31 ± 8.55	
Yes	34.83 ± 10.27	
Health insurance		**0.005**
No	36.82 ± 8.24	
Yes	34.14 ± 10.93	
	***B* (95% CI)**	***p*-value**
Age, in years	0.088 (0.007 0.169)	0.034
Body mass index (BMI), kg/m^2	−0.124 (−0.294 0.047)	0.156
Household crowding index (HCI)	−2.462 (−4.056 −0.868)	**0.003**
Doctor-Patient Communication Scale	0.213 (0.100 0.325)	**<0.001**
WHO-5 well-being index, over 100	0.018 (−0.016 0.053)	0.305
Health literacy scale	0.143 (0.045 0.241)	**0.005**

$p = 0.001$) were related to lower mean doctor-patient communication scores. Moreover, higher LMAS-14 ($B = 0.154$, $p < 0.001$) and health literacy ($B = 0.113$, $p = 0.009$) scores were significantly associated with higher doctor-patient communication mean scores (Table 3).

Table 3. Associations of Doctor-Patient Communication scores with socio-demographics, medical history, and health-related measures.

	Doctor patient communication scale	
	Mean ± SD	*p*-value
Gender		0.196
Male	55.17 ± 9.90	
Female	56.29 ± 7.27	
Marital status		0.579
Single/divorced/widowed	55.33 ± 10.19	
Married	55.89 ± 8.12	
Employment status		0.118
Unemployed/student/retired	55.31 ± 9.45	
Employed	56.58 ± 6.81	
Work field		**0.018**
Medical field	57.94 ± 4.81	
Non-medical field	55.58 ± 8.84	
Educational level, university level		**0.042**
No	54.65 ± 9.68	
Yes	56.50 ± 7.77	
Monthly Income		0.717
Low	55.27 ± 8.99	
Medium	55.88 ± 8.76	
High	56.55 ± 5.57	
Smoking (cigarettes or E-cigarettes)		0.949
No	55.75 ± 8.45	
Yes	55.81 ± 9.00	
Smoking water-pipe (Hookah)		0.388
No	55.63 ± 8.85	
Yes	56.79 ± 6.58	
Alcohol intake		0.601
No	55.83 ± 8.32	
Yes	55.00 ± 11.75	
Any previous surgeries		0.623
No	55.51 ± 8.23	
Yes	55.94 ± 8.88	
History of cardiovascular disease		
No	56.63 ± 7.27	**0.022**
Yes	54.54 ± 10.11	
History of other diseases		0.935
No	55.67 ± 6.68	
Yes	55.78 ± 8.83	
Health insurance		0.769
No	55.93 ± 8.03	
Yes	55.67 ± 8.95	
	***B* (95% CI)**	***p*-value**
Age, in years	−0.048 (−0.117 0.021)	0.175
Body mass index (BMI), kg/m^2	−0.032 (−0.178 0.114)	0.670
Household crowding index (HCI)	−2.333 (−3.688 −0.979)	**0.001**
LMAS-14 scale	0.154 (0.073 0.236)	**<0.001**
WHO-5 well-being index, over 100	0.014 (−0.015 0.044)	0.339
Health literacy scale	0.113 (0.029 0.196)	**0.009**

WHO wellbeing index

Participants with high versus low or medium income and those with health insurance versus no insurance had significantly higher mean WHO well-being scores ($p = 0.047$ and $p = 0.008$, respectively; Table 4). Older age

Table 4. Associations of WHO-wellbeing index scores with socio-demographics, medical history, and health-related measures.

	WHO wellbeing index scale	
	Mean ± SD	*p*-value
Gender		0.457
Male	48.64 ± 27.96	
Female	46.54 ± 29.01	
Marital status		0.152
Single/divorced/widowed	43.78 ± 30.60	
Married	48.62 ± 27.83	
Employment status		0.535
Unemployed/student/retired	48.18 ± 29.06	
Employed	46.36 ± 27.53	
Work field		0.791
Medical field	46.25 ± 30.48	
Non-medical field	47.64 ± 28.37	
Educational level, university level		0.575
No	46.53 ± 31.09	
Yes	48.19 ± 26.11	
Monthly Income		**0.047**
Low	44.40 ± 29.23	
Medium	47.51 ± 28.16	
High	58.71 ± 26.98	
Smoking (cigarettes or E-cigarettes)		0.665
No	47.12 ± 28.41	
Yes	48.43 ± 28.81	
Smoking water-pipe (Hookah)		0.356
No	47.06 ± 28.44	
Yes	51.15 ± 29.06	
Alcohol intake		0.080
No	46.81 ± 28.46	
Yes	56.00 ± 28.08	
Any previous surgeries		0.588
No	48.46 ± 29.04	
Yes	46.90 ± 28.18	
History of cardiovascular disease		0.912
No	47.40 ± 27.38	
Yes	47.72 ± 30.09	
History of other diseases		0.385
No	51.02 ± 29.30	
Yes	47.10 ± 28.42	
Health insurance		**0.008**
No	42.73 ± 26.46	
Yes	50.24 ± 29.30	
	***B* (95% CI)**	***p*-value**
Age, in years	0.265 (0.037 0.493)	**0.023**
Body mass index (BMI), kg/m^2	−0.370 (−0.849 0.108)	0.129
Household crowding index (HCI)	−1.691 (−6.232 2.849)	0.464
LMAS-14 scale	0.143 (−0.131 0.417)	0.305
Doctor patient communication scale	0.157 (−0.165 0.478)	0.339
Health literacy scale	0.269 (−0.010 0.547)	**0.059**

($B = 0.265$, $p = 0.023$) and higher health literacy ($B = 0.269$, $p = 0.059$) scores were significantly related to higher WHO well-being scores.

Health literacy scale

Individuals with higher education compared to lower levels (40.37 ± 9.39 vs 36.83 ± 10.34, $p < 0.001$), those with medium income compared to low or

Table 5. Associations of health literacy scores with socio-demographics, medical history, and health-related measures.

	Health Literacy scale	
	Mean ± SD	*p*-value
Gender		0.890
Male	38.89 ± 9.56	
Female	39.03 ± 10.25	
Marital status		0.138
Single/divorced/widowed	40.50 ± 11.71	
Married	38.52 ± 9.31	
Employment status		0.737
Unemployed/student/retired	38.84 ± 10.24	
Employed	39.18 ± 9.35	
Work field		0.132
Medical field	41.50 ± 10.98	
Non-medical field	38.75 ± 9.81	
Educational level, university level		**<0.001**
No	36.83 ± 10.34	
Yes	40.37 ± 9.39	
Monthly Income		**0.014**
Low	36.61 ± 10.03	
Medium	39.88 ± 9.83	
High	39.29 ± 9.21	
Smoking (cigarettes or E-cigarettes)		0.150
No	39.44 ± 10.22	
Yes	37.92 ± 9.17	
Smoking water-pipe (Hookah)		0.917
No	38.94 ± 9.96	
Yes	39.11 ± 9.68	
Alcohol intake		0.793
No	38.93 ± 9.77	
Yes	39.41 ± 11.73	
Any previous surgeries		0.362
No	39.51 ± 9.58	
Yes	38.59 ± 10.15	
History of cardiovascular disease		0.090
No	39.65 ± 10.48	
Yes	38.00 ± 9.01	
History of other diseases		0.878
No	39.18 ± 9.32	
Yes	38.94 ± 10.00	
Health insurance		**0.045**
No	40.27 ± 9.51	
Yes	38.23 ± 10.08	
	***B* (95% CI)**	***p*-value**
Age*, in years	0.058 (−0.022 0.137)	0.157
Body mass index (BMI)*, kg/m^2	0.051 (−0.115 0.218)	0.545
Household crowding index (HCI)*	−1.232 (−2.808 0.345)	0.125
LMAS-14 scale	0.137 (0.043 0.232)	**0.005**
WHO-5 well-being index, over 100	0.033 (−0.001 0.066)	**0.059**
Doctor patient communication scale	0.149 (0.038 0.260)	**0.009**

high income (39.88 ± 9.83 vs 36.61 ± 10.03 vs 39.29 ± 9.21, $p = 0.014$; Table 5), and those without health insurance compared to those with insurance coverage (40.27 ± 9.51 vs 38.23 ± 10.08, $p = 0.045$) had significantly higher health

literacy scores. Higher LMAS-14, WHO well-being, and doctor-patient communication scores were significantly related to higher health literacy scores ($p < 0.05$ for all; Table 5).

Linear regression

Table 6 represents the models of linear regression. In the first model, advanced age ($B = 0.093$, $p = 0.049$), university education ($B = 2.872$, $p = 0.017$), a history of prior surgery ($B = 2.317$, $p = 0.021$), and a medium income level ($B = 3.605$, $p = 0.006$) were significantly associated with higher adherence to lipid-lowering medications, as indicated by the LMAS-14 scale. A higher doctor-patient communication score was related to higher adherence ($B = 0.166$, $p = 0.003$), while cigarette smoking ($B = -3.854$, $p = 0.001$) and having health insurance ($B = -2.146$, $p = 0.039$) showed lower overall adherence.

Higher LMAS-14 adherence scores ($B = 0.119$, $p = 0.006$) were significantly related to a higher doctor-patient mean scores, whereas a higher household crowding index ($B = -2.204$, $p = 0.002$) was significantly related to lower doctor-patient communication scores (Model 2).

Model 3 showed that older age ($B = 0.278$, $p = 0.017$), being married ($B = 6.737$, $p = 0.047$), having health insurance ($B = 8.080$, $p = 0.006$), and having higher health literacy scores ($B = 0.330$, $p = 0.021$) were all significantly associated with higher WHO-wellbeing scores.

Model 4 shows that married individuals had significantly lower health literacy scores than single ones ($B = -2.271$, $p = 0.05$). Having a higher doctor-patient communication score was significantly related to higher health literacy ($B = 0.117$, $p = 0.042$).

Discussion

This study investigated medication adherence and the role of various sociodemographic and clinical factors on adherence levels in Jordanian patients with dyslipidemia. In particular, our study sheds light on the role of health literacy, health well-being, and doctor-patient communication in shaping medication adherence patterns, thereby contributing to a comprehensive understanding of adherence behaviours in this context. Results showed that older age, higher educational levels, prior surgery history, medium income levels, and better doctor-patient communication were associated with higher medication adherence. Conversely, cigarette smoking and access to health insurance were linked to lower medication adherence levels. These findings highlight the need for tailored interventions that take into account sociodemographic characteristics and the dynamics of physician-patient communication in an effort to improve medication adherence in patients with dyslipidemia.

Table 6. Linear regression.

	LMAS-14 score		
	Unstandardized *B*	*p*-value	95% CI
Model 1: Taking LMAS-14 mean scores as the dependent variable			
Age	0.093	**0.049**	0.000 0.186
Educational level (university degree vs no*)	2.872	**0.017**	0.508 5.236
Monthly income (Medium vs. low*)	3.605	**0.006**	1.027 6.182
Cigarette smoking (yes vs. no*)	−3.854	**0.001**	−6.084 −1.624
Health insurance (yes vs. no*)	−2.146	**0.039**	−4.184 −0.107
Doctor-Patient Communication score	0.166	**0.003**	0.056 0.276
Previous surgery (yes vs, no*)	2.317	**0.021**	0.349 4.284

Variables entered: socio-demographics (age, BMI, household crowding index, employment status, work field, education, monthly income, cigarette smoking, waterpipe smoking), medical history (previous surgeries, history of cardiovascular diseases, history of other diseases, health insurance), Doctor-Patient Communication score, and Health literacy scale score.
*Stands for the reference group.

	Doctor patient communication scores		
	Unstandardized *B*	*p*-value	95% CI
Model 2: Taking the Doctor-patient communication scale mean score as the dependent variable			
Age, in years	−0.074	0.069	−0.154 0.006
Gender (females vs males*)	1.635	0.064	−0.097 3.367
Household crowding index	−2.204	**0.002**	−3.599 −0.809
LMAS-14 score	0.119	**0.006**	0.034 0.203
Health literacy scale score	0.079	0.065	−0.005 0.163

Variables entered: socio-demographics (age, gender, employment status, work field, education, household crowding index), medical history (history of cardiovascular diseases), LMAS-14 scores, Health literacy scale.
*Stands for reference group.

	WHO wellbeing scores		
	Unstandardized *B*	*p*-value	95% CI
Model 3: Taking the WHO wellbeing index mean scores as the dependent variable			
Age, in years	0.278	**0.017**	0.049 0.506
Marital status (married vs single*)	6.737	**0.047**	0.085 13.389
Health insurance (yes vs. no*)	8.080	**0.006**	2.356 13.804
Health literacy scale score	0.330	**0.021**	0.050 0.610

Variables entered: socio-demographics (age, marital status, monthly income, BMI, alcohol intake), medical history (health insurance), and Health literacy scale score.
*Stands for reference group.

	Health Literacy scores		
	Unstandardized *B*	*p*-value	95% CI
Model 4: Taking the Health literacy scale mean scores as the dependent variable			
Marital status (married vs. single/divorced/widowed)	−2.271	**0.057**	−4.606 0.065
Educational level (university degree vs no*)	2.237	0.065	−0.136 4.609
Health insurance (yes vs. no*)	−1.784	0.096	−3.887 0.318
Cigarette smoking (yes vs. no*)	−2.023	0.070	−4.209 0.164
Doctor-Patient Communication score	0.117	**0.042**	0.004 0.231
WHO-5 well-being index score	0.032	0.062	−0.002 0.066

Variables entered: sociodemographic (age, marital status, work field, education, monthly income, smoking cigarette, household crowding index), medical history (history of cardiovascular disease, health insurance), LMAS-14 score, Doctor-Patient Communication score, WHO-5 well-being index.
*Stands for reference group.

Our findings align with previous research that indicates older age is associated with better medication adherence. Studies conducted in the United States have similarly shown that older patients exhibit higher adherence rates compared to younger individuals (Kripalani et al., 2010); (Cohen et al., 2012; Rolnick et al., 2013). This could be attributed to older adults' greater awareness of their health status and the importance of medication in managing chronic conditions. Additionally, older individuals may have established routines that facilitate regular medication intake, contributing to higher adherence rates (Lopes & Santos, 2021). On the other hand, a published overview of systematic reviews revealed that adherence was found to be the lowest in very young and very old people (Gast & Mathes, 2019).

The positive association between higher educational levels and medication adherence is well-documented in this study. Education enhances patients' understanding of their condition and the significance of adhering to prescribed treatments (Taibanguay et al., 2019; Tan et al., 2019; Zhao et al., 2015). Similar findings were reported in different studies; hence, patients with better education and knowledge about their disease were found to be more adherent to their medications in a study conducted in China for patients with coronary heart disease (Zhao et al., 2015) and another similar study targeting Chinese patients who are prescribed antihypertensive medications (Lee et al., 2013). This study reinforces the need for educational interventions to improve adherence among patients with lower educational attainment. Educated patients are more likely to comprehend the long-term benefits of adherence, recognise the risks of non-adherence, and possess the skills to manage their treatment effectively (Tan et al., 2019).

Our finding that medium income levels are associated with better adherence contrasts with some studies that found no significant relationship between income and (Aravindakshan et al., 2021; Bonger et al., 2018; Saraiva et al., 2020; Trief et al., 2022).This discrepancy highlights the complex interplay of socio-economic factors and suggests that financial stability at a medium income level might provide sufficient resources for medication procurement without the stressors associated with low income or the complacency that can accompany higher income levels. Individuals with medium income may also have better access to healthcare services and medications, further supporting their adherence.

Cigarette smoking and access to health insurance were potential barriers to medication adherence in our sample. A recent systematic review on the determinant of non-adherence to medications for dyslipidemia also reported higher non-adherence among current smokers(Lopes & Santos, 2021). Contrary to our findings, this review found that medication adherence was higher among patients with health insurance(Lopes & Santos, 2021).

The role of doctor-patient communication in enhancing medication adherence is supported by numerous studies (Casula et al., 2012; Lopes & Santos, 2021; Saifan et al., 2023). Effective communication fosters trust, ensures that patients understand their treatment regimen, and encourages adherence (Wu et al., 2022). Our study underscores the importance of training healthcare providers in communication skills to improve patient outcomes. Good communication practices include listening to patient concerns, providing clear instructions, and engaging patients in decision-making. Regarding the WHO wellbeing index, patients with higher health literacy reported higher well-being scores. Indeed, patients who possess a better understanding of their condition and treatment options may feel more confident in managing their health and making informed decisions, consequently experiencing a higher quality of life (Streja & Streja, 2020). These findings underscore the need for holistic approaches to dyslipidemia management that not only focus on medical interventions but also address the psychosocial and educational needs of patients to optimise their overall well-being (Cho et al., 2020).

Theoretical contributions

This study contributes to the existing body of knowledge by highlighting the specific socio-demographic and clinical factors influencing medication adherence in a Middle Eastern context. Unlike previous studies that have primarily focused on Western populations, our research provides insights into the adherence behaviours of Jordanian patients, thereby addressing a significant gap in the literature. Moreover, the study emphasises the importance of health literacy and doctor-patient communication, reinforcing their roles as critical determinants of medication adherence.

The theoretical contributions of this study are multifaceted. Firstly, it adds to the understanding of how socio-demographic factors, such as age, education, and income, impact medication adherence. Secondly, it highlights the role of health literacy in patient adherence, suggesting that patients who can understand and process health information are more likely to adhere to their medication regimens. Lastly, the study provides evidence on the importance of doctor-patient communication in adherence, indicating that effective communication can bridge the gap between healthcare providers and patients, leading to better health outcomes.

Practical implications

The practical implications of our findings are substantial. Healthcare providers should prioritise educational initiatives to enhance patients' understanding of dyslipidemia and its management. Tailored interventions that address the socio-economic conditions of patients, particularly focusing on those with medium income

levels, can significantly improve adherence rates. Furthermore, enhancing doctor-patient communication through targeted training programmes can lead to better adherence and, consequently, improved health outcomes.

Healthcare systems should consider integrating health literacy programmes into routine care, providing patients with the necessary tools to manage their health effectively. Additionally, policies aimed at improving socio-economic conditions, such as subsidising medication costs for lower-income patients, could alleviate financial barriers to adherence. Training programmes for healthcare providers should emphasise communication skills, ensuring that providers can convey information clearly and empathetically.

The results of this study underscore the multifaceted nature of medication adherence. Effective management of dyslipidemia requires a holistic approach that considers socio-demographic factors, health literacy, and the quality of doctor-patient interactions. Interventions aimed at improving these areas are likely to yield significant benefits in terms of adherence and overall patient well-being.

Our study shows that medication adherence is not solely influenced by individual behaviours but is also shaped by broader socio-economic and clinical factors. By addressing these determinants, healthcare providers and policymakers can develop comprehensive strategies to improve adherence, leading to better health outcomes and reduced healthcare costs. The integration of educational, economic, and communicative interventions can create a supportive environment for patients, encouraging adherence and enhancing quality of life.

Limitations

This study is subject to several limitations. The cross-sectional design limits the ability to infer causality from the observed associations. Additionally, the use of self-reported data may introduce information bias, potentially leading to overestimation of adherence levels. The study's focus on a specific population within Jordan may limit the generalizability of the findings to other groups.

Future research should consider longitudinal designs to establish causal relationships between the identified factors and medication adherence. Moreover, expanding the study to include diverse populations across different regions could enhance the generalizability of the findings. Utilising objective measures of adherence, such as pharmacy refill records, could also provide a more accurate assessment of adherence behaviours.

Conclusion

In conclusion, this study provides valuable insights into the factors influencing medication adherence among Jordanian patients with dyslipidemia. By highlighting the importance of socio-demographic characteristics, health literacy, and

doctor-patient communication, our research offers a foundation for developing targeted interventions to enhance adherence and improve patient outcomes. Future research should aim to explore these relationships longitudinally and in diverse populations to further validate and extend our findings.

Our study emphasises the need for a comprehensive approach to managing dyslipidemia, considering the socio-economic, educational, and communicative factors that influence medication adherence. By addressing these determinants, healthcare providers and policymakers can improve adherence rates, enhance patient outcomes, and reduce the economic burden of dyslipidemia. This research underscores the critical role of tailored interventions in promoting medication adherence and advancing public health.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Author contributions

DM and MB: conceptualisation. DM and MB: investigation. DM, MB, MAJ, FAH, and RA: methodology. RA: project administration. DM and MB: supervision: DM, MB, BH, SH, and HH. Formal analysis: DM and SM. writing – original draft preparation: ST, SHB. SM, DM and MB. writing – reviewing and editing: DM, MB, SM, ST, SH and HH. All authors read and approved the final version of the manuscript.

Data availability statement

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

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References

Al-Noumani, H., Alharrasi, M., Lazarus, E. R., & Panchatcharam, S. M. (2023). Factors predicting medication adherence among Omani patients with chronic diseases through a multicenter cross-sectional study. *Scientific Reports*, *13*(1), 7067. https://doi.org/10.1038/s41598-023-34393-4

AlMuhaidib, S., AlBuhairan, F., Tamimi, W., AlDubayee, M., AlAqeel, A., Babiker, A., AlFaraidi, H., AlJuraibah, F., Badri, M., & Al Alwan, I. (2022). Prevalence and factors associated with dyslipidemia among adolescents in Saudi Arabia. *Scientific Reports*, *12*(1), 16888. https://doi.org/10.1038/s41598-022-21262-9

Al Qasem, A., Smith, F., & Clifford, S. (2011). Adherence to medication among chronic patients in middle eastern countries: Review of studies. *Eastern Mediterranean Health Journal*, *17*(4), 356–363. https://doi.org/10.26719/2011.17.4.356

Alvi, Y., Khalique, N., Ahmad, A., Khan, H. S., & Faizi, N. (2019). World health organization dimensions of adherence to antiretroviral therapy: A study at antiretroviral therapy centre, Aligarh. *Indian Journal of Community Medicine: Official Publication of Indian Association of Preventive & Social Medicine*, *44*(2), 118.

Aoki, T., & Inoue, M. (2017). Association between health literacy and patient experience of primary care attributes: A cross-sectional study in Japan. *PLoS ONE*, *12*(9), e0184565. https://doi.org/10.1371/journal.pone.0184565

Aravindakshan, R., Abraham, S. B., & Aiyappan, R. (2021). Medication adherence to oral hypoglycemic drugs among individuals with type 2 diabetes mellitus – A community study. *Indian Journal of Community Medicine: Official Publication of Indian Association of Preventive & Social Medicine*, *46*(3), 503.

Berberich, A. J., & Hegele, R. A. (2022). A modern approach to dyslipidemia. *Endocrine Reviews*, *43*(4), 611–653. https://doi.org/10.1210/endrev/bnab037

Bonger, Z., Shiferaw, S., & Tariku, E. Z. (2018). Adherence to diabetic self-care practices and its associated factors among patients with type 2 diabetes in Addis Ababa, Ethiopia. *Patient Preference and Adherence*, *12*, 963–970. https://doi.org/10.2147/PPA.S156043

Bou Serhal, R., Salameh, P., Wakim, N., Issa, C., Kassem, B., Abou Jaoude, L., & Saleh, N. (2018). A new Lebanese medication adherence scale: Validation in Lebanese hypertensive adults. *International Journal of Hypertension*, *2018*, 3934296. doi:10.1155/2018/3934296

Casula, M., Tragni, E., & Catapano, A. L. (2012). Adherence to lipid-lowering treatment: The patient perspective. *Patient Preference and Adherence*, *6*(2012), 805–814.

Cho, S. M. J., Lee, H. J., Shim, J. S., Song, B. M., & Kim, H. C. (2020). Efficacy of combination therapy with ezetimibe and statins versus a double dose of statin monotherapy in participants with hypercholesterolemia: A meta-analysis of literature. *Lipids in Health and Disease*, *19*(1), 1–12. https://doi.org/10.1186/s12944-019-1182-5

Cohen, M. J., Shaykevich, S., Cawthon, C., Kripalani, S., Paasche-Orlow, M. K., & Schnipper, J. L. (2012). Predictors of medication adherence postdischarge: The impact of patient age, insurance status, and prior adherence. *Journal of Hospital Medicine*, *7*(6), 470–475. https://doi.org/10.1002/jhm.1940

Cutler, R. L., Fernandez-Llimos, F., Frommer, M., Benrimoj, C., & Garcia-Cardenas, V. (2018). Economic impact of medication non-adherence by disease groups: A systematic review. *BMJ Open*, *8*(1), e016982. https://doi.org/10.1136/bmjopen-2017-016982

Gast, A., & Mathes, T. (2019). Medication adherence influencing factors – An (updated) overview of systematic reviews. *Systematic Reviews*, *8*(1), 1–17. https://doi.org/10.1186/s13643-019-1014-8

Gellad, W. F., Grenard, J. L., & McGlynn, E. A. (2009). A review of barriers to medication adherence: A framework for driving policy options.

Gurgel do Amaral, M., Reijneveld, S. A., Almansa, J., Navis, G., & de Winter, A. F. (2021). Do uncontrolled hypertension, diabetes, dyslipidemia, and obesity mediate the relationship between health literacy and chronic kidney disease complications? *International Journal of Environmental Research and Public Health*, *18*(10), 5235. https://doi.org/10.3390/ijerph18105235

Hallit, S., Haddad, C., Sacre, H., Rahme, C., Akel, M., Saleh, N., Chalhoub, C., & Salameh, P. (2021). Medication adherence among Lebanese adult patients with hypothyroidism: Validation of the Lebanese medication adherence scale and correlates. *Clinical Epidemiology and Global Health*, *9*, 196–201. https://doi.org/10.1016/j.cegh.2020.08.014

Jimmy, B., & Jose, J. (2011). Patient medication adherence: Measures in daily practice. *Oman Medical Journal*, *26*(3), 155. https://doi.org/10.5001/omj.2011.38

Kripalani, S., Gatti, M. E., & Jacobson, T. A. (2010). Association of age, health literacy, and medication management strategies with cardiovascular medication adherence. *Patient Education and Counseling*, *81*(2), 177–181. https://doi.org/10.1016/j.pec.2010.04.030

Lee, G. K., Wang, H. H., Liu, K. Q., Cheung, Y., Morisky, D. E., & Wong, M. C. (2013). Determinants of medication adherence to antihypertensive medications among a Chinese population using Morisky medication adherence scale. *PLoS ONE*, *8*(4), e62775. https://doi.org/10.1371/journal.pone.0062775

Lopes, J., & Santos, P. (2021). Determinants of non-adherence to the medications for dyslipidemia: A systematic review. *Patient Preference and Adherence*, *15*, 1853–1871. https://doi.org/10.2147/PPA.S319604

Malaeb, D., Sacre, H., Mansour, S., Haddad, C., Sarray El Dine, A., Fleihan, T., Hallit, S., Salameh, P., & Hosseini, H. (2023). Assessment of medication adherence among Lebanese adult patients with non-communicable diseases during COVID-19 lockdown: A cross-sectional study. *Frontiers in Public Health*, *11*, 1145016. https://doi.org/10.3389/fpubh.2023.1145016

Mroueh, L., Ayoub, D., El-Hajj, M., Awada, S., Rachidi, S., Zein, S., … Al-Hajje, A. (2018). Evaluation of medication adherence among Lebanese diabetic patients. *Pharmacy Practice (Granada)*, *16*(4), 1291. https://doi.org/10.18549/PharmPract.2018.04.1291

Naderi, S. H., Bestwick, J. P., & Wald, D. S. (2012). Adherence to drugs that prevent cardiovascular disease: Meta-analysis on 376,162 patients. *The American Journal of Medicine*, *125*(9), 882–887.e1. e881. https://doi.org/10.1016/j.amjmed.2011.12.013

Omani-Samani, R., Maroufizadeh, S., Almasi-Hashiani, A., Sepidarkish, M., & Amini, P. (2019). The WHO-5 well-being index: A validation study in people with infertility. *Iranian Journal of Public Health*, *48*(11), 2058.

Rolnick, S. J., Pawloski, P. A., Hedblom, B. D., Asche, S. E., & Bruzek, R. J. (2013). Patient characteristics associated with medication adherence. *Clinical Medicine & Research*, *11*(2), 54–65. https://doi.org/10.3121/cmr.2013.1113

Saifan, A. R., Oleimat, B., Shhadeh, A. F. A., & Al-Yateem, N. (2023). Telemedicine and cardiovascular diseases. *Jordan Journal of Applied Science-Natural Science Series*, *17*(2), 48–50.

Saraiva, E. M. S., Coelho, J. L. G., dos Santos Figueiredo, F. W., & do Souto, R. P. (2020). Medication non-adherence in patients with type 2 diabetes mellitus with full access to medicines. *Journal of Diabetes & Metabolic Disorders*, *19*(2), 1105–1113. https://doi.org/10.1007/s40200-020-00612-2

Streja, E., & Streja, D. (2020). *Management of dyslipidemia in the elderly*. Endotext.

Suresh, K., & Chandrashekara, S. (2012). Sample size estimation and power analysis for clinical research studies. *Journal of Human Reproductive Sciences*, *5*(1), 7. https://doi.org/10.4103/0974-1208.97779

Sustersic, M., Gauchet, A., Kernou, A., Gibert, C., Foote, A., Vermorel, C., & Bosson, J.-L. (2018). A scale assessing doctor-patient communication in a context of acute conditions based on a systematic review. *PLoS ONE*, *13*(2), e0192306. https://doi.org/10.1371/journal.pone.0192306

Świątoniowska-Lonc, N., Polański, J., Tański, W., & Jankowska-Polańska, B. (2020). Impact of satisfaction with physician–patient communication on self-care and adherence in patients with hypertension: Cross-sectional study. *BMC Health Services Research*, *20*(1), 1–9. https://doi.org/10.1186/s12913-020-05912-0

Taibanguay, N., Chaiamnuay, S., Asavatanabodee, P., & Narongroeknawin, P. (2019). Effect of patient education on medication adherence of patients with rheumatoid arthritis: A randomized controlled trial. *Patient Preference and Adherence*, *13*, 119–129. https://doi.org/10.2147/PPA.S192008.

Tan, J. P., Cheng, K. K. F., & Siah, R. C. J. (2019). A systematic review and meta-analysis on the effectiveness of education on medication adherence for patients with hypertension, hyperlipidaemia and diabetes. *Journal of Advanced Nursing*, *75*(11), 2478–2494. https://doi.org/10.1111/jan.14025

Tavakoly Sany, S. B., Behzhad, F., Ferns, G., & Peyman, N. (2020). Communication skills training for physicians improves health literacy and medical outcomes among patients with hypertension: A randomized controlled trial. *BMC Health Services Research*, *20*(1), 1–10. https://doi.org/10.1186/s12913-020-4901-8

Tavakoly Sany, S. B., Doosti, H., Mahdizadeh, M., Orooji, A., & Peyman, N. (2021). The health literacy status and its role in interventions in Iran: A systematic and meta-analysis. *International Journal of Environmental Research and Public Health*, *18*(8), 4260. https://doi.org/10.3390/ijerph18084260

Thomson, R., Murtagh, M., & Khaw, F. M. (2005). Tensions in public health policy: Patient engagement, evidence-based public health and health inequalities. *Quality and Safety in Health Care*, *14*(6), 398–400. https://doi.org/10.1136/qshc.2005.014175

Trief, P. M., Kalichman, S. C., Wang, D., Drews, K. L., Anderson, B. J., Bulger, J. D., & Weinstock, R. S. (2022). Medication adherence in young adults with youth-onset type 2 diabetes: iCount, an observational study. *Diabetes Research and Clinical Practice*, *184*, 109216. https://doi.org/10.1016/j.diabres.2022.109216

Wu, D., Lowry, P. B., Zhang, D., & Tao, Y. (2022). Patient trust in physicians matters – Understanding the role of a mobile patient education system and patient-physician communication in improving patient adherence behavior: Field study. *Journal of Medical Internet Research*, *24*(12), e42941. https://doi.org/10.2196/42941

Yim, H.-H., Hwang, H.-S., Park, H.-K., Park, K.-Y., & Park, M. (2021). Association between patient experience and medication compliance of dyslipidemia: Using Korea national health and nutrition examination survey (2015). *Korean Journal of Family Medicine*, *42*(2), 116. https://doi.org/10.4082/kjfm.19.0128

Yuan, Y., Chen, W., Luo, L., & Xu, C. (2021). Dyslipidemia: Causes, symptoms and treatment. *International Journal of Trend in Scientific Research and Development*, *5*(2), 1013–1016.

Zhao, S., Zhao, H., Wang, L., Du, S., & Qin, Y. (2015). Education is critical for medication adherence in patients with coronary heart disease. *Acta Cardiologica*, *70*(2), 197–204. https://doi.org/10.1080/AC.70.2.3073511

Zill, J. M., Christalle, E., Müller, E., Härter, M., Dirmaier, J., & Scholl, I. (2014). Measurement of physician-patient communication – A systematic review. *PLoS ONE*, *9*(12), e112637. doi:10.1371/journal.pone.0112637