https://doi.org/10.4082/kjfm.19.0081 • Korean J Fam Med 2021;42:150-158

KJFM
Korean Journal of Family Medicine

eISSN: 2092-6715

■ Original Article

Determining the Prevalence of and the Factors Associated with Antihypertensive Medication Non-Adherence in the Gaza Strip

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Background: This study aimed to estimate the prevalence of and determine the factors associated with antihypertensive medication (A-HTNM) non-adherence among hypertension care seekers attending primary health clinics in the Gaza Strip.

Methods: A cross-sectional survey was conducted as the recruitment phase of a clustered randomized controlled trial including 538 participants. The participants were randomly selected from 10 primary health care centers by two-stage cluster random sampling. A structured questionnaire was used to collect data through face-to-face interview. The questionnaire was developed based on the World Health Organization determinants for medication non-adherence and the Health Belief Model. The main outcomes of this study were the prevalences of A-HTNM non-adherence and its associated factors. Adherence status was assessed using the eight-item Morisky Self-Report Medication Adherence Scale. Data were analyzed by STATA ver. 14.0 (Stata Corp., College Station, TX, USA) using a standard complex survey, accounting for unresponsiveness and the clustering sampling approach.

Results: The overall prevalence of A-HTNM non-adherence was 65.8% (95% confidence interval [CI], 59.2–71.8). Among all studied predictors, only self-efficacy of participants (odds ratio [OR], 3.8; 95% CI, 1.79–2.84) and social support (OR, 2.26; 95% CI, 2.82–5.11) remained significantly associated with A-HTNM non-adherence after adjusting for age, education level, number and frequency of A-HTNM doses per day, and comorbidities.

Conclusion: The high prevalence of non-adherence highlights the need for serious intervention to enhance the adherence rate among hypertension patients. The associated factors can be considered when developing appropriate interventions.

Keywords: Antihypertensive Drugs; Medication Non-Adherence; Prevalence

Received: June 15, 2019, Revised: August 23, 2019, Accepted: September 5, 2019
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INTRODUCTION

Hypertension (HTN) was the sixth leading cause of death in Palestine in 2016,[1] with a prevalence rate of 27.6%.[2] HTN is associated with community and individual burden through increased risk of stroke, heart, and kidney diseases.[3] The goal for patients with HTN is to achieve a blood pressure (BP) lower than 130/80 mm Hg.[4] The availability of a large number of antihypertensive medications (A-HTNM) indicate the progress in the management of HTN in the last 5 years,[5] although the rates of BP control and outcomes in HTN patients remain suboptimal as most of the efforts are directed to study the effects of medications, while little attention is paid on determining whether patients take these medications as prescribed or not.[6] In 2003, the World Health Organization (WHO) advocated the term "adherence" to describe patients' active, voluntary, and collaborative involvement in a mutually acceptable course of behavior to produce therapeutic results. According to the WHO, the average rate of adherence to long-term therapy in developed countries is 50%, and the rates are even lower in developing countries.[7] Adherence to medical treatment is a crucial mediator of antihypertensive treatment, while non-adherence is a strong barrier against effective BP control.[8] Evidence indicates that non-adherence to chronic disease medications is common, and about 45.2% of HTN patients are non-adherent to prescribed medication regimens.[9] The WHO has conceptualized factors related to medication adherence in five domains (patient-related factors, socioeconomic factors, health condition-related factors, therapy-related factors, and healthcare system-related factors).[10] Furthermore, the Health Belief Model (HBM) has been widely used in medication adherence studies under the assumption that patients are able to make decisions about their health.[11]

In this study, we aimed to estimate the prevalence of and to determine the associated factors of A-HTNM non-adherence based on the WHO determinants and HBM among HTN care seekers in primary health care centers in the Gaza Strip.

METHODS

1. Study Design and Participants

A cross-sectional survey was conducted between August 1 and December 30, 2018. The cross-sectional survey data were derived from the baseline data of the recruitment phase of a clustered randomized controlled trial. A total of 538 HTN care seekers from 10 primary health care centers across the Gaza Strip governorates were enrolled. Participants were recruited by two-stage cluster random sampling. In the first stage, 10 centers were randomly selected by a stratified simple random sampling approach to select two centers from each governorate. In the second stage, we proportionally selected participants from each center using systematic random sampling based on the eligibility criteria and their agreement to be involved in the study. When any of the selected patients refused to participate, the next patient was selected.

2. Eligibility Criteria

Palestinian citizens attending government primary health centers in Gaza, aged above 18 years, registered as an HTN patient since at least 1 year, and taking at least one A-HTNM were eligible for this study. Patients who were diagnosed with cognitive impairment or a serious medical condition as reported by their primary care physician were excluded from the study.

3. Measures

A structured questionnaire was used to collect data from the participants via a 20-minute interview during clinic hours (8 AM to 2 PM, 5 days a week). The questionnaire variables in this study were exposure and outcome variables. The exposure variables included participants' characteristics (age, sex, marital status, employment, education level) and health status variables (smoking status, comorbidities, weight, height, body mass index [BMI], BP measurement, number and frequency of A-HTNM doses, and duration of HTN).

In addition, other exposure variables of interest (beliefs about medication, self-efficacy, intrinsic motivation, social support, and health system-related factors) were also assessed. The outcome variable was A-HTNM adherence.

BP was measured on the right arm in sitting position using a mercury sphygmomanometer after completing the interview; the result was recorded as the person's BP expressed in terms of mm Hg. Weight and height were measured using a mechanical weighing machine with a height rod (Health o Meter, McCook, IL, USA). Consequently, BMI was calculated using the WHO chart based on weight and height.

4. Instruments

An instrument was developed based on the WHO determinants for medication non-adherence and HBM. The first part of the questionnaire consisted of questions about the demographic characteristics and clinical history of participants. The second part involved the determination of patients' adherence status. The third part involved the evaluation of patients' understanding and perception of HTN (HBM constructs: perceived susceptibility, perceived severity, and perceived threat). The fourth domain involved the assessment of the participants' beliefs about medications (HBM constructs: perceived barriers and benefits). The fifth domain involved the determination of the participants' active participation in monitoring and decision making in relation to disease management (HBM construct: self-efficacy), and the sixth domain involved the evaluation of the participants' intrinsic motivation (HBM construct: internal cues to action). The last two domains involved the assessment of healthcare system-related factors such as relationships between patients and physicians and health system support (HBM constructs: perceived barriers and benefits).

Adherence status was assessed using the eight-item Morisky Medication Adherence Scale (MMAS-8), a known validated and reliable self-report medication adherence scale.[12]

The Belief about Medication Questionnaire (Arabic version) was used to test the participants' beliefs about the use of A-HTNMs and the

https://doi.org/10.4082/kjfm.19.0081

degree of acceptance of the validity and reliability observed in different cultures with some cross-cultural adaptation of the scale.[11,13,14]

Self-efficacy was defined as a behavior-specific predictor, which was assessed using the modified version of the existing scale.[15] Intrinsic motivation was defined as the degree of one's motivation for a particular behavior, which was scored using the Treatment Self-Regulation Questionnaire (TSRQ); both of these tools were previously validated and are widely used.[16]

An Arabic validated and reliable version of the Patient-Doctor Relationship Questionnaire-9 was used to assess the relationship between patients and doctors.[13,17] Likewise, a health care system support questionnaire was used with some modifications.[13,18]

The Morisky Scale, TSRQ, and Self-Efficacy Questionnaires were translated to Arabic based on the five-step process (forward translation, expert panel, back translation, editing, and pre-testing) of translating and adapting an instrument recommended by the WHO.[19] Other covariates such as medical comorbidities were assessed using the Charlson Comorbidity Index, which is a validated and widely used weighted-index designed to evaluate disease comorbidity.[20]

Content validity of the Arabic questionnaires were reviewed by panel of experts. Required changes were made to clarify any ambiguity and to ensure the comprehension of Palestinian participants after the pilot study.

Reliability tests were performed by test-retest within a period of 2 weeks. Intra-class correlation coefficients (ICC) and 95% confidence intervals (CIs) were computed for the three questionnaires (Morisky Scale, TSRQ, and Self-Efficacy Questionnaire). Table 1 reveals the strong agreement level and statistically significant ICC; an ICC agreement level of 0.75–0.9 was considered good, while an ICC level of >0.90 indicated excellent reliability.[21] The lowest and highest ICC in each questionnaire ranged between 0.63 and 0.95. However, the ICC for all other items was more than 0.75.

Internal consistency was tested by determining the Cronbach's α for MMAS-8 adherent, TSRQ and Self-efficacy domains, which give the values of 0.92, 0.81, and 0.91 respectively, and 0.81 for the whole questionnaire, which is considered almost good.

5. Definition of Antihypertensive Medications Adherence

In this study, we depended on a self-report medication adherence scale to determine the adherence status. The MMAS-8 by Morisky et al.[12] was used for this purpose. It can identify the exact reasons for patients' non-adherence and why the individual is exhibiting this behavior. It consisted of eight questions that are assigned points ranging from 0 ("no" answer) to 1 ("yes" answer); a lower score indicates more adherence (0/8). The score has its own cut-off points: 0 for perfect adherence, 1–2/8 for medium adherence, and ≥3/8 for low adherence.[12]

To define the status of adherence, the MMAS-8 scale responses were dichotomized into optimal and suboptimal adherence. Responses of 0/8 were classified as optimal adherence, while responses indicating non-adherence (≥3/8) and moderate adherence (1–2/8) were defined as suboptimal adherence (A-HTNM non-adherent).

The cut-off point for optimal adherence in HTN patients was 80% or more than that in patients showing A-HTNM. However, the decision to use self-report measures to identify patients with different levels of adherence was based on the suggested cut-off point of the scale used.

6. Sample Size

The sample size was calculated to be 165 participants, with an estimated non-adherence rate of 70%.[22] The sample size increased to 291 participants considering the effect of a cluster design by 1.5 and allowing a nonresponse rate of 15%. However, the sample size was increased again to 538 participants for the purpose of conducting a controlled trial, as these data were the baseline data of a clustered randomized controlled trial.

7. Data Analysis

IBM SPSS ver. 23.0 (IBM Corp., Armonk, NY, USA) was used for ICC test and Cronbach's α. One-way random effects model was performed, and the ICC was reported.

For the main analysis, a standard complex survey data analysis was performed by STATA ver. 14.0 (Stata Corp., College Station, TX, USA). We accounted for clustering using the STATA PSU option and for unequal probability of selection using sample weight variable analysis.

Table 1. ICC agreement level

Questionnaire	No. of test (%)	No. of retest (%)	ICC single measure	95% confidence interval	P-value	Cronbach's α
MMAS-8			0.91	0.85–0.95	<0.001	0.92
Adherent	24 (47)	23 (45.1)				
Moderately adherent	17 (33.4)	13 (25.5)				
Non-adherent	10 (19.6)	15 (29.4)				
TSRQ*			0.90	0.84–0.94	<0.001	0.81
Mean >3	50 (98.0)	49 (96.0)				
Mean ≤3	1 (2.0)	2 (4.0)				
Self-efficacy*			0.84	0.73–0.90	<0.001	0.91
Mean >3	44 (86.3)	44 (86.3)				
Mean ≤3	17 (13.7)	17 (13.7)				
Cronbach's α for all						0.81

ICC, intra-class correlation; MMAS-8, eight-item Morisky Medication Adherence Scale; TSRQ, Treatment Self-Regulation Questionnaire.
*On the Likert scale.

Data were checked for quality and statistical assumption before conducting the main analysis. None of the tested variables violated the statistical assumptions; hence, there was no need to performed non-parametric tests.

Data were described using descriptive statistics, and groups were compared using the chi-square test for categorical variables. Under the standard complex survey data setting, univariable logistic regression was performed to assess the association between medication adherence state and participants' characteristic variables and other predictors. A multiple logistic regression model was used to assess the adjusted effect of explanatory variables on the medication adherence rate. All significant variables at a level of 0.1 were included in the multiple regression analysis. Variables that disturbed the model were excluded by the backward stepwise elimination method. A two-sided P-value of less than 0.05 was considered significant.

Table 2. Participants' characteristics (n=538)

Characteristic	% or mean	95% confidence interval
Categorical variable (%)		
Governorate		
North Gaza	15.34	11.6–19.9
Gaza city	28.92	25.6–32.4
Middle zone	25.08	20.4–30.3
Khan Yunis	21.86	15.5–29.9
Rafah	8.80	7.1–10.8
Age groups (y)		
28–39	6.98	2.9–15.4
40–59	49.71	40.5–58.9
≥60	43.31	30.7–56.7
Sex		
Male	39.05	30.9–47.8
Female	60.95	52.1–69.08
Marital status		
Married	90.43	83.0–94.8
Single	1.87	0.85–4.1
Divorced	1.21	0.50–2.8
Widowed	6.49	2.8–14.1
Employment		
Employed	13.53	10.7–16.9
Jobless	27.93	23.2–33.1
Retired	13.18	7.2–22.9
House wife	45.35	36.5–54.0
Level of education		
Illiterate	9.78	5.5–16.7
Elementary school	43.10	38.4–47.9
Secondary school	27.02	24.4–29.7
University	20.09	19.1–21.1
BMI (kg/m^2)		
Normal (18.5–24.9)	7.56	6.52–9.87
Overweight (25–29.5)	27.23	25.58–28.95
Obese (≥30)	65.20	62.15–68.14
BP		
Controlled	54.41	39.6–68.5
Uncontrolled	45.59	31.4–60.4
Continuous variable (mean)		
Age (y)	57.14	53.11–61.17
BMI (kg/m^2)	32.25	31.86–32.63
Weight (kg)	87.39	86.04–88.75
Height (cm)	164.43	163.90–164.97
Systolic BP (mm Hg)	131.66	126.78–136.53
Diastolic BP (mmHg)	83.27	81.53–85.02

BMI, body mass index BP, blood pressure.

8. Ethical Considerations

Prior to conducting this research study, ethical approval from Tehran University of Medical Sciences Ethical Committee (code no., IR.TUMS.SPH.REC.1396.4828) was obtained. Approval from the Palestinian Health Research Council (Helsinki committee) (PHRC/HC/322/18) was gained. The purpose of the study was explained to all participants, and they were reassured that their data will remain confidential; each participant was asked to sign a consent form prior to participation.

RESULTS

1. Participants' Characteristics

A total of 538 participants were included in the survey, with a 94% re-

Table 3. Participants' health status (n=538)

Characteristic	% or mean	95% confidence interval
Categorical variable		
Duration of hypertension since diagnosis (y)		
1–5	42.24	31.2–54.1
6–20	52.57	43.1–61.9
>20	5.19	3.3–7.8
No. of antihypertensive medications		
One medication	64.42	59.6–68.9
Two medication	27.50	23.5–31.8
Three and more medications	8.08	54.6–11.7
Frequency of antihypertensive medications taken per day		
Once	64.84	55.7–72.9
Twice and more	35.16	27.0–44.2
Smoking status		
Never	81.42	76.5–85.4
Former	8.78	5.3–14.2
Current	9.79	7.9–12.1
Other comorbidities		
Low	85.57	71.8–93.2
High	14.43	6.7–28.1
Perception of blood pressure control		
Controlled	58.96	50.4–66.9
Uncontrolled	34.02	28.0–40.6
Don't know	7.01	3.1–15.1
Self-rated health		
Very poor	3.80	0.9–13.9
Poor	14.87	8.6–24.4
Fair	39.41	34.2–44.8
Good	36.17	25.2–48.7
Excellent	57.36	34.1–92.0
Continuous variable (mean)		
Duration of hypertension (y)	8.46	6.68–10.25

https://doi.org/10.4082/kjfm.19.0081

sponse rate. More than half (60.95%) were women with an overall mean age of 57.1 years (95% CI, 53.1–61.2 years). The majority were educated (90.2%), married (90.4%), unemployed (86.5%), and non-smokers (81.4%). Obesity was the most common comorbidity among the study population, with a mean BMI of 32.25 kg/m^2 (95% CI, 31.86–32.63 kg/m^2). Of the total participants, 45.6% had uncontrolled BP with

Table 4. Univariate analysis of adherent status and participants' characteristics

Characteristic	Adherent %	Non-adherent %	P-value (two sided)	Unadjusted odds ratio (95% confidence interval)
Age (y)			0.012*	1.03† (1.01–1.06)
18–35	2.6	3.6		
36–50	16.5	27.8		
51–65	47.3	50.4		
>66	33.6	18.2		
Sex			0.301	
Female	43.6	36.7		Reference
Male	56.4	63.3		1.33 (0.71–2.5)
Marital status			0.702	
Not married	10.2	9.2		Reference
Married	89.8	90.8		0.89 (0.42–1.89)
Employment			0.303	
Unemployed	89.1	85.1		Reference
Employed	10.9	14.9		0.69 (0.31–1.56)
Level of education			0.028†	
Illiterate	6.9	11.3		Reference
Literate	93.1	88.7		1.7 (1.08–2.67)
Body mass index (kg/m^2)			0.380	
Normal (18.5–24.9)	8.7	6.9		Reference
Above normal (>25.0)	91.3	93.1		0.78 (0.40–1.5)

*Statistically significant variables in multivariable regression analysis. †Odds ratio for age as a continuous variable.

Table 5. Univariate analysis of adherent status and participants' health status

Variable	Adherent %	Non-adherent %	P-value (two sided)	Unadjusted odds ratio (95% confidence interval)
Duration of hypertension (y)			0.039*	
1–5	32.4	47.4		Reference
>5	67.6	52.6		1.88 (1.04–3.37)
No. of antihypertensive medications			0.042*	
One medication	59.0	67.2		Reference
Two medications and more	41.0	32.8		1.43 (1.02–2)
Frequency of antihypertensive medications taken per day			0.087*	
Twice and more	31.6	37.0		Reference
Once	68.4	63.0		1.27 (0.95–1.71)
Smoking status			0.266	
Nonsmoker	86.9	91.9		Reference
Smoker	13.1	8.1		1.7 (0.57–5.08)
Other comorbidities			0.098*	
High	11.8	15.8		Reference
Low	88.2	84.2		1.40 (0.91–2.14)
Perception of BP control			0.055*	
Uncontrolled	26.1	48.8		Reference
Controlled	73.9	51.2		2.7 (0.97–7.56)
Self-rated health			0.121	
Poor	46.5	64.1		Reference
Good	53.5	35.9		2.05 (0.76–5.51)
BP measurement			0.036*	
Uncontrolled	34.7	51.3		Reference
Controlled	65.3	48.7		1.98 (1.06–3.68)

BP, blood pressure.
*Statistically significant variables at a level of 0.1 included in multivariable regression analysis.

mean systolic and diastolic BP of 131.66 mm Hg (95% CI, 126.78–136.53 mm Hg) and 83.27 mm Hg (95% CI, 81.53–85.02 mm Hg), respectively. More than half of the participants (57.25%) had been diagnosed with HTN for more than 5 years (mean, 8.46 years; 95% CI, 6.68–10.25 years). Almost two-thirds of the participants (64.4%) were treated with only one A-HTNM once a day (64.84%), while 35.6% were treated with two or more medications twice or several times a day (35.16%). Only 14.43% of participants had high comorbidities. Approximately 58.96% of the participants considered that their BP is controlled, while 41.9% rated themselves as having a good health status in the self-rated health questionnaire (Tables 2, 3).

2. Prevalence of Adherence and Non-adherence

The participants were divided into three groups according to their MMAS-8 scores: non-adherent (≥3/8), moderately adherent (1–2/8), and adherent (0/8). Approximately 32% (95% CI, 28%–36%) and 32% (95% CI, 26%–42%) of the respondents were classified as moderately adherent and non-adherent, respectively, while 34% (95% CI, 28%–41%) were adherent. The MMAS-8 scale responses were dichotomized into optimal adherence (0/8) and suboptimal adherence (A-HTNM non-adherent) (≥1/8). The overall prevalence of A-HTNM non-adherence was 65.8% (95% CI, 59.2%–71.8%).

3. Relationship between Adherence Status and Predictors

Under the standard complex survey data setting, univariable logistic regression was used to predict the association between adherence status and baseline data of the participants and other interesting explanatory variables. Tables 4 and 5 show that participants' ages (odds ratio [OR], 1.03; 95% CI, 1.01–1.06), education level (OR, 1.7; 95% CI, 1.08–2.67), number of years since HTN diagnosis (OR, 1.88; 95% CI, 1.04–3.37), number of A-HTNMs (OR, 1.43; 95% CI, 1.02–2.00), and BP measurement (OR, 1.98; 95% CI, 1.06–3.68) were the only factors associated significantly with adherent status.

In the prediction of other independent variables, which could be associated with medication adherence status, Table 6 shows that self-efficacy of the participants (OR, 4.47; 95% CI, 3.28–6.09) and social support (OR, 2.87; 95% CI, 2.66–3.09) were the only predictors that were significantly associated with adherent status among all other studied factors.

A multiple logistic regression model was used to assess the adjusted association of predictors with adherence status. All statistically significant variables from univariate analysis at a level of 0.1 were included in the multiple logistic regression analysis. The 11 factors that were included in the model were age, education level, duration of HTN, frequency of anti-HTN medication, number of anti-HTN medications per day, other comorbidities, BP measurement, perception of BP control, self-efficacy of participants, social support, and intrinsic motivation. Four of them (duration of HTN, perception of BP control, BP measurement, and intrinsic motivation) disturbed the model; hence, they were excluded by the backward stepwise elimination method. The other seven factors remained statistically significant and were found to be associated with the risk of A-HTNM non-adherence (Table 7).

These significant predictors included the following: age (OR, 1.04;

Table 6. Univariate analysis of adherent status and explanatory variables

Predictor	Adherent %	Non-adherent %	P-value (two sided)	Unadjusted odds ratio (95% confidence interval)
Mean score of participants' understanding and perception about hypertension			0.132	
Good	98.2	94.9		3.03 (0.62–14.78)
Poor	1.8	5.1		Reference
Mean score of beliefs about medication			0.455	
Positive	74.4	77.6		0.84 (0.48–1.46)
Negative	25.6	22.4		Reference
Mean score of self-efficacy of participants			<0.001*	
Good	84.8	55.5		4.47 (3.28–6.09)
Poor	15.2	44.5		Reference
Mean score of intrinsic motivationparticipants			0.070*	
High	58.1	43.1		1.82 (0.93–3.59)
Low	41.9	56.9		Reference
Mean score of relationships between patients and physician			0.244	
Good	2.1	3.8		1.85 (0.56–6.09)
Poor	97.9	96.2		Reference
Mean score of health system support			0.385	
Good	46.3	42.1		1.18 (0.75–1.86)
Poor	53.7	57.9		Reference
Mean score of social support			<0.001*	
Good	87.3	70.5		2.87 (2.66–3.09)
Poor	12.7	29.5		Reference

*Statistically significant variables at a level of 0.1 included in multivariable regression analysis.

https://doi.org/10.4082/kjfm.19.0081

Table 7. Predictors that remained significant in multiple regression analysis

Variable	Adjusted odds ratio (95% confidence interval)	P-value
Age	1.04 (1.03–1.06)	0.002
Education level		0.030
Illiterate	Reference	
Literate	2.23 (1.12–4.45)	
Frequency of antihypertensive medication		0.010
≥Twice	Reference	
Once	2.12 (1.31–3.42)	
No. of antihypertensive medications		<0.001
One medication	Reference	
≥2 medications	2.27 (1.91–2.71)	
Other comorbidities		0.016
High	Reference	
Low	1.60 (1.14–2.24)	
Self-efficacy of participants		<0.001
Poor	Reference	
Good	3.80 (2.82–5.11)	
Social support		<0.001
Poor	Reference	
Good	2.26 (1.79–2.84)	

By the Hosmer and Lemeshow strategy.

95% CI, 1.03–1.06), with the odds of non-adherent status increased by 0.04 times for a 1-year decrease in age; education level (OR, 2.23; 95% CI, 1.12–4.45), with the odds of adherent status increased by 2.23 times among literate participants compared with illiterate participants; and the number of anti-HTN medications per day (OR, 2.27; 95% CI, 1.91–2.71), with the odds of adherent status increased by 2.27 times among patients using two or more medications compared with those taking one medication. The odds of adherent status also increased by 2.12 times among patients using medications once a day (OR, 2.12; 95% CI, 1.31–3.42) compared with those taking the medication twice or more per day. On comparing between patients with low and high comorbidity, other comorbidities (OR, 1.60; 95% CI, 1.14–2.24) were likely to increase the odds of adherent status by 1.6 times. Other significant explanatory factors were self-efficacy of participants (OR, 3.8; 95% CI, 1.79–2.84) and social support (OR, 2.26; 95% CI, 2.82–5.11). The adherent rates were increased by 3.8 and 2.26 among patients with good self-efficacy and good social support compared with those who had poor self-efficacy and social support, respectively.

DISCUSSION

HTN complications can be prevented by patients' adherence to A-HTNM. Factors such as age, sex, number of pills per day, side effects of medication, comorbid medical conditions, patient's inadequate understanding about the complications of A-HTNM, lack of social support, poor physician-patient relationship, and health care support affect adherence in different populations.[5,7,23-25]

Addressing these factors is very important for successful control and management of HTN. To the best of our knowledge, this is the first study to investigate adherence to A-HTNM and its associated factors among HTN patients attending primary health care centers in the Gaza Strip. We investigated the levels of medication adherence and its predictors among 538 HTN patients attending primary health care centers in the Gaza Strip governorates.

Self-reported measures were used in this research to determine the patients' perceived response in relation to their medication adherence behavior, which met the purpose of the study and can serve as a basis for conducting an interventional controlled trial on behavioral change among non-adherent participants.

The MMAS-8 proved to be reliable, with good concurrent and predictive validity in primarily low-income HTN patients and might function as a screening tool in outpatient settings based on its own cut-off points. The scale was shown to correlate strongly with sustained behavioral change for individuals who attended counseling sessions.[12,26]

Actually, there is no gold standard measure for medication adherence among the widely available measures of medication adherence used in this research. The self-report scales have been classified as an indirect and subjective measure of medication adherence. It is a low cost and simply applicable measure. Determination of medication adherence can be objective or subjective, also called as direct or indirect. The direct measure of medication adherence depends on the biological assay of the drug in body fluids (blood or urine); however, it does not provide information about intentional and unintentional reasons for medication non-adherence. By contrast, indirect measures that involve self-report measures have the potential to identify the exact reasons for patients' non-adherence and why the individual is exhibiting this behavior.

Many other indirect measures are available: pill count, pharmacy refill records, BP measurements, and Medication Events Monitoring System (MEMS). The pill count method has been criticized by researchers because many patients did not return with their pill containers on each clinic visit. In addition, some patients might combine some pills from different containers into one medication container. Moreover, some patients do not bring the real bottles, which have some remaining pills that indicate their poor adherence to medications or discard the remaining pills before their clinic visit to show their perfect adherence to the prescribed medications. Although the effectiveness of MEMS has been shown, it is an expensive measure and has a practical problem: the removal of the dosage unit is equivalent to taking the medication. Thus, the patient could open the container without taking the medications just to increase the adherence rate.

Meanwhile, because a perfect measure does not exist, a multi-measure approach can be a good solution. Still, the decision regarding choosing a suitable approach should balance reliability and practicality, especially cost-effectiveness and the purpose of the study.[26]

The overall prevalence of A-HTNM non-adherence was 65.8% (95% CI, 59.2%–71.9%). Approximately 32% and 34% of the respondents were moderately adherent and non-adherent, respectively. These values are almost lower than those of a previous study conducted in the

West Bank of Palestine in 2013, which revealed that 28.9% and 54% had medium and poor adherence, respectively.[27] The values reported in this study fall within the range of the recorded results in the United Arab Emirates (54.4%), Saudi Arabia (72.1%),[13] and Pakistan (77%).[24]

In our study, age and education level were found to be significant independent factors associated with adherence, with better adherence observed in older and more educated people; this finding is in line with those of other studies.[13,24,27] Older patients could be more sensitive to the side effect and show deterioration when their medications are ignored; these reasons probably motivated them to increase their adherence to their treatment. Therefore, counseling for patients in the younger age groups should consider full and detailed explanation about the complications of HTN and the risks of poor adherence to medications. Patients with greater levels of education may have a better understanding regarding the goal of controlling their BP and the potential complications associated with A-HTNM non-adherence.

This study found a positive relationship between adherence and the number of pills prescribed. Patients taking only one tablet are less adherent compared with those taking multiple pills per day. This is inconsistent with what has been advocated about one tablet dosing to increase adherence. However, this finding is consistent with those of several other studies.[13,23,24] One reason for this finding could be that patients taking two or more pills recognize the severity of their disease and hence become more attentive to their treatment. In addition, taking multiple pills probably helped them avoid forgetting their medications.

We also found that high comorbidities were associated with a decrease in adherence among these patients. However, previous studies in Saudi Arabia and the United States have reported that patients with high comorbidities were more likely to adhere to multiple medications.[13,28]

Social support is a construct that describes the structure of a person's social environment and the perceptible instrumental and emotional support the social environment provides. Self-efficacy is the ability of patients to take their medications in good and bad situations and their ability to integrate medication management into their daily life.[29] This study illustrates the significant effect of self-efficacy and social support on adherence to antihypertensive treatment. However, only a few studies in the Arabic region have addressed these factors, and the finding is consistent with those of several other studies conducted in different countries.[30]

Although this study is the first study in the Gaza Strip that used the survey method to assess medication adherence, several limitations were observed. First, this study did not consider all factors associated with A-HTNM adherence. Therefore, a qualitative approach and exploration of more factors may provide additional information for A-HTNM adherence. Second, we did not determine the number of other medications that the patients were taking beside A-HTNM. Third, we did not discuss the classes of A-HTNM and were only concerned about the number of A-HTNM.

In conclusion, adherence to antihypertensive treatment is low among HTN patients attending primary health care clinics in the Gaza Strip, Palestine. Therefore, screening for non-adherence to A-HTNM should be a part of the routine care in primary health care clinics.

Older age, higher education level, multiple pills per day, low comorbidities, good self-efficacy, and social support were considered as predictors of higher adherence. Thus, more attention should be given to younger and less educated patients. As the same as, attention should be paid to participants who take only one pill a day, had high comorbidities and complain of poor self-efficacy and social support. Due to the multiple factors associated with non-adherence, interventions for improving adherence rate should be mainly directly toward the individuals themselves to increase their ability to challenge and cross this gap regardless of the life situations they are facing.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

ACKNOWLEDGMENTS

The researchers would like to thank the Palestinian Ministry of Health and the General Administration of Primary Health Care. This study was approved by the Tehran University of Medical Sciences Ethical Committee and the Palestinian Health Research Council. The researchers are grateful to them.

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