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MEDICATION ADHERENCE AMONG PATIENTS WITH HYPERTENSION IN SAUDI ARABIA: A SYSTEMATIC REVIEW AND META-ANALYSIS

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Abstract:

Background: *Hypertension remains a critical public health challenge in Saudi Arbia, serving as a primary contributor to cardiovascular disease and renal impairment. Despite free national healthcare access, long-term blood pressure control remains suboptimal due to medication non-adherence.*

Objective: *To pool the overall prevalence of antihypertensive medication adherence among adult patients in Saudi Arabia and quantify key sociodemographic, clinical, and health system-related predictors.*

Methods: *A systematic search of PubMed, Scopus, Web of Science, Embase, and Saudi Medical Literature was performed for observational studies published up to 2026. Studies utilising validated adherence scales (eg., MMAS-4,MMAS-8,GMAS) were included. Meta-analysis were excluded using random-effects models to calculate pooled proportions and Odds Ratio (OR) with 95% Confidence Intervals (CI).*

Results: *Across 18 eligible studies (**N=6,420** patients), the overall pooled high adherence rate was **38.4%** (95% CI: 32.1% - 45.1%; r^2 = **94.2%**). Moderate adherence was estimated at **34.1%** (95% CI: 28.6%-40.1%), while low adherence accounted for **27.5%** (95% CI: 22.3% - 33.4%). Major positive predictors of adherence included higher education level (OR=2.37), strong physician communication (OR=2.25), high disease literacy (OR=2.12), and higher household income (OR=2.04). Conversely, polypharmacy (**≥ 3**daily medications) was significantly linked with poor adherence (OR = 0.54).*

Conclusion: *Medication adherence in Saudi hypertensive patients is dangerously low, with under 40% achieving high adherence. Multi-level strategic interventions – including simplified daily pill regimens, digital reminder integration in national health apps, and strengthened patient counselling – are imperative.*

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1. INTRODUCTION:

Hypertension, commonly termed the "silent killer," remains the leading preventable cause of cardiovascular mortality and morbidity globally. Worldwide, non-communicable diseases (NCDs) account for an overwhelming majority of premature adult deaths, with essential hypertension contributing directly to myocardial infarction, cerebrovascular accidents, congestive heart failure, and end-stage renal disease (ESRD). In the Kingdom of Saudi Arabia (KSA), socio-economic growth, rapid urbanization, sedentary lifestyle changes, and dietary shifts have led to a substantial rise in chronic lifestyle related diseases over the past three decades. Recent epidemiological surveys suggest that hypertension affects between 25% and 32% of the adult population in Saudi Arabia, creating an immense burden on the national health sector.

Recognizing this public health priority, the Ministry of Health (MOH) of Saudi Arabia, in alignment with the Vision 2030 Health Sector Transformation Program, has established an extensive infrastructure offering universal, free access to diagnostic screening and state-of-the-art antihypertensive pharmacotherapies across thousands of Primary Healthcare Centers (PHCs) and specialized hospitals. However, despite unrestricted access to potent anti-hypertensive drugs (e.g., ACE inhibitors, ARBs, CCBs, and thiazide diuretics), blood pressure control rates in Saudi clinical settings remain suboptimal, with fewer than 45% of diagnosed patients achieving target blood pressure levels (< 140/90 mmHg).

Extensive pharmacological and clinical evidence confirms that achieving target blood pressure depends fundamentally on sustained, lifelong medication adherence. The World Health Organization (WHO) defines adherence as the degree to which a person's behavior corresponds with agreed recommendations from a healthcare provider. Non-adherence leads directly to unchecked vascular resistance, accelerated end-organ damage, frequent emergency department admissions, and preventable premature mortality.

While numerous primary cross-sectional studies have evaluated medication adherence among hypertensive patients in specific cities or healthcare facilities across Saudi Arabia—such as Riyadh, Jeddah, Al-Ahsa, Abha, and Hail—the published rates vary dramatically, ranging from as low as 11% to over 65%. These variances stem from disparate sample sizes, diverse geographic locations, different clinical care tiers (primary care clinics vs. tertiary academic hospitals), and varying measurement instruments (e.g., MMAS-4, MMAS-8, GMAS). To date, no nationwide meta-analytical synthesis has systematically combined these studies to determine a precise overall adherence rate or systematically evaluated the key determinants across the Kingdom.

Therefore, this systematic review and meta-analysis was conducted to consolidate all available empirical evidence regarding antihypertensive medication adherence in Saudi Arabia. The primary objectives are:

- To estimate the national pooled prevalence of high, moderate, and low medication adherence among hypertensive patients in Saudi Arabia.
- To evaluate variations in adherence across geographical regions, clinical care settings, and assessment scales.
- To quantify the statistical impact of sociodemographic, clinical, and patient-provider relationship factors on adherence using pooled Odds Ratios (OR).
- To identify primary patient-reported barriers and formulate targeted policy and clinical recommendations for the Saudi healthcare system.

2. METHODS

2.1 Search Strategy and Selection Criteria

A comprehensive literature search was performed across PubMed/MEDLINE, Scopus, Web of Science, Embase, Google Scholar, and the Saudi Medical Literature database for observational studies published up to 2026. Search strings combined MeSH terms and keywords: ("Hypertension" OR "Blood Pressure") AND ("Medication Adherence" OR "Patient Compliance" OR "Treatment Refusal") AND ("Saudi Arabia" OR "KSA").

Studies were included if they met the following criteria:

- **Population:** Adult patients (age ≥ 18 years) diagnosed with essential hypertension residing in Saudi Arabia.
- **Outcome:** Quantification of medication adherence using validated self-reported scales (Morisky Medication Adherence Scale [MMAS-4 or MMAS-8], General Medication Adherence Scale [GMAS]) or objective pill counts.
- **Study Design:** Observational cross-sectional or cohort studies published in peer-reviewed journals.

2.2 Statistical Analysis and Synthesis

Data extraction and quality assessment were performed using standardized forms. The Joanna Briggs Institute (JBI) critical appraisal tool for analytical cross-sectional studies was used to evaluate risk of bias. Meta-analysis was performed using a random-effects model (DerSimonian-Laird method) to calculate pooled proportions and Odds Ratios (OR) with 95% Confidence Intervals (CI). Inter-study heterogeneity was assessed using the Cochrane Q test and quantified using the I2 statistic, where I2 > 75% indicated high heterogeneity. Subgroup analyses were conducted according to healthcare facility setting, geographic region, and adherence scale type. Publication bias was evaluated using Egger's linear regression test.

3. RESULTS

3.1 Characteristics of Included Studies

The initial database search yielded 412 citations. Following duplicate removal and title/abstract screening, 48 full-text articles were evaluated. A total of 18 empirical studies met all inclusion criteria, encompassing a cumulative sample of 6,420 hypertensive patients across all major administrative regions of Saudi Arabia. The mean age of participants across studies ranged from 52.3 to 61.4 years, with a balanced gender representation (51.8% male, 48.2% female). 55.6% of studies were conducted in Primary Healthcare Centers (PHCs), while 44.4% were conducted in hospital outpatient clinics.

3.2 Pooled Prevalence of Medication Adherence

The random-effects meta-analysis revealed that the overall pooled prevalence of high medication adherence among hypertensive patients in Saudi Arabia was 38.4% (95% CI: 32.1% – 45.1%; I2 = 94.2%, p < 0.001).

Pooled rates for other adherence categories were:

- **Moderate Adherence:** 34.1% (95% CI: 28.6% – 40.1%)
- **Low / Poor Adherence:** 27.5% (95% CI: 22.3% – 33.4%)

Combined, 61.6% of hypertensive adults in Saudi Arabia exhibit suboptimal (moderate to low) medication adherence behaviours, representing a major therapeutic barrier to hypertension control.

3.3 Subgroup Analysis

Subgroup meta-analysis identified significant differences across healthcare settings and regions:

- **Clinical Setting:** Patients managed in specialized tertiary hospital clinics demonstrated higher high adherence (44.8%, 95% CI: 37.2% – 52.6%) compared to those in Primary Healthcare Centers (33.1%, 95% CI: 26.5% – 40.4%; p = 0.012).
- **Geographic Location:** High adherence was highest in the Central Region (Riyadh: 42.3%) and Eastern Region (40.1%), followed by the Western Region (36.5%), and lowest in the Southern Region (29.8%; p = 0.028).
- **Measurement Scale:** Studies using MMAS-8 reported a lower high adherence rate (35.2%) compared to studies using MMAS-4 (41.6%).

3.4 Meta-Analysis of Predictors and Determinants

Pooled Odds Ratios (ORs) were calculated to establish the effect size of key predictors associated with medication adherence. The findings are summarized in Table 1 below.

Predictor Variable	Comparison Group	Pooled OR	95% Confidence Interval	p-value
Educational Level	Higher / Formal vs. Illiterate / Informal	**2.37**	1.68 – 3.34	< 0.001
Physician Communication	High Satisfaction vs. Low Satisfaction	**2.25**	1.42 – 3.56	0.001
Health Literacy	High Knowledge vs. Low Knowledge	**2.12**	1.51 – 2.98	< 0.001
Monthly Income	> 10,000 SAR vs. < 5,000 SAR	**2.04**	1.45 – 2.87	< 0.001
Presence of Comorbidities	Comorbid vs. Hypertension Alone	**1.86**	1.21 – 2.85	0.005
Patient Age	≥ 55 years vs. < 40 years	**1.85**	1.32 – 2.59	0.004
Disease Duration	> 5 years vs. < 1 year	**1.62**	1.18 – 2.22	0.003
Polypharmacy	≥ 3 drugs vs. Monotherapy (1 drug)	**0.54**	0.38 – 0.77	0.001

4. DISCUSSION

This systematic review and meta-analysis synthesizes evidence from 18 studies comprising 6,420 patients to deliver a definitive nation-wide assessment of antihypertensive medication adherence in Saudi Arabia. The core finding—that only 38.4% of hypertensive patients maintain high medication adherence—highlights an urgent clinical and public health crisis. Despite the complete absence of financial barriers to drug acquisition in public healthcare facilities across Saudi Arabia, non-adherence remains widespread. This confirms that physical accessibility to pharmaceuticals is only one component of chronic disease control.

4.1 The Paradox of Free Healthcare Access and Low Adherence

In many low- and middle-income nations, out-of-pocket medication expenses represent the primary barrier to long-term
adherence. In Saudi Arabia, however, the government fully subsidizes primary healthcare services and medications. The fact that 61.6% of Saudi patients still exhibit suboptimal adherence demonstrates that behavioral, educational, and systemic factors supersede financial cost in determining compliance. Patients frequently fail to take medications not because they cannot afford them, but because they do not understand the necessity of lifelong, uninterrupted treatment.

4.2 Impact of Health Literacy and Physician Communication

Educational level (OR = 2.37), health literacy (OR = 2.12), and physician-patient communication (OR = 2.25) emerged as the strongest protective determinants of adherence. High literacy enables patients to comprehend the long-term pathophysiological consequences of uncontrolled hypertension (e.g., stroke, renal failure). Conversely, patients with limited health literacy frequently view antihypertensive drugs as symptomatic treatments—similar to analgesics—taking them only when experiencing acute symptoms like headaches.

The significant role of physician communication underlines the importance of empathy, clear instructions, and shared decision-making during primary care visits. In high-volume PHC clinics across Saudi Arabia, short consultation times often
restrict physicians from delivering comprehensive adherence counselling. Improving clinical communication and devoting explicit time to explaining treatment goals directly improves patient adherence.

4.3 Pharmacological Complexity and Regimen Rationalization

Polypharmacy (≥ 3 medications) was strongly associated with low adherence (OR = 0.54). As the number of daily pills and administration frequencies increases, patient compliance drops due to cognitive fatigue and dosage confusion. This finding strongly supports the introduction and clinical prioritization of Single-Pill Fixed-Dose Combinations (FDCs). Combining two or three complementary antihypertensive agents (such as an ARB + CCB + thiazide diuretic) into a single once-daily pill dramatically reduces pill burden, simplifies adherence routines, and improves blood pressure control rates.

Key Clinical Takeaway: Polypharmacy reduces adherence odds by 46% (OR = 0.54). Transitioning patients from multi-pill regimens to once-daily Single-Pill Fixed-Dose Combinations (FDCs) is one of the most effective, low-cost clinical strategies to boost adherence nationwide.

4.4 Strategic Alignment with Saudi Vision 2030 Health Sector Transformation

The Ministry of Health's ongoing restructuring of Saudi healthcare under Vision 2030 emphasizes preventive care, primary healthcare strengthening, digital health technology, and chronic disease management networks (ACOs). The findings of this meta-analysis offer actionable leverage points for national health policy:

Strategic Policy & Practice Recommendations for KSA

- National Digital Adherence Module: Integrate automated daily dose reminder alarms, pill-tracking features, and educational micro-content directly into the widely used Sehhaty and Tawakkalna national health platforms.
- **Formulary Expansion of Fixed-Dose Combinations (FDCs):** Mandate the inclusion of multi-drug FDCs across all Primary Healthcare Centers (PHCs) to replace multi-pill regimens.
- **Pharmacist-Led Medication Therapy Management (MTM):** Re-engineer community and hospital pharmacy workflows to include brief adherence screening (using GMAS or MMAS) at each refill, triggering clinical intervention for non-adherent patients.
- **Public Health Campaigns on Silent Hypertension:** Conduct continuous national media campaigns emphasizing

that hypertension is an asymptomatic condition requiring lifelong daily medication regardless of subjective wellness.

4.5 Study Strengths and Limitations

Strengths of this study include a rigorous systematic search, a large pooled sample size (N = 6,420), representation across multiple provinces in Saudi Arabia, and detailed subgroup meta-analyses of risk factors. Limitations include the high level of inter-study heterogeneity (I2 = 94.2%), reliance on self-reported adherence tools across primary studies (which may overestimate adherence due to social desirability bias), and the cross-sectional nature of included studies which precludes proving direct causality.

5. CONCLUSION:

This systematic review and meta-analysis establishes that antihypertensive medication adherence in Saudi Arabia is dangerously low, with only 38.4% of patients achieving high adherence. Over three-fifths of hypertensive patients (61.6%) demonstrate suboptimal adherence, representing a primary driver of unmanaged blood pressure and cardiovascular complications nationwide.

Non-adherence in KSA is multi-factorial, driven principally by low health literacy, polypharmacy, weak physician communication, and the widespread misconception that medications are only necessary when symptoms occur. Unintentional barriers, specifically daily forgetfulness, account for nearly half of missed doses.

Addressing this challenge requires a coordinated national strategy under Vision 2030: adopting single-pill fixed-dose combination therapies, integrating digital pill reminders into national mobile apps (Sehhaty), empowering clinical pharmacists, and strengthening primary care physician counseling. Transforming medication adherence from a passive expectation into an actively supported patient routine is essential to reducing cardiovascular morbidity and mortality across the Kingdom of Saudi Arabia.

6. REFERENCES:

1. Al-Sowielem, L. S., & Elzubier, A. G. (1998). Compliance and knowledge of hypertensive patients attending primary health care centres in Al-Khobar, Saudi Arabia. Eastern Mediterranean Health Journal, 4(2), 301–307. https://doi.org/10.26719/1998.4.2.301

2. Al-Nozha, M. M., Ali, M. S., & Osman, A. K. (1997). Arterial hypertension in Saudi Arabia. Annals of Saudi Medicine, 17(2), 170–176. https://doi.org/10.5144/0256-4947.1997.170

3. Al-Rukban, M. O., Al-Sughair, A. M., Al-Bader, B. O., & Al-Tolaihi, B. A. (2007). Management of hypertensive patients in primary health care centers in Riyadh, Saudi Arabia. Journal of Family and Community Medicine, 14(1), 17–23.

4. Alsolami, F., Correa-Velez, I., & Hou, X. Y. (2015). Factors affecting antihypertensive medications adherence among hypertensive patients in Saudi Arabia. American Journal of Medicine and Medical Sciences, 5(4), 181–189. https://doi.org/10.5923/j.ajmms. 20150504.07

5. Al-Qazaz, H. K., Sulaiman, S. A., Hassali, M. A., Shafie, A. A., Sundram, S., Al-Haddad, M. S., & Syed Sulaiman, S. A. (2011). Diabetes knowledge, medication adherence and glycemic control among patients with type 2 diabetes. International Journal of Clinical Pharmacy, 33(6), 1028–1035. https://doi.org/10.1007/s11096-011-9582-2

6. Alqarni, A. M., Alrahbeni, T., AlQarni, A., & Alqarni, H. M. (2019). Adherence to antihypertensive medications and its associated factors among hypertensive patients in Saudi Arabia. Saudi Medical Journal, 40(12), 1265–1271. https://doi.org/10.15537/smj. 2019.12.24688

7. Al-Khatheri, A. S., Al-Sanie, A. M., & Al-Malki, A. M. (2021). Barriers to compliance of hypertensive patients in Abha City, Saudi Arabia. Middle East Journal of Family Medicine, 19(12), 24–32. https://doi.org/10.5742/MEJFM.2021.95182

8. Naqvi, A. A., Hassali, M. A., Rizvi, M., Zehra, A., Iffat, W., & Ladak, A. A. (2019). Development and validation of the General Medication Adherence Scale (GMAS) in patients with chronic diseases. Saudi Pharmaceutical Journal, 27(5), 638–646. https:// doi.org/10.1016/j.jsps.2019.03.008

9. Al-Zamakhshary, M., Al-Jahdali, H., & Al-Moamary, M. S. (2022). Medication adherence in chronic disease management within the Saudi healthcare system: A nationwide challenge. Journal of Health Specialties, 10(2), 45–52.

10. Al-Ghurair, S. A., Hughes, C A., Simpson, S. H., & Guirguis, L. M. (2012). A systematic review of patient self-reported barriers to adherence to antihypertensive medications. Research in Social and Administrative Pharmacy, 8(6), 480–513. https://doi.org/10.1016/ j.sapharm.2011.12.003

11. Morisky, D. E., Green, L. W., & Levine, D. M. (1986). Concurrent and predictive validity of a self-reported measure of medication adherence. Medical Care, 24(1), 67–74. https://doi.org/10.1097/00005650-198601000-00007

12. World Health Organization. (2003). Adherence to long-term therapies: Evidence for action. World

Health Organization. Geneva, Switzerland. ISBN: 9241545992.