

Role of Community Health Workers in Healthcare Delivery: Impact on Access and Patient Outcomes in Underserved Communities of West Champaran, Bihar, India—A Prospective Facility-Linked Cohort Study

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Abstract

Background: Community health workers (CHWs) are central to primary healthcare strengthening and universal health coverage, particularly in underserved populations where geographic, financial, and informational barriers limit service uptake and continuity of care. Evidence supports CHW effectiveness across settings, but facility-linked evidence from high-need districts remains limited.[1,3]

Aim: To assess the impact of a structured CHW facilitation package on healthcare access and selected clinical/process outcomes among patients from underserved communities linked to Government Medical College, Bettiah.

Methods: A prospective, facility-linked cohort study was conducted from 5 January 2025 to 31 December 2025 among 65 patients from underserved catchment areas. CHWs provided home-based education, appointment facilitation, referral navigation, follow-up reminders, and barrier-resolution support. Primary outcome was timely OPD access (≤ 14 days of identified need/referral). Secondary outcomes included missed visits, completion of essential investigations, adherence ($\geq 80\%$), and condition-specific control (blood pressure control among hypertensive participants; HbA1c control among participants with diabetes). Pre-post comparisons were analyzed using McNemar tests for paired proportions and paired tests for continuous measures; multivariable logistic regression explored predictors of improved access.

Results: Timely OPD access improved from 38% to 72% ($p < 0.001$), missed visits reduced from 46% to 20% ($p < 0.001$), and essential investigation completion increased from 29% to 58% ($p < 0.001$). Adherence ($\geq 80\%$) improved from 41% to 69% ($p < 0.001$). Blood pressure control among hypertensive participants increased from 41% to 63% ($p = 0.01$). In adjusted models, ≥ 3 CHW contacts was associated with higher odds of timely access (aOR ~ 3.1).

Conclusion: A structured CHW facilitation package was associated with substantial improvements in timely access, continuity, and selected outcomes in underserved communities linked to a tertiary-care public facility. Findings support strengthening CHW-facility integration and targeted supervision to sustain gains.[1,3]

Keywords: Community Health Workers; Access To Care; Underserved Communities; Primary Healthcare; India; Bihar; ASHA; Navigation; Outcomes.

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Introduction

Underserved communities in low- and middle-income settings frequently experience a convergence of barriers—distance to facilities, opportunity costs, limited health literacy, fragmented referral pathways, and constrained

capacity within primary care—that collectively impede timely access and continuity of care. These barriers contribute to late presentation, preventable complications, avoidable emergency utilization, and inequities in health outcomes. Community health

workers (CHWs) have been positioned globally as a pragmatic and scalable response to these access gaps by functioning as trusted, community-embedded intermediaries who connect households with services, reinforce preventive behaviors, and support navigation through health systems.[1] The WHO guideline on optimizing CHW programmes emphasizes that CHW impact depends not only on community embeddedness but also on health-system supports—role clarity, training, supervision, remuneration, and functional referral linkages.[1,2] These implementation features are especially critical in rural and resource-constrained districts, where weak referral connectivity and competing demands on frontline workers can dilute effectiveness. Evidence from diverse settings suggests CHWs can improve service uptake and selected outcomes, yet effects vary across programmes and contexts, highlighting the importance of local evaluation.[3]

India's primary healthcare architecture includes large-scale community health worker platforms, particularly Accredited Social Health Activists (ASHAs), which have historically demonstrated strongest contributions in maternal and newborn health (MNH), with persistent gaps in breadth of knowledge and enabling systems support.[4,5] Systematic syntheses indicate that ASHAs modestly improve key MNH service coverage while facing operational challenges across states and regions, suggesting that context-specific strengthening is needed to maximize equity impacts.⁴ National and multi-state evaluations further show that CHW functionality and effectiveness are influenced by training, supportive supervision, incentives, and system responsiveness.⁶

Bihar, including districts such as West Champaran, has been the focus of major health system strengthening and community-based initiatives, demonstrating that improvements in primary healthcare delivery and community engagement can be achieved at scale when interventions are aligned with systems capacity and monitoring.[7] District-level innovations to improve CHW mobility and service reach have also been explored in West Champaran, illustrating how practical system enablers can affect community-level service delivery.[8] However, despite these initiatives, underserved catchment communities still face meaningful access barriers, and facility-linked evidence on how structured CHW facilitation influences timely utilization and measurable outcomes remains limited, particularly when linked to tertiary public facilities that serve as referral hubs.

Beyond MNH, CHW interventions have been associated with improvements in chronic disease management and care processes among vulnerable populations. A widely cited systematic review found that CHW interventions can improve chronic disease-related outcomes and care processes across

settings, though heterogeneity in interventions and study designs is notable.[9] More recent syntheses in diabetes care similarly indicate that CHW interventions can achieve clinically meaningful improvements in glycaemic control in certain populations, reinforcing the plausibility of CHW-led navigation and adherence support as a mechanism for improving outcomes.[10] Additionally, systematic evidence suggests CHW interventions can influence healthcare utilization patterns, including reductions in some forms of preventable utilization, while underscoring that CHWs alone are not sufficient—programme design and system integration matter.[3]

Against this background, we conducted a prospective, facility-linked cohort evaluation at Government Medical College, Bettiah, during 2025 to assess the impact of a structured CHW facilitation package on healthcare access and selected outcomes among patients from underserved communities. We hypothesized that CHW-supported navigation would improve timely access to outpatient care, reduce missed visits, increase completion of essential investigations, and improve adherence and selected condition-specific control metrics.

Materials and Methods

This prospective, facility-linked cohort study was conducted at Government Medical College, Bettiah, West Champaran, Bihar, India, over a one-year period from 5 January 2025 to 31 December 2025, with the objective of assessing the impact of community health worker (CHW)-led facilitation on healthcare access and selected clinical outcomes among underserved populations. The study population comprised 65 adult patients residing in rural and socioeconomically disadvantaged catchment areas served by the institution. Participants were consecutively enrolled following identification of healthcare need either through outpatient referral, community screening, or follow-up requirement for chronic disease management. Individuals aged ≥ 18 years who required facility-based consultation or continuity care and provided written informed consent were included, whereas patients requiring emergency hospitalization, those unable to provide consent, or individuals planning relocation outside the study area during follow-up were excluded.

Following enrollment, baseline demographic, socioeconomic, geographic, and clinical characteristics were recorded using a structured case record form. Information collected included age, sex, educational status, distance from healthcare facility, mobile phone accessibility, health literacy proxy indicators, comorbidity status, and prior healthcare utilization patterns. Baseline clinical parameters relevant to existing chronic conditions, particularly hypertension and diabetes mellitus,

were documented from clinical examination and medical records.

The intervention consisted of a structured community health worker facilitation package delivered by trained CHWs operating within the study catchment area. CHWs conducted scheduled home visits and telephonic follow-ups aimed at improving healthcare navigation and continuity of care. Core intervention components included health education regarding disease recognition and treatment importance, facilitation of outpatient department (OPD) appointments, assistance in referral linkage, reminder-based follow-up for consultations and investigations, counseling to improve medication adherence, and identification of logistical or socioeconomic barriers affecting healthcare utilization. CHWs also coordinated with designated facility focal personnel to ensure streamlined patient movement within hospital services and feedback-based follow-up. Participants were followed longitudinally throughout the study period. The primary outcome was timely healthcare access, defined as attendance at the outpatient department within 14 days of identified healthcare need or referral. Secondary outcomes included frequency of missed scheduled visits, completion of prescribed essential laboratory investigations, treatment adherence of $\geq 80\%$ assessed through combined pill-count and self-report measures, blood pressure control among hypertensive participants (defined as $<140/90$ mmHg), and glycemic control among diabetic participants ($\text{HbA1c} < 7\%$) at follow-up evaluation.

Data were entered into a secured electronic database and analyzed using standard statistical procedures. Continuous variables were summarized as mean $\pm$ standard deviation, while categorical variables were

expressed as frequencies and percentages. Pre- and post-intervention comparisons were performed using paired statistical methods; McNemar's test was applied for categorical outcomes and paired t-test or Wilcoxon signed-rank test was used for continuous variables depending on distribution normality. Multivariable logistic regression analysis was conducted to identify independent predictors associated with improvement in timely healthcare access, and results were expressed as adjusted odds ratios (aOR) with 95% confidence intervals. A two-tailed p-value of <0.05 was considered statistically significant.

Result

Table 1 presents the baseline socio-demographic characteristics of the study participants enrolled in the community health worker (CHW) intervention program ($n = 65$). The mean age of participants was 44.1 ± 13.6 years, with a predominance of female participants (60%). A large proportion of individuals belonged to rural areas (75.4%), reflecting the underserved population targeted in the study. More than half of the participants had education limited to primary level or below (58.5%) and 63.1% reported low household income, indicating significant socioeconomic vulnerability. Geographical accessibility remained a major concern, as 56.9% of participants resided ≥ 5 km from the healthcare facility. Although mobile phone availability was present in the majority (67.7%), nearly one-third lacked personal access, potentially influencing healthcare communication and follow-up. Additionally, 53.8% of participants demonstrated low health literacy, highlighting the need for structured community-based facilitation.

Table 1: Baseline Socio-Demographic Profile

Variable	Category	N	Percentage (%)
Sex	Female	39	60
	Male	26	40
Residence	Rural	49	75.4
	Urban/Peri-urban	16	24.6
Education	$\leq$ Primary education	38	58.5
	$>$ Primary education	27	41.5
Household Income	Low income (self-reported)	41	63.1
	Middle/Above	24	36.9
Distance to facility	≥ 5 km	37	56.9
	< 5 km	28	43.1
Mobile phone access	No	21	32.3
	Yes	44	67.7
Health literacy	Low (proxy)	35	53.8
	Adequate	30	46.2

Table 2 summarizes the baseline clinical characteristics and healthcare access barriers among the study participants ($n = 65$) prior to

implementation of the community health worker (CHW) intervention. A substantial proportion of participants had underlying chronic conditions, with

hypertension present in 55.4% and diabetes mellitus in 27.7%, while 33.8% exhibited multimorbidity, indicating a considerable burden of chronic disease requiring continuous healthcare engagement. Healthcare utilization challenges were prominent at baseline, as 46.2% of participants reported missing at least one scheduled medical appointment in the

preceding three months. Structural barriers were frequently identified, with 61.5% reporting transport-related financial constraints and 43.1% experiencing difficulty navigating healthcare facility processes. Additionally, 50.8% perceived prolonged waiting time as a deterrent to seeking care.

Table 2: Baseline Clinical Profile & Healthcare Access Barriers

Characteristic	Category	n	Percentage (%)
Hypertension	Present	36	55.4
Hypertension	Absent	29	44.6
Diabetes Mellitus	Present	18	27.7
Diabetes Mellitus	Absent	47	72.3
Multimorbidity (≥ 2 chronic conditions)	Yes	22	33.8
Multimorbidity (≥ 2 chronic conditions)	No	43	66.2
Prior missed appointment (last 3 months)	Yes	30	46.2
Prior missed appointment (last 3 months)	No	35	53.8
Transport cost barrier	Reported	40	61.5
Transport cost barrier	Not reported	25	38.5
Navigation difficulty (facility process)	Yes	28	43.1
Navigation difficulty (facility process)	No	37	56.9
Waiting-time deterrent	Reported	33	50.8
Waiting-time deterrent	Not reported	32	49.2

Table 3 demonstrates the comparison of healthcare access and clinical outcomes before and after implementation of the community health worker (CHW)-led intervention among the study participants (n = 65). Following CHW facilitation, a significant improvement was observed in timely outpatient department (OPD) access, which increased from 38.5% at baseline to 72.3% post-intervention ($p < 0.001$). Concurrently, the proportion of participants missing scheduled healthcare visits markedly decreased from 46.2% to

20.0% ($p < 0.001$). Completion of essential laboratory investigations improved substantially from 29.2% to 58.5%, while treatment adherence $\geq 80\%$ increased from 41.5% to 69.2%, both showing strong statistical significance.

Among participants with hypertension, adequate blood pressure control improved from 41.7% to 63.9%, and glycemic control among diabetic participants nearly doubled from 22.2% to 44.4% following the intervention.

Table 3: Pre- and Post-Intervention Outcomes after Community Health Worker (CHW) Facilitation

Outcome	Pre-intervention n (%)	Post-intervention n (%)	Absolute Change (%)	p-value
Timely OPD access (≤ 14 days)	25 (38.5%)	47 (72.3%)	+33.8	<0.001
Missed scheduled visit	30 (46.2%)	13 (20.0%)	-26.2	<0.001
Essential investigation completed	19 (29.2%)	38 (58.5%)	+29.3	<0.001
Treatment adherence $\geq 80\%$	27 (41.5%)	45 (69.2%)	+27.7	<0.001
BP control among hypertensive (n=36)	15 (41.7%)	23 (63.9%)	+22.2	0.01
HbA1c <7% among diabetes (n=18)	4 (22.2%)	8 (44.4%)	+22.2	0.04

Table 4 presents the results of multivariable logistic regression analysis identifying independent predictors associated with improvement in timely healthcare access following the community health worker (CHW) intervention. The analysis demonstrated that participants receiving three or more CHW contacts had significantly higher odds of

achieving timely outpatient care (aOR 3.10; 95% CI: 1.30–7.40; $p = 0.01$), indicating that greater interaction intensity with CHWs played a crucial role in improving healthcare utilization.

Baseline uncontrolled disease status was also independently associated with improved healthcare access after intervention (aOR 2.40; 95% CI: 1.05–

5.70; $p = 0.04$), suggesting that patients with higher clinical need benefitted more from structured CHW support. Other factors such as female sex, distance

from healthcare facility, health literacy status, and mobile phone availability showed trends toward association but did not reach statistical significance.

Table 4: Multivariable Logistic Regression Analysis

Predictor Variable	Adjusted Odds Ratio (aOR)	95% CI (Lower)	95% CI (Upper)	p-value
CHW contacts ≥ 3 (vs < 3)	3.1	1.3	7.4	0.01
Female sex (vs male)	1.25	0.55	2.84	0.59
Distance to facility ≥ 5 km	0.62	0.28	1.36	0.23
Low health literacy	0.58	0.25	1.33	0.20
Mobile phone available	1.9	0.82	4.42	0.13
Baseline uncontrolled disease	2.4	1.05	5.7	0.04

Discussion

In this facility-linked prospective cohort from underserved communities in West Champaran, Bihar, a structured CHW facilitation package was associated with large improvements in timely outpatient access, reductions in missed visits, and higher completion of essential investigations. Improvements were also observed in adherence and condition-specific control metrics (blood pressure control among hypertensive participants and HbA1c control among participants with diabetes), suggesting that navigation and continuity support can translate into measurable care process and intermediate outcome gains.

Our findings are directionally consistent with global guidance that CHW programmes can strengthen access pathways when CHWs are embedded in communities and connected to functional health-system supports.[1,2] The WHO guideline and its abridged Lancet Global Health publication highlight that CHW effectiveness depends on coherent policies across selection, training, supervision, and integration within the broader workforce.[2] In our setting, the facility focal-person linkage and emphasis on referral navigation were intentionally aligned with this principle, which may explain the particularly strong effects seen for timely access and investigation completion—two outcomes highly sensitive to “system friction” rather than solely patient motivation.

The magnitude of improvement in timely care-seeking and reduced missed visits aligns with systematic evidence that CHWs can improve service utilization and, in some contexts, reduce preventable utilization; however, heterogeneity across studies is well documented.[3] The systematic review by Jack et al. noted that rigorous RCTs often show more modest effects than observational designs and emphasized that CHWs alone do not guarantee success—intervention design and health system context matter.[3]

Our observed improvements should therefore be interpreted as reflecting both CHW activity and the local programme configuration (facility linkage,

repeated contacts, and barrier-resolution orientation), rather than CHW presence alone.

Our results also resonate with evidence that CHW interventions can improve chronic disease care processes and intermediate outcomes among vulnerable populations. Kim et al. synthesized evidence across chronic diseases and found CHW interventions frequently improved disease control and care processes, supporting the plausibility of our observed improvements in adherence and blood pressure control.[9] More recent diabetes-focused meta-analytic evidence indicates CHW interventions can deliver clinically meaningful reductions in HbA1c under certain conditions (e.g., intervention duration and intensity), reinforcing the pathway from navigation and support to measurable metabolic outcomes.[10] While our diabetes subgroup was small, the direction of change was consistent with these findings.

In India, CHW platforms such as ASHAs have demonstrated strongest documented impacts in maternal and newborn health, with systematic evidence suggesting modest but positive improvements in MNH service coverage and persistent challenges related to training breadth, workload expansion, and system support.[4,5] Multi-state evaluation evidence further suggests determinants of functionality include supportive supervision, incentives, and health-system responsiveness.[6] Our “contact intensity” signal—where ≥ 3 CHW contacts was associated with higher odds of timely access—fits with this implementation logic: repeated contacts likely enhance problem recognition, reduce informational barriers, and improve follow-through on referrals.

The Bihar context is particularly relevant. Evidence from statewide initiatives and primary healthcare strengthening in Bihar demonstrates that large-scale improvements are possible when programme components are integrated with monitoring, quality improvement, and community engagement.[7] District-level operational enablers—such as improved CHW mobility interventions explored in West Champaran—further underscore that practical system supports can shape coverage and

responsiveness.[8] Our findings extend this context by providing facility-linked evidence that navigation-focused CHW facilitation can improve measurable access and continuity outcomes in a tertiary public facility referral catchment.

Implications

From a health-systems perspective, the strongest gains in our study were for outcomes sensitive to navigation and coordination (timely OPD access, missed visits, investigation completion). These are precisely the areas where CHWs can add value as “connective tissue” between households and facilities.^{1,2} Programmatically, these results support (i) defining CHW roles to include referral navigation, (ii) tracking contact intensity as a performance/process metric, and (iii) strengthening facility receptivity (clear pathways, focal persons, and feedback loops).

Limitations

This was a single-centre facility-linked evaluation with a small sample. Pre–post designs are susceptible to secular trends and regression to the mean, and subgroup outcome estimates (e.g., HbA1c) are underpowered. Outcomes such as adherence may be prone to measurement bias if self-report was used. Future work using controlled designs, longer follow-up, and cost-effectiveness assessment would strengthen inference, consistent with the literature emphasizing design heterogeneity and the need for rigorous evaluation.³

Conclusion

In underserved communities linked to Government Medical College, Bettiah, a structured CHW facilitation package was associated with marked improvements in timely access, reduced missed visits, increased completion of essential investigations, improved adherence, and better intermediate control outcomes in key chronic conditions. Strengthening CHW–facility integration and ensuring supportive supervision may help sustain and scale these gains in high-need districts.

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