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Original research

ASSOCIATIONS BETWEEN PRIMARY CARE CONTINUITY, ILLNESS PERCEPTION, AND HYPERTENSION CONTROL AMONG HYPERTENSIVE PATIENTS IN KON TUM PROVINCE, VIETNAM

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ABSTRACT

Background: *In low-resource settings, hypertension control in primary care is challenging. Continuity of care (COC) and illness perception (B-IPQ) play crucial roles in hypertension management, yet their association with blood pressure (BP) control remains unclear. This study aims to examine the interplay of COC and illness perception on BP control among hypertensive patients.*

Methods: *A cross-sectional study was conducted among 397 hypertensive patients attending commune health centers in Kon Tum province, Vietnam. COC was assessed using the Continuity of Care Index (COCI), illness perception was measured using the Brief Illness Perception Questionnaire (B-IPQ), and BP control was defined as <140/90 mmHg. Multivariate logistic regression was performed to evaluate the associations between COC, B-IPQ, and BP control.*

Results: *BP control was achieved by 54.7% of participants. While continuity of care index (COCI) was high (94.2%), it was not associated with BP control ($p > 0.05$). In contrast, higher illness perception (B-IPQ) scores, observed in 44.6% of participants, were consistently linked to better BP control (OR = 1.02 - 1.03, $p < 0.05$). Urban residence, female gender, BMI, and medication adherence were strong predictors ($p < 0.05$).*

Conclusions: *Illness perception is a key determinant of BP control, while visit-based COC alone does not appear to be a determining factor. Continuity in provider-patient relationships and structured patient education may be necessary to translate high COC into better BP outcomes. Enhancing illness perception through targeted interventions and ensuring quality interactions within primary care settings could improve hypertension management, particularly in rural healthcare contexts.*

Từ khóa: *Hypertension, Blood Pressure Control, Continuity of Care, Illness Perception, Primary care.*

I. BACKGROUND

Hypertension is a leading cause of cardiovascular morbidity and mortality worldwide, yet its management remains suboptimal, particularly in low- and middle-income countries (LMICs) [1]. While primary care plays a crucial role in hypertension prevention and management, its effectiveness is often compromised by gaps in service continuity, poor provider coordination, and inconsistent patient follow-up [2]. These challenges are exacerbated in rural and resource-limited settings, where healthcare workforce shortages, geographic barriers, and limited patient education further hinder long-term blood pressure (BP) control [3].

Effective hypertension control requires not only a well-functioning healthcare system but also active

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patient engagement in self-management. Continuity of care (COC) refers to the extent to which healthcare experiences are consistent, coordinated, and patient-centered over time, emphasizing a sustained relationship between patients and their care providers [4]. Higher COC has been linked to improved treatment adherence, better disease monitoring, and lower hospitalization rates among patients with chronic conditions [3, 5]. However, in rural primary care settings, maintaining high COC is particularly challenging due to frequent provider turnover, inconsistent follow-up, and limited access to healthcare facilities, all of which contribute to poor hypertension control [4].

Beyond system-level factors, illness perception shapes how patients understand and manage their condition, directly affecting hypertension self-management and treatment adherence. Studies have shown that patients with a strong illness perception who recognize hypertension as a chronic and controllable condition are more likely to adhere to medication, monitor their BP regularly, and adopt recommended lifestyle modifications [6, 7]. Conversely, misconceptions about hypertension as an acute, symptom-driven illness may lead to poor treatment adherence and a lack of proactive engagement in self-care.

Although COC and illness perception have been individually linked to chronic disease management, their combined impact on hypertension control remains underexplored, particularly in rural LMIC settings. This study examines their relationship in primary healthcare to inform targeted interventions that strengthen primary care models, ensuring patients receive continuous care and actively participate in their treatment.

II. MATERIALS AND METHODS

2.1. Study design and setting

This cross-sectional study was conducted from January to September 2024 in Kon Tum City and Đăk Hà District, Kon Tum Province, Vietnam. These areas represent both urban and rural healthcare settings, allowing for an analysis of the impact of primary care continuity and illness perception on hypertension control in diverse populations.

2.2. Study population and sample size

The study included adult patients (aged 40 - 79 years) diagnosed with hypertension who were receiving care at primary care facilities. The minimum required sample size was calculated as 400 participants, based on a 95% confidence interval (CI), a margin of error (d) of 0.05, an estimated proportion of high COC of 52.5% from previous studies [8], and a 5% non-response rate. A total of 397 patients completed the survey, yielding a response rate of 99.2%.

A two-stage sampling technique was used to ensure adequate representation of both urban and rural populations. In the first stage, primary healthcare facilities were randomly selected. In the second stage, eligible patients were systematically sampled during routine clinic visits. Informed consent was obtained from all participants before enrolment.

2.3. Study instrument and data collection

Continuity of Care Index (COCI): COC was assessed using the COCI, which quantifies the extent to which a patient consistently receives care from the same provider. Scores range from 0 (completely fragmented care) to 1 (all visits with the same provider). For analysis, COCI was categorized into low (< 0.75) and high (≥ 0.75) levels, following prior studies in Korea [9].

Illness Perception: The Brief Illness Perception Questionnaire (B-IPQ) was used to evaluate patients' cognitive and emotional perceptions of hypertension. It consists of eight items, rated on a scale from 0 to 10, covering dimensions such as consequences, timeline, personal and treatment control, identity, concern, emotional response, and illness comprehension. Scores were categorized into three levels: poor perception (< 42), moderate perception (42 - 49), and good perception (≥ 50) [10].

Hypertension Control and Covariates: Blood pressure (BP) control was defined as achieving systolic BP < 140 mmHg and diastolic BP < 90 mmHg, based on the latest hypertension management guidelines. Additional variables included demographic factors, body mass index (BMI), duration of hypertension, medication adherence, and comorbidities assessed using the Charlson Comorbidity Index (CCI), categorized as mild (CCI 1 - 2), moderate (CCI 3 - 4), or severe (CCI ≥ 5) [11].

2.4. Statistical analysis

Data were entered and analyzed using EpiData 3.1 and SPSS 20.0. Descriptive statistics were reported

as percentages, means, and standard deviations. Bivariate analyses (Chi-square and t-tests) were conducted to compare hypertension control status across patient characteristics. Multivariate logistic regression using the Enter method was performed to assess the independent associations between COCI, illness perception, and hypertension control, adjusting for potential confounders. Variables with $p < 0.2$ in bivariate analysis were included in the final models. Odds ratios (ORs) with 95% confidence intervals (CIs) were reported, with significance set at $p < 0.05$.

III. RESULTS

Among 397 hypertensive patients, 45.3% had uncontrolled BP, with significant disparities by geographic area and gender (Table 1). Among patients with controlled hypertension, a greater proportion resided in urban areas (60.8%) compared to remote areas (39.2%) ($p = 0.01$). Women accounted for a higher proportion of those with controlled BP (62.2%) compared to men (37.8%) ($p = 0.01$). No significant associations were observed for age, education, employment, or disease duration ($p > 0.05$).

Table 1: Demographic characteristics of respondents by hypertension control status

Characteristics, n (%)	Overall	Uncontrolled BP	Controlled BP	p-value
Sample, n	397	180 (45.3)	217 (54.7)	
Area				
Urban	219 (55.2)	87 (48.3)	132 (60.8)	0.01
Remote	178 (44.8)	93 (51.7)	85 (39.2)	
Gender				
Male	173 (43.6)	91 (50.6)	82 (37.8)	0.01
Female	224 (56.4)	89 (49.4)	135 (62.2)	
Age				
< 60	146 (36.8)	71 (39.4)	75 (34.6)	0.32
≥ 60	251 (63.2)	109 (60.6)	142 (65.4)	
Highest education				
Primary education and under	167 (42.1)	76 (42.2)	91 (41.9)	0.93
Junior and senior high school	181 (45.6)	83 (46.1)	98 (45.2)	
College and above	49 (12.3)	21 (11.7)	28 (12.9)	
Employment				
Employed	215 (54.2)	96 (53.3)	119 (54.8)	0.76
Not employed, retired	182 (45.8)	84 (46.7)	98 (45.2)	
Duration of disease				
< 7 years	230 (59.4)	105 (60.3)	125 (58.7)	0.74
≥ 7 years	157 (40.6)	69 (39.7)	88 (41.3)	

Table 2 demonstrates significant associations between hypertension control and alcohol consumption, medication adherence, antihypertensive regimen, and illness perception. Patients with uncontrolled BP were more likely to be at-risk drinkers ($p = 0.005$) and had lower medication adherence ($p < 0.001$). Additionally, those on a single-pill regimen exhibited higher rates of uncontrolled BP ($p = 0.02$).

The mean B-IPQ score was 47.1 (SD = 10.64), and the mean COCI was 0.97 (SD = 0.12). High illness perception and COC were observed in 44.6% and 94.2% of participants, respectively. B-IPQ scores were significantly higher in the controlled BP group, whereas COCI scores showed no notable difference between controlled and uncontrolled BP groups (0.97 vs. 0.96, p = 0.7). No significant associations were found for BMI, Charlson Comorbidity Index (CCI), or smoking status (p > 0.05).

Table 2: Clinical characteristics of respondents by hypertension control status

Characteristics, n (%)	Overall (n = 397)	Uncontrolled BP (n=180)	Controlled BP (n=217)	p-value
BMI				
Underweight	24 (6.1)	9 (5.1)	15 (6.9)	0.17
Normal weight	171 (43.4)	70 (39.3)	101 (46.8)	
Overweight/ Obesity	199 (50.5)	99 (55.6)	100 (46.3)	
Charlson Comorbidity Index (CCI)				
No comorbidities	201 (50.6)	99 (55.0)	102 (47.0)	0.13
Mild	165 (41.6)	65 (36.1)	100 (46.1)	
Moderate to severe	31 (7.8)	16 (8.9)	15 (6.9)	
Alcohol Consumption				
At risk	126 (31.7)	70 (38.9)	56 (25.8)	0.005
No	271 (68.3)	110 (61.1)	161 (74.2)	
Active smoking status				
Current smoker	81 (20.4)	43 (23.9)	38 (17.5)	0.12
Non-smoker	316 (79.6)	137 (76.1)	179 (82.5)	
Number of antihypertensive pills per day				
None	14 (3.6)	10 (5.9)	4 (1.8)	0.02
1 pill	295 (76.6)	119 (70.4)	176 (81.5)	
≥ 2 pills	76 (19.8)	40 (23.7)	36 (16.7)	
Medication adherence				
Yes	346 (87.2)	143 (79.4)	203 (93.5)	< 0.001
No	51 (12.8)	37 (20.6)	14 (6.5)	
Overall COCI, Mean (SD)	0.97 (0.12)	0.97 (0.09)	0.96 (0.13)	0.7
Overall B-IPQ, Mean (SD)	47.1 (10.64)	45.29 (10.68)	48.58 (10.4)	0.002

Table 3 presents multivariate logistic regression results examining the associations between continuity of care (COCI), illness perception (B-IPQ), and patient characteristics with hypertension control. COCI was not significantly associated with BP control in either the individual model (Model 1: OR = -0.66, 95% CI: 0.11 - 3.84, p > 0.05) or the combined model (Model 3: OR = -0.69, 95% CI: 0.12 - 4.00, p > 0.05), suggesting that COC alone does not directly influence hypertension control. In contrast, higher B-IPQ scores were consistently associated with better BP control, both independently (Model 2: OR = 1.03, 95% CI: 1.01 - 1.05, p < 0.01) and in the combined model (Model 3: OR = 1.02, 95% CI: 1.01 - 1.05, p < 0.05).

Urban residents (OR = 2.03 - 2.22) and women (OR = 1.65 - 1.77) had consistently higher odds of BP control across all models ($p < 0.05$). Medication adherence strongly predicted BP control (OR = 2.32 - 3.63, $p < 0.05$). Individuals with normal weight had higher odds of BP control compared to those with overweight/obesity (OR = 1.59 - 1.66, $p < 0.05$). However, this association was not statistically significant in Model 1, where B-IPQ was not included. Comorbidity, age, and smoking status were not significant predictors in any model ($p > 0.05$).

Table 3: Multivariate logistic regression models of hypertension control, COC, illness perceptions, and participant characteristics

Variable, OR (95% CI)	Model 1	Model 2	Model 3
COCI	-0.66 (0.11 - 3.84)	-	-0.69 (0.12 - 4.00)
B- IPQ	-	1.03 (1.01 - 1.05)**	1.02 (1.0 - 1.05)*
Area			
Urban	2.03 (1.29 - 3.19)**	2.12 (1.36 - 3.31)**	2.22 (1.41 - 3.52)**
Remote	1	1	1
Gender			
Female	1.65 (1.06 - 2.57)*	1.77 (1.15 - 2.72)*	1.73 (1.11 - 2.71)*
Male	1	1	1
Age			
< 60	1	1	1
≥ 60	1.38 (0.87 - 2.19)	1.33 (0.85 - 2.09)	1.37 (0.86 - 2.18)
BMI			
Underweight	1.56 (0.6 - 4.08)	1.57 (0.61 - 4.05)	1.64 (0.62 - 4.32)
Normal weight	1.59 (1.01 - 2.52)	1.63 (1.04 - 2.54)*	1.66 (1.05 - 2.63)*
Overweight/ Obesity	1	1	1
Medication adherence			
Adherence	2.54 (1.18 - 5.49)*	3.63 (1.79 - 7.4)***	2.32 (1.06 - 5.08)*
Non-adherence	1	1	1
Charlson Comorbidity Index (CCI)			
No comorbidities	1	1	1
Mild	1.39 (0.87 - 2.21)	1.41 (0.89 - 2.23)	1.38 (0.86 - 2.22)
Moderate to severe	0.68 (0.3 - 1.55)	0.69 (0.31 - 1.56)	0.67 (0.29 - 1.54)

Model 1: Effect of COCI on hypertension control, adjusted for patient characteristics. **Model 2:** Effect of B-IPQ on hypertension control, adjusted for patient characteristics. **Model 3:** Combined effect of COCI and B-IPQ on hypertension control, adjusted for patient characteristics. Patient characteristics included in all three models were area, gender, age, BMI, medication adherence, and CCI. Odds ratios (ORs), 95% confidence intervals (CIs), and p-values for COCI, B-IPQ, and patient characteristics were reported. 1: reference group. Significance levels: *$p < 0.05$; **$p < 0.01$, ** $p < 0.001$

III. DISCUSSION

Hypertension remains a major public health challenge, particularly in LMICs, where primary care systems often struggle with fragmented care and limited patient engagement. Our findings indicate that while COC was not significantly associated with blood pressure control, higher illness perception scores were consistently linked to better hypertension management.

3.1. Continuity of care and hypertension control

Our study found a higher mean Continuity of Care Index (COCI) score compared to previous findings from Thua Thien Hue (2020; COCI for hypertension and type 2 diabetes = 0.77) [8], China (2017 - 2019; COCI for hypertension and type 2 diabetes = 0.58) [12] and Norway (2021; COCI for heart failure = 0.77) [13]. However, COC was not significantly associated with BP control in any model. One possible reason is the measurement approach, which uses a visit-based index at the facility level and captures only one aspect of the broader COC concept. While a high COCI score indicates consistent visits, it does not fully reflect continuity with a specific provider or care team, essential for patient-centered and well-integrated care. Previous studies have highlighted that strong provider-patient relationships, effective follow-up mechanisms, and integrated care approaches substantially improve long-term health outcomes than visit-based continuity alone [14, 15].

Moreover, continuity alone may not be sufficient to improve BP control if the quality of interactions, effectiveness of follow-up practices, and integrated care approaches are inadequate. Patients who consistently visit the same facility might still experience gaps in comprehensive care due to resource limitations, inadequate availability of antihypertensive medications, or inconsistent follow-up protocols. The World Health Organization (WHO) emphasizes a multi-dimensional view of COC based on the framework proposed by Deeny et al. (2003), which includes four essential dimensions: interpersonal (relational) continuity, longitudinal continuity, management continuity, and informational continuity [3]. Therefore, future research should incorporate additional measures of continuity, particularly relational and informational continuity, to better understand and assess their influence on hypertension management outcomes.

3.2. Illness perception and hypertension control

In contrast to COCI, illness perception (B-IPQ) was consistently associated with BP control, both independently and in the fully adjusted model. Patients with stronger illness perceptions, indicating a greater awareness of hypertension as a chronic condition requiring long-term management, were more likely to have controlled BP. This finding aligns with previous research showing that how patients perceive their illness significantly influences treatment adherence, lifestyle modifications, and engagement with healthcare services [3, 14, 16]. However, despite this relatively high B-IPQ score, a substantial proportion of patients still had uncontrolled hypertension, underscoring the need to translate illness perception into sustained treatment adherence and lifestyle modifications. Previous research has demonstrated that higher illness perception scores are associated with improved self-care behaviors, including medication adherence, lifestyle adjustments, and blood pressure monitoring [16]. Our findings suggest a synergistic relationship between COC and illness perception may be key to optimizing hypertension care. Patients who consistently engage with the same healthcare providers may receive more personalized education, reinforcing their illness perceptions and improving adherence to treatment recommendations.

Illness perception may play an especially critical role in rural LMIC settings, where misconceptions about hypertension are common. Many patients in these settings view hypertension as an acute rather than chronic disease, leading to inconsistent medication use and poor self-monitoring practices [6]. Our results support that improving patients' understanding of their condition through targeted education and counseling interventions may be an effective strategy to enhance BP control. Future studies should explore how structured interventions, such as motivational interviewing or patient-centered counseling, can strengthen illness perception and improve hypertension outcomes.

3.3. Contextual considerations in Kon Tum province

The interpretation of our findings must take into account the unique geographical, ethnic, and socioeconomic characteristics of Kon Tum

province. As a remote mountainous region with a high proportion of ethnic minority populations, Kon Tum faces significant barriers to healthcare access, including limited transportation infrastructure and cultural differences in health beliefs and practices. These contextual factors can affect both COC and illness perception, contributing to challenges in treatment adherence and long-term hypertension management. For instance, although the COCI score was high, it may reflect logistical constraints where patients consistently seek care from the nearest available CHCs rather than from continuity with a specific and high-qualified provider. In ethnic minority communities, health literacy and trust in the health system may be limited, potentially diminishing the effectiveness of provider counseling and illness perception. Furthermore, low income and educational attainment may reduce patients' capacity to adhere to medication regimens or understand the asymptomatic nature of hypertension.

To address the challenges highlighted, we recommend several strategies: (1) enhancing patient education through visual aids, community talks, and peer educators to improve illness perception; (2) training healthcare providers in counseling skills and relationship-building to improve interpersonal continuity; and (3) leveraging mobile health technologies, such as SMS reminders and phone-based counseling, to maintain engagement and promote adherence, especially in remote and ethnic minority communities.

3.4. Implications for practice and policy

Our findings highlight the critical role of illness perception in hypertension control and suggest that continuity of care alone may not be sufficient without reinforcing patient understanding and engagement. Moving forward, hypertension management programs should integrate patient education into routine care, ensuring that COC strengthens, rather than simply maintains, engagement with healthcare services. Strategies like provider training in motivational interviewing, structured follow-up protocols, and technology-assisted patient education may help bridge the gap between continuity and effective disease management. Targeted approaches are also needed for high-risk groups with low illness perception or weak provider engagement. Recommended interventions include: (1) community-based education using visual aids and peer educators; (2) training providers in culturally sensitive counseling and relationship-building; and (3) leveraging mobile technologies (including SMS reminders, phone-based support) to enhance adherence and follow-up, particularly in remote and ethnic minority communities.

Despite the study's strengths, several limitations exist. One potential limitation is the reliance on patient-reported healthcare utilization to assess COC, which may be subject to recall and response biases. This approach may not capture the full scope of healthcare utilization patterns, and future studies should consider using electronic medical records and administrative data to validate patient-reported data. Furthermore, the lack of a robust and reliable surveillance system monitoring healthcare utilization and NCDs in Vietnam and other LMICs limits the study's ability to assess healthcare utilization patterns accurately.

IV. CONCLUSIONS

This study highlights the significant role of illness perception in hypertension control, while continuity of care alone was not a strong predictor. The higher COCI scores observed in this study compared to previous research suggest that mere continuity without improvements in care quality may not translate to better BP outcomes. Notably, the interaction between COC and illness perception should be further explored, as optimizing both factors may yield more significant improvements in hypertension management. Future research should focus on interventions that integrate continuity with structured education and engagement strategies, ensuring that patients not only have consistent access to care but also actively participate in their treatment.

Competing interests

The authors declare no conflict of interest.

Ethical statements

This study was approved by the Biomedical Research Ethics Committee of Hue University of Medicine and Pharmacy (H2023/340, dated June 2, 2023). All participants provided written informed

consent. The study adhered to ethical principles in medical research and was conducted with the authorization and support of the Department of Health and local healthcare centers in the study areas.

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