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Review Article

The effectiveness of community health workers in reducing blood pressure in South Asia

Molly U. Long*

Southern Illinois University, Carbondale, IL, USA

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***Correspondence:**
Dr. Molly U. Long,
E-mail: mollyulong@gmail.com

ABSTRACT

Globally, one-third of adults have hypertension, the leading modifiable risk factor for the leading causes of death worldwide- ischemic heart disease and stroke. In South Asia, where the burden of hypertension is high and the number of physicians and nurses is insufficient for the population, community health workers (CHWs) are one potential means to fill this gap in care. This literature review analyzes evidence of the effectiveness of utilizing CHWs to reduce systolic blood pressure in the South Asian context. Searches for relevant articles in South Asia were performed in PubMed and Cochrane databases. The database searches led to the retrieval of 66 articles, of which 5 studies were selected for this review. A significant reduction in systolic blood pressure (ranging from 5 to 8.9 mmHg decrease and/or improved BP control in the population, OR 1.6) was found in CHW interventions targeting hypertensive adults in the community. The results demonstrate that CHW interventions in South Asia can be effective in significantly reducing systolic blood pressure in hypertensive adults in a community. In an area of the world with a shortage of physicians and nurses, these findings indicate that CHWs can be utilized to effectively reduce systolic blood pressure in hypertensive patients in South Asian communities. This has great potential for long-term reduction of ischemic heart disease and stroke in this region of the world.

Keywords: Community health worker, Hypertension, South Asia, Systolic blood pressure

INTRODUCTION

The World Health Organization (WHO) estimates that one-third of adults 30-79 years old have hypertension.[1] The majority of these individuals live in low- and middle-income countries.[1] Elevated systolic blood pressure (SBP) is the top modifiable risk factor that contributes to premature cardiovascular death worldwide.[2] This is significant, as the top 2 causes of death globally - ischemic heart disease (IHD) and stroke - are related to cardiovascular disease (CVD),[3,4] accounting for nearly 24% of all deaths annually.[1,5] Additionally, in patients diagnosed with hypertension, reducing SBP by 5 mmHg can reduce the likelihood of a cardiovascular event such as stroke or heart attack by 10%.[6]

South Asia is one region of the world that reflects this global problem of hypertension. South Asia includes India, Pakistan, Bangladesh, Nepal, Sri Lanka, and Bhutan. All of these countries are low- and middle-income countries, comprising nearly 25% of the world's population, with almost 2 billion people.[7] Among these 6 nations, the prevalence of individuals with hypertension ranges from 29% to 43%.[1] Of those with hypertension, only 7-16% have their blood pressure controlled.[1] As such, it is not surprising that IHD and stroke are among the top 5 causes of death and among the top 10 causes of disability-adjusted life years in each of these South Asian nations.[8]

In response to this grim global reality, one of the United Nations' 2030 Sustainable Development Goals is to see

global premature mortality due to non-communicable diseases such as IHD and stroke reduced by one-third through actively pursuing prevention and treatment interventions.[9]

Reaching this Sustainable Development Goal in South Asia is a great challenge because the traditional healthcare workforce of doctors, nurses, and midwives is currently insufficient (Figures 1 and 2). It is estimated that to have universal healthcare coverage in South Asia that adequately addresses non-communicable diseases such as IHD and stroke, 2.5 million more doctors and 11 million more nurses and midwives are needed.[10]

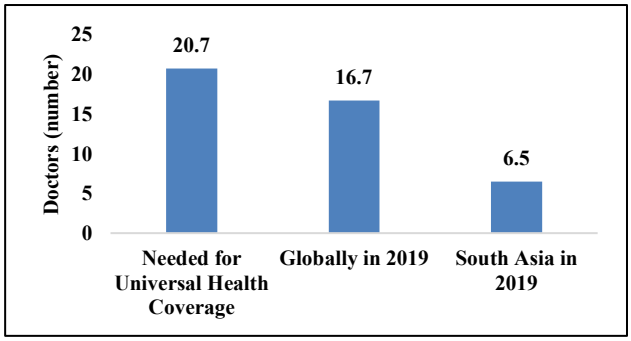

Figure 1: Doctors per population of 10,000.
Data from GBD 2019 Human Resources for Health Collaborators[10]

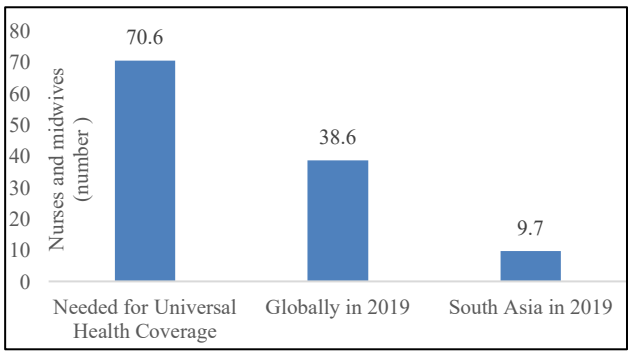

Figure 2: Nurses and midwives per population of 10,000.
Data from GBD 2019 Human Resources for Health Collaborators[10]

In many areas of the world, especially in places like South Asia, where health disparities are great and resources are few, community health workers (CHWs) have been added to the healthcare workforce and utilized to attempt to improve population health.[11] CHWs are individuals from within the community being served. They understand the culture of the community, the social systems, and the unique community challenges. They receive basic training to serve as CHWs in specific areas relevant to their communities. CHWs are bridges between those in their communities and the medical system. Traditionally, CHWs have worked in maternal and childcare and have made a significant positive impact.[12,13] In more recent years, studies from other low- and middle-income countries have shown that CHWs can also be utilized to reduce the non-communicable disease burden in their communities through their involvement in prevention and management interventions.[14]

This literature review examines whether CHW interventions can effectively reduce systolic blood pressure in South Asian communities.

METHODS

PubMed and Cochrane Library were utilized for the literature search. First, a literature search using PubMed was done using the search terms "community health workers" [MESH] and "hypertension" [MESH]. A second search was done using the terms "task sharing" and "hypertension" [MESH]. Each search was narrowed to include articles from the last 5 years, randomized controlled trials, meta-analyses, and systematic reviews. The 2 searches yielded 21 articles, including a systematic review, 15 which referenced 1 additional relevant study.

Cochrane Library was then searched using the terms "community health worker," "hypertension," and country names for each of the 6 nations comprising South Asia (India, Pakistan, Bangladesh, Nepal, Sri Lanka, and Bhutan). The searches were narrowed to the last 5 years, and those also found on PubMed. These Cochrane Library searches yielded 45 articles.

From the 68 articles yielded from the above searches, duplicates were excluded. Then, the following inclusion criteria were applied: randomized control trials, studies occurring in South Asia, studies focused on CHW interventions, and studies in which the primary outcome studied was systolic blood pressure reduction or blood pressure control in adults. Exclusion criteria included insufficient sample size and publications before 2019.

With the application of the above, 5 studies met the criteria for inclusion in this literature review.

RESULTS

The 5 South Asian studies evaluated are summarized in Table 1. Each study utilized CHW interventions to determine their impact on blood pressure control in local communities.

Study characteristics

The studies included 5 cluster randomized controlled trials.[16-20] The Jafar et al study took place in Bangladesh, Pakistan, and Sri Lanka while the others were completed in India.[16-20] Three studies focused on hypertensive adults in the community; the Joshi et al. study focused on adults in the community at intermediate to high risk for cardiovascular disease and the Kondal et al study focused at the population level in the community.[16-20] The number of study participants in each ranged from 527 to 11,315, with the population-level study being the largest.[18,19]

Table 1: Studies included for review.

Author (year), location, study type	Number of subjects (N)	Inclusion criteria	Intervention	Outcome measured	Intervention effect	Significance
Gamage et al (2020), Rural India, CRT[16]	1,649	Hypertension (current antihypertensive medication use, existing diagnosis of hypertension, mean BP >/= 140/90 mmHg on final 2 of at least 3 readings on two separate days)	Six group-based meetings from CHWs every 2 weeks over 3 months for BP monitoring, hypertension education, lifestyle modification advice	Primary outcome- percent achieving BP control from baseline to 5 monthsa	Intervention BP control increased from 49.5% to 69.7% of population; control group BP control increased from 52.2% to 61.7%.	Yes (Odds ratio [OR] 1.6, 95% CI 1.2-2.1; p=0.001)
				Secondary outcome- mean change in SBP from baseline to 5 monthsa	Mean decrease in SBP in 5 mmHg in intervention compared to control group	Yes (95% CI: -7.1 to -3.0 mmHg; p<0.001)
Jafar et al (2020), Rural Bangladesh, Pakistan, Sri Lanka, CRT[17]	2645	Age >40 and hypertension (current antihypertensive medication use or persistently elevated BP >/=140/90 mmHg on 2 of 3 readings over two separate days)	Home visits every 3 months from CHWs for BP monitoring, medication adherence, lifestyle counseling, referral as needed; trained physicians for referrals; care coordination	Primary outcome- mean change in SBP from baseline to 24 months	Mean reduction in SBP of 5.2mmHg in intervention compared to control group	Yes (95% CI: -3.2 to -7.1 mmHg; p<0.001)
Khetan et al (2019), Semi-Urban India, CRT[18]	527b	Age 35 to 70 and hypertension (current antihypertensive medication use or BP >/=140/90 mmHg on 2 separate days)	Home visits every 2 months from CHWs focused on lifestyle counseling, improving health care seeking behavior, medication adherence	Primary outcome- mean change in SBP from baseline to 2 years	Mean decrease in SBP of 8.9 mmHg in intervention compared to control group	Yes (95% CI: -3.5 to -14.4 mmHg; p=0.001)
Kondal et al (2022), Rural India, CRT[19]	11,315	Age >18	Single home visit by CHWs focused on lifestyle modifications, medication adherence, giving interventional aids	Primary outcome- mean change in SBP from baseline to 18 months	Mean increase in SBP of 1.8 mmHg in intervention compared to control group	No (95% CI: -0.21 to 3.70 mmHg)
Joshi et al (2019), Rural India, CRT[20]	3261	Age >/=35 and moderate to high CVD risk (>/=10% risk of CVD in next 10 years by NHANES score)	Six home visits in 12 months from CHWs for BP monitoring, medication adherence; med adjustment as needed by tele-med call	Primary outcome- mean change in SBP from baseline to 12 months	Mean reduction in SBP of 0.7 mmHg in intervention compared to control group	No (95% CI: -1.82 to +0.42 mmHg; p=0.18)

Abbreviations: CRT- cluster randomized controlled trial, CHWs- community health workers; BP- blood pressure; SBP- systolic blood pressure; OR- odds ratio; CI- confidence interval; CVD- cardiovascular disease. a. Outcomes were measured on a single visit 2 months after the final program of the intervention. BP was measured at least 3 times at that visit (and up to 5 times if consecutive readings differed by more than 10 mmHg systolic or 6 mmHg diastolic). The mean of the final 2 consecutive measurements was considered the final BP, which was used to determine the 2 outcomes. b. The total number of participants in this study was greater, but the arm of hypertensive patients studied numbered 527. c. National Health and Nutrition Examination Survey (NHANES) score, which utilizes age, gender, diabetes history, SBP, and body mass index to determine an individual's risk of having cardiovascular disease in the next 10. years.

Training

The training length for CHWs varied widely across the studies, ranging from 2 days to 4 weeks, or occurring at intervals over 24 months.[16-20] The Jafar et al. and Khetan et al. studies also included hypertension management training for the physicians to whom CHW would refer.[17-18] Ongoing monitoring and feedback of CHW work was a part of the studies of Gamage et al. and Khetan et al.[16,18]

CHW intervention length

Frequency of the CHW interventions ranged from a single home visit over 18 months, to home visits every 2 weeks for 3 months, to visits every 1 to 3 months for 1 to 2 years.[16-20]

CHW intervention content

In the study by Kondal et al., CHWs focused home visits solely on lifestyle modification counseling and medication adherence.[19] All others included blood pressure monitoring in addition.[16-18, 20] The intervention of the Khetan et al study included encouraging better health-care-seeking patterns in their patients.[18] In the study by Jafar et al CHWs were trained to refer patients with uncontrolled blood pressure.[17] In the study by Joshi et al CHWs on home visits immediately called patients' doctors for medication adjustments if blood pressures were inadequately controlled.[20]

Primary outcomes

Studies focused on hypertensive individuals in the community demonstrated significant improvements in blood pressure control with CHW interventions.[16-18] The primary outcome for the studies by Khetan et al. and Jafar et al was mean systolic blood pressure reduction. The study by Khetan et al. yielded a reduction of 8.9 mmHg (95% CI: -3.5 to -14.4 mmHg; p=0.01).[18] The study by Jafar et al. yielded a reduction of 5.2 mmHg (95% CI: -3.2 to -7.1 mmHg; p<0.001).[17]

The primary outcome for Gamage et al was the percentage of hypertensive individuals in the intervention group achieving blood pressure control, defined as less than 140/90 mmHg. Gamage et al found a 10.8% greater BP control in the intervention group compared to the control group (with an odds ratio of 1.6, 95% CI 1.2-2.1; p=0.001).[16]

In contrast, the Kondal et al study, focused on systolic blood pressure reduction in the general population and included a mixed sample (hypertensive and non-hypertensive community members) with a single-visit intervention.[19] The Kondal et al study demonstrated no such blood pressure reduction, but rather a non-significant 1.75 mmHg increase (95% CI: -0.21 to 3.70 mmHg).[19] Additionally, the Joshi et al. study focused on systolic blood pressure reduction in intermediate to high cardiovascular disease risk individuals, who were also a mixed sample of hypertensive and non-hypertensive individuals. The Joshi et al study demonstrated neither statistically nor clinically significant SBP reduction in the CHW intervention group (0.7 mmHg decrease; 95% CI -1.82 to +0.42 mmHg; p=0.18).[20]

Other outcomes

Other outcomes measured in the studies had mixed findings. Medication adherence significantly improved by 13.5% in the Joshi et al. study (74.9% adherence or 275 of 367 participants; 95% CI 70.2 to 79.0% in the intervention arm and 61.4% adherence or 210 of the 342 participants; 95% CI 56.14 to 66.41% in the control arm, p=0.001).[20] Jafar et al. also found a significant increase in the Morisky Medication Adherence Scale-8, a patient questionnaire used to assess patients' risk for medication adherence problems (0.60, 95% CI, 0.24 to 0.96).[17,21-22] Gamage et al demonstrated improved SBP despite not showing significant improvement in medication adherence (adjusted OR 1.2, 95% CI 0.8 to 1.9, p=0.34).[16]

In the Kondal et al study, using an intervention aid of a calibrated salt spoon demonstrated significantly reduced salt use between the intervention (reduced from 93% to 49%) and control groups (from 80% to 65%) by the end of the study (OR 2.4: 95% CI 1.2-4.7).[19]

DISCUSSION

These studies from South Asia demonstrate that CHW interventions significantly reduce systolic blood pressure when they target hypertensive individuals in the community.[16-18] Those whose blood pressure is least controlled (more than 160/100 mmHg) demonstrated the greatest reduction in blood pressure from CHW interventions.[17] However, CHW interventions did not demonstrate significant blood pressure reduction when they targeted entire populations or even subgroups that included non-hypertensive individuals.[19,20]

CHW interventions that show a significant reduction in systolic blood pressure include certain elements that should be highlighted as likely contributors to intervention effectiveness. For example, each effective CHW intervention included regular, ongoing home visits.[16-18] The interval between visits varied greatly, ranging from 2 weeks to 3 months, but regularity was a common factor in all.[16,17] Additionally, effective interventions included ongoing oversight and feedback for CHWs in their work.[16,18] Effective interventions also had algorithms, checklists, or templates to guide CHWs through each home visit.[17,18]

Two of the three effective CHW interventions were designed to be interwoven into the larger medical system.[17,18] This included approaches such as encouraging regular follow-up with their primary doctor, having a clear and direct process for referral for patients with

uncontrolled hypertension, creating a process of hypertension triage and care coordination at government clinics, and providing training in appropriate hypertension management for doctors managing patients with hypertension.[17,18]

Interestingly, CHW interventions that demonstrated effectiveness also demonstrated that CHWs can be effectively trained in as little as 5 to 7 days when training is accompanied by ongoing oversight, feedback, and visit templates or algorithms mentioned earlier.[16,18]

Another element that surfaced in this review warrants further study. One study suggests dispensing calibrated salt spoons as a part of a CHW intervention can significantly reduce salt use in households.[19] Since switching from a high-sodium to a low-sodium diet may reduce SBP by up to 8 mmHg (95% CI, 4-11 mmHg; P<0.001), dispensing aids such as calibrated salt spoons in CHW interventions may have the potential to significantly impact SBP.[23]

Limitations

This review has some limitations. First of all, all 5 of the studies from South Asia were clustered randomized controlled studies. There was no blinding in the studies due to the nature of the intervention. While clustered randomized controlled trials are fitting to the nature of the CHW role, they also have the possibility of diluting the perceptible effect of an intervention, as those in the intervention group may interact and share with the control group. This possibility of dilution was most likely in the Khetan et al. and Joshi et al. studies, where randomization occurred by household rather than community or district.[18,20]

Another limitation is the inability to conclude the effect of CHW blood pressure reduction interventions targeted at South Asian communities as a whole. The Kondal et al study, which focused on the entire population, suggested that CHW interventions had no significant impact on systolic blood pressure.[19] However, the study included just a single home visit intervention over 18 months. To make definitive conclusions regarding the impact of CHWs on entire populations, further studies using proven best practices for CHW interventions are needed. These would include regular CHW intervention visits, blood pressure monitoring, a process for referral for higher care, etc.

Finally, more and larger studies are needed in South Asia to draw definitive conclusions on secondary outcomes such as medication adherence and the impact of lifestyle modifications on SBP.

Implications for community medicine and public health

Traditionally, South Asian CHWs have been effectively utilized to improve maternal and child health. Demonstrating that CHWs can be utilized to significantly improve blood pressure control in hypertensive individuals in South Asian communities is a first step in exploring the impact CHWs may have on the great burden of IHD, stroke, and other non-communicable diseases in South Asia. With the high prevalence of non-communicable diseases in South Asia and a significant shortage in the healthcare workforce, now is the time to determine if CHWs could effectively impact non-communicable disease burden and, if so, how to expand the integration of CHWs into the South Asian healthcare workforce.

CONCLUSION

A review of CHWs' impact on SBP in South Asia thus far suggests that, while CHW interventions targeted at the population level have not yet been adequately researched, interventions targeting hypertensive patients in communities can significantly reduce SBP in these South Asian communities. The best practices of CHW interventions that facilitate significant blood pressure reduction include regular, ongoing visits to patients, proper oversight and feedback of CHWs, CHW use of algorithms and checklists, and CHWs and their interventions being woven into the larger medical system. Expanding known effective strategies of utilizing CHWs with the larger population at risk of IHD, stroke, and other non-communicable diseases may be a way to address the larger gap that exists in meeting the United Nations' 2030 Sustainable Development goal regarding reducing non-communicable diseases in South Asia.

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