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Original Research Article

Impact of Community-Based Interventions on Chronic Disease Management: Effectiveness of Community Health Worker–Led Interventions on Diabetes and Hypertension Management at Patna Medical College and Hospital

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Abstract

Background: Diabetes and hypertension are the two leading causes of cardiovascular morbidity and premature mortality in India although substantial gaps continue to exist in the areas of detection, persistence of care, patient compliance, and the achievement of therapeutic outcomes. Task-sharing schemes directed by community health workers (CHWs) are gradually supported to improve the chronic conditions yield in low- and middle-income locations.

Aim: The current research is aimed at measuring the efficacy of a CHW-led and community-based intervention in regulating glycaemic and blood pressure in adults with known type 2 diabetes and/or hypertension receiving care in Patna Medical College and Hospital (PMCH) in Patna, Bihar, India.

Methods: We conducted pragmatic parallel-group, cluster-randomised controlled trial over 12 months follow-up of communities catchment clusters that were associated with PMCH. The participants who fitted the criteria were adults with uncontrolled type 2 diabetes (HbA1c at or above 7.0% and/or a minimum of 90mmHg DBP and/or SBP). The intervention included CHW home visits, structured education, ongoing adherence, blood-pressure and glucose levels monitoring, risk-factor counselling, adaptation of referrals, and linkage to the clinicians with the help of the standardised algorithms. The 12-month changes in HbA1c and systolic blood pressure (SBP) were considered as primary outcomes. Mixed-effects models/models were used to consider clustering and baseline values.

Findings: The analysis was conducted on an intention-to-treat basis on 402 participants (intervention n=204; usual care n=198). The adjusted difference in reduction of HbA1c was found to be 0.70⁻ in the intervention group compared to usual care at 12 months (95% interval -0.85 -0.55; $p<0.001$). The adjusted difference in the mean reduction of SBP was -8.6mmHg (95%CI -11.4-5.8; $p<0.001$). The HbA1c controlling rates under 7 per cent improved to 41.7 per cent in the intervention group and the BP under 140/90mmHg to 58.3 per cent. The adherence and retention of medications and care-follow up improved, and the acute-care visits were reduced.

Conclusion: Community intervention led by CHW and associated with PMCH provided clinically significant results of HbA1c and SBP, therefore, supporting the feasibility of scalable task-sharing models in the framework of the non-communicable-disease programme in India.

Keywords: community health worker; sharing tasks; diabetes; hypertension; management of chronic diseases; India; cluster randomized controlled trial; adherence; strengthening primary care.

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Introduction

The first stage is the chronic noncommunicable diseases, where diabetes mellitus and hypertension take key places in determining the morbidity, disability, and mortality of the world. Recent epidemiological statistics show that the incidence of diabetes is on the ever-growing upward curve and the trends reveal that the number of the population and individuals with diabetes is going to increase significantly in the year 2050 unless effective prevention and control operational techniques are established [1,2]. Hypertension, in its turn, is still widespread and symbolizes one of

the largest risk factors of cardiovascular disease, stroke, and chronic renal disease worldwide that can be modified [3]. In the Indian setting, the two conditions have a very high burden, which is continuously increasing, driven by the impact of demographic changes, urbanisation, changes in lifestyle, and increased life expectancy [3].Although improvements have been made in the pharmacotherapy and the development of clinical guidelines, optimal glycaemic and blood-pressure control in the real world practice has not been achieved. In practice, empirical studies all point to the lack of agreement between diagnosing, starting treatment, compliance, and achieving the prescribed goals, especially in under-resource environments [3,4]. Existing obstacles include poor access to health care, busy procession of patients in tertiary centres, weak follow-up of care, poor health literacy, poverty, and discontinuity of care. They are also more marked in the crowded areas of India, where in places like Patna Medical College and Hospital (PMCH), tertiary institutions are receiving populations of catchment that well exceed their operational capacity to follow up chronic diseases in the long term.

Conventional facility-focused models of care may be insufficient in the case of long-term management of chronic-disease, through the continuous focus on patients instead of the episodic encountering. The chronic causes demand continuous observation, strengthening of compliance, change in lifestyle and immediate detection of complications. However, clinicians in high-volume outpatient environments are often faced with time limits that limit counselling, behavioural support and individual/personalised monitoring. This has led to the growing approval of innovative models of care-delivery that are not confined to the clinic setting by the international health organizations as well as national initiatives [4,5].Task sharing, which is the planned reallocation of health-care tasks by physicians to trained non-physician staff, has proven to be an effective way of improving workforce shortages and increasing the efficiency of service-delivery [6]. One of the key cadres in this paradigm is community facilitator, also known as community health workers (CHWs). CHWs are recruited periodically within the local communities, and therefore can provide culturally engaging education, behavioural counselling, adherence support, and home-based monitoring and retain a close proximity to supervising clinicians. It has been empirically demonstrated that CHWs are capable of increasing the rate of early disease detection, enhancing the rate of treatment adherence, reducing the loss to followness, and encouraging healthier lifestyle behaviors [6,7].

The success of interventions conducted by CHWs has been demonstrated in the range of global researches. An example of such a study is the HOPE-4 cluster randomised trial that revealed that community-based cardiovascular risk management led by non-physician health workers significantly increased blood-pressure levels and reduced the overall risk of cardiovascular disease [8]. Similarly, systematic review related to the diabetes management state that CHW interventions may produce clinically tangible benefits in HbA1c levels; yet, the extent of impact varies based on the intensity, duration, and intensity of intervention in combination with the formal health systems [9]. These results support the hypothesis that community-based strategies can be used to supplement the costs of facilities and overcome limitations, which could not be addressed by clinic-only initiatives. The National Programme on Prevention and Control of Cancer, Diabetes, Cardiovascular Diseases and Stroke (NPCDCS) in India emphasizes the importance of screening, early detection, and lifelong follow up of chronic conditions in communities through fortification (within the communities) [5]. In maternal health programmes and child health programmes, community health workers e.g. Accredited Social Health Activists (ASHAs) already play vital roles and are being recruited into NCD control activities. According to early programmematic assessments, formatted CHW involvement has the capacity to boost detection rates as well as follow up compliance in diabetic and hypertensive patients [10].It is based on these considerations that the current study has been conducted in Patna Medical College and Hospital where the effectiveness of a structured community-based intervention by trained community health workers with patients having uncontrolled diabetes and/or hypertension is to be observed. The main aim was to answer the question whether this kind of intervention might contribute significantly to the glycaemic control and blood-pressure regulation compared to the traditional facility-based care.

The investigation is aimed at enlightening policymakers, clinicians and the entire community on the potential future of CHW-led models in strengthening chronic-disease control in resource-limited environments.

Materials & Methods

Study Design and Setting: This study was conducted as a pragmatic, parallel-group study, cluster-randomized trial that would test the effectiveness of a community health worker-based strategy of managing chronic diseases. It was tried at local catchment areas in the community that were associated with Patna Medical College and Hospital (PMCH), Patna, Bihar, India. Geographically isolated neighbourhood areas were

used as clusters with specialisation of community health workers. The duration of the study was 12 months with the baseline evaluation and periodical assessment 12 months later. To enhance external validity, the pragmatic design was selected with the view of replicating real clinical and community situations.

Study Population and Eligibility Criteria: The individuals who were screened as eligible participants were adults between the ages of 30 and 70 years, living in the chosen clusters. The subjects were enrolled in the study when they had diabetes mellitus type 2 with HbA1c percentage of 7.0 and above or fasting plasma glucose of 130 and above and/or hypertension in terms of the mean of two standardized values of systolic blood pressure of 140 and above and diastolic blood pressure of 90 and above. The participants could not be less than 12 months permanently living in the study area and with income calculated annually. The exclusion criteria included pregnancy, severe renal disease requiring dialysis, advanced heart failure (New York heart association class 3 or 4), active malignancy or any medical or cognitive condition that was likely to interfere with the provision of informed consent or rendered compliance with the follow up program.

Randomization and Allocation: The clusters were randomly assigned to either the intervention arm or the usual -care arm in an 1:1 allocation sequence created using a computer-generated random allocation table and created by an independent statistician uninvolved in the process of recruiting the participants or in assessing the outcomes. The concealment of allocation was carried out until the share of clustering. Blinding of individuals and community health workers was not possible as a result of the intervention nature; however, outcome measurements were carried out using standard protocols in order to reduce the bias that was introduced by measurements.

Intervention Description: The intervention arm participants were told a structured, community-based intervention program conducted by trained community health workers. Before the study began, all workers were made to attend standardized training on the basics of the chronic disease, measurement types, counselling methods, adherence of measurement, documentation procedures, and referral criteria. Community health workers made regular home visits during the study period every month in the first six months and then every six to eight weeks thereafter. Each time they visited, they would take blood pressure measurements employing calibrated digital instruments, check capillary blood glucose where necessary, and examine medication compliance, strengthen lifestyle counselling, and detect signs and symptoms that required physician attention. Educational activities on diet change, salt intake, encouragement of physical activities, cessation of tobacco use and medicine literacy. Workers also whether it was needed to make appointments, remind participants of clinic visits, and also to arrange referrals to PMCH physicians in case the readings could not be controlled or where the suspicion of complications was detected. Standardized forms that were consistent with guideline-based management algorithm were used to record all activities.

Usual Care Group: The participants under this group were those assigned to the control arm and they were left to access common in-facility care in PMCH or other related primary care centers. This consisted of doctor visits, prescription and counselling as per common practice. This was not to include any structured home visits or other form of monitoring on top of the regular services.

Outcome Measures: The outcome measures were namely the change in glycated hemoglobin (HbA1c)-form of diabetic participants and the change in systolic blood pressure-form of hypertensive participants between the baseline and 12 months. The secondary outcomes were the change in diastolic blood pressure, percentage of those who achieved glycaemic control which was defined as HbA1c<7, frequency of those who achieved blood pressure control which was defined as less than 140/90 mmhg, medication adherence measured by use of a validated questionnaire, loss to follow-up rates, and incidence of acute-care visit related to glycaemic or blood pressure variation. The standardized procedures were used to measure them at the baseline and during the follow-up visits. Blood pressure was measured as the average of the two measurements made separated at the time of five minutes, and the laboratory measure of the HbA1c level was made through standardized assays.

Sample size Calculation: Sample size was calculated for this cluster-randomised controlled trial to detect a clinically meaningful between-group difference of 0.5% in HbA1c at 12 months, assuming a standard deviation of 1.5%, two-sided α of 0.05, and 80% statistical power. Under individual randomisation, 141 participants per arm were required. To account for clustering at the community level, the sample size was adjusted using a design effect calculated as $1+(m-1)\rho$, assuming an average cluster size of 25 participants and an intracluster correlation coefficient (ICC) of 0.02, yielding a design effect of 1.48. After adjustment, 417 participants were required. Allowing for an anticipated 10% loss to follow-up, the final target sample size was approximately 460 participants, corresponding to 20 clusters (10 per arm) with around 25 participants per cluster. This sample size provided adequate power to detect

clinically relevant improvements in glycaemic control while accounting for cluster-level correlation and attrition.

Data Collection and Quality Control: Case-record forms and standardized case-record staff fair data collection: The data collection involved trained staff filling out the baseline demographics, clinical and laboratory data by using standardized case-record forms. Follow up data was captured during home visits and checked by supervisory staff at intervals as recorded by community health workers. To maintain the accuracy of measurements and comply with protocols, the measuring devices were recalibrated and retrained after a certain period of time. The analysis of the data was done after it had undergone data entry that was assessed to be consistent and complete.

Statistical Analysis: All the analyses were done on the basis of the intention-to-treat. Continuous variables were presented in the form of mean in standard deviation and categories in frequency and percentages. The changes in continuous outcomes were evaluated in mixed-effects linear regression models and included clustering and adjusted the effects depending on the baseline values and potential confounders: age, sex, disease duration and body mass index. Logistic mixed-effects regression was used when the outcomes to be measured were categorical, such as the achievement of target control. The estimates of effects were provided with 95 percent confidence intervals. Sensitivity analysis based on multiple imputation was used to impute missing data and statistical significance was established as p-value 0.05. The statistical analysis was done through common statistical software.

Results

As shown in Table 1, respondents in the community health worker (CHW) intervention group and usual-care group were at baseline sufficiently similar regarding demographic, clinical, and treatment related variables, and both groups were randomised and compared. The age of the respondents in both groups was not significantly different (54.2 ± 9.8 vs 53.6 ± 10.1ʻyears); this expressed no evidence of selection bias related to age. Gender distribution was also balanced, with 47.1 percent of the females in the intervention arm and 45.5 percent of the control arm (p6), which has balance in terms of sex susceptible metabolic risk profile.

There was no significant difference in anthropometric status between groups as shown almost equal body mass indices (26.8 +-3.9 vs +-26.6 +-4.1 kg / m 2; p=.64), which indicates the same initial metabolic risk loads. The occurrence of diabetes and hypertension was also similar (p >ʻ0.85 in both cases) and the distribution of the disease was found to be equally balanced before the intervention. Notably there were no statistically significant differences in baseline glycaemic control and BP, and the mean HbA1c levels (8.6 Philosophies) were identical in both arms, as was the average systolic blood pressure (152 mmHg). This gives the implication that the two groups had equal severity of metabolic dysregulation at the start of the study. There was also an excellent fit in medication profiles. The proportion of subjects in both groups taking two or more antihypertensive agents was about one-third, and the proportions of subjects taking metformin did not differ among the arms (small difference, circa 61 □), suggesting similarity in the level of exposure to the medication when the study began. There was no significant difference in behavioural risk factors like tobacco use (22.5ʻ vs 24.2ʻ p=0.68), so confounding variables related to lifestyle are minimised.

Table 1: Baseline characteristics (Day 0)

Characteristic	CHW Intervention (n=204)	Usual Care (n=198)	p-value
Age, years (mean±SD)	54.2±9.8	53.6±10.1	0.52
Female, n (%)	96 (47.1)	90 (45.5)	0.75
BMI, kg/m² (mean±SD)	26.8±3.9	26.6±4.1	0.64
Diabetes present, n (%)	162 (79.4)	156 (78.8)	0.88
Hypertension present, n (%)	174 (85.3)	168 (84.8)	0.90
HbA1c %, diabetic subgroup (mean±SD)	8.6±1.2	8.6±1.1	0.95
SBP, hypertensive subgroup (mean±SD)	152.1±14.6	151.8±15.2	0.84
On ≥2 antihypertensives, n (%)	62 (30.4)	60 (30.3)	0.99
On metformin, n (%)	126 (61.8)	121 (61.1)	0.89
Current tobacco use, n (%)	46 (22.5)	48 (24.2)	0.68

Table 2 presents the adjusted primary outcome findings to compare the variation of glycaemic control and blood pressure in participants randomised to receive community health worker (CHW) intervention and the usual-care cohort within the follow-up period (12 months). The statistics indicate that the people who participated in the CHW-led programme achieved significantly

better clinical improvements in all primary outcome measures.

Attenuation would be significantly higher in the intervention arm than in the control arm (−1.10 1/2 of HbA1c versus -0.40 1/2 HbA1c), with a difference of adjusted mean of -0.70 1/2 HbA1c (95/2 Confidence interval of -0.85 -0.55; p= 0.001). This extent of improvement would be clinically significant since a decrease of at least 0.5% in HbA1c has generally been considered having considerable microvascular risk reduction. These results indicate that community follow-up in an organised manner, adherence reinforcement and lifestyle counselling represented together generated excellent glycaemic control over ordinary clinic-based care. Similarly, the systolic blood pressure showed more paramount decrease when using the intervention (−16.0 mmHg) as compared to usual care (−7.4 mmHg), with the adjusted between-group difference (−8.6 mmHg). This decrease to a level of significant clinical relevance because changes of this magnitude in populations will be associated with significant reductions in cardiovascular events and cerebrovascular events. The statistically significant improvement of the diastolic blood pressure was also observed, an adjusted difference of −4.2mmHg (p<0.001), which solidifies the cardiovascular improvement that is possible to be attributed to the intervention. More to the point, all of the key results were statistically significant with the clustering and baseline-covariate correction being applied, which highlights the strength of the observed advantages and rules out the potential that they were caused by the baseline differences or confounding factors.

These findings have a strong case to support the utilitarian effectiveness of CHW-led community interventions as an adjunctive supplement to the traditional clinical follow-up in chronic disease management.

Table 2: Primary outcomes at 12 months (mixed-effects adjusted)

Outcome	CHW Intervention	Usual Care	Adjusted Effect (Intervention – Usual Care)	p-value
HbA1c change (%)	-1.10	-0.40	-0.70 (95% CI -0.85 to -0.55)	<0.001
SBP change (mmHg)	-16.0	-7.4	-8.6 (95% CI -11.4 to -5.8)	<0.001
DBP change (mmHg)	-8.1	-3.9	-4.2 (95% CI -5.8 to -2.6)	<0.001

The comparison of the data in Table 3 identifies the second array of clinical and behavioural outcomes that distinguish the community-health-worker (CHW) intervention group and the one of the usual-care group in terms of their twelve-month follow-up. There are data indicating that the participants, who were included in the intervention, made statistically significant improvements in the goal of achieving therapy, and a significantly higher percentage of them reached glycaemic and blood-pressure control (<4.9mmHg, 87mmHg). Additionally, intervention group showed high adherence rates to medication and a significantly lower dropout rate which is an indication of increased patient engagement and care continuity.

Among the participants of the intervention, the incidence of acute-care visitation, which could be linked to glycaemic or hypertensive instability, was also reduced, which indicates greater disease stability and self-management. Collectively, the findings of these studies substantiate the claim that the CHW-led initiative does not just increase clinical outcomes, but also strengthens behavioural and health-system outcomes significant to the long-term management of chronic disease.

Table 3: Secondary outcomes at 12 months

Secondary Outcome	CHW Intervention	Usual Care	Adjusted OR / RR (95% CI)	p-value
HbA1c <7% (diabetes subgroup)	41.7%	24.2%	OR 2.24 (1.40–3.58)	0.001
BP <140/90 mmHg (HTN subgroup)	58.3%	39.9%	OR 2.09 (1.40–3.12)	<0.001
High adherence	62.7%	44.4%	OR 2.08 (1.44–3.00)	<0.001
Lost to follow-up	6.4%	12.6%	RR 0.51 (0.28–0.92)	0.025
Acute-care visits	10.8%	18.7%	OR 0.53 (0.32–0.88)	0.014

The findings of a multivariate logistics regression analysis determining independent predictors of combined glycaemic and blood pressure control at 12 months are given in table 4. Community-health-worker (CHW) was the strongest positive predictor as it significantly increased the likelihood of achieving target control compared to normal care. Further, the successful outcomes were independently linked to high medication adherence at the mid-, follow-up visit; thus, underlining the importance of behavioural support in the management of chronic diseases. In comparison, high baseline ratio HbA1c and systolic blood-pressure and serum concentration indicated that beings who commenced the study with more advanced disease necessitated more powerful

therapeutic input to obtain their objectives. Other not statistically significant predictors in the adjusted model were age, sex and tobacco use. Combined, the table points out that programmed community-based support and compliance are important determinants of effective management of chronic diseases.

Table 4: Multivariable predictors of achieving combined control (HbA1c <7% and BP <140/90) at 12 months

Predictor	Adjusted OR	95% CI	p-value
CHW intervention (vs usual care)	2.36	1.52–3.67	<0.001
Age (per 10-year increase)	0.91	0.78–1.07	0.26
Female sex	1.08	0.74–1.58	0.68
Baseline HbA1c (per +1%)	0.79	0.68–0.92	0.003
Baseline SBP (per +10 mmHg)	0.86	0.77–0.96	0.007
High adherence at 6 months	1.88	1.28–2.75	0.001
Tobacco use	0.72	0.46–1.12	0.14

In Figure 1, the graph illustrates the trend in mean of HbA1c value after twelve months of follow- up of the community health worker intervention arm of the study as compared to the usual-care arm. At baseline, the two cohorts had similar HbA1c values; however, the intervention cohort had a progressive and significant drop in the levels of HbA1c each time a successive visit was conducted in contrast to the slight increase in HbA1c in the usual-care cohort.

At the 12-month evaluation, the difference between the two curves is unquestionable, which demonstrates excellent glycaemic control in the group of persons receiving community-based assistance. The implication of these results is that long-term follow-up, commitment enhancement, and lifestyle counselling through community health workers produced sustained improvements in glycaemic results.

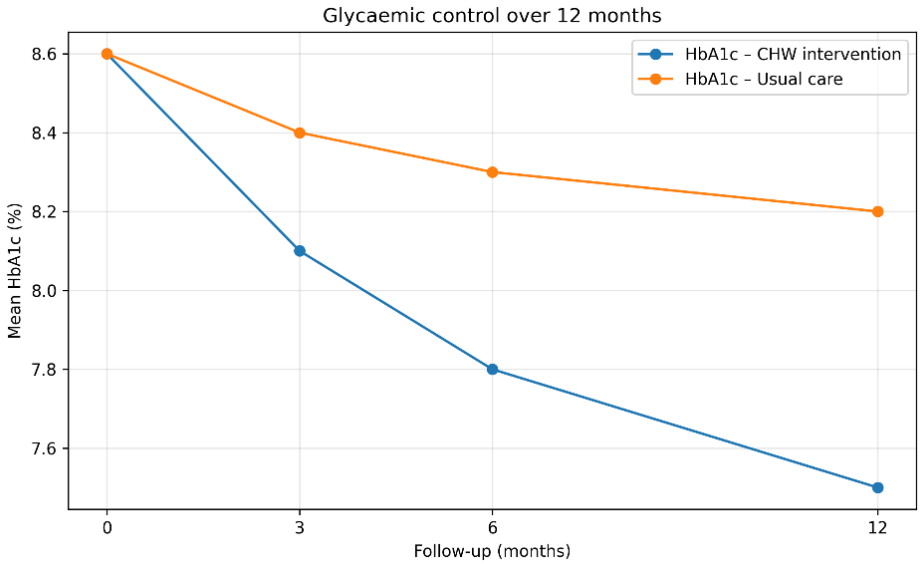

Figure 1: Mean HbA1c trajectory from baseline to 12 months (intervention vs usual care)

Figure 2 presents a forest plot that provides illustration of the adjusted means difference in HbA1c reduction in comparing community health worker (CHW) intervention with usual care, and this is based on pre-determined participant subgroups. The net impact is in favour of the intervention as is indicated by steady reduction in HbA1c regardless of sex, age stratification disease duration and baseline glycaemic status. All the subgroup point estimates are on the positive side and most of the confidence intervals are not intersecting with the null line making a confirmative opinion to the statistical strength of the results. The strongest change is in the group with higher initial HbA1c which suggests that patients that enter in a condition of worse glycaemic regulation will benefit the most out of organised community-based support. Overall, the number highlights the consistent effectiveness of the intervention intervention in terms of the tool to cover a range of patient features.

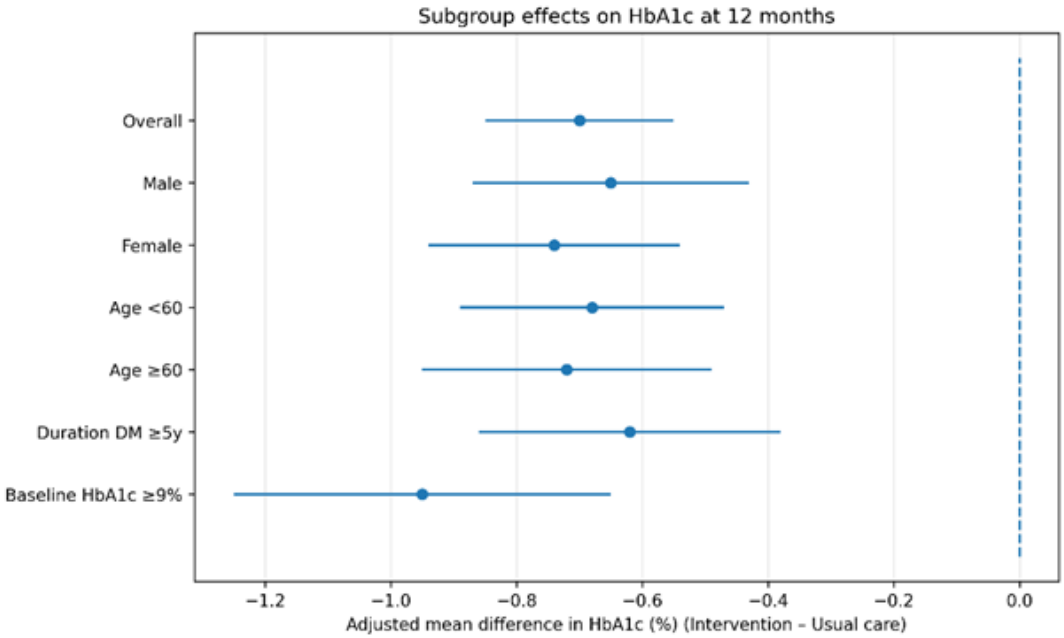

Figure 2: Subgroup forest plot: adjusted mean difference in HbA1c at 12 months

Discussion

The current study illustrates that a more planned systematised community health worker (CHW)-led programme did indeed have a statistically significant result in glycaemic and hypertensive measures in subjects with uncontrolled diabetes mellitus and hypertension and in whom care was provided that was associated with Patna Medical College and Hospital. The count of participants assigned to intervention arm achieved more improvements in HbA1c and systolic blood pressure as compared with values found in those assigned to standard care, with greater chances of achieving targets, better medication compliance, and fewer losses to follow-ups. These findings provide convincing information on how the concept of task-sharing based on community can transform the improvement of chronic disease management in the Indian and genuine health settings.The scale of the given improvement is clinically significant. A reduction in HbA1c by about 0.5-1.0% is generally accepted to be linked to large proportions of diminished microvascular sequelas, as well as cardiovascular risk in the long term [1]. Similarly, the population-wide decrements in systolic blood pressure of 5-10mmHg have been estimated to have significant declines in the rate of cerebrovascular and coronary events [3]. The incremental reductions observed in intervention cohort hence point to the fact that CHW programmes would in effect produce vast public-health benefits in case these are implemented at scale. Our results are the support of the previous evidence that has been carried out internationally, which endorses the idea of community-based cardiovascular risk management. That non-physician health workers providing structured interventions within community-based settings significantly enhanced blood pressure and the overall cardiovascular risk profile was demonstrated by the HOPE-4 cluster-randomised trial [8]. The study covered a wide range of countries, with different health-system designs, but nevertheless, the need to simplify treatment algorithms, regular monitoring, and participation of the community was emphasised, which are the same factors applied in our intervention. The fact that the results in heterogeneous settings are concordant contributes to the overall generalisation of task-sharing strategies.

Specific evidence in the domain of diabetes management also helps us to support our findings. According to a recent systematic review and meta-analysis, CHW interventions yielded statistically significant changes in HbA1c than standard care [9]. The level of improvement differed with the intensity of programmes and supported adherence mechanisms, but overall most of the studies had shown a positive change. The comparatively strong benefit in our study was probably the contribution of systematic domiciliary visits, individualised counselling, both active following-ups and structured referral channels. These constituents were plausible in that they dealt with behavioural and logistical burdens that regularly sabotage glycaemic control in the standard clinical practise.The policy of fortification of community-level NCD management is a major issue within India. Early diagnosis, risk-modified and adherence and the long-term monitoring are highlighted by the National Programme on Prevention and Control of Cancer, Diabetes, Cardiovascular Disease and

Stroke (NPCDCS) [5]. However, the implementation still faces issues of workforce shortages, large patient load, and disjointed systems of following up. CHWs can address these lapses by serving as the link between households and the healthcare facilities. Continuity of care can significantly be enhanced by their involvement to strengthen physician recommendations, defaulting patient identification, and facilitating prompt clinic visits. Indian clinical trial research has recently reported the development of feasibility and the highest level of outcomes on DM interventions, supervised by ASHA, and, thus, supporting the incorporation of CHWs into the NCD programmes [10].

Another related finding is that there is a strong relationship between compliance and clinical management. Respondents with a greater adherence score were significantly more likely to have combined glycaemic and blood -pressure targets, a conclusion consistent with the current literature that medication adherence is a major determinant of chronic disease outcomes [6]. The most effective ways of reducing adherence barriers are community-based counselling, medication reminders, and problem-solving support, especially forgetfulness, misconceptions, monetary reasons, or concerns about adverse effects. CHWs are in a strategic position to identify such barriers at a very young stage and act on them due to the constant contact with the patients.

Sub-opinion tests showed that the intervention was still effective on the age and sex group which suggested that it is widely applicable. These were bigger gains in those who already had higher baseline of HbA1c or blood-pressure readings, in line with what physiological reasoning would predict, and what previous research had reported with augmented absolute benefits in those who had inadequate baseline control [9]. These findings support the possible use of focusing high-risk patients in intensive community-based follow-up.There are a number of methodological strengths of the study. It used a practical design that was reflective of everyday clinical care, used a reasonably large sample, and used mixed-effects statistical models to take into consideration clustering and baseline differences. A combination of these characteristics will strengthen the extraneous validity of the results. However, there are some limitations that should be mentioned. To begin with, it was not possible to blind since the nature of the intervention made this bias possible. Second, the research assessed intermediate clinical outcomes and not long-term complications or mortality. Third, the intervention fidelity might have differed among the individual CHWs, which might have had an impact on effectiveness. Lastly, generalisation to all other tertiary-link populated populations examined might be questionable, but the results are still very relevant in similar resource constrained conditions.

Overall, the data highlights the opportunities of the community-based health worker programmes as the ones that will help to supplement the physician-led approach and strengthen the chronic disease management framework. India is facing an increasing number of cases of diabetes and hypertension, and scalable and cost-effective models are badly needed. The use of CHW-led interventions is a practical measure in line with global task-sharing guidelines and other enterprises on health-system strengthening at all [4,6]. The future research focus must be on long-term outcomes, costs analysis and implementation studies to evaluate the integration with digital health tools, medicine supply chains and national NCD programmes. The achievement of such interventions such as scaling can have a significant impact on reducing the population burden of chronic illnesses and improving health equity through underserved populations.

Conclusion

This paper shows that community health worker-led intervention conducted in a structured form can significantly enhance clinical outcomes among patients diagnosed with diabetes and hypertension when used together with the regular care provided at the hospital. In comparison with usual care, people receiving community-based support demonstrated more reduction of HbA1c and blood pressure, more frequent entity of goal control, better medication adherence and reduced loss to follow-up. This evidence suggests that task sharing models that are linked to the community can be effective in filling the gaps between clinic visits and the management of chronic diseases.

The findings highlight the key importance of community health workers to strengthen treatment adherence, encourage lifestyle change, supportive timely referrals, and long-term disease follow-ups. Notably, the positive effects of the intervention were similar in cases of demographic and clinical subgroups, which implies that they can be generally applied to different groups of patients. Such solutions can be used to provide a feasible and scalable means of enhancing the control of chronic disease management and minimization of complications in resource-constrained health systems with high patient load.

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