ASSESSMENTOFMEDICATIONADHERENCE INHYPERTENSIVEPATIENTSAMONG WARANGALPOPULATION

Abstract

Background – Hypertension is the most common disease in India where 1 in 4 people suffering with it. In order to achieve the intended therapeutic outcomes, medication adherence is essential. Patients with hypertension must adhere to their disease by taking theirprescriptionsontime,followingtheirdiet, andmakingotherlifestylemodifications. This study aims to assess medication adherence in Warangal population among hypertensive patients with comorbidities, social habits, medication use etc.

Aims: The aim of the study is to assess the level of medication adherence and to investigate predictors of medication adherence and controlled hypertension in patients and to identify the factors enhancing medication adherence. The secondary aim is to describe the extent and type of medication used in patient population in Warangal.

StudyDesign: AnObservational, retrospectiveand cross – sectional study wasemployed to assess the predictors and level of medication adherence in hypertensive patients.

Place and Duration of Study: Department of Cardiology, Sri Sri Cardiac Centre and Bhageerath Cardiac Care Centre, Hanamkonda,Warangal. The study wasconducted from October 2022 to April 2023 for about a duration of 7 months.

Methodology: Thisstudyincludes300Hypertensivepatients(Male–169,Female– 131) of age range between 20-90 years with various comorbidities like diabetes mellitus, coronary artery disease, hypothyroidism, dyslipidemia, COPD. We also included various sociodemographic factors like Gender, Age, Literacy, Income status, Alcohol consumption, Smoking status, Marital status, Controlled and Uncontrolled hypertension, usage of various drugs and Duration of hypertension. We observed Medication Adherence by using MMAS –8 scale.

Results: Low levels of medication adherence among femalepatients (41%), educated patients (58%) compared to other groups because of awareness about their condition. Low adherence is noted in patients with low-income status (9.6%), High adherence in non-smokers(73.3%) and non-alcoholic (60.6%) compared to smokers (10.6%) and alcoholics (12.6%)and high adherenceisreportedinmarried(85%)categoryascomparedtounmarried (2.6%), Patients with low comorbidities reported high adherence compared to patients with low comorbidities. High medication adherence is reported in uncontrolled blood pressure (50.3%)andinpatientswith≤1year(24.6%)and2-6years(28%)ofdurationof

hypertension. High adherence is noted with 2 combination therapy (23.6%), most of the participants are adherent to Telmisartan+ Metoprolol (25.2%) followed by Telmisartan+ hydrochlorothiazide (19.3%). According to MMAS-8 scale most of the patients reported (Q1) and (Q6), 91.3% of our study population were adherent to their medication, 7% were moderately adherent and 1.6% were low adherent to their medication.

Conclusion:91.3%of Medicationadherenceisnotedinhypertensivepatients inWarangal population. 8.6% of Medication Non-Adherence is noted and various factors for non-adherence were reported by patients. However various methods and apps should be developed to overcome the Medication Non-Adherence.

Keywords:DASHdiet,Hypertension,MedicationAdherence,MMAS–8,Non-Adherence

1.Introduction

Hypertensionispersistentincreaseinthebloodpressure.Itisdefinedassystolicbloodpressure (SBP)valuesof**130mmHg**ormoreand/ordiastolicbloodpressure(DBP)morethan**80mmHg**(1). Classificationofhypertensionwasbasedontheimpactonrisk aswasdone bytheFifthJoint National CommitteeontheDetection,EvaluationandTreatmentofhighbloodpressure(JNC-V).Accordingto JNC-V,adultbloodpressureisclassifiedasfollows:(2).IftheSBP120-139mmHgandDBP80-89 mmHgiscalledasprehypertension.IftheSBP140-159mmHgandDBP90-99mmHgiscalledas stageI hypertension. If theSBPmorethanorequalto160mmHgandDBPmorethanorequalto100 mmHgiscalledasstageIIhypertension.Medicationadherenceisthekeyinachievingthedesired clinicaloutcomes(3).Adherencetodiseaseinhypertensivepatients involvespatient'sregularuseof medications,adherencetotheirdiet andexecutingotherlifestylechanges.(4).Medicationadherence isinfluencedbymultiplefactorslikediseaserelated,patientrelated,therapyrelated,healthcare relatedfactors(5).

Non-adherencecanbetwotypesIntentionalwhereActiveprocesswherebythepatientchoosesto deviatefromthetreatmentregimenandUnintentionalPassiveprocessinwhichthepatientmaybe careless orforgetfulaboutadheringtotreatmentregimen(**6**).Furthermore,psychosocialfactorsalso influencemedicationadherence,suchasdepressedemotion,perceivedseverityofdisease,self-rated health,perceivedsymptoms,andself-efficacy.Morisky medicationadherencescale–8(MMAS-8) is usedtodevelopandtoimproveandstructureself-reports.

Thisquestionnaireisusefulasacomplimenttomoreobjectivemeasuresasitmayprovideadditional informationonthereasonswhypatientsdonotadhereoronthebarriersencounteredbypatients duringtheirmedicationtakingprocess.Thescoreofeightweresummedtocreateanoverall adherencescorerangingfrom0to8.AnMMASscore<6indicateslowadherence,ascore=8 indicateshighadherenceandascore≥6and<8indicatesmoderateadherence(3).

AdoptingeithertheDASHdietortheclassicMediterraneandietcanmeetthenutritionalneedsof hypertensivepeople.Consumptionoffruits,vegetables,grains,dairyproducts,andfoodshighinK+, Mg+2,Ca+2,andphosphorusareallpartofthisdiet.Restrictingsodiumisakeyfactorindecreasing bloodpressure.TheeffectsoftheDASHdietarecomparabletothoseofasinglemedicationtherapy. Exerciseandweightlossarethesecondprimarystrategyforcontrollinghypertensionafterdietary changes.Astressfullifestyle,depression,andanxietyneedtobeavoidedasmuchaspossible. Reducingalcoholconsumptionalsolowersbloodpressure.However,changingone'slifestyleisa dynamicprocessthatnecessitatesongoingadherence(7).

2.Materialand Methods

Thesubjectsofabove15years withvalidprescriptionswereselectedby asimplerandomsampling technique.Thedatawascollectedfromhypertensivepatientswithorwithoutcomorbidities who visitedthecardiologydepartmentaftercarefulconsiderationofeligibilitycriteria.Eachparticipant wasinformedabouttheobjectiveofastudyandthebenefitsassociatedwithstudyimmediatelybefore samplecollection.AstructuredMMAS8questionnairethatincludemedicationuse,misseddoses, forgetfulnessandsociodemographicdatawhichwasinEnglishandtranslatedtolocal Telugu languageandwasretranslatedbacktoEnglishtoensureconsistency.Subjectswhovolunteered to participateinthestudyhaveansweredquestionsinthequestionnaire

MoriskyMedicationAdherenceScale(MMAS-8)Questionnaire

1. Doyousometimes forgettotakeyourdrug?

2. Peoplesometimesmisstakingtheirmedicinesforreasonsotherthanforgetting.
   Thinkingoverthepast2weeks,werethereanydayswhenyoudidnottakeyour

drug?

3.Haveyouevercutbackorstoppedtakingdrugwithouttellingyourdoctorbecause youfeltworsewhenyoutookit?

4.Whenyoutravel orleavehome,doyousometimesforgettobringalongyourdrug?

5.Didyoutakeallyourdrug yesterday?

6.Whenyoufeellikeyoursymptomsareundercontrol,doyousometimesstop takingyourdrug?

7.Takingmedicineeverydayisarealinconvenienceforsomepeople.Doyouever feelhassledaboutstickingtoyourmedication?

8.Howoftendo youhavedifficultyrememberingtotakeyourmedication?

Rarely=4

Onceawhile=3

Sometimes=2

Never =1

3.Resultsand Discussion

Table1-Medicationadherencebasedongender

Gender	N (%)	Adherence(%)	Non-Adherence (%)
Male	169(56.3%)	50.3%	6%
Female	131(43.6%)	41%	2.6%

Table2-Agewisemedicationadherenceinhypertensivepatients

Age	N	Adherence(%)	Non-Adherence (%)
20-30	14 (4.6%)	4%	0.6%
31-40	36 (12%)	11.6%	0.3%
41-50	75 (25%)	22%	3%
51-60	89(29.6%)	27.6%	2%
61-70	55(18.33%)	16%	2.3%
71-80	28(9.33%)	9%	0.3%
81-90	03(1%)	1%	0%

Table3-MedicationAdherencebasedonLiteracy

Education	N (%)	Adherence(%)	Nonadherence (%)
Primarylevel	18(6%)	5.3%	0.6%
Educated	191(63.6%)	58%	5.6%
Graduate	15(5%)	5%	0
Illiterate	76(25.3%)	22.6%	2.6%

Table4-MedicationAdherencebasedonIncomestatus

Incomestatus	N	Adherence(%)	Non-Adherence (%)
High	3 (1%)	1%	0%
Moderate	139(46.33%)	41.3%	5%
Low	33 (11%)	9.6%	1.3%
Unknown	125(41.66%)	39.3%	2.3%

Table5-Medicationadherencebasedonalcoholconsumption

Category	N	Adherence(%)	Non-Adherence (%)
Alcoholic	38(12.6%)	8%	4.6%
Nonalcoholic	189(63%)	60.6%	2.3%
Reformed	7 (2.3%)	2%	0.3%
Occasional	69 (23%)	21%	1%

Table6-MedicationAdherencebasedonSmoking

Category	N	Adherence(%)	Non-Adherence (%)
Smoker	45 (15%)	10.6%	4.3%
Occasional	11 (3.6%)	3%	0.6%
Reformed	15(5%)	4.6%	0.3%
Non-smoker	229(76.33%)	73.3%	3%

Table7-MedicationAdherencebasedonMaritalstatus

Maritalstatus	N	Adherence(%)	Non-Adherence (%)
Married	281(93.6%)	85%	8.6%
Unmarried	8 (2.6%)	2.6%	0%
Unknown	11(3.66%)	3.6%	0%

Table8-MedicationAdherencebasedonnumberofcomorbidities

No.of comorbidities	N	Adherence(%)	Non-Adherence (%)
1	113(27.6%)	33.3%	4.3%
2	23 (7.6%)	7%	0.6%
3	6 (2%)	2%	0%
>3	1 (0.3%)	0.3%	0%
No comorbidities	127(42.3%)	39.3%	3%
Unknown	30 (10%)	9.3%	0.6%

Table9-MedicationAdherencebasedonControlledandUncontrolledHypertension

Category	N	Adherence(%)	Non-Adherence (%)
Controlled	136(45.3%)	40.6%	4.6%
Uncontrolled	164(54.6%)	50.3%	4.3%

Table10-MedicationAdherencebasedondrugsusedinhypertension

Drug	N	Adherence(%)	Non-Adherence (%)
Singletherapy	110	98 (89%)	12(10.9%)
2combinations	79	71(23.6%)	8(2.6%)
3 combinations	40	39(13%)	1(0.3%)
Multipletherapy	71	66(22%)	5(1.6%)

Table11-MedicationAdherencebasedondurationofhypertension

Duration	N	Adherence(%)	Non-adherence (%)
≤1 year	77(25.6%)	24.6%	1%
2-6 years	89(29.6%)	28%	1.6%
7-10years	46(15.3%)	15.3%	0%
11-15years	14 (4.6%)	3.6%	1%
16-20years	18(6%)	4.6%	1.3%
21-25years	6 (2%)	0.6%	1.3%
26-30years	1 (0.33%)		0.3%
Unknown	49(16.3%)	14.3%	2%

Table12-MedicationAdherenceofpatientsassessedbyMMAS-8scale

Questions	Yes	No
Forgettingsometimestotake your medications	17 (5.6%)	283(94.3%)
Forgetting to take medicationsoverlasttwo weeks	3 (1%)	297(99%)
Stoppingmedicationononown self after feeling discomfort withdrugsoradverseeffects	6 (2%)	294(98%)
Forgettingtotakemedication while leaving out of home	7 (2.3%)	293(97.6%)
Takingmedicationyesterday	292(97.3%)	8 (2.6%)
Stopping drugs own-self with thinking good blood pressure control	13 (4.3%)	287(95.6%)
Feelingdiscomforttotake drugs daily	2 (0.6%)	298(99.3%)
Frequencyofforgetting medication		

Never	274	91.3%
Once inawhile	4	1.3%
Rarely	2	0.6%
Sometimes	15	5%
Always	5	1.6%

Table13-Overall adherence

Overalladherence	**N**	**Percentage(%)**
Highadherence(=8)	274	91.3%
Moderateadherence(6-8)	21	7%
Lowadherence(<6)	5	1.6%

Table14-Reasonsfornon-Adherenceamongparticipants

Reasons	**N (%)**
Forgetfulness	19 (6.3%)
Lackofreminders	6 (2%)
Busylifestyle	15(5%)
Sideeffectsofmedication	6 (2%)
Interruptionsofdailyroutine	15(5%)
Misbelievesonmedicine	5 (1.6%)
Takingmedicationonwrongtime	2 (0.6%)

Medicationuse amonghypertensivepatientswere observed, however91.3%patientswho participatedinourstudyareadherenttoantihypertensivemedicationsandobservedbyconsidering factorslikeage,gender,literacyrate,incomestatus,maritalstatus,socialhabitslikealcohol consumptionandsmoking,comorbidities,durationofhypertensionandtreatmentassociatedwith levelofawareness,forgetfulness,lackofreminders,misbelievesandsideeffectsonmedication, alsomedicationadherencewasmeasuredusingMMAS-8scale.

Wehavefoundthat48%ofparticipantsarewithcomorbidconditions.Mostcommonwere diabetesmellitus,CAD,COPD,Cervicalspondylosis,Dyslipidemia,hypothyroidismetc.Inour studyweobserved300patients.Outofwhich91.3%ofthestudysubjectswerefoundtobe adherent.Incontrasttoourstudy,accordingtoAsgedometal.,(2018)(8)61.8%wereadherent.

169(56.3%)ofstudyparticipantsweremaleand131(43.6%)arefemalescomparedto 51 (33.3%)weremaleand102(66.7%)arefemalesoutof153participantsPirasathandSundareshan

(2021)(9)andinourstudy50.3%maleparticipantswereadherentand6%arenon-adherentand 41%femaleparticipantsareadherentand2.6%arenon-adherent comparedtoKhayyat etal.,(2017) (3)40%malepatientsareadherentand41patientsarenon-adherentand59%malepatientsare adherentand41%arenon-adherent.

Wefoundthatthepercentageofagegroupbetween20-30yearswas4.6%,12%ofthe patientsbelongstotheagegroup31-40years,25%ofthepatientsbelongtoagegroup41-50, 29.6%ofthepatientsbelongtoagegroup51-60,18.33%ofpatientsbelongtotheagegroup61- 70,9.33%ofpatientsbelongtotheagegroup71-80and1%ofpatientsbelongtotheagegroup 81-90.Incontrasttoourstudy,accordingtoKhayyatetal.,(2017)(3),2.5%ofpatientsbelongto theagegroupof19-35,23%ofpatientsbelongtotheagegroupof36-50,50.5%ofthepatients belongtotheagegroupof51-65,20.1%ofthepatientsbelongtotheagegroupof66-85and3.9%of thepatientsbelongtotheagegroupof>85.Inourstudy,outof4.6%ofagegroup20-30,4%are adherentand0.6%arenon-adherent,12%ofagegroup31-40,11.6%areadherentand0.3%are non-adherent,25%ofagegroup41-50,22%areadherentand3%arenon-adherent,29.6%of agegroup51-60,27.6%areadherentand2%arenon-adherent,18.33%ofagegroup61-70, 16%areadherentand2.3%arenon-adherent,9.33%ofagegroup71-81,9%areadherentand 0.3%arenon-adherentand1%ofagegroup81-90,1%areadherentandnonon-adherenceis noted.

Wealsoconsideredlevelofeducationasafactorofmedicationadherence,we foundthatpercentageofprimarylevelwas6%,educatedwas63.6%,graduateswas5%and illiteratewas25.3%comparedtoKhayyatetal.,(2017)(3),elementarywas22.5%,highschoolwas 17.2%,BSdegree orhigherwas12.3% andilliterate was48%.Medicationadherenceinourstudy wasfoundtobe5.3%are adherentand 0.6%arenon-adherentinprimarylevel, 58%areadherent and5.6%arenon-adherentineducated,5%areadherentandnonon-adherenceisnotedin graduates,22.6%areadherentan2.6%arenon-adherentinilliterates.

Wefoundthat1%ofparticipantshavehighincome,46.33%havemoderateincome,11% havelowincomeand41.66%participantsincomestatusisunknown.Incontrasttoourstudy, accordingtoShimelsetal.,(2021)(10),45.7%wasbelongtoextremepovertyand54.3%wasbelong tomoderatepovertyorbetterandinourstudy1%wereadherentand nonon-adherence isnotedin highincome,41.3%adherenceand5%non-adherenceisnotedinmoderateincome,9.6% adherenceand1.3%non-adherenceisnotedinlowincomeandinunknownincomestatus39.3% and2.3%areadherenceandnon-adherencerespectively.

We foundthat8%wereadherentand4.6%werenon-adherentinalcoholics,60.6%were adherentand2.3%werenon-adherentinnon-alcoholics,2%wereadherentand0.3%werenon- adherentin reformedand21%were adherentand1%werenon-adherentin occasionalalcoholics. Incontrasttoourstudy,accordingtoSibomanaetal.,(2019)(11),11.7%werealcoholicinwhich 76.9%werehighlyadherentand23.1%werelowtomoderateadherentand88.3%werenon- alcoholicinwhich76.5%werehighlyadherentand23.5%werelowtomoderateadherent.

Incaseofsmokers10.6%wereadherentand4.3%werenon-adherent,3%wereadherent and0.6%werenon-adherentinoccasionalsmokers,4.6%wereadherentand0.3%werenon- adherentinreformedand73.3%wereadherentand3%werenon-adherentinnon-smokers comparetoSibomanaetal.,(2019)(11),5.4%weresmokersinwhich83.3%werehighly adherentand16.7%werelowtomoderateadherentand94.6%werenon-smokersinwhich 76.2%werehighlyadherentand23.8%werelowtomoderateadherent.

Inthisstudy93.6%weremarried,2.6%wereunmarriedand3.66%participantsmarital statusisunknowncomparedtoAsgedometal.,(2018)(8),78.6%weremarried,6.8%were unmarriedandwidowedand14.6%weredivorced.Inourstudy85%wereadherentand8.6%were non-adherent inmarried category,2.6% wereadherentand nonon-adherenceisnotedinunmarried categoryand3.6%wereadherent andnonon-adherenceisnotedinunknowncategorycomparedto Khayyatetal.,(2017)(3),49%wereadherentand51%werenon-adherentinmarriedcategory,60% and40%wereadherentandnon-adherentinunmarriedrespectively,31%and69%wereadherent andnon-adherentinwidowedrespectivelyand42%and58%wereadherentandnon-adherentin divorcedrespectively.

Wenoticedthat48%ofparticipantsarewithcomorbidities,42% are withoutcomorbidities and10%areunknowncomparedtoShimelsetal.,(2021)(10),38.9%arewithcomorbiditiesand 61.1%arewithoutcomorbidities.Inourstudy27.6%ofparticipantshaving1comorbidityinwhich 33.3%adherentand4.3%werenon-adherent,7.6%ofparticipantsarehavingtwocomorbiditiesin which7%wereadherentand0.6%werenon-adherent,2%ofparticipantsarehaving3 comorbiditiesinwhich2%wereadherentandnonon-adherenceisnoted,42.3%ofparticipants werehavingnocomorbidities inwhich39.3%wereadherentand3%werenon-adherentand10% ofparticipantsareunknowninwhich9.3%wereadherentand0.6%werenon-adherentcompared toKhayyatetal.,(2017)(3),48%arewith≤2morbidities,45.6%arewith3morbiditiesand6.4% arewith≥4comorbiditiesand47%wereadherentand53%werenon-adherentofparticipants having≤3comorbiditiesand41%and59%wereadherentandnon-adherentofparticipantswith>3 comorbiditiesrespectively.

Wefiguredoutthat46.15%ofhypertensivepatientsarewithDM,4.19%arewithCAD, 4.89%arewithCOPD,4.19%arewithCervicalSpondylosis,2.79%arewithdyslipidemia,2.79% arewithhypothyroidism,2.09%arewithEpilepsyand31.85%areothersascomorbidities.In contrasttoourstudy,accordingtoAsgedometal.,(2018)(8),26.1%arewithDM,23.2%arewith peripheralneuropathy,11.4%arewithdyspepsia, 5%arewithHypertrophicheartdisease, 2.5%are withheart failure,2.1%are withCKDand3.1%areothers.Inourstudy,57participantsareadherent and9participantswerenon-adherentwithDM,6wereadherentandnonon-adherenceisnotedin participantswithCAD,6wereadherentand1werenon-adherentwithCOPD,5wereadherent and1 were non-adherentwithCervicalspondylosis,4wereadherentandnonon-adherenceis notedwith dyslipidemia,4wereadherentandnonon-adherenceisnotedwithhypothyroidism,1wereadherent andnonon-adherenceisnotedwithepilepsyand42wereadherentand4werenon-adherentin others.Highadherence(46.15%)isnotedinpatientswithDMwithHypertension.

Wecametoknowthat45.3%ofparticipantsarewithcontrolledhypertensionand54.6% arewithuncontrolledhypertensioncomparedtoKhayyatetal.,(2017)(3),69.6%arewith controlledhypertensionand30.4%arewithuncontrolledhypertension.Inourstudy,40.6%and 4.6%areadherentandnon-adherentincontrolledhypertensionrespectivelyand50.3%and4.3% areadherentandnon-adherentinuncontrolledhypertensionrespectively.

Wenoticedthat25.6%ofourstudyarewithhypertensionsince≤1year,29.6%arewith hypertensionfrom2-6years,15.3%arewithhypertensionfrom7-10years,4.6%arewith hypertensionfrom11-15years,6%arewithhypertensionfrom16-20years,2%arewith hypertensionfrom21-25years,0.33%arewithhypertensionfrom26-30years anddurationof hypertensionof16.3%wasunknown,comparedtoBoratesetal.,(2018)(4)9.5%arewith hypertensionfrom6-12months,38.1%arewithhypertensionfrom2-6years,20.4%arewith hypertensionfrom7-10years,32%arewithhypertensionfrom≥11years.

Inpatientswithdurationofhypertension≤1year24.6%wereadherent,1%werenon adherent,2-6years28%wereadherent,1.6%werenonadherent,7-10years15.3%wereadherent, thereisnononadherence,11-15years3.6%wereadherent,1%werenonadherent,16-20years 4.6%wereadherent,1.3%werenon-adherent,21-25years0.6%wereadherent1.3%werenon adherent,26-30yearsthereisnoadherence0.3%werenonadherentandinunknowncategory 14.3%wereadherent,2%werenonadherent.

Outof300patients,110patientswereonmonotherapy,79wereontwocombination therapy,40wereonthreecombinationtherapyand71wereonmultipletherapy.Incontrasttoour study,accordingtoKhayyatetal.,(2017)(3)10wereon1medication,25wereon2medications,34 wereon3medications,48wereon4medications,34wereon5medications,53wereon≥6 medications.Inpatientsreceivingmonotherapy–telmisartan-45wereadherent7werenon adherent,metoprolol–26wereadherent1was nonadherent,Bisoprolol–8wereadherentandno nonadherenceisnoted,amlodipine–6wereadherent,1wasnonadherent,Cilnidipine–4were adherentandthereisnononadherence,Clonidine–1wasadherentthereisnononadherence, propranolol–1wasadherent1wasnonadherent,Olmesartan–2wereadherentthereisnonon adherence,Prazosin– 2wereadherent1wasnonadherent,Nebivolol– 1wasadherentthere isno nonadherence,Ramipril–1wasadherent1wasnonadherence.Outof110patientsreceiving monotherapymostofthepatientswereadherenttotelmisartanfollowedbymetoprolol.Inpatients receivingtwocombinationtherapy71wereadherent8werenonadherent,wheremostofthepatients wereadherenttoTelmisartan+MetoprololandTelmisartan+Hydrochlorothiazide.Inpatients receivingthreecombinationtherapy39wereadherent1wasnonadherentwheremostofthe

patientsareadherenttoMetoprolol+Telmisartan+ChlorthalidoneandTelmisartan+Amlodipine+ Hydrochlorothiazide.Inpatientsreceivingmultipletherapy66wereadherent5werenonadherent.

WeusedMMAS-8Scaletoassessthemedicationadherence.Thisconsistsof8questions, Moriskymedicationadherencescale–8(MMAS-8)isusedtodevelopandtoimproveand structureself-reports.Itissimple,practicalandcosteffectivetoevaluatepatient'smedication adherenceThisquestionnaireisusefulasacomplimenttomoreobjectivemeasuresasitmay provideadditionalinformationonthereasonswhypatientsdonotadhereoronthebarriers encounteredbypatientsduringtheirmedicationtakingprocess.Thescoreofeightweresummed tocreateanoveralladherencescorerangingfrom0to8.AnMMASscore<6indicateslow adherence,ascore=8indicateshighadherenceandascore≥6and<8indicatesmoderate adherence(13)(14).

Wefoundthat91.3%arehighlyadherent(=8),7%weremoderatelyadherent(6-8)and 1.6%participantsarelowadherent(<6)totheirhypertensivemedications.IncontrasttoKhayyatetal., (2017)(3)22.5%werehighlyadherent,23.5%weremoderately adherentand54%werelow adherent becauseinSaudiArabiawomenwithlongtimeconditionsarelesslikelytoreceive medical treatmentandmonitoringrecommendedbyclinicalguideline.Furthermore,middleagedpatients usuallyhaveworkrelatedcommitmentsandotherprioritiesintheirlives,thereforemaynotbeableto attendtheirclinicappointmentsandtaketheirmedicationsasprescribed.

4.Conclusion

Thisstudydeterminestheknowledge,beliefsaboutmedication andmedicationadherencein hypertensivepatients.Lowlevelsofmedicationadherenceamongfemalepatients(41%)have reportedinthisstudy,ithasbeendocumentedthatduetotheirbusylifestyle,lackofremindersand forgetfulnessarereasonsforlowadherenceinfemalesandineducatedpatients(58%)compared toothergroupsbecauseofawarenessabouttheircondition,medicationuseandeffectsofnot usingmedication.Lowadherenceisnotedinpatientswithlow-incomestatus(9.6%)duetothe affordabilityof themedicationandlackoffollow-ups.Highadherenceinnon-smokers(73.3%)and non-alcoholic(60.6%)comparedtosmokers(10.6%)andalcoholics(12.6%)isnotedassmoking andalcoholicconsumptionweakenstheeffectofanti-hypertensivedrugssothepeoplemaythink thedrugisinefficientinthemandhighadherenceisreportedinmarried(85%)categoryas comparedtounmarried(2.6%)duetothelackofreminders.Patientswithlowcomorbiditiesreported highadherencecomparedtopatientswithcomorbidities.Asthenumberofcomorbiditiesincreases adherenceisdecreased.Thismaybeduetopolypharmacy,adversedrugreactionsandlackof interestinlongtermpatients.Highmedicationadherenceisreportedinuncontrolledblood pressure(50.3%)patientsastheytendtotakemedicationsregularly.

Highadherenceisnotedinpatients≤1year(24.6%)and2-6years(28%)ofdurationof hypertensioncomparedtolongtermhypertensivepatients.Newlydiagnosedpatientshavefearof theirconditionsothatleadtotaketheirmedicationsregularly,inlongtermpatientsmayneglect theirmedicationduetopolypharmacyandpossibleadversedrugeffectsandhighadherenceis notedwith2combinationtherapy(23.6%)mostoftheparticipantsareadherenttoTelmisartan+ Metoprolol(25.2%)followedbyTelmisartan+hydrochlorothiazide(19.3%)astheyarecost effective,minimalADRsand easilyavailableinthemarket.AccordingtoMMAS-8 scalemostofthe patientsreportedforgettingmedicationsometimes(Q1)andstoppingdrugsontheirownthinking goodbloodpressurecontrol(Q6),91.3%ofourstudypopulationwereadherenttotheirmedication, 7%weremoderatelyadherentand1.6%werelowadherenttotheirmedication.Mostofthe patientsreportedforgetfulness (6.3%)busylifestyle(5%),interruptionsindailyroutine(5%),lackof reminders(2%),sideeffectsofmedications(2%),misbeliefsonmedicine(1.6%)andtaking medicationinwrongtime(0.6%)arethepredictorsofnon-adherenceinourstudy.

Toovercomethemedicationnon-adherencefactorslikemedicationcharts,introducingpill countingmethod,medicationtoolslikemobileapps,bloodpressuretrackers,educatingthecare

takersofthepatients,automaticrefills,ongoingcommunicationwithhealthcareprovidersmay improvethemedicationadherence.

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COMPETINGINTERESTS

Authorshavedeclaredthatnocompetinginterestsexist

AUTHORS'CONTRIBUTIONS

Thisworkwascarriedoutincollaborationamongallauthors.Allauthorsreadandapprovedthe finalmanuscript.

CONSENT

Allauthorsdeclarethat'writteninformedconsentwasobtainedfromthepatient(orotherapproved parties)forpublicationofthisarticleandaccompanyingimages.

ETHICALAPPROVAL

Allauthorsherebydeclarethatallexperimentshavebeenexaminedandapprovedbytheiec of CarecollegeofPharmacy.

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ABBREVIATIONS

ATH-Antihypertensivepatient
aTRH-Apparenttreatment-resistanthyper
DASH-DietaryApproachestoStopHypertension

DAT-Digitaladherencetechnologies
JNC-V-FifthJointNationalCommittee
MAQ-MedicationAdherenceQuestionnaire
MMAS–8-MoriskyMedicationAdherenceScale–8
N-Numberofpatients

APPENDIX

MORISKYMEDICATIONADHERENCESCALE(MMAS-8)QUESTIONNAIRE

Questions	Response(Yes)	Response(No)
Forgettingsometimesto take your medication		
Forgetting to take medicationoverlast2 weeks		
Stopping medication own-selfafterfeelingof discomfort with drugs/ adverse effects		
Forgetting to take medicationwhileleaving out of home		
Takingmedication yesterday		
Stopping drugs own-self withthinkinggoodblood pressure control		
Feelingdiscomfortto take drugs daily		
Thefrequencyof forgettingtotake medication Rarely = 4 Once a while = 3 Sometimes=2never=1		
Score–8high		

Sociodemographicdetailsofhypertensivepatient'squestionnaire

Demographicvariables	Response(Yes/No)	(N)
GENDER		
Male		
Female		
AGE(Years)		
20-30		
31-40		
41-50		
51-60		
61-70		
71-80		
81-90		
91-100		
EDUCATIONLEVEL		
Educated		
Primarylevel		
Graduate		
Illiterate		
EMPLOYMENTSTATUS		
Self-employee		
Governmentemployee		
Homemaker		
Software		
RMP		
Retired		
Unknown		
Unemployed		
INCOMESTATUS		
High		
Moderate		
Low		
Unknown		
MARITALSTATUS		
Single		
Married		
Unknown		
SMOKINGSTATUS		
Smoker		
Nonsmoker		

Occasionally		
Reformed		
ALCOHOLSTATUS		
Consumers		
Nonconsumers		
Occasionally		
Reformed		
COMORBIDITY		
DiabetesMellitus		
Renalcalculi		
OldCVA		
Hypothyroidism		
PostPPIstatus		
AKI		
CAD		
Dyslipidaemia		
Cervicalspondylitis		
Bronchialasthma		
Obesity		
COPD		
MVR		
Hyperthyroidism		
Gastritis		
Anxiety		
Psychiatricillness		
AWMI		
LumbarPIVD		
Rheumatoidarthritis		
CKD		
Dialysis		
RHD		
Anaemia		
SLE		
Epilepsy		
Osteoarthritis		
No comorbidity		
DURATION OF HYPERTENSION(Years)		
1		
2-6		
7-10		
11-15		
16-20		
21-25		
26-30		
Notknown		

DURATION OF TREATMENT(Years)		
1		
2 -6		
7 -10		
11-15		
16-20		
21-25		
26-30		
Unknown		
HYPERTENSIONRANGE		
Controlled		
Uncontrolled		
GivenMedications		

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462 WEHAVEUSEDTHEABOVEQUESTIONNAIRE TOCOLLECTTHEDATA