

Comparative Risk Reduction of Hypertension in Diabetic Patients by Allopathic and Alternative Therapeutic Systems – A Cross Sectional Survey

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ABSTRACT

Objectives: The main goal of study is to assess the effect of different therapeutic systems of medicine including Allopathic and Alternative Medicine in reducing the risk of Hypertension (HTN) by applying standardized tools of Evidenced Based Medicine in patients of T2D (Type-II-Diabetes).

Methods: Cross-sectional study was conducted from July-2018 to June-2019. Two-hundred (N=200) confirmed cases of T2D enrolled in the study. Patients treated with either Allopathic, Herbal, Homeopathic and/or Combination-systems of medicines. Primary-end-point of study was outcome of Hypertension. Data has been evaluated by Relative Risk Reduction (RRR) of HTN and Number-Needed-to-Treat (NNT) for reduction of one case of HTN. Data was processed through the Statistical-Package-for-Social-Sciences (SPSS-22).

Results: Four groups of therapy were compared in T2D patients; Allopathic, Homeopathic, Herbal and Combination. T2D-patients taking insulin; RRR of HTN by Allopathic-system V/S Combination-system:-27.30%,NNT≈-05.0; without insulin RRR by Allopathic-system V/S Homeopathic-system:-211%,NNT≈-2.0; V/S Herbal:-84.72%,NNT≈-3.0; combination:-42%,NNT≈-4.0. With Exercise RRR by Allopathic-system V/S Herbal-system:-550%,NNT≈-1.0; V/S combination:-35.41%,NNT≈-5.0. Without Exercise RRR by Allopathic-system V/S Homeopathic:-211%,NNT≈-2.0; V/S Herbal-system:-69.62%,NNT≈-3.0; V/S combination-system:-46.86%,NNT≈-4.0. With Low-caloric-diet RRR by Allopathic-system V/S Homeopathic-system:-646%,NNT≈-1.0; V/S Herbal-system:-86.66%,NNT≈-2.0; V/S combination:-45.82%,NNT≈-3.0. Without Low-caloric-diet RRR by Allopathic-system V/S Homeopathic -system: -52%,NNT≈-4.0; V/S Herbal-system:-128%,NNT≈-2.0; V/S combination-system:-42.5%,NNT≈-4.0. In combination-systems of medicine; RRR by Allopathic + Homeopathic V/S Allopathic + Herbal: 16.25%,NNT≈10; V/S Allopathic + Homeopathic + Herbal: 46.16%,NNT≈2.

Conclusion: Allopathic-system of medicine posses' high risk of HTN compared to homeopathic, herbal and combination-systems of medicine in T2D-patients.

Keywords: Diabetes; hypertension; risk; relative-risk-reduction; number-needed-to-treat.

INTRODUCTION

Diabetes mellitus (DM) and Hypertension (HTN) are considered as silent killer; their prevalence is rising day by day; the co-existence of both diseases synergistically contributes in the development of micro and macro vascular complications and ultimately lead to death [1]. In patients of Type-II Diabetes Mellitus (T2DM); micro-vascular complications increases the risk of cardiovascular complications including HTN [2]. According to one published data; around 10% of US (United States) adult population is suffering from DM; among which 76.30% patients have HTN along with DM.[1] It is recommended that treatment of HTN should be more aggressive in patients having DM; particularly T2DM [3].

Plenty of published data is available of Allopathic system of medicine for the treatment of DM, T2DM and HTN. Randomized controlled trial on Allopathic system of medicines revealed that in diabetic patients; the target goal is to keep blood pressure <140/90 mm Hg [4]. American Diabetes Association (ADA) mentioned in Standard of Medical care for Diabetes – 2020; preferred drug classes to meet target goal of blood pressure in diabetic individuals are; ACE (Angiotensin Converting Enzyme) Inhibitors, ARB (Angiotensin Receptor Blockers), CCB (Calcium Channel Blockers) and Diuretics [5]. Because large number of population in the world are now relying on Complementary & Alternative Medicine (CAM) for their major and minor health related disorders; that is why; in recent years CAM is a main focus of research [6]. In Pakistan for treating different ailments; approximately 50% of population are preferring CAM (homeopathic; herbal; combinations of different therapy) and it is attaining the popularity [7]. Relative risk reduction (RRR) of any disease related complications and number needed to treat (NNT) analysis are standardized tools provided by Evidences Based Medical Practices (EBM) to compare the outcomes of different therapeutic systems as well as different drugs [8].

Due to this reason; the main goal of current study is to assess the effect of different therapeutic systems of medicine including Allopathic and CAM in reducing the risk of HTN by applying standardized tools of EBM in patients of T2D (Type II Diabetes).

MATERIALS AND METHODS

Study Design, Place and Duration: Cross-sectional prospective study was conducted from July-2018 to June-2019 on comparative effectiveness of Alternative medicine and Allopathic oral hypoglycemic medicines in T2D patients in outpatient care-centers of Karachi.

Data Collection: Two-hundred (N=200) confirmed cases of T2D enrolled in the study. Patients treated with Allopathic, Herbal, Homeopathic and/or Combination systems of medicines (Figure – 1).

Study End-Point: Outcome of Hypertension was considered as a primary end point of study.

Ethical Approvals: Institutional Bioethics Committee, University of Karachi (Project-reference-number IBC-KU-23) and Interactive Rsch. & Development, IRB-IRD#IRD_IRB_2017_03_018,IRB#1-IRD (Registration-number-IRB-00005148) have granted the ethical approval for study.

Sample Size and Technique: Minimum sample size of the study was 196 T2D patients. Sample size was determined by using precision analysis technique [9].

Data Collection Procedure: Data was obtained by pre-designed and organized questionnaires. A written informed consent was obtained from each patient prior to initiating the survey. According to Declaration of Helsinki; [10], all researchers ensured the patient's data confidentiality.

Assessment of Data: After filling the primary questionnaire by the clinicians; data has been evaluated by Absolute Risk Reduction (ARR); Relative Risk Reduction (RRR); Relative Risk of any outcome of HTN and Number-Needed-to-Treat (NNT) for reduction of one case of HTN; they are an important indicators of clinical efficacy of drugs or therapeutic systems in Evidence Based Medicine [11]. Relative risk reduction (RRR) is the difference in event rates between two treatment groups, expressed as a proportion of event rate [12]. The number needed to treat (NNT) refers to the number of patients that must receive the treatment in order to for one patient to experience a desired outcome.[8] The data was processed through the Statistical Package for Social Sciences (SPSS version 22).

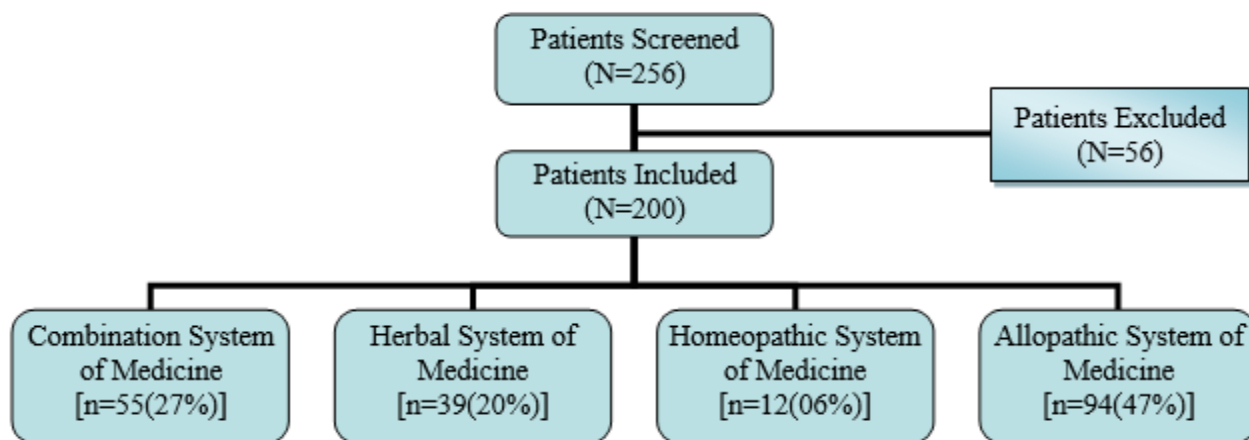


Figure 1. Therapeutic arms of different treatments.

RESULTS

Number Needed to Treat (NNT) analysis for reduction of one outcome of HTN, Absolute Risk Reduction (ARR), Relative Risk Reduction (RRR) of HTN were determined in between therapeutic systems versus insulin use (Table 1).

Number Needed to Treat (NNT) analysis for reduction of one outcome of HTN, Absolute Risk Reduction (ARR), Relative Risk Reduction (RRR) of HTN were determined in between therapeutic systems versus physical activity status (Table 2).

Number Needed to Treat (NNT) analysis for reduction of one outcome of HTN, Absolute Risk Reduction (ARR), Relative Risk Reduction (RRR) of HTN were determined in between therapeutic systems versus low caloric diet status (Table 3).

Number Needed to Treat (NNT) analysis for reduction of one outcome of HTN, Absolute Risk Reduction (ARR), Relative Risk Reduction (RRR) of HTN were determined in between different combinations of therapeutic systems (Table 4).

Table 1. Insulin Use Status Wise Incidences, Relative Risk, RRR*, ARR** of Hypertension and NNT*** for One Case of Hypertension in Different Therapeutic Systems in Comparison to Allopathic System.

Insulin Status	Incidences of Hypertension				Relative Risk	RRR*	ARR**	NNT***
	Allopathic System	Homeopathic System	Herbal System	Combination System				
With Insulin	88.13%	-----	-----	69.23%	-1.27	-27.30%	-18.90%	-5.29 ≈ -5.0
Without Insulin	77.77%	25%	-----	-----	-3.11	-211.08%	-52.77%	-1.89 ≈ 2.0
		-----	42.10%	-----	-1.84	-84.72%	35.67%	-2.80 ≈ 3.0
		-----	-----	54.76%	-1.42	-42.01%	-23.01%	-4.34 ≈ 4.0

*RRR=Relative Risk Reduction; **ARR=Absolute Risk Reduction; ***NNT=Number Needed to Treat

Table 2. Exercise / Physical Activity Status Wise Incidences, Relative Risk, RRR*, ARR of Hypertension and NNT*** For One Case of Hypertension in Different Therapeutic Systems in Comparison to Allopathic System.**

Exercise / Physical Activity	Incidences of Hypertension				Relative Risk	RRR*	ARR**	NNT***
	Allopathic System	Homeopathic System	Herbal System	Combination System				
Physical Activity	81.25%	-----	12.50%	-----	-6.50	-550%	-68.75%	-1.45 ≈ -1.0
				60.0%	-1.35	-35.41%	-21.25%	-4.70 ≈ -5.0
No Physical Activity	84.81%	27.27%	-----	-----	-3.11	-211%	-57.54%	-1.73 ≈ -2.0
		-----	50.0%	-----	-1.69	-69.62%	-34.81%	-2.87 ≈ -3.0
		-----	-----	57.77%	-1.46	46.80%	-27.04%	-3.69 ≈ -4.0

*RRR=Relative Risk Reduction; **ARR=Absolute Risk Reduction; ***NNT=Number Needed to Treat

Table 3. Diet Status Wise Incidences, Relative Risk, RRR*, ARR of Hypertension and NNT*** For One Case of Hypertension in Different Therapeutic Systems in Comparison to Allopathic System.**

Low Caloric Diet Status	Incidences of Hypertension				Relative Risk	RRR*	ARR**	NNT***
	Allopathic System	Homeopathic System	Herbal System	Combination System				
Low Caloric Diet	93.33%	12.5%	-----	-----	-7.46	-646%	-80.33%	-1.23 ≈ -1.0
		-----	50.0%	-----	-1.86	-86.66%	-43.33%	-2.30 ≈ -2.0
		-----	-----	64.0%	-1.45	-45.82%	-29.33%	-3.40 ≈ -3.0
Low Caloric Diet Status	76.0%	50.0%	-----	-----	-1.52	-52.0%	-26.0%	-3.84 ≈ -4.0
		-----	33.33%	-----	-2.28	-128%	-42.67%	-2.34 ≈ -2.0
		-----	-----	53.33%	-1.42	-42.50%	-22.67%	-4.41 ≈ -4.0

*RRR=Relative Risk Reduction; **ARR=Absolute Risk Reduction; ***NNT=Number Needed to Treat

Table 4. Therapy Combination Wise Incidences, Relative Risk, RRR*, ARR of Hypertension and NNT*** For One Case of Hypertension in Different Therapeutic Systems Combinations Compare to Allopathic + Homeopathic Combination.**

Incidences of Hypertension			Relative Risk	RRR*	ARR**	NNT***
Allopathic + Homeopathic System	Allopathic + Herbal System	Allopathic + Homeopathic + Herbal System				
53.84%	64.28%	-----	0.83	16.24%	10.44%	9.57 ≈ 10.0
	-----	100%	0.53	46.16%	46.16%	2.16 ≈ 2.0

*RRR=Relative Risk Reduction; **ARR=Absolute Risk Reduction; ***NNT=Number Needed to Treat

DISCUSSION

Hypertension (HTN) is a common issue in the patients of T2D; according to one reference; it is exceeding 60% in T2D patients [13]. HTN and T2D as a co-morbid conditions; enhances the risk of macro-vascular and micro-vascular complications due to

overlapping risk factors [13]. These risk factors include; duration of T2D, age, sex, ethnicity/race, BMI (Body Mass Index), glycemic control and presence of kidney disease [14]. Due to these risk factors; blood pressure should be monitored in every clinical visit of T2D patient as well as at home [15]. Current study

compared different therapeutic systems for risk reduction of HTN in T2D patients.

In general; it is noted in current study that in comparison of the allopathic and other systems of medicine; HTN cases are having rising trend except combination system of medications. In patients of diabetes vascular remodeling and increase body fluid leads to HTN [16]. Calcium-calmodulin pathway has been extremely investigated and reported that it increases intracellular calcium levels; which leads to inhibition of gene responsible for insulin synthesis; as a result of this stiffness of arteriole occurs and leads to HTN [17]. In comparison of different therapeutic systems; it is observed in current study that incidences of HTN were higher in allopathic system of medicine (88.13%) compared to combination system of medicine (69.23%), while patient were also taking insulin. Based upon these incidences; RRR and NNT by allopathic system compared to combination system were -27.30% and \approx -5.0 respectively; hence it has concluded that combination system of medicine is better than allopathic system for risk reduction of HTN compared to allopathic system in T2D patients. (Table 1) In another study; RRR of microvascular complication with allopathic drugs was 25% ($p=0.0099$) [18]. Without use of insulin; almost similar observations were noted compared to homeopathic system, herbal system and combination system. RRR and NNT by allopathic system compared to homeopathic system, herbal system and combination system were -211.08%; \approx -2.0, -84.72%; \approx -3.0, -42.01%; \approx -4.0 respectively. (Table 1) Without insulin administration; patients were having less incidences of HTN in all three comparative therapeutic systems i.e. homeopathic (25%), herbal (42.10%) and combination system (54.76%). Findings of these data are emphasizing that alternative system of medicines are better compared to allopathic system of medicine for risk reduction of HTN in T2D patients. Despite all these findings; anti-diabetic efficacy of allopathic system of medicine are superior compare to all other system of medicines [19-21].

Physical activity and exercises in T2D patients are important non-pharmacological interventions to keep patients fit. According to American Diabetes Association; physical activity and exercise should be recommended to all diabetic patients for better glycemic control [22]. Current study compared different therapeutic systems for risk reduction of HTN while patients were engaged in physical activities and

not engaged in physical activity. (Table 2) With the physical activity; incidences of HTN were reported more in allopathic group (81.25%) compared to herbal (12.50%) and combination system (60%). Based upon these incidences RRR and NNT by allopathic system of medicine compared to herbal and combination system were -550%; \approx -1.0 and -35.41%; \approx -5.0 respectively. Findings were not different in the arm of study, where patients were not engaged in physical activity; RRR and NNT by allopathic system of medicine in this arm compared to homeopathic system, herbal system and combination system were -211%; \approx -2.0, -69.62%; \approx -3.0 and -46.80%; \approx -4.0 respectively. (Table 2) In general; it is observed that aerobic and resistance exercises not only improve glycemic control but also reduce cardiovascular risk markers e.g. HTN [23].

Nutritional management of T2D patients by recommendation of low-caloric-diet also produce better regulation of blood glucose levels [24]. Due to this reason current study also measured the risk of HTN in T2D patients while these patients were taking low-caloric-diet and were not taking low-caloric-diet. (Table 3) Observed incidences of HTN in T2D patients with low-caloric-diet were; allopathic system (93.33%), homeopathic system (12.50%), herbal system (50%) and combination system (64%). Similarly, without low-caloric-diet; incidences were allopathic system (76%), homeopathic system (50%), herbal system (33.33%) and combination system (53.33%). These incidences of HTN with and without low-caloric-diet are also providing evidence that risk is higher in allopathic system of medicine compared to all other alternative systems. (Table 3) With low-caloric-diet; RRR and NNT by allopathic system compared to homeopathic, herbal and combination systems were -646%; \approx -1.0, -86.66%; \approx -2.0, -45.82%; \approx -3.0 respectively. Similarly; without low-caloric-diet; RRR and NNT by allopathic system compared to homeopathic, herbal and combination systems were -52; \approx -4.0, -128%; \approx -2.0, -42.50%; \approx -4.0 respectively. Cardio-vascular risk factors were reduced in T2D patients when they have been evaluated by dietary patterns; omega-6-fattyacids, soft drinks, fruits, vegetables, olive oil, processed meat, lean fatty meat and low fried foods significantly decreases the risk of HTN including other cardiovascular complications.[25] Many patients use combination of different therapeutic systems for the management of T2D. Current study compared three different combinations

of therapy and also evaluated the risk of HTN; these combinations were allopathic + homeopathic system, allopathic + herbal system and allopathic + homeopathic + herbal system. (Table 4) In these combinations allopathic + homeopathic system was compared with allopathic + herbal system and allopathic + homeopathic + herbal system. In these combinations; lowest incidences of HTN were noted in allopathic + homeopathic system (53.84%). RRR by allopathic + homeopathic system compared to allopathic + herbal system was 16.24% and NNT was ≈ 10 ; similarly, compared to allopathic + homeopathic + herbal system RRR was 4.16% and NNT ≈ 2 ; hence profile of allopathic + homeopathic system is best for risk reduction of HTN compared to other combinations.

CONCLUSION

Despite superior anti-diabetic efficacy of allopathic system of medicine; risk of HTN is higher compared to homeopathic, herbal and combination system of medicine in T2D patients. Among combination systems of medicine; allopathic + homeopathic system of medicine is superior in risk reduction of HTN.

LIST OF ABBREVIATIONS

HTN = Hypertension; T2D = Type-II-Diabetes; RRR = Relative Risk Reduction; NNT = Number Needed to Treat; SPSS = Statistical Package of Social Sciences; T2DM = Type-II Diabetes Mellitus; ADA = American Diabetes Association; ACE = Angiotensin Converting Enzyme; ARB = Angiotensin Receptor Blocker; CCB = Calcium Channel Blocker; CAM = Complementary and Alternative Medicine; EBM = Evidenced Based Medical Practices; IBC-KU = Institutional Bioethics Committee-Karachi University; ARR = Absolute Risk Reduction

DECLARATIONS

Availability of data and materials: In order to maintain the confidentiality of participants; datasets generated during the current study are not publicly available. However; it can be available from the corresponding author on a reasonable request.

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