

Association of Medical Nutrition Therapy in the Management of Hypertension among Patients at Lady Reading Hospital, Peshawar: A Cross-Sectional Study

1. Inam Ullah

Lecturer in Department of Allied Health Sciences, Surgical Technology at IQRA National University Swat Campus.

Email: inamu536@gmail.com

2 Humaira Jamal*

MS in Human Nutrition & Dietetics

Email: hurikhan862@gmail.com

3. Maisam Ali

Department of Human Nutrition, The University of Agriculture, Peshawar, Pakistan:

Clinical Dietitian, Combined Military Hospital (CMH) Jhelum, Pakistan.

Email: maisamali528@gmail.com

4. Sidra Zaeem

Clinical Dietitian, Shaukat Omer Memorial Hospital (SOMH) Fauji Foundation, Karachi, Pakistan.

Email: zaeemsidra98@gmail.com

5. Muhammad Qasim

Teaching Assistant at KMU IPMR, Department of Occupational Therapy (OT) at Peshawar.

Email: qasaimkhan9454325@gmail.com

6. Hadeeqa Iman

MSc (Hons) in Human Nutrition

Email: hadeeqaiman99@gmail.com

7. Rohaib Ahmed

Emergency Care Technologist

Email: rohaibkhan987@gmail.com

8. Abdullah Khan

Student of Nigar Nursing College Swabi. Email: abdullahkhan10ff@gmail.com

Author Details

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Corresponding E-mails & Authors*:

Humaira Jamal*

Email: hurikhan862@gmail.com

Abstract

Background: Hypertension is a major public health problem around the globe and Medical Nutrition Therapy is one of the non-pharmacological methods used to treat hypertension. The association between Medical Nutrition Therapy and Blood Pressure Control in Hypertensive patients of Lady Reading Hospital (LRH), Peshawar was assessed.

Methods: The methods used were non-probability (convenient sampling) and a cross sectional study involving 384 hypertensive patients at LRH, Peshawar. A structured and pre tested questionnaire was used for collecting data which included socio-demographic characteristics, dietary practices and adherence to MNT and analyzed on SPSS version 27. Descriptive and inferential statistics such as chi square test of association was used and values of $p < 0.05$ were taken as statistically significant.

Results: There were 384 participants, of whom 98 were good adherers (25.5%), 224 were moderate adherers (58.3%) and 62 were poor adherers (16.1%). Overall, 283 were able to control their blood pressure (73.7%). There was a tendency towards a greater proportion of controlled BP among participants with good MNT adherence, 77.6%, than among those with poor adherence, 64.5%, ($\chi^2 = 3.53$, $p = 0.171$) although this composite adherence-BP association was not statistically significant. Reduced sodium (salt) intake was significantly associated with better blood pressure control (80.9% controlled vs 70.0%; $p = 0.029$); reduced intake of fried/processed food and regulation of meal timing were not significantly associated with outcomes ($p > 0.05$) while regular intake of fruit/vegetables was not significant ($p = 0.352$). Better control of blood pressure was significantly associated with higher BMI category ($p < 0.001$).

Conclusion: There was significant effect of dietary sodium restriction on the maintenance of BP control, and higher BMI on poorer control; there was a trend towards better control with composite MNT adherence, but this was not significant. The results here confirm that sodium reduction and weight management are important components of hypertension care that are achievable with Medical Nutrition Therapy and weight management, but that greater

structure and adherence with nutrition counselling are needed to enhance the impact of these approaches.

1. Introduction

Hypertension is one of the most common modifiable risk factors for cardiovascular disease and for early death, both in the world and in the European Union. The prevalence of adults aged 30–79 living with hypertension has more than doubled from 1990 to 2019, with an estimated 626 million women and 652 million men with the condition in need of treatment, but under 50% of all those with hypertension are getting it [1]. According to the World Health Organization, 32.2 million adults aged 30 – 79 years are estimated to be hypertensive in Pakistan, of which many are either undiagnosed or poorly controlled [2].

This is consistent with the local survey results. According to the National Health Survey of Pakistan (NHS) 2012, the prevalence of hypertension among adult population of Pakistan (>15 years) stood at about 18.9%, and was significantly more prevalent in urban areas and among males [3]. Meta-analytical studies also indicate that the pooled prevalence of hypertension among adults in Pakistan has increased over the decades from approximately 19.6% in the 1990s to almost 30% in the 2010s, and the prevalence was higher in urban areas among males [4]. Yet, this increasing burden is compounded by the challenges in hypertension research and management within the Pakistani context, which includes lack of population based surveillance, inconsistent adherence to the treatment and low utilization of non-pharmacological management [5,6].

Major hypertension guidelines suggest medical nutrition therapy (MNT), which can include weight management, sodium restriction, personalized dietary counselling, and structured meal planning, as a first-line, non-pharmacologic therapy, either as a stand-alone or as a complementary treatment to pharmacologic therapy [7]. The Dietary Approaches to Stop Hypertension (DASH) diet, low-sodium diets and the Mediterranean diet have consistently been found in randomized controlled trials and systematic reviews to reduce systolic and diastolic blood pressure, mainly due to the lowering of sodium and increasing of potassium [8]. Structured nutrition counselling in comparative-effectiveness studies has also shown significant decreases in blood pressure and anthropometric measurements in adults with hypertension and excess body weight [9].

In addition to dietary counselling, multi-component (self-monitoring, medication self-management and dietary modification) lifestyle interventions have been shown to result in clinically meaningful reductions in blood pressure (systolic and diastolic) compared to usual care [10]. Structured treatment models that combine remote monitoring with nutrition counselling have also shown to be effective at reducing BP in older people with hypertension over a long-term follow-up period [11], and family-based self-management programs that focus on sodium consumption compliance have been shown to have a beneficial effect on compliance and BP outcomes in community-based settings [12]. This combined evidence highlights the need to consider the structure of patient education, follow-up and adherence support, as well as nutritional content, to realize the effectiveness of MNT.

The potential benefit of structured MNT may be significant in Pakistan, where dietary patterns tend to be high in sodium from processed foods, cooked with ghee and have irregular meal patterns. But, there is little available locally for the real world effectiveness of MNT among patients attending the tertiary care centres, who have hypertension. Lady Reading Hospital (LRH) is one of the biggest tertiary care hospitals of Khyber Pakhtunkhwa and is an excellent platform to explore this association in a heterogeneous cohort of hypertensive patients.

The purpose of this study was thus to evaluate the effectiveness of Medical Nutrition Therapy in the treatment of hypertension at LRH, Peshawar and to determine the relationship between MNT adherence (sodium reduction and healthy food consumption) and BP control in hypertension patients attending LRH, Peshawar. The results of the study will guide to implementing this counselling into a routine care of hypertension in Pakistan in tertiary care settings.

Materials and Methods

This is an analytical cross sectional study was conducted in the Nutrition and dietetics Outpatient department of Lady reading hospital (LRH), Peshawar, tertiary care teaching hospital of Khyber Pakhtunkhwa and surrounding areas. Data collection took place for 6 Months (between January to June 2026).

Study Population and Sampling

The study population consisted of adult hypertensive patients who were diagnosed during the study period at LRH. The number of patients (n = 384) was

determined by non-probability convenient sampling technique. The sample size was determined based on the Cochran formula for an infinite population with a 95% confidence level, an anticipated proportion of 50% (to produce the maximum sample size) and a margin of error of 5%, resulting in a minimum sample size of 384 participants. Inclusion/exclusion criteria are provided in this section.

Inclusion/exclusion criteria

Inclusion criteria: Adults ≥ 18 years of age who had been diagnosed by a physician as having hypertension, attended LRH during the study period, and gave informed consent.

Exclusion: Pregnant women, patients with severe cognitive impairment, patients unwilling to participate and patients with secondary hypertension of identifiable non-dietary cause.

Data Collection Tool

A structured, interviewer-administered questionnaire was used for data collection, and was developed based on literature review and pre-tested on a small sample not included in final analysis. The questionnaire consisted of four sections: socio-demographic characteristics (age, gender, residence, marital status, education, occupation, monthly income and household size); clinical history and anthropometric measurements (duration of hypertension, use of antihypertensive medication, adherence to antihypertensive medication, presence of coexisting conditions, family history, height, weight, BMI, two consecutive systolic/diastolic blood pressure readings and derived mean systolic and diastolic readings); dietary practices and adherence to Medical Nutrition Therapy (receipt and source of nutrition counselling, frequency of added salt, weekly intake of processed foods, daily servings of fruits and vegetables, regularity of meal times, use of low-fat cooking methods, an overall rating of adherence to diet advice, and perceived barriers to adherence); and outcomes (current blood pressure control status, and the participant's perceived helpfulness of dietary advice). Participants sat for at least 5 minutes before BP was taken. An appropriate cuff size was used for two readings and the mean was used for analysis of the systolic and diastolic readings.

Operational Definitions

Hypertension was defined based on common clinical criteria (systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg or current use

of antihypertensive medication). The adherence to MNT was evaluated by a composite score that included sodium restriction, intake of fruits and vegetables, meal timing, decreased intake of fried/processed foods, and dietary counselling. Positive practice was awarded a score of 1 and negative practice was awarded a score of 0. Total scores were considered as poor (score <50), moderate (50–69), and good (score $\geq$ 70) adherence based on predefined cut-offs. Blood pressure control was considered to be a reading of less than 140/90 mmHg at assessment.

Statistical Analysis

IBM SPSS Statistics version 27 was used to enter and analyze the data. Socio-demographic and clinical features were summarized using descriptive statistics (frequencies, percentages, means and standard deviations). The chi-square test of association was used to assess the association between MNT adherence and control of blood pressure and between specific MNT practices (sodium reduction, regularity of meals, and intake of fruits and vegetables) and outcomes of hypertension. The p value <0.05 was the cut-off for statistical significance for all analyses.

Ethical Considerations

The Institutional Ethical Review Board of Lady Reading Hospital, Peshawar, gave ethical approval on 1st January 2026. All participants signed informed consent forms before entering the study and patient information was kept confidential throughout the study as per the declaration of Helsinki.

Results

A total of 384 hypertensive patients meeting the inclusion criteria were enrolled and completed the structured questionnaire in full, yielding complete data for analysis on all primary study variables. The socio-demographic characteristics of the study participants are summarized in Table 1.

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	18–40	29	7.6
	41–60	152	39.6
	>60	203	52.9

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	189	49.2
	Female	195	50.7
Residence	Urban	206	53.6
	Rural	178	46.4
Education	None/Primary	150	39.1
	Secondary/Higher	234	60.9
Duration of hypertension	<5 years	203	52.9
	≥5 years	181	47.1

Table 1. Socio-demographic and clinical characteristics of study participants (N = 384).

Regarding adherence to Medical Nutrition Therapy, 98 (25.5%) of participants demonstrated good adherence, 224 (58.3%) moderate adherence, and 62 (16.1%) poor adherence to prescribed dietary recommendations, as summarized in Table 2.

MNT Adherence Level	Frequency (n)	Percentage (%)
Good adherence	98	25.5
Moderate adherence	224	58.3
Poor adherence	62	16.1
Total	384	100.0

Table 2. Distribution of participants by level of adherence to Medical Nutrition Therapy.

Blood pressure was controlled (<140/90 mmHg) in 283 participants (73.7%) overall. Participants with good MNT adherence had the highest proportion of controlled blood pressure (77.6%), compared with 74.6% among those with moderate adherence and 64.5% among those with poor adherence, as shown in

Table 3. However, this composite adherence-BP association did not reach statistical significance ($\chi^2 = 3.53$, $df = 2$, $p = 0.171$), indicating a favourable but non-significant trend toward better blood pressure control with higher overall MNT adherence in this sample.

MNT Adherence	BP Controlled n (%)	BP Uncontrolled n (%)	Total	p-value
Good adherence	76 (77.6%)	22 (22.4%)	98	0.171
Moderate adherence	167 (74.6%)	57 (25.4%)	224	
Poor adherence	40 (64.5%)	22 (35.5%)	62	
Total	283	101	384	

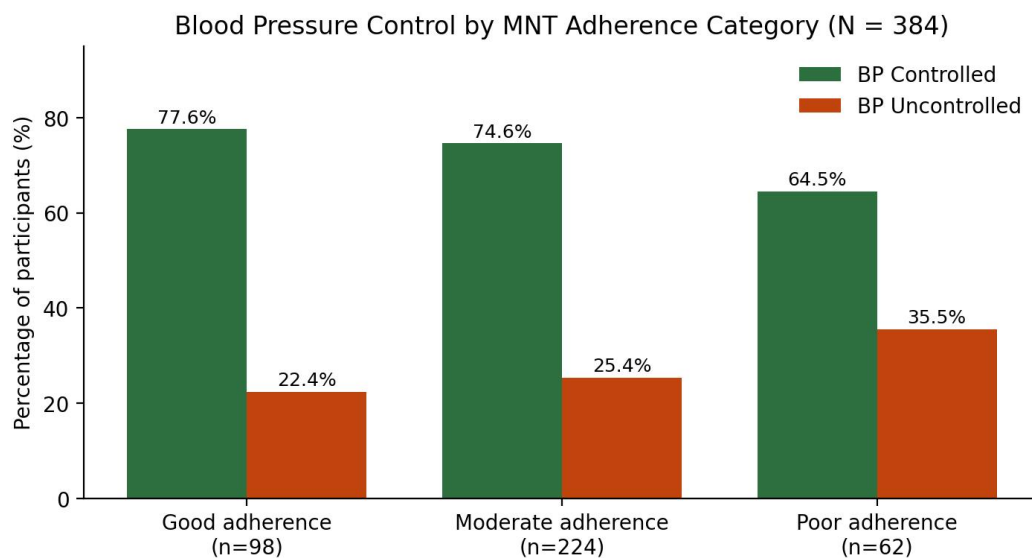
Table 3. Association between Medical Nutrition Therapy adherence and blood pressure control ($\chi^2 = 3.53$, $df = 2$, $p = 0.171$).

Among the individual dietary practices examined, reduced dietary sodium (salt) intake was the only practice significantly associated with blood pressure control: 80.9% of participants who rarely or never added salt to their food had controlled blood pressure, compared with 70.0% of those with higher salt-addition frequency ($\chi^2 = 4.79$, $p = 0.029$). Regular fruit/vegetable intake, regular meal timing, and limited intake of fried/processed foods were not significantly associated with blood pressure control in this sample (all $p > 0.05$), although regular meal timing showed a trend toward better control (76.3% vs 69.1% controlled; $p = 0.152$) (Table 4). Body mass index (BMI) category was also significantly associated with blood pressure control ($\chi^2 = 18.96$, $p < 0.001$): controlled blood pressure was observed in 100% of underweight, 82.9% of normal-weight, 72.7% of overweight, and only 60.0% of obese participants, indicating that a higher BMI was associated with a progressively lower likelihood of blood pressure control. Mean systolic and diastolic blood pressure across the sample were 129.0 ± 10.5 mmHg and 82.2 ± 6.1 mmHg, respectively, and mean BMI was 26.9 ± 4.6 kg/m².

Dietary Practice / Group	BP Controlled n (%)	BP Uncontrolled n (%)	Total	p-value
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Dietary Practice / Group	BP Controlled n (%)	BP Uncontrolled n (%)	Total	p-value
Reduced sodium intake — Rarely/never added salt	106 (80.9%)	25 (19.1%)	131	0.029
Reduced sodium intake — Frequently added salt	177 (70.0%)	76 (30.0%)	253	
Regular fruit/vegetable intake — Regular intake	121 (71.6%)	48 (28.4%)	169	1.000
Regular fruit/vegetable intake — Irregular/low intake	162 (75.3%)	53 (24.7%)	215	
Regular meal timing — Regular meal timing	187 (76.3%)	58 (23.7%)	245	0.152
Regular meal timing — Irregular meal timing	96 (69.1%)	43 (30.9%)	139	
Limited fried/fast food intake — Limited intake	141 (74.6%)	48 (25.4%)	189	0.779
Limited fried/fast food intake — Frequent intake	142 (72.8%)	53 (27.2%)	195	

Table 4. Association between specific dietary practices and blood pressure control among study participants (chi-square test).



$\chi^2 = 3.53$, $df = 2$, $p = 0.171$ (not statistically significant)

Figure 1. *Percentage of participants with controlled versus uncontrolled blood pressure across good, moderate, and poor MNT adherence categories ($\chi^2 = 3.53$, $df = 2$, $p = 0.171$).*

Discussion

There was a positive (although not statistically significant) relationship between overall composite MNT adherence and blood pressure control in this cross-sectional study. However, there was a significant association between reduced sodium and good BP control. The results are in line with a large amount of international evidence to support the use of structured dietary intervention in the management of hypertension.

The finding that sodium restriction improves blood pressure control is consistent with systematic reviews and RCTs that confirmed that DASH and Mediterranean diets are some of the most effective non-pharmacological interventions to reduce the BP [8]. Likewise, one-to-one nutrition counseling has been shown to yield significant reductions in BP and anthropometric measures in overweight hypertensive adults in previous studies, highlighting the benefits of structured nutrition guidance as observed in the present study [9].

The size of effect of adherence in this study is similar to that seen in multi-component lifestyle intervention trials where a self-monitoring and diet modification group had clinically significant reductions in both SBP and DBP

when compared with usual care after 6 months [10]. It is also in line with structured therapy programmes which include nutrition advice and remote follow-up that have shown sustained blood pressure improvements in older hypertensive people over 12 months [11]. When combined with the present findings, this implies that the effectiveness of MNT in tertiary care practice in real world conditions like LRH can be improved if the dietary counselling is complemented with structured follow-up and adherence counseling instead of a single educational session.

The importance of family and behavioural support in maintaining dietary adherence has also been demonstrated in community-based interventions designed to increase sodium consumption, where increased adherence to sodium recommendations was associated with better blood pressure outcomes when family members were actively involved in supporting the dietary recommendations [12]. Adding family centred counselling to MNT delivery at LRH and other tertiary care centres can build adherence and help achieve blood pressure control even further, as most of the Pakistani families prepare their own food at home.

These findings are of special importance because the burden of hypertension is substantial and increasing in Pakistan as population-based surveys estimate it to be around 18–19% among adults and even higher in urban areas and among males [3,4]. Although this burden, there is still little evidence of structured non-pharmacological interventions available locally, and too much clinical management is still based on the use of pharmacotherapy exclusively [5,6]. The present study provides evidence from the hospital setting to support the incorporation of structured Medical Nutrition Therapy in the conventional treatment of hypertension in a large tertiary care hospital in Khyber Pakhtunkhwa. These findings indicate that specialist nutrition counselling services, with trained dietitians or nutrition educators, may have a cost-effective role to play in hypertension clinics of tertiary care hospitals from a health-systems viewpoint. Incorporating MNT into the usual blood pressure clinic care is a cost-effective approach to better BHP, and a scalable approach for improving BHP at the population level, especially in resource-limited areas.

Strengths and Limitations

The sample size for this study is adequate as determined by standard statistical procedures and the data collection tool used was structured and pre-tested. There are some drawbacks to be noted, however. First, the cross sectional design does not allow for causal inference about the direction of the association between adherence to MNT and control of blood pressure. Second, the dietary adherence was self-reported, and thus could be prone to social desirability and recall bias. Third, the sampling frame used was hospital-based in a single centre which might restrict generalisability of results to community-dwelling hypertensive patients outside tertiary care hospitals. Fourth, this study used only bivariate chi-square tests of association, and multivariable binary logistic regression, which would allow simultaneous control for adherence to the MNT, reduction in sodium intake, BMI category, age, gender, medication adherence, duration of hypertension, and education, was not performed, and would need to be before any predictor of BP control could be said to represent an independent predictor. Longer term prospective and interventional studies, using objective dietary assessment methods, multivariable regression modelling, are recommended to confirm and extend these findings.

Conclusion

This cross-sectional study of 384 hypertensive patients at Lady Reading Hospital, Peshawar revealed that reducing salt intake (sodium reduction) was significantly correlated with improved control of blood pressure and higher BMI was significantly correlated with poorer control. The overall composite adherence to Medical Nutrition Therapy was in a favourable direction to better control of blood pressure for good, moderate, and poor adherence categories, though this relationship was not significant; in addition to the overall composite adherence, other individual adherence categories (fruits/vegetables, regularity of meals, limited fried/processed food) were not significantly associated with outcomes in this sample. These collectively suggest that, as an evidenced- and practice-based intervention, sodium reduction and weight management are worthwhile strategies for helping to achieve better blood pressure control, and that delivering MNT that is more structured and sustained than counselling alone

might be necessary to make a statistically significant impact on blood pressure control. Sodium-based nutrition counselling by a dietitian, along with pharmacological therapy, should be strengthened in routine hypertension care in tertiary care in Pakistan as a reasonable, low cost approach, but should be confirmed by prospective studies.

Recommendations

Qualified dietitians must be part of the routine hypertension care service at LRH and other tertiary care hospitals and provide structured MNT counselling.

Sodium restriction and healthy eating should be reinforced at the household level through inclusion of family-centered dietary education.

Longitudinal and interventional studies are necessary to assess the causal effect of MNT, and the frequency and content of counselling.

National hypertension control programs should encourage the creation of low-sodium food environments and nutrition literacy at the policy level.

Authors' Contribution

Humaira Jamal: Conceptualization, methodology, investigation, data curation, formal analysis, interpretation of results, original draft preparation, and corresponding author responsibilities. Humaira Jamal made the primary contribution to the study and manuscript preparation.

Inam Ullah: Conceptualization, methodology, supervision, validation, project administration, critical review and editing of the manuscript, and overall guidance throughout the research. Inam Ullah made a major contribution to the study design, execution, and finalization of the manuscript.

Maisam Ali: Contributed to data interpretation, clinical nutrition expertise, literature review, and critical revision of the manuscript for important intellectual content.

Sidra Zaeem Assisted in data collection, participant coordination, data validation, and manuscript review.

Muhammad Qasim: Contributed to data collection, data organization, statistical support, and manuscript review.

Hadeeqa Iman Assisted with literature review, data management, quality assurance of the dataset, and proofreading of the manuscript.

Rohaib Ahmed: Assisted in participant recruitment, data collection, data entry, and proofreading of the final manuscript.

Abdullah Khan Contributed to manuscript editing, formatting, reference management, and final approval of the manuscript prior to submission.

All authors read and approved the final version of the manuscript and agreed to be accountable for all aspects of the work.

Conflict of Interest

The authors have no conflict of interest to disclose.

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