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ORIGINAL RESEARCH

Role of Perceived Social Support in Adherence to Antihypertensives and Controlled Hypertension: Findings of a Community Survey from Urban Nepal

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Introduction: Social support is considered vital for effective management of chronic conditions, but its role in improving adherence to antihypertensive medication and control of hypertension in urban Nepal is unknown. We examined the role of social support in adherence to antihypertensives and controlled blood pressure to inform future interventions for hypertension management.

Methods: We analyzed cross-sectional data collected at baseline of a cluster randomized trial of hypertension patients (n=1252) in the community between May and November 2022. Multidimensional scale of perceived social support was used to measure social support, adherence to antihypertensives was measured using the Morisky medication adherence scale −8, and individuals with systolic- and diastolic- blood pressure less than 140 and 90 mmHg respectively were considered to have controlled hypertension. Modified Poisson regression models were used to estimate the prevalence ratios and corresponding 95% confidence intervals.

Results: We found that 914 (73%) individuals received moderate to high social support. Participants receiving high social support had a numerically lower proportion of controlled hypertension (51%) however not statistically significant. The proportion of good adherence to antihypertensives did not differ between the social support categories. There was no association in overall, family, friends, and significant other sub-scales of social support with controlled hypertension and adherence to antihypertensives.

Discussion: Further studies to understand the quality and mechanisms through which social support contributes to blood pressure control are needed for the health system to include social support in designing and implementing community-based interventions for hypertension management.

Keywords: hypertension control, adherence, social support, Nepal

Introduction

Hypertension is the most common risk factor for cardiovascular diseases (CVDs).[1] Globally it affects about 40% of the population and causes approximately 7.6 million deaths every year.[2] Despite the availability of effective interventions, including antihypertensive medication only 20% with hypertension have well-controlled blood pressure.[3] In Nepal, high blood pressure was the leading cause of CVDs in 2017[4] where 20–30% of adult women and men have hypertension.[5] The high proportion of untreated (89% of those aware) and uncontrolled (96% of those on treatment) hypertension in Nepal,[5] jeopardizes the government's commitment to reduce CVDs.[6]

Management of hypertension may require substantial efforts, including adherence to antihypertensive medications, monitoring of blood pressure, frequent follow-up with healthcare providers, weight reduction, physical activity, healthy diet, and avoidance of alcohol and tobacco use.[7] Patients with chronic conditions like hypertension often need social and family support to optimally manage their ailment.[8,9] Social support is a multidimensional concept often defined as activities

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and relationships that individuals receive and provide to each other within their social networks.[10] A large and diverse social support network can boost self-esteem and provide better access to information and resources.[11,12] Health-related interactions with friends and family promote healthy behaviors including adherence to treatment.[13–16] Feeling connected with others and the awareness that support is available when needed are important for positive health outcomes.[17–19] Positive social relationships help patients cope with illness associated stress promoting better prognosis.[20] Social support may protect patients from complications by helping with health management,[16] or by encouraging healthy behaviors.[21] However, the evidence on the role of social support in the management of chronic conditions is inconclusive. Studies have shown a positive,[22–26] null[27,28] and an inverse association[29] between social support and management of chronic conditions. The role of social support in the management of chronic conditions like hypertension has not been sufficiently explored in the Nepalese context. One study from Nepal reported a positive association between social support and self-care for hypertension.[30] In this study, we explored how perceived social support influences medication adherence and control of high blood pressure. The results from this study could serve to inform targeted community-based interventions according to the level of social support received by hypertension patients for controlling hypertension.

Materials and Methods

Study Setting

The study was conducted in Budhanilkantha municipality, Kathmandu, Nepal. The municipality has nearly 150,000 inhabitants[31] and has 11 public health facilities that provide primary health care and tertiary care is provided by the private and public hospitals nearby. Hypertension prevalence of the urban areas such as Budanilakantha (25.2%) is similar to the national average (24.5%).[5]

Study Design and Population

Cross-sectional data collected at baseline from 1252 hypertensive individuals enrolled in a cluster randomized trial (Registration no: NCT05292469). The detailed trial methods are published elsewhere.[32] Trained enumerators identified participants seeking support from health workers and volunteers, screened for eligibility, and obtained written informed consent after explaining the trial objectives. Eighteen years and older individuals with established hypertension diagnosis (systolic BP ≥140 mmHg and/or diastolic BP ≥ 90 mmHg on at least two consecutive visits or using antihypertensive medication) and able to respond to the questions were recruited. Pregnant women were excluded.

Data Collection

Trained enumerators collected baseline data from 2 May 2022 through 7 November 2022 using an android operating system tablet installed with KOBO toolbox electronic data collection platform. The questionnaire was pretested. Participants were shown picture cards with examples of physical activity and commonly used utensils for drinking alcohol to ensure accurate measurements.[5]

Outcomes

Hypertension control

An "Omron" digital instrument was used to measure blood pressure three times in a resting position and the mean of the last two measurements was registered. Participants with systolic and diastolic blood pressure less than 140 and 90 mmHg were categorized as controlled hypertension others as uncontrolled hypertension.

Medication adherence

We administered an eight-item Morisky Medication Adherence Scale (MMAS-8) (Supplementary Table 1).[33] The scale is widely used to measure medication adherence and is reported to have good reliability (α = 0.83) and validity with sensitivity of 93% and specificity of 53% for low adherence.[34] The first seven questions have responses YES coded as 0 and NO coded as 1. The code of the fifth question was reversed and the responses to the eighth question were re-coded from 2 to 0.75, 3 to 0.5, 4 to 0.25, 5 to 0 during the analysis. Responses to all eight questions were added to get MMAS, and a score above 6 was considered good adherence and ≤6 poor adherence.[35]

Exposures

Modified multidimensional scale of perceived social support (MSPSS) was used to measure the adequacy of support participants received from family, friends, and significant others (Supplementary Table 2).[36] Twelve questions with answers on a 5-point Likert scale (1 = strongly disagree; 5=strongly agree) were asked to the participants. Cronbach's alpha has been estimated to be 0.92, 0.85, 0.85 and 0.86 for total and family, friends, and significant others subscales, respectively.[36] The MSPSS was translated into Nepali by SB and was reviewed by the study clinician. During training, the wording of the questions was discussed with the enumerators from the study community. The enumerators pretested the questions, and any problems encountered in administering the questions were discussed and addressed before finalizing the tool. The internal consistency reliability for the MSPSS was found good with a Cronbach's alpha of 0.91 for the overall score and 0.87, 0.91, and 0.84 for family, friend, and significant other subscales, respectively. The overall MSPSS ranged between 12 and 60, high scores indicate high perceived social support. The subscale scores were calculated by adding the responses for related questions. During analysis, scores were divided by the number of questions included in each scale resulting in scores ranging between 1 and 5. The scores were categorized as low (1.00–3.59), moderate (3.60–4.59), and high (4.60–5.00) support.

Covariates

The covariates included in the model were age (continuous), gender (female/male), ethnicity (Brahmin Chettri/Newars/Tamang, Sherpa, Rai, Gurung, Magar/Dalits), current marital status (unmarried/married), education (illiterate/primary/secondary/high school and above), and per capita annual income in US dollars (continuous). Other variables considered were occupation status (unemployed/paid employment), self-reported diabetes status (status not known/non-diabetic/diabetic), years since hypertension diagnosis, and prescribed antihypertensives (Yes/No). The diet quality questionnaire assessed 32 different food groups participants ate in the 24 hours preceding the survey.[37] The global dietary recommendation score (ranging from 0 to 18, higher score means better diet quality) was calculated by subtracting foods recommended to limit from foods recommended as healthy and adding nine. It measures adherence to a healthy diet protective against non-communicable diseases.[37] Fruits and vegetable scores ranged from 0 to 6, with scores of <3 indicate the likelihood of eating less than 400 grams of fruits and vegetables.[37] Daily salt intake was asked and categorized as ≤10 grams, 11–15 grams, and >15 grams. A global physical activity questionnaire[38] was used to calculate metabolic equivalents of task (METs) minutes per week categorizing <600 METs (inadequate) and ≥600 (adequate). Body mass index of <25 kg/m^2 and ≥25 kg/m^2 was categorized as normal weight and overweight, respectively.[39] Standard drinks per week were calculated by asking current alcohol drinkers about drinking frequency and amount of different types of alcohol[5] and categorizing into non-drinkers (≤1 standard drink per month), moderate drinkers (<3 standard drinks per week), and high drinkers (≥3 standard drinks per week). Tobacco use including both smoked and chewed was categorized as never, and ever users.

Statistical Analysis

Descriptive statistics were presented as frequencies and percentages for categorical variables and mean and standard deviation for continuous variables. Confounders included in the model were identified a priori by constructing a directed acyclic graph (DAG)[40] to assess the association between MSPSS and controlled hypertension and adherence to antihypertensives. We fitted Poisson regression to assess the association between MSPSS and hypertension control. Prevalence ratios and corresponding 95% confidence intervals were estimated. Two models were fitted, unadjusted (model 1) and adjusted for age, gender, ethnicity, marital status, education, and income (model 2). Similar models were also fitted to assess the association between MSPSS and adherence to antihypertensives. Based on the DAGs, mediators such as dietary, lifestyle and clinical factors were not included in the model. All analyses were performed with Stata 18.[41]

Ethics

We have obtained ethical approval from Nepal Health Research Council (Protocol number: 682/2021) approved on 24 December 2021 and Regional Committee for Medical and Health Research Ethics, Norway (Reference number: 399479) approved on 22 February 2022. We have adhered to the declaration of Helsinki throughout the research process.

Results

The mean age of study participants was 57.5 years, and 60% were females. Table 1 shows the distribution of socio-demographic, lifestyle and clinical factors by categories of overall MSPSS. Participants with high social support were

Table 1 Socioeconomic, Lifestyle, and Clinical Factors by Levels of Overall MSPSS

	N	Low Support N (%)	Moderate Support N (%)	High Support N (%)
Age (years)				
mean, ±SD#		58.9 (±12.7)	58.2 (±11.9)	55.5 (±11.7)
21–44	184	41 (22.3)	74 (40.2)	69 (37.5)
45–59	527	136 (25.8)	220 (41.8)	171 (32.4)
≥60	541	161 (29.8)	245 (45.3)	135 (24.9)
Gender				
Female	752	231 (30.7)	323 (43.0)	198 (26.3)
Male	500	107 (21.4)	216 (43.2)	177 (35.4)
Marital status				
Married	1050	244 (23.2)	457 (43.5)	349 (33.2)
Unmarried	202	94 (46.5)	82 (40.6)	26 (12.9)
Ethnicity				
Brahmin/Chettri	674	165 (24.5)	300 (44.5)	209 (31.0)
Newar	238	67 (28.1)	107 (45.0)	64 (26.9)
Tamang/ Rai/ Sherpa/ Magar/ Gurung	260	78 (30.0)	102 (39.2)	80 (30.8)
Dalits	80	28 (35.0)	30 (37.5)	22 (27.5)
Education				
Illiterate	413	151 (36.6)	162 (39.2)	100 (24.2)
Primary (grade 0–4)	458	118 (25.8)	222 (48.5)	118 (25.2)
Secondary (grade 5–10)	220	47 (21.4)	87 (39.5)	86 (39.1)
High school and above	161	22 (13.7)	68 (42.2)	71 (44.1)
Occupation				
Unemployed	823	243 (29.5)	358 (43.5)	222 (27.0)
Paid employment	429	95 (22.1)	181 (42.2)	153 (35.7)
Per-capita annual income (USD*)				
Mean, ±SD		1100.2 (±1628.4)	1087.5 (±1559.3)	1203.8 (±1374.3)
<500	345	117 (33.9)	148 (42.9)	80 (23.2)
500–1000	442	108 (24.4)	198 (44.8)	136 (30.8)
>1000	465	113 (24.3)	193 (41.5)	159 (34.2)

(*Continued*)

Table 1 (Continued).

	N	Low Support N (%)	Moderate Support N (%)	High Support N (%)
Physical activity (Metabolic equivalents of task)				
<600	598	173 (28.9)	252 (42.1)	173 (28.9)
≥600	654	165 (25.2)	287 (43.9)	202 (30.9)
Body mass index (kilogram/meters^2)				
Normal weight (<25)	370	108 (29.2)	164 (44.3)	98 (26.5)
Overweight (≥25)	882	230 (26.1)	375 (42.5)	227 (31.4)
Alcohol (standard drinks per week)				
Non-drinkers	1003	280 (27.9)	442 (44.1)	281 (28.0)
Moderate drinkers <3	72	12 (16.6)	21 (29.2)	39 (54.2)
High drinkers ≥3	177	46 (26.0)	76 (42.9)	55 (31.1)
Tobacco use (smoke/smokeless)				
Never	823	224 (27.2)	372 (45.2)	227 (28.6)
Ever	429	114 (26.6)	167 (38.9)	148 (34.5)
Daily salt intake (grams/day)				
≤10	555	126 (22.7)	258 (46.5)	171 (30.8)
11–15	451	154 (34.2)	159 (35.3)	138 (30.6)
>15	246	58 (23.6)	122 (49.6)	66 (26.8)
Global dietary requirement score				
mean, ±SD		10.3 (±1.8)	9.7 (±2.0)	10.9 (±1.5)
Fruits and vegetable intake (grams/day)				
<400	1067	276 (25.9)	449 (42.1)	342 (32.0)
≥400	185	62 (33.5)	90 (48.7)	33 (17.8)
Diabetes status				
Unaware	264	87 (33.0)	104 (39.4)	73 (27.6)
No	718	197 (27.4)	318 (44.3)	203 (28.3)
Yes	270	54 (20.0)	117 (43.3)	99 (36.7)
Prescribed hypertension medication				
Yes	1180	318 (27.0)	504 (42.7)	358 (30.3)
No	72	20 (27.8)	35 (48.6)	17 (23.6)
No of antihypertensives taking (past 2 weeks)				
Not taking	10	2 (20.0)	3 (30.0)	5 (50.0)
One	598	175 (29.3)	260 (43.5)	163 (27.3)

(*Continued*)

Table 1 (Continued).

	N	Low Support N (%)	Moderate Support N (%)	High Support N (%)
Two	498	121 (24.3)	213 (42.8)	164 (32.9)
Three to four	74	20 (27.0)	28 (37.8)	26 (35.1)
Years since hypertension diagnosis				
mean, ±SD		8.8 (±7.8)	8.3 (±7.2)	7.9 (±7.4)
Poorly controlled blood pressure (cutoff <160/100 mmHg)				
Yes	190	51 (26.8)	78 (41.1)	61 (32.1)
No	1062	287 (27.0)	461 (43.4)	314 (29.6)

Notes: #Standard Deviation *USD=United States Dollars (Exchange rate 1USD=130 Nepali rupees).
Abbreviation: USD, United States Dollars.

generally younger and more often males, married, belonged to Brahmin/Chettri ethnicity, were highly educated, had paid employment, had high per capita income, physically active, overweight, drink <3 standard drinks per week, current tobacco users, consumed daily <10 grams salt, had high global dietary requirement score, consumed less fruits and vegetables, were diabetic, were prescribed more than three antihypertensives, had shorter duration since diagnosis of hypertension and had poorly controlled blood pressure.

Out of the 1252 participants 914 (73%) reported receiving moderate to high overall MSPSS. Figure 1 shows that the high proportion of individuals with controlled hypertension and good adherence to antihypertensives were in moderate MSPSS category (58.7%) and high MSPSS category (74.3%), respectively. The distribution of MSPSS subscales by status of hypertension control and adherence to antihypertensives are shown in Supplementary Tables 3 and 4.

Overall, there was no significant association between social support and controlled hypertension (Table 2). However, individuals who received a moderate level of social support from friends exhibited 1.18 (95% CI, 1.04–1.33) times higher prevalence of controlled hypertension compared to those receiving low support.

Further, Table 3 shows that there was no association between social support and prevalence of adherence to antihypertensives, and unadjusted and adjusted estimates were very similar.

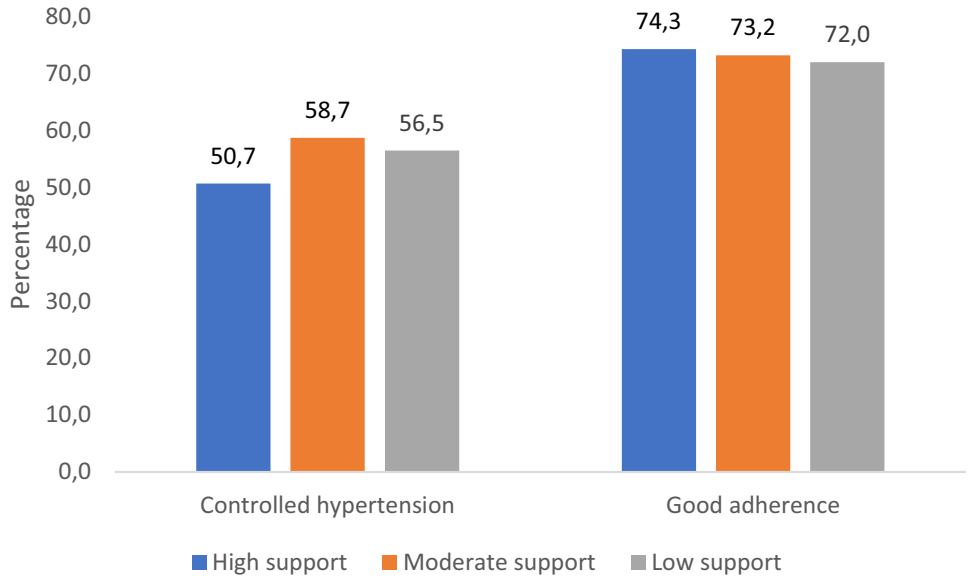

Figure 1 Proportion controlling hypertension and good adherence to antihypertensives in categories of overall MSPSS.

Table 2 Association Between MSPSS and Controlled Hypertension

	Model 1[a] Prevalence Ratio (95% CI)	Model 2[b] Prevalence Ratio (95% CI)
Overall MSPSS		
Low	Reference	Reference
Moderate	1.03 (0.92–1.16)	1.03 (0.92–1.16)
High	0.90 (0.78–1.03)	0.90 (0.78–1.04)
Family subscale		
Low	Reference	Reference
Moderate	1.03 (0.89–1.18)	1.02 (0.81–1.17)
High	0.89 (0.76–1.03)	0.89 (0.76–1.03)
Friend subscale		
Low	Reference	Reference
Moderate	1.17 (1.04–1.32)	1.18 (1.04–1.33)
High	0.94 (0.82–1.09)	0.95 (0.82–1.10)
Significant other subscale		
Low	Reference	Reference
Moderate	1.03 (0.92–1.16)	1.04 (0.93–1.18)
High	0.89 (0.79–1.01)	0.90 (0.80–1.02)

Notes: [a]Model 1: unadjusted. [b]Model 2: adjusted for age (continuous), gender (nominal), marital status (nominal), ethnicity (nominal), education (ordinal) and income (continuous).

Table 3 Association Between MSPSS and Adherence to Antihypertensives

	Model 1[a] Prevalence Ratio (95% CI)	Model 2[b] Prevalence Ratio (95% CI)
Overall MSPSS		
Low	Reference	Reference
Moderate	1.02 (0.93–1.11)	1.01 (0.93–1.10)
High	1.03 (0.94–1.13)	1.02 (0.94–1.13)
Family subscale		
Low	Reference	Reference
Moderate	1.03 (0.93–1.14)	1.02 (0.92–1.13)
High	1.02 (0.91–1.13)	1.00 (0.91–1.12)
Friend subscale		
Low	Reference	Reference
Moderate	1.02 (0.94–1.11)	1.03 (0.95–1.12)
High	1.00 (0.91–1.09)	1.00 (0.91–1.10)

(*Continued*)

Table 3 (Continued).

	Model 1[a] Prevalence Ratio (95% CI)	Model 2[b] Prevalence Ratio (95% CI)
Significant other subscale		
Low	Reference	Reference
Moderate	0.98 (0.89–1.07)	0.97 (0.89–1.06)
High	0.98 (0.91–1.07)	0.97 (0.90–1.06)

Notes: [a]Model 1: unadjusted. [b]Model 2: adjusted for age (continuous), gender (nominal), marital status (nominal), ethnicity (nominal), education (ordinal) and income (continuous).

Discussion

In this study, we explored how perceived social support received by hypertension patients affected adherence to antihypertensives and control of hypertension. Our analysis showed that 73% of participants received moderate to high social support. Despite anticipating a positive association between MSPSS and controlled hypertension, we found that participants in the high MSPSS category had the lowest proportion of hypertension control (51%) while the proportion of good adherence did not differ between MSPSS categories. There was no association between MSPSS and adherence to antihypertensives and controlled hypertension except for friend's sub-scale where higher prevalence of controlled hypertension was observed in moderate social support compared to low.

Very few studies from Nepal have reported on the relationship between social support and hypertension control and adherence to antihypertensives. Our finding that hypertensive patients receive high social support is in line with previous studies from Ethiopia[42] and Turkey,[43] but not with studies from Nepal[30] and Malaysia.[44] Previous studies from high-income countries agree with our findings that social support is neither associated with hypertension control[45,46] (Spain/Korea) nor with adherence to antihypertensives[28] (USA). However, a positive association between social support with controlled hypertension has been reported by a study from Vietnam[47] and with adherence to antihypertensives by studies from India,[23] China[48] and Turkey.[43] The inconsistent findings could be due to discrepancies in how social support was measured. A few studies have used MSPSS[30,43,49] to measure social support but their outcome measure was self-efficacy to hypertension rather than hypertension control while those with hypertension control as the outcome measured social support differently by measuring frequency of visits by friends and family,[45] social support inventory,[28] self-esteem and belongingness[23] and availability of informational, emotional, practical support.[27,46,48]

The quality and type of social support received has a bearing on adherence to medication and hypertension control.[13] Practical support received for household chores lowered the risk of uncontrolled hypertension in Vietnam,[47] whereas financial support from friends was harmful to adherence to medication in China.[48] Therefore, nuanced studies disentangling the mechanisms through which social support the process of hypertension management are needed.

The reason hypertensive patients received high social support in our study may be due to availability of family members rendered by large family size in our sample. Despite the high level of support received by participants, we did not observe a significant positive association between MSPSS and hypertension control and adherence to antihypertensives. This may be due to a tendency of parents not wanting to burden children with their health concerns.[50] Also, nearly 33% of the participants were illiterate and their friends and family are likely similar. Even when support is available, a poorly educated social network may not be capable of imparting the informational support needed to adhere to treatment and thereby control hypertension.[51]

Another explanation to the discrepancy of our results with other studies might be differences in individual and cultural characteristics. A large proportion of unemployed individuals may have skewed our sample towards a higher level of social support. People value financial support and therefore financially dependent individuals may report receiving high support. Also, the threshold for expected support may vary between different societies, for example in

a patriarchal society like Nepal, women as primary care takers in the family may have a lower threshold of social support, whereas elderly men who command more respect in society may have a higher threshold.

We found a numerically higher prevalence of controlled hypertension among those receiving moderate support from friends but not those receiving higher support. A possible explanation might be that those receiving higher support spend longer time with friends and are thereby more exposed to peer pressure for unhealthy behaviour which was indicated as a barrier for effective control of blood pressure in our formative study in the same population.[52] Reverse causation can also not be ruled out, as those with poorly controlled blood pressure may be receiving higher support from friends.

Strengths and Limitations

Our study adds to the sparse literature examining this association using validated instruments such as MSPSS and MMAS-8. We recruited hypertension patients from the community (not hospital) ensuring a representative sample. Since the outcome of interest (controlled hypertension and good adherence to antihypertensives) was common (larger than 10%), we fitted a modified Poisson regression model which gives a better approximation of the risk than overestimated odds ratio.[53] This study is not without limitations. The cross-sectional design may have masked the true association between social support and controlled hypertension, as it is possible that individuals with uncontrolled hypertension or with poor adherence were receiving more support. Given the numerous statistical tests we conducted, it is essential to interpret any significant findings with caution to mitigate the risk of drawing false-positive conclusions. The findings are based on data from one urban municipality, which might limit the generalizability of our findings to the general hypertensive population in Nepal. Social support as a construct would be better explored using a mixed-method approach as the MSPSS tool does not capture the type of social support received.[49] The reliance on self-reported data on medication and social support may have resulted in recall bias skewing the data in the direction of social desirability leading to over-estimated adherence and social support.

Conclusion

This study shows that hypertensive patients in Nepal in general have good social support.

However, social support was not foremost for medication adherence and control of hypertension. Future interventions for example digital technologies that facilitate remote monitoring and communication with care providers[54] should nurture the high level of social support received by the hypertension patients. However, contextual studies to delineate the mechanisms through which social support can augment adherence to treatment, healthy behaviour, routine monitoring, and follow-up for hypertension management are needed for social support to have precedence in future interventions for hypertension patients.

Abbreviations

CVDs, Cardiovascular diseases; DAG, Directed acyclic graph; METs, Metabolic equivalents of task; MMAS, Morisky medication adherence scale; MSPSS, Multidimensional scale of perceived social support.

Data Sharing Statement

Data cannot be shared publicly for ethical reasons but are available on reasonable request to Ms Sanju Bhattarai and Dr Abhijit Sen.

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Disclosure

The authors declare that they have no competing interests in this work.

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