

Managing hypertension in nurse-led primary care clinics in rural Ethiopia

Kebubush Shanko¹, Fikadu Balcha², Eldryd Parry³, Andrew Mortimore⁴, Clive Osmond⁵, David IW Phillips⁵, Yoseph Mamo¹

Abstract

Background: Providing health care for patients with hypertension has been difficult in rural areas of sub-Saharan Africa because of lack of medical staff and facilities. The use of non-physician healthcare workers offers a possible solution, but little is known about the feasibility and clinical response to treatment.

Methods: We carried out a descriptive, retrospective review of the records of a sequential sample of 249 hypertensive patients aged 52.3 (SD 12.7) years from eight health centres in a rural area of southern Ethiopia where nurses and health officers had been previously trained to diagnose, treat and manage non-communicable diseases including hypertension. The study evaluated the changes in systolic and diastolic blood pressures following treatment over a 30 month period.

Results: The mean systolic blood pressure on admission was 156.1(SD 21.1) mm Hg and the mean diastolic pressure 95.7(SD 12.7) mm Hg. Of the 249 subjects, 105(42.1%) defaulted from clinic follow-up during the period of the study. More than half (53.8%) were controlled on monotherapy with a thiazide diuretic, the remainder required combination therapy. Significant declines in systolic and diastolic blood pressure were achieved in each blood pressure group with the exception of the lowest pressure groups.

Conclusion: Our study demonstrates that nurses and health officers working in remote rural health centres can obtain worthwhile reductions in blood pressure in patients with hypertension. Moreover, this could often be achieved with a single, inexpensive diuretic, hydrochlorothiazide, although combination therapy was sometimes required. [*Ethiop. J. Health Dev.* 2018; 32(2):104-109]

Key words: Hypertension, blood pressure, task-shifting, delivery of health care, nurses, Ethiopia.

Introduction

Hypertension is one of the most important modifiable causes of cardiovascular disease and is globally estimated to cause 7.5 million deaths or about 12.8% of the total mortality (1). Although thought to be almost non-existent in African societies in the first half of the twentieth century, the latest WHO data show that Africa has the highest prevalence of raised blood pressure, 46% for both sexes combined (2). Projections based on current epidemiological data suggest that the number of adults in this region needing treatment will rise to 150 million by 2025 (3). These trends are strongly linked with the economic development and demographic transition that is occurring in Africa associated with urbanisation, ageing and lifestyle changes such as increases in smoking and alcohol consumption, reduced physical activity and adoption of "Western" diets. Although survey data demonstrate that the frequency of hypertension is higher in urban areas, rural communities, who still form the majority of Africa's population, have surprisingly high prevalence rates (3). Yet it is these poor, rural populations who are most likely to have inadequate primary healthcare provision and for whom the control of hypertension offers the greatest challenge. The reasons for this include the under-resourcing of formal health systems, the lack of qualified medical staff and the focus of existing rural primary care systems on infectious

disease and maternal/child health so that chronic disease care is left to hospitals in larger towns and cities, often located far away from the rural populations they serve. As a result, progress in the awareness, detection and treatment of hypertension in Africa remains very low in most rural areas (3).

A system of decentralized non-communicable disease (NCD) care in rural health centres is required to address the challenge of providing appropriate hypertension care for these marginalized populations. The difficulty in recruiting trained physicians necessitates the development of an alternative workforce appropriate to the community's needs. This can be achieved by task-shifting, whereby nurses and health officers do the NCD care that would have been normally carried out by physicians. Although task-shifting has been widely used in treating infectious disease, childhood conditions and for anti-retroviral therapy, it is only recently that this approach has been applied to NCDs. Two reviews have highlighted the small number of studies and the lack of good evidence of the effectiveness of task shifting strategies, especially for cardio-vascular disease (4, 5). A number of studies have evaluated the use of non-physician healthcare workers for NCD screening programmes or in situations where there is physician back-up. However, a systematic review (5) could only identify

¹Jimma University Chronic disease project;

²Jimma University Nursing School;

³London School of Hygiene and Tropical Medicine, London, UK;

⁴Academic Unit of Primary Care and Population Sciences; University of Southampton, Southampton, UK;

⁵MRC Lifecourse Epidemiology Unit, Southampton General Hospital, Tremona Road, Southampton SO16 6YD, UK, Email: CO: diwp@mrc.soton.ac.uk, DIP: D.I.Phillips@soton.ac.uk Tel +44 (0) 23 8077 7624, Fax +44 (0) 23 8070 4021

four linked studies, all originating from Cameroon (6-9), where there was complete task-shifting of hypertension care (i.e. including diagnosis, management and treatment). Because complete task-shifting is likely to be the most practical scenario in rural Ethiopia, we have carried out a retrospective review of the effectiveness of hypertension care in eight rural health centres in south-western Ethiopia where a system of comprehensive NCD care based in primary health centres and managed by nurses and health officers has been in place for many years.

Methods

Study setting: Jimma is one of the zones of the Ethiopian Regional State of Oromia with a 2016 projected total population of 3.13 million (10). The public health service delivery in the zone is carried out through three district hospitals, one teaching hospital, one Defence Force hospital, 110 health centres and 482 health posts. Eight of these centres (Agaro, Asendabo, Shebe, Yebu, Seka, Serbo, Dedo and Omonada) have formed the basis for an NCD decentralisation project funded through support from the Tropical Education and Health Trust (THET) and Jimma University. The rural hypertension programme began in 2010.

Training of nurses and health officers: As previously described (11), the head of each health centre identified one or more suitable and motivated nurses or health officers who were bought together and given a short intensive training on the management of non-communicable diseases by senior internal medicine specialists. The trainees were provided with pocket guides, appropriate equipment including aneroid sphygmomanometers and laminated algorithms for diagnosis and treatment. The training was supported by regular visits from senior internal medicine specialists once a month. Disease registers and clinic records were completed for all attending patients. The nurses or health officers were encouraged to screen patients attending the health centre for a wide range of different conditions in addition to treating patients presenting with symptomatic hypertension.

If the initial blood pressure reading was 140/90 or above, two subsequent readings at 30 minute intervals were obtained. If the blood pressure was still elevated but less than 160/100 without additional risk factors (for example diabetes), non-pharmacological measures targeting factors such as taking more fruits and vegetables, stopping khat chewing or smoking and reducing stress, alcohol consumption and salt intake were encouraged. However as this was a traditional rural population, obesity and other related risk factors were extremely uncommon. For the remainder and those who did not respond to these measures, a stepwise approach to drug treatment was used, starting with hydrochlorothiazide (12.5mg to 50 mg/day) and adding a calcium channel blocker or an ACE inhibitor if required. The first clinic visit included a baseline assessment as well as education on risk factors. During subsequent visits, blood pressure levels were measured. Patient loss to follow-up was defined as a failure for a

patient to return to the clinic within three months of the last scheduled visit. The primary outcome of the study was the change in systolic and/or diastolic pressure levels during the follow-up visits.

Data collection: A search of the records in the eight health centres yielded a total of 1,013 newly-diagnosed patients aged 18 years or older attending the health centres between September 2010 and August 2015 who had been on treatment for at least one year. Hypertension was diagnosed by a systolic (and/or diastolic) blood pressure consistently in excess of 140 mm Hg (90 mm Hg). A sample of one in four patients was selected using sequential sampling. Data extracted from the case notes were basic demographic information (age, gender, and residence), the blood pressure measurements and the type of treatment. Data collection was carried out with pre-prepared checklists. This was entered on to computer spreadsheets prior to analysis. All the data was collected by KS, who is a graduate qualified nurse.

Analysis: Analysis of the data was carried out using SPSS 22 for Windows. Means and standard deviations were tabulated and confidence intervals estimated based on the normal distribution.

Ethical approval for the retrospective analysis of unlinked patients' record data was obtained from Jimma University College of Health Science Institutional Review Board.

Results

Clinic records were successfully identified for 249 patients (121 men and 128 women) who had been diagnosed over a 30 month period and had a mean age of 52.3 (SD 12.7) years. The mean systolic blood pressure on admission was 156.1(SD 21.1) mm Hg and the mean diastolic pressure 95.7(SD 12.7) mm Hg. Of the 249 subjects, 38 (15.3%) had initial systolic blood pressure below 140 mm Hg; 87 (34.9%) between 140 and 159 mm Hg; 75 (30.1%) between 160 and 179 mm Hg; and 49 (19.7%) above 180 mm Hg. Diastolic blood pressure was below 100 mm Hg in 131 (52.6%), and 100 mm Hg or more in 118 (47.4%) subjects. A total of 134 (53.8%) of the subjects were treated with hydrochlorothiazide alone at doses of between 12.5 and 50 mg while the remaining 115 (46.2%) required additional antihypertensive agents (hydrochlorothiazide in combination with nifedipine, or enalapril). Of the initial group of 249 subjects, 105 (42.2%) defaulted from clinic follow-up during the period of the study; of these 71 had defaulted within 18 months of the commencement of treatment, the remainder defaulting subsequently.

Figure 1 shows the changes in systolic blood pressure according to the initial blood pressure level during the course of follow-up and illustrates that substantial declines in blood pressure were achieved in each blood pressure group with the exception of the lowest (<140 mm Hg) group. Table 1 shows the actual decline in blood pressure levels according to the age, gender and

treatment groups which were evaluated at between 9 and 12 months after presentation.

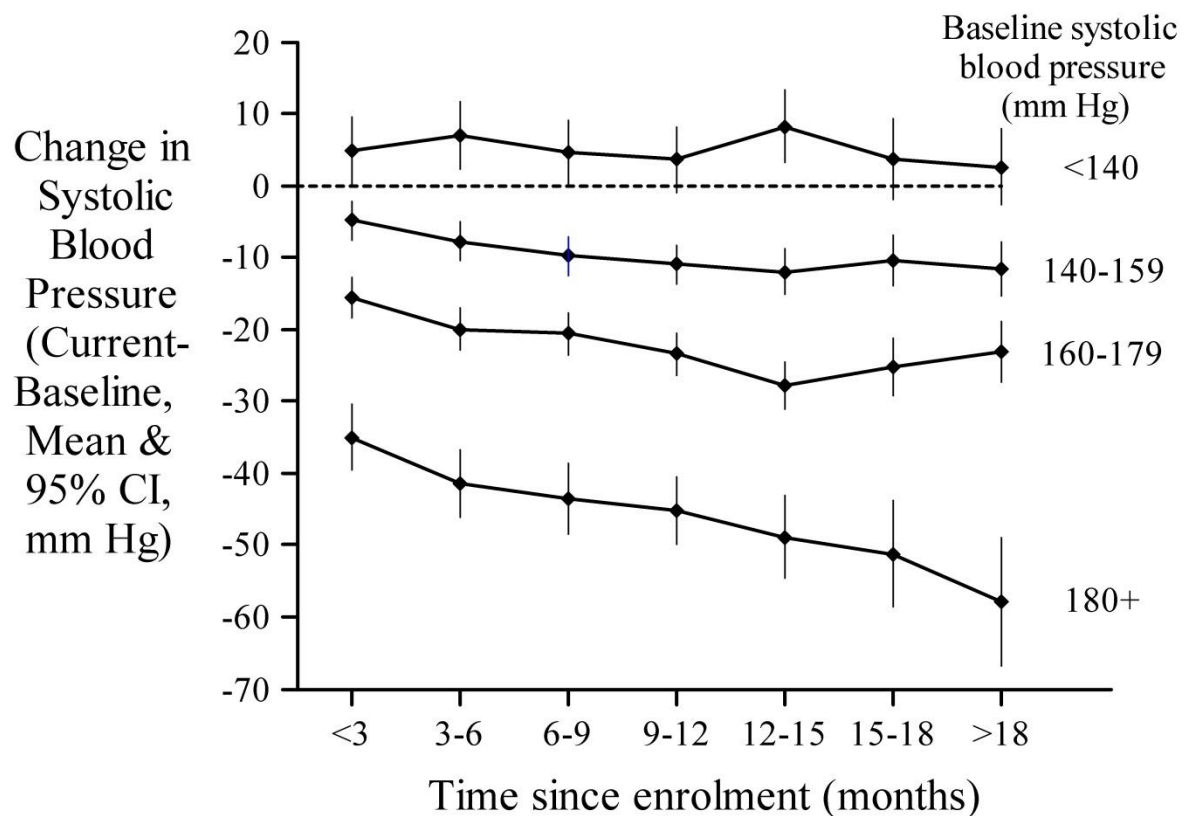


Figure 1: Systolic blood pressure during clinic follow-up in the 249 men and women from the eight Jimma Zone health centres (September 2010-August 2015). The changes in blood pressure during the 30 month follow-up period are shown according to levels of initial systolic blood pressure

Table 1: Changes in systolic blood pressure during clinic follow-up in the 249 men and women from the eight Jimma Zone health centres (September 2010-August 2015) according to gender, age and type of treatment

	Baseline Systolic Blood Pressure (mm Hg)							
	≤139		140-159		160-179		≥180	
	Change in systolic blood pressure from baseline, measured at 9-12 months (mm Hg)							
	Est	95% CI	Est	95% CI	Est	95% CI	Est	95% CI
All Subjects	4.8	1.1, 8.5	-9.9	-12.1, -7.7	-22.6	-24.8, -20.4	-46.0	-50.0, -42.1
Gender								
Male	4.5	-0.9, 9.8	-6.7	-10.4, -3.1	-20.9	-24.1, -17.8	-46.6	-51.5, -41.6
Female	5.1	-0.7, 11.0	-11.9	-14.6, -9.2	-25.1	-28.1, -22.0	-45.4	-52.2, -38.6
Age (years)								
≤50	3.2	-3.6, 10.1	-9.9	-13.2, -6.7	-23.2	-26.0, -20.4	-45.3	-51.5, -39.1
>50	6.7	3.1, 10.3	-9.9	-13.1, -6.8	-22.1	-25.6, -18.6	-46.7	-52.1, -41.4
Treatment								
HCT alone	4.6	0.4, 8.8	-11.7	-14.0, -9.3	-24.2	-27.2, -21.3	-49.0	-56.4, -41.7
Other	5.4	-4.9, 15.8	-6.6	-11.1, -2.1	-21.3	-24.4, -18.1	-45.1	-49.8, -40.3

Est = estimate; CI = confidence interval ; HCT = Hydrochlorothiazide

They suggest that the different age and gender groups have responded similarly and that at all levels of blood pressure over 50% of subjects had an adequate response to hydrochlorothiazide alone although more complicated drug regimens were required in a significant minority of cases. Figure 2 and Table 2

show the parallel changes in diastolic blood pressure. Again significant falls in blood pressure have been achieved in all but the lowest blood pressure groups. As with systolic blood pressure, effects were similar in different gender, age and treatment groups.

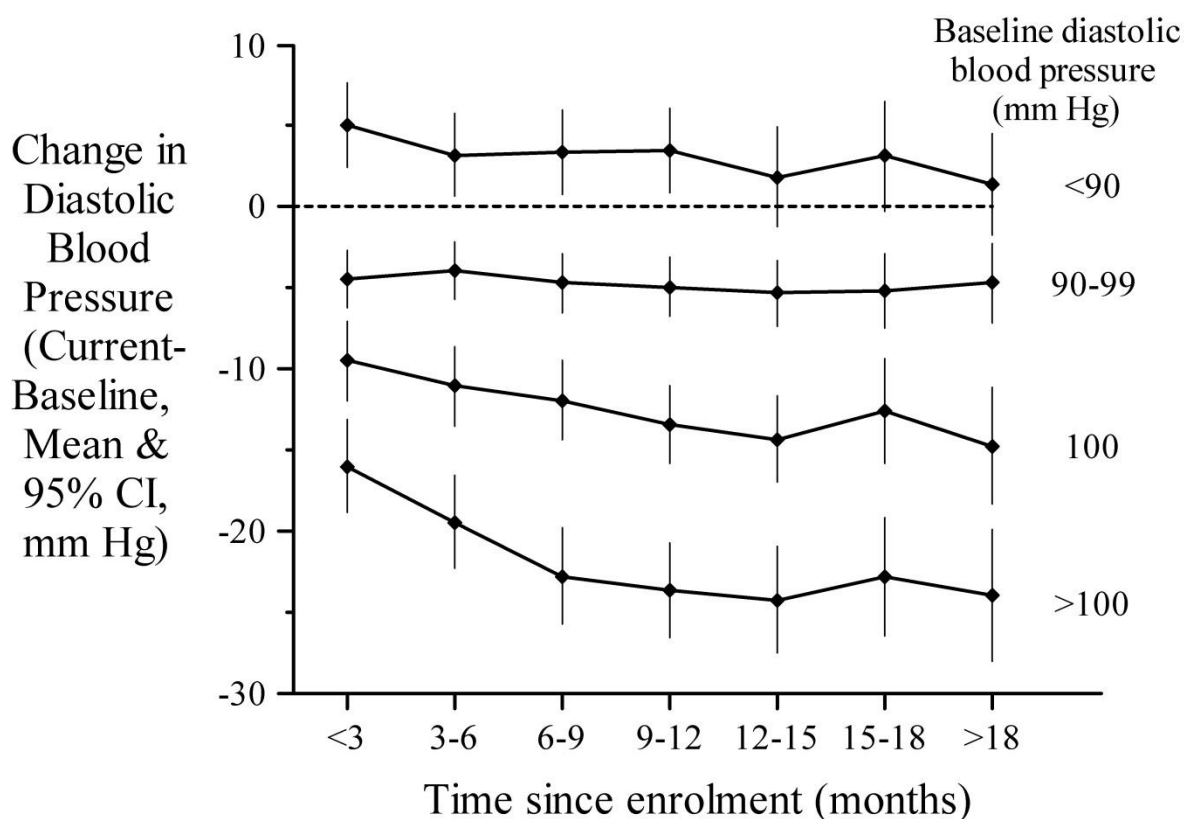


Figure 2: Diastolic blood pressure during clinic follow-up in the 249 men and women from eight Jimma Zone health centres (September 2010-August 2015). The changes in blood pressure during the 30 month follow-up period are shown according to levels of initial diastolic blood pressure.

Table 2: Changes in diastolic blood pressure during clinic follow-up in the 249 men and women from the eight Jimma Zone health centres (September 2010-August 2015) according to gender, age and type of treatment

	Baseline Diastolic Blood Pressure (mm Hg)							
	≤89		90-99		100		≥101	
	Change in diastolic blood pressure from baseline, measured at 9-12 months (mm Hg)							
	Est	95% CI	Est	95% CI	Est	95% CI	Est	95% CI
All Subjects	3.4	0.8, 6.0	-5.0	-6.8, -3.2	-13.4	-15.9, -11.0	-23.7	-26.6, -20.8
Gender								
Male	4.1	0.4, 7.9	-4.8	-7.2, -2.3	-13.3	-17.3, -9.2	-24.0	-28.3, -19.7
Female	3.0	-0.8, 6.7	-5.0	-7.7, -2.3	-13.5	-16.6, -10.4	-23.4	-27.4, -19.4
Age (years)								
≤50	4.9	0.5, 9.3	-5.2	-7.7, -2.7	-13.1	-16.6, -9.5	-24.7	-28.6, -20.8
>50	1.8	-0.7, 4.4	-4.7	-7.4, -2.1	-13.9	-17.2, -10.5	-22.1	-26.7, -17.5
Treatment								
HCT alone	2.0	-0.8, 4.8	-4.9	-7.2, -2.6	-13.7	-16.6, -10.9	-21.4	-28.8, -14.0
Other	6.9	0.3, 13.5	-4.9	-8.0, -1.7	-13.2	-17.2, -9.1	-24.4	-27.7, -21.1

Est = estimate; CI = confidence interval; HCT = Hydrochlorthiazide

Results were comparable in the eight different health centres. The percentage of patients achieving normotensive status at the end of the study period (defined as blood pressure $\leq 140/90$ mm Hg) in the hydrochlorthiazide group was 47.7% compared with 32.1% in the combination therapy group.

Discussion

Our study demonstrates that nurses and health officers working in remote rural health centres can achieve good blood pressure control for patients with hypertension. The observed falls in systolic and diastolic blood pressure were clinically significant and long-lasting. In over half of the cases this was achieved with a single, inexpensive diuretic, hydrochlorthiazide.

It is now apparent that hypertension is a major health problem in both rural as well as urban sub-Saharan Africa and that most of the medical care in rural areas will have to be delivered by the non-physician workforce due to the dearth of medically qualified staff in rural areas. Yet there is virtually no available information on the effectiveness of hypertension treatment delivered by rural nurses and health officers. Our results (Table 1 and Table 2) compare well with previously published data in similar populations, while the proportion achieving target blood pressures although low are within the range reported for several European populations (12). Kengne et al. (2009) reported a study of nurse-led hypertension treatment in urban and rural Cameroon, showing a 14.4 mm Hg systolic and 12.1 mm Hg diastolic difference at the end of 26 months follow-up (6). Another study from Cameroon described task-shifting in eight rural health districts and reported that systolic BP decreased by 22.8 mm Hg and diastolic BP by 12.4 mm Hg (8). In a rural area of Kwa-Zulu-Natal, South Africa, Coleman et al. (1998) reported successful treatment of 70% of hypertensives in a two year follow-up (13). All agree, however, that it is hard to achieve good detection, awareness and control in both urban and rural settings in Africa (3, 14).

Clinic default is a major obstacle in providing effective care for hypertension and other non-communicable diseases in sub-Saharan Africa. This arises for a number of reasons, which not only include the costs and difficulties involved in continuing clinic attendance but also the many cultural obstacles facing the biomedical approach to hypertension control. In the Ethiopian context, these include a sense of disappointment that a cure is not being offered, a preference for traditional healing systems and a very different view of the nature of health and disease (15). In the present study, 42% of the enrolled patients defaulted during the 30 month follow-up period, which was somewhat higher than that reported among patients attending an outpatient clinic at Gondar Hospital, 35.4% (16), and much higher than the rates reported in the Cameroon studies, 22.7% and 18.1% over similar follow-up periods (6, 8), possibly as a result of the greater remoteness of the Jimma Zone clinics and associated travel difficulties.

An interesting finding in the present study was that monotherapy with hydrochlorothiazide appeared to be effective in a high proportion of patients at all levels of initial blood pressure. Although the reasons for this are not clear, it is recognised that hypertension in African origin populations is usually characterized by low renin, expanded circulatory volumes and sensitivity to salt. Diuretics are the preferred initial therapy, and monotherapy with a diuretic or a calcium channel antagonist has consistently lowered blood pressure more effectively than other agents (17). Our findings provide support for the use of hydrochlorothiazide as a first line medication in primary care as it is effective, simple and cheap.

There are many limitations to this study which is an attempt to assess the model of task-shifting of care in remote rural communities. These include its relatively small size, the absence of a comparative arm, the accuracy of blood pressure measurement and the question as to what extent some of the observed effects may have been accounted for by the selective dropout of participants who were less likely to respond to treatment. Additionally we were unable to assess the levels of other cardiovascular risk factors at baseline or monitor them during follow-up, or evaluate patients for target organ damage. In addition much work needs to be done to research process evaluation. Nevertheless, our results support the feasibility of using nurses and health officers to effectively manage hypertension in rural areas where few health facilities are available.

Reference

1. World Health Organization. Global health risks: mortality and burden of disease attributable to selected major risks. Geneva: WHO; 2009.
2. World Health Organization. Global status report on non communicable diseases. Geneva: WHO; 2010.
3. van de Vijver S, Akinyi H, Oti S, Olajide A, Agyemang C, Aboderin I, et al. Status report on hypertension in Africa--consultative review for the 6th Session of the African Union Conference of Ministers of Health on NCD's. *Pan Afr Med J.* 2013;16:38.
4. Ogedegbe G, Gyamfi J, Plange-Rhule J, Surkis A, Rosenthal DM, Airhienbuwa C, et al. Task shifting interventions for cardiovascular risk reduction in low-income and middle-income countries: a systematic review of randomised controlled trials. *BMJ Open.* 2014;4(10):e005983.
5. Joshi R, Alim M, Kengne AP, Jan S, Maulik PK, Peiris D, et al. Task shifting for non-communicable disease management in low and middle income countries--a systematic review. *PloS one.* 2014;9(8):e103754
6. Kengne AP, Awah PK, Fezeu LL, Sobngwi E, Mbanya JC. Primary health care for hypertension by nurses in rural and urban sub-Saharan Africa. *Journal of clinical hypertension.* 2009;11(10):564-72.
7. Kengne AP, Sobngwi E, Fezeu L, Awah PK, Dongmo S, Mbanya JC. Setting-up nurse-led pilot clinics for the management of non-communicable diseases at primary health care level in resource-limited settings of Africa. *Pan Afr Med J.* 2009;3:10.
8. Labhardt ND, Balo JR, Ndam M, Grimm JJ, Manga E. Task shifting to non-physician clinicians for integrated management of hypertension and diabetes in rural Cameroon: a programme assessment at two years. *BMC health services research.* 2010;10:339.
9. Labhardt ND, Balo JR, Ndam M, Manga E, Stoll B. Improved retention rates with low-cost interventions in hypertension and diabetes management in a rural African environment of nurse-led care: a cluster-randomised trial. *Tropical medicine & International Health.*

- 2011;16(10):1276-84.
10. Central Statistical Agency. Population projection of Ethiopia for all regions at woreda level from 2014-2017. Addis Ababa: Federal Democratic Republic of Ethiopia, 2013.
 11. Mamo Y, Seid E, Adams S, Gardiner A, Parry E. A primary healthcare approach to the management of chronic disease in Ethiopia: an example for other countries. *ClinMed*. 2007;7(3):228-31.
 12. Wolf-Maier K, Cooper RS, Kramer H, Banegas JR, Giampaoli S, Joffres MR, et al. Hypertension treatment and control in five European countries, Canada, and the United States. *Hypertension*. 2004;43(1):10-7.
 13. Coleman R, Gill G, Wilkinson D. Noncommunicable disease management in resource-poor settings: a primary care model from rural South Africa. *BullWorld Health Organ*. 1998;76(6):633-40.
 14. Agyemang C. Rural and urban differences in blood pressure and hypertension in Ghana, West Africa. *Public Health*. 2006;120(6):525-33.
 15. Levene D, Phillips DI, Alemu S. Medical traditions and chronic disease in Ethiopia: a story of wax and gold? *Trop Doct*. 2016;46(3):122-5.
 16. Ambaw AD, Alemie GA, SM WY, Mengesha ZB. Adherence to antihypertensive treatment and associated factors among patients on follow up at University of Gondar Hospital, Northwest Ethiopia. *BMC Public Health*. 2012;12:282.
 17. Materson BJ, Reda DJ, Cushman WC, Massie BM, Freis ED, Kochar MS, et al. Single-drug therapy for hypertension in men. A comparison of six antihypertensive agents with placebo. The Department of Veterans Affairs Cooperative Study Group on Antihypertensive Agents. *N Engl J Med*. 1993;328(13):914-2.