Table 1 Studies of adherence/nonadherence to chronic medication in Middle Eastern countries

Study/setting/country	Sample	Definition of patients' adherence/ nonadherence	Methods/measures	Study findings and conclusions
Al-Faris et al. 2002 [2] Outpatient clinics, Saudi Arabia	147 children with epilepsy	Noncompliant: missed a total of 1 day doses/week	Cross-sectional study Adherence to medication measured by patients' self-report using detailed questionnaire	14% of patients noncompliant with medication Variable linked to noncompliance: type of seizures Variables *not* linked to noncompliance: age; nationality; sex; family size; area of residence; frequency of medication; side-effects of medication
Bassili et al. 1998 [3] Outpatient clinics, Egypt	250 children with bronchial asthma	Compliant, poorly compliant or noncompliant (physicians' judgement)	Cross-sectional study Adherence to management measured using questionnaire filled by physicians	2.8% of patients poorly compliant or noncompliant with symptomatic management during acute attacks.38.4% poorly compliant or noncompliant with prophylactic management
Hashmi et al. 2007 [4] Outpatient clinics, Pakistan	438 patients with hypertension	Adherent: took ³ 80% of doses as prescribed	Cross-sectional study Adherence to medication measured by 2 self-report methods: total number of tablets prescribed/ week and how many pills taken and missed; Morisky scale [21]	23% of patients noncompliant with medication. Variables linked to noncompliance: increasing age; better awareness; higher number of pills prescribed. Variables *not* linked nonadherence: depression.
Fahey et al. 2006 [5] 2 primary health care (PHC) centres, UAE	203 patients with hypertension	Noncompliant: took < 80% of doses correctly	Cross-sectional study Adherence to medication measured by: 7-item questionnaire modified from Morisky scale [21] to determine patients' adherence; and 10-item questionnaire to elicit physician's estimate of patients' adherence	Nonadherence: patients' self-report) 48%; physicians' estimate 29% Nonadherence (patients' report): negatively correlated with: achieving target blood pressure; and positively correlated with physician's evaluation of seriousness of disease Nonadherence (physicians' estimate): negatively correlated with treatment effectiveness: patients' knowledge, communication quality; seriousness of condition

Baune et al. 2004 [6] Outpatient and PHC clinics, Palestine	336 patients: case group of 112 with acute stroke and hypertension and control group of 224 with hypertension only	No clear classification	Case–control study.Adherence to medication measured using questionnaire	25% of case patients noncompliant 4.5% of control patients noncompliant
Youssef and Moubarak, 2002 [7] PHC centres, Egypt	316 patients with hypertension	Fully compliant: no doses missed Partially compliant: took ³ 90% of doses Noncompliant: took < 90% of doses	Cross-sectional study Adherence to medication measured by patients' self-report using questionnaire	22.2% of patients partially compliant and 25.9% noncompliant Variables linked to noncompliance: education level; complications related to hypertension; side-effects; smoking; restriction of dietary salt and fat; knowledge about nature of disease; associated complications and ideal management plan; perception of benefits of adherence to treatment; blood pressure control; susceptibility to unfavourable events related to hypertension Variables *not* linked to noncompliance: patients' demographic characteristics; duration of the original illness; presence of coexisting health problems; number of hypertensive drugs; frequency of dose; patients' perception of danger of original disease; compliance to ideal exercise and ideal body weight
Elzubier et al. 2000 [8] Outpatient clinic, Sudan.	198 patients with hypertension.	Noncompliant: took < 80% of pills.	Cross-sectional study. Adherence to medication measured by: patients' self-report of whether taking medication regularly or not; pill counts; and verified by blood pressure measurement.	49.5% of patients noncompliant (40% with the pill count method). Variables linked to noncompliance: inability to buy drugs; asymptomatic nature of hypertension; complications of hypertension; blood pressure level. Variables *not* linked to noncompliance: lack of belief in drugs; side-effects from drugs; number of drugs taken; dosage regimen.
Al-Sowielem and Elzubier, 1998 [9] 4 PHC centres, Saudi Arabia.	190 patients with hypertension.	No clear definition of adherence.	Cross-sectional study. Adherence to medication measured by: patients' self-report using a questionnaire; and verified by therapeutic outcome (diastolic blood pressure > 90 mmHg).	25.3% of patients noncompliant based on self-report and 65.8% based on therapeutic outcome (diastolic blood pressure). Variables linked to noncompliance: irregular follow-up; younger age; better educated. Variables *not* linked to noncompliance: sex; nationality; difficulty with compliance; presence of other diseases; continuity of care with same physician; preference of place of care; number of drugs taken for hypertension; mode of diagnosis of hypertension.

Khalil and Elzubier, 1997 [10] 5 PHC centres and 2 outpatient clinics, Saudi Arabia.	347 patients with hypertension.	Pill count (average of 2 visits 3 weeks apart). Noncompliant: took < 80% of medications, based on the average.	Cross-sectional study. Adherence to medication measured by: pill count; and verified by blood pressure measurement.	47% of patients noncompliant. Variables linked to noncompliance: age; sex (female); nationality (Saudi Arabian nationals had higher noncompliance); duration of disease; presence of complications; follow-up in PHC rather than hospital; side-effects; duration of treatment; number of drugs; education about disease offered by health care provider; illness-associated symptoms.
Roaeid & Kablan, 2007 [11] Diabetes centre, Libyan Arab Jamahiriya.	805 patients with diabetes (type 1 and 2).	No clear definition or classification.	Cross-sectional study. Adherence to treatment measured by patients' self-report through interviews and questionnaire filled by physicians.	27.1% of patients not taking treatment regularly.
El-Shazly et al. 2000 [12] 14 outpatient clinics and diabetic centres, Egypt.	1000 patients with diabetes (type 1 and 2).	No clear definition or classification.	Cross-sectional study. Adherence to medication measured using questionnaire filled by physicians.	11.4% of patients noncompliant (15.1% in non-health insured patients and 5.7% in health insured patients). Variable linked to noncompliance: not having health insurance.
Khattab et al. 1999 [13] PHC centre, Saudi Arabia.	294 patients with diabetes (type 1 and 2).	Compliance: good - took medications as prescribed; fair - missed 1–3 doses/month; poor - missed 4 doses/month	Cross-sectional study Adherence to medication measured by: self-report questionnaire filled by physicians (diabetic follow-up card); and pill count	1.4% of patients had poor compliance, 14% fair compliance and 84.2% good compliance. Variables *not* linked to noncompliance: sociodemographic characteristics of patients; care characteristics; and disease characteristics.
Kamel et al. 1999 [14] Diabetic clinic, Egypt	300 patients with diabetes (type 1 and 2)	Poor compliance: took < 50%. Satisfactory compliance: took 50%–75%. Very good compliance: took > 75% of medications	Cross-sectional study Adherence to medication measured by patients' self-report using a questionnaire	1.7% of patients had poor, 20% satisfactory and 78.3% very good compliance Variables *not* linked to noncompliance: use of insulin injections, medication names and medication types.

Al-Saffar et al. 2005 [15] Outpatient clinic, Kuwait	278 patients with depression	Noncompliant: took < 80% of expected pill count *and* self-reported failure to take medication as prescribed	Educational interventional study Adherence to medication measured at 2 months and 5 months by patients' self-report and tablet count	88% of patients nonadherent in the control group at both follow-ups. Variables *not* linked to noncompliance: concern that therapy would impose restrictions on patients' lifestyle or have an adverse affect on their work; patients' belief that their physicians really understood the nature of their problem; and side-effects of medications.
Al-Saffar et al. 2003 [16] Outpatient clinic, Kuwait	176 patients with depression	Good compliance: divergence from prescribed treatment time. Noncompliance: self-reported failure to take medication as directed	Cross-sectional study Adherence to medication measured by: patients' self-report; and prescription refill adherence	30% of patients noncompliant (via pill counts) and 24% (via self-report) Variables linked to noncompliance: underlying intention to take medications; little or no confidence that symptoms were amenable to medical intervention; views about whether depression was more of a psychological than a medical problem; female sex; belief that depression was a disease best treated by medication; concern about the addictive nature of therapy; and uncertainty whether or not physicians can do anything to help Variables *not* linked to noncompliance: patients' characteristics and side-effects of medication
Fido and Husseini, 1998 [17] Outpatient clinic, Kuwait	120 patients with psychiatric problems	Nonadherent: failure to take medication as prescribed for > 1 week	Cross-sectional study Adherence to medication measured by patients', caretakers' or relatives' self-report using questionnaire (checklist)	55% of patients prematurely discontinued medication Variables linked to non-compliance: male sex; previous multiple hospital admission; diagnosis of schizophrenia and mania; age; being single; and educational level
Al-Jahdali et al. 2007 [18] Outpatient clinic, Saudi Arabia	334 patients with asthma	No clear definition or classification	Cross-sectional study Adherence to inhaled corticosteroids measured by patients' self-report though structured questionnaire interviews	38% of patients noncompliant Variables linked to noncompliance: education; negative perception of the role of inhaled corticosteroids in management of bronchial asthma; and negative perception regarding inhaled corticosteroids safety e.g. leading to addiction Variables not linked to noncompliance: duration and severity of asthma
Jabbar and Al-Shammari, 1993 [19] Outpatient clinic, Saudi Arabia.	104 patients with epilepsy	Noncompliant: missed a total of 3 day's doses/month	Cross-sectional study Adherence to medication measured by pill count	30.8% of patients noncompliant Variables linked to noncompliance: educational level; and adverse effects of disease on patients' academic performance Variables not linked to noncompliance: sex; marital status; age; family history of disease; duration of disease; type of the epilepsy; level of control; and therapeutic regimen

Gulbay et al. 2006 [20] Outpatient clinic, Turkey	140 adults with chronic obstructive pulmonary disease	Used medication "correctly": patients who had correct knowledge on ≥ 2 of their bronchodilator doses & who used convenient inhalation technique Used medication "regularly": patients who said they took medication every day. Adherent: used medication correctly and regularly	Cross-sectional study Adherence to medication measured by patients' self-report using questionnaire	10%–20% of patients did not use medication correctly and regularly Risk of poor adherence by increased 44.4 fold with: lower educational level; female sex; unawareness of chronicity of disease; and being uninformed