Policy and practice

Package of essential noncommunicable disease (PEN) interventions in primary health-care settings in the Democratic People’s Republic of Korea: a feasibility study

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Abstract

The prevention and control of noncommunicable diseases (NCDs) is a priority for the Democratic People’s Republic of Korea. Mortality due to NCDs in people aged over 30 years was 1239 per 100 000 in 2009 and the 2014–2020 national strategy includes population-level goals for health promotion and disease prevention. This paper reports a pilot study on the feasibility of implementing components of the World Health Organization (WHO) Package of essential noncommunicable disease (PEN) interventions for primary health care in low-resource settings (WHO PEN) to enable early detection and management of cardiovascular disease and diabetes mellitus at the level of primary care. WHO PEN protocols were adapted for local use by household doctors, who provide ambulatory care in polyclinics in the mornings and household visits in the afternoons. The pilot project was implemented in two polyclinics in Pyongyang, covering a population of 32 000. After training, and during routine household visits in June 2014, 70 household doctors screened all adults aged over 35 years (18 340) for cardiovascular disease and diabetes mellitus, and their risk factors. A total of 2319 patients with cardiovascular disease or diabetes, and those with high-risk factors, were referred to the polyclinics for three quarterly visits for testing and management. Final household screening of the population was done in June 2015. This pilot project demonstrated the feasibility of integrating screening and management into the standard primary health-care system in the Democratic People’s Republic of Korea. The household doctors were able to detect and manage risks for cardiovascular disease and diabetes by using the protocols based on WHO PEN. Among 18 340 individuals aged over 35 years, implementation of WHO PEN interventions led to a significant reduction in the number of people with a 10-year risk of cardiovascular disease ≥20% (from 1748 [9.5%] to 543 [3.0%]) over a 1-year period. Involvement of household doctors can increase access to services for prevention and control of cardiovascular disease and diabetes in the Democratic People’s Republic of Korea.

Keywords: cardiovascular disease, Democratic People’s Republic of Korea, diabetes, intervention, primary health care

Background

Noncommunicable diseases (NCDs) pose a significant public health burden globally.1 In most countries, people of low socioeconomic status who live in marginalized communities have a higher risk of death from NCDs than those in more advantaged communities.2 In terms of both morbidity and mortality, the global epidemic of NCDs is not only increasing but also having a disproportionate impact in low- and middle-income countries.3 In the Democratic People’s Republic of Korea, mortality due to NCDs in individuals aged over 30 years was 1239 per 100 000 in 2009.4 Prevention of NCDs has been a priority for some time for the Democratic People’s Republic of Korea, which ratified the World Health Organization (WHO) Framework Convention on Tobacco Control in 2005.5 The 2014–2020 national strategy aims to reduce the prevalence of NCDs, the proportion of premature deaths, loss of working ability, and risk factors for NCDs. It also aims to conduct multisectoral activities to target risk factors and improve the quality of medical services.6

In addition to the policies for health promotion and disease prevention targeted at the population level, approaches to risk detection and risk management at the individual level have also been advocated. Early detection and management of individuals with NCDs or at high risk of NCDs can reduce the complications of NCDs, thereby improving survival and quality of life. In high-income countries, mortality from cardiovascular disease has declined, owing to better access to services for prevention and treatment of NCDs.7 The WHO Package of essential noncommunicable disease (PEN) interventions for primary health care in low-income settings (WHO PEN) was developed to enable early detection and management at...
the primary-care level in low-resource settings. WHO PEN is a prioritized set of cost-effective interventions that can be delivered to an acceptable quality of care at low cost; it is the minimum standard for NCDs, to strengthen national capacity to integrate and scale up care of heart disease, stroke, cardiovascular risk, diabetes, cancer, asthma and chronic obstructive pulmonary disease in primary health care in low-resource settings.

This paper describes the processes and outcomes of piloting WHO PEN protocols for cardiovascular disease and diabetes mellitus in the Democratic People’s Republic of Korea in 2014. The specific aim of these pilots was to assess the feasibility of integrating the interventions into the existing primary health-care system.

Local setting

According to WHO data for 2013, the Democratic People’s Republic of Korea had a population of 24 895 000, of whom 61% were living in urban areas, and is a low-income country by World Bank classification. The health-care system in the country comprises primary-, secondary- and tertiary-care clinics/hospitals. Household doctors deliver primary health care through polyclinics in urban areas or ri (administrative unit) people’s hospitals in rural areas. On average, each household doctor looks after 130 households. These doctors provide ambulatory care in the polyclinics or ri people’s hospitals in the mornings and visit households in the afternoon. Comprehensive primary care, consisting of prevention, diagnosis, treatment and hospitalization, is provided free of cost. The network of polyclinics and ri people’s hospitals is supported by specialist doctors in the secondary- and tertiary-care institutions at county, provincial and national levels. To date, the major focus of the health system has been on prevention and control of communicable diseases and on maternal and child health.

Protocol development and PEN pilot implementation

Preparations for adaptation of the WHO PEN protocols began in 2012 at a country-level consultation workshop. Only the protocols for cardiovascular disease and diabetes were selected for implementation in this pilot. Guidelines for integrated management of cardiovascular disease and diabetes in polyclinics and ri people’s hospitals were finalized in 2013. In June 2014, the pilots were initiated in two polyclinics in Pyongyang, which were staffed by household doctors, specialist doctors, nurses, laboratory technicians and pharmacists.

After conducting the training of trainers (directors and specialist doctors of polyclinics), household doctors were trained in each of the two polyclinics in 2-day workshops in 2013 and 2014. Equipment to measure blood glucose and cholesterol at the polyclinics, WHO/International Society of Hypertension (ISH) 10-year risk prediction charts for cardiovascular disease (with or without diabetes), and health education materials were provided by WHO. The WHO/ISH charts are country specific and are used to indicate the 10-year risk of a fatal or non-fatal major cardiovascular event (myocardial infarction or stroke), according to age, sex, blood pressure, smoking status, total blood cholesterol and presence or absence of diabetes. Medicine supplies were also augmented by WHO, to cater for the basic medical needs of patients with cardiovascular disease or diabetes in the two polyclinics.

In June 2014, using a structured questionnaire, household doctors screened adults aged over 35 years during household visits. These doctors identified known cases of cardiovascular disease and diabetes and assessed their risk factors. In addition, for all household members older than 35 years, they measured height, weight, waist circumference and blood pressure; tested urine for sugar and albumin; and assessed 10-year risk of cardiovascular disease, using the WHO/ISH risk prediction charts. The household doctors counselled household members for smoking cessation, alcohol harm reduction, healthy diet and physical activity. Patients with any of the following were invited to the polyclinic for further examination and management:

- diagnosed hypertension, heart disease, stroke, diabetes or kidney disease;
- new chest pain or change in the severity of angina or breathlessness;
- suspected diabetes – positive urine glucose test or symptoms of weight loss, polydipsia, polyuria and nocturia;
- cardiac murmurs, lung crackling/rales;
- blood pressure ≥160/100 mmHg or ≥140/90 mmHg (≥130/80 mmHg in patients with diabetes) while on treatment with two or three drugs;
- a high (≥20%) 10-year risk for cardiovascular disease.

The household screening was repeated after 1 year, using the same methods.

At the polyclinic, a clinical record form was used for registration and follow-up of patients, and was kept in a folder alongside the records of chronic disease. In the first clinic visit, fasting and 2-hour post-prandial blood glucose and cholesterol were tested with the glucometer and cholesterol meter, and appropriate counselling was given and treatment prescribed in consultation with the specialist doctor. The same assessment was done at the polyclinic after 3 months and 6 months. Those who did not respond to treatment were referred to hospital.

Medicines prescribed according to a defined protocol, depending on the patient’s condition, were dispensed for 3 days initially and the patient was reassessed; thereafter, medicines were dispensed at weekly intervals for as long as the patient’s condition required. Whenever shortage of medicine occurred, patients with mild disease were prescribed koryo traditional medicines. Supervision was carried out by Ministry of Public Health and WHO officials. Monitoring reports were sent to the Ministry of Public Health every quarter.

Performance assessment

The performance of the pilot project was evaluated in December 2015. Based on the WHO health-system evaluation framework, a pilot project-evaluation framework was prepared in consultation with the programme managers. WHO health-system building blocks were used to trace the link between inputs, coverage and outcomes.

The WHO planning guide for implementation of WHO PEN to strengthen primary health care was utilized for preparation.
of tools for observation of PEN sites, and interviews with key informants. Using the evaluation tools, the two project sites were observed; training material, screening questionnaires, equipment, patient clinic records and monitoring reports were reviewed; and key personnel (2 directors, 8 household doctors, 2 specialist doctors, 2 nurses, 2 laboratory technicians, 2 pharmacists and 8 patients) were interviewed.

Outcomes

As already described in detail, the PEN project was implemented in three selected dongs (neighbourhoods; total population 32 000) of two polyclinics in Pyongyang. Screening of the household population was carried out in the selected dongs, by 70 household doctors affiliated to the selected polyclinics. In all households of the selected dongs, individuals aged over 35 years were screened, and those with high risk were invited to polyclinics for further evaluation. Household screening was also repeated after 1 year.

Household screening

All individuals aged over 35 years were screened at household level, irrespective of their disease status. Of the total number screened (n = 18 340), the numbers with WHO/ISH 10-year risk of cardiovascular disease <10%, 10% to <20%, 20% to <30%, and ≥30% were found to be 15 047 (82.1%), 1545 (8.4%), 925 (5.0%) and 823 (4.5%), respectively; 2723 (14.8%) had high blood pressure (>140/90 mmHg); 777 (4.2%) had positive urine glucose; 4497 (24.5%) had high waist circumference (men >90 cm, women >80 cm); and 4494 (24.5%) had high body mass index (>23 kg/m²) (see Fig. 1, baseline). All those screened were counselled for risk reduction, and those who met the referral criteria specified in the screening protocol were referred to a polyclinic for further examination and testing for blood glucose and cholesterol. After 1 year, the repeat assessment of risk factors by household screening in the same population revealed a significant decline in risk factors (see Fig. 1, 1 year).

Follow-up of high-risk patients

Of the 18 340 persons screened in the households, 2319 (12.6%) met the criteria listed above and were referred to the two polyclinics. They were registered and followed up. Those consuming alcohol were counselled for alcohol harm reduction and those who were current smokers were advised on smoking cessation. They were also counselled for healthy diet and physical activity. Polyclinic records indicated that PEN reports were submitted regularly to higher authorities, which supervised the project periodically by site visits.

The polyclinic records indicated that several risk factors declined significantly from the first polyclinic visit to the third visit (see Fig. 2). A significant reduction had occurred in the categories of 10-year cardiovascular risk of (i) 20% to <30% and (ii) ≥30% from (i) 587 (25.3%) to 306 (13.2%) and (ii) 395 (17.0%) to 176 (7.6%) respectively between the first and third polyclinic visit. Compared to baseline (data not shown), by the third quarter, the number with a fasting blood glucose level of >7 mmol/L declined from 642 (27.7%) to 232 (10.0%) and the number with a blood cholesterol level of >6.6 mmol/L declined from 247 (10.7%) to 74 (3.2%) among the 2319 high-risk patients.

Medicines were prescribed as per protocol and those who did not respond to treatment were referred to hospital. Indents for medicines were sent regularly but some shortage of medicine was experienced in the last week of the month.

Lessons learnt and challenges

Household doctors were able to use the adapted protocols on cardiovascular disease and diabetes. They were also able to use the WHO/ISH charts for 10-year risk of cardiovascular disease. Their capacity has been enhanced and their awareness about major NCD risk factors has increased. Among individuals aged over 35 years who were screened at the household level, a large proportion were found to have high (≥20%) 10-year risk of cardiovascular disease. All high-risk patients were followed up and a significant reduction occurred in the 10-year risk of cardiovascular disease over a 9-month follow-up period. Most of

Fig. 1. Prevalence of risk factors for cardiovascular disease among individuals aged over 35 years in three dongs of Pyongyang, Democratic People’s Republic of Korea, 2014–2015 (n = 18 340)

![Fig. 1. Prevalence of risk factors for cardiovascular disease among individuals aged over 35 years in three dongs of Pyongyang, Democratic People’s Republic of Korea, 2014–2015 (n = 18 340)](image-url)

BMI: body mass index; CVD: cardiovascular disease; F: female; M: male.
the patients had received medicine free of cost from the health facility close to their home; thus, regular intakes of medicines may have led to the favourable changes observed in this short period of time. Similar findings were observed in the evaluation of the Bhutan PEN project\textsuperscript{13} and a cardiovascular disease risk-management project in north India.\textsuperscript{14}

Though risk factors showed a declining trend, there is scope for further improvement, as many of the patients referred to the polyclinics (20.8\%) still had a high risk (≥20\%) of cardiovascular disease at the end of the third follow-up visit. It is important to analyse the level of adherence to medication and lifestyle changes. In the Bhutan PEN pilot, high adherence to medical care was reported.\textsuperscript{13} The extent of the availability of laboratory consumables and medicines could not be assessed in the Democratic People’s Republic of Korea, as reporting on these items was not included in the routine monitoring system. Computer software (spreadsheets) could be developed to record patients’ clinical data and facilitate monitoring of outcomes.

Assessment of the population-level impact of the PEN pilot was done by a repeat household screening survey, which revealed significant changes in the risks at the population level. Household doctors can carry out screening at periodic intervals during their routine household visits. An assessment of cost effectiveness, as was done in Bhutan,\textsuperscript{15} could help policy-makers to decide whether it is possible in the current economic scenario to extend PEN to the entire country in a phased manner, by supplying medicines and laboratory reagents from the regular health budget.

In conclusion, implementation of WHO PEN protocols related to cardiovascular disease and diabetes has improved risk management in selected polyclinics of the Democratic People’s Republic of Korea, which has a well-defined system of primary care staffed by household doctors. Efforts should be made to extend the pilot project to rural areas and increase people’s hospitals in the provinces, before scale-up to the entire country. Protocols for cancer and chronic respiratory diseases should also be developed.

Acknowledgements: We thank the staff of the Ministry of Public Health and National Institute of Public Health Administration, Democratic People’s Republic of Korea for piloting WHO PEN in the country.

Source of support: This project was supported by the World Health Organization Country Office for the Democratic People’s Republic of Korea.

Conflicts of interest: None declared.

Authorship: SHC, KYN, HCS, RG, SMS and KUO contributed to the planning and implementation of the study design, including monitoring, and collection, analysis and interpretation of the data; they also contributed to writing the manuscript. RK planned and carried out the evaluation, data analysis and interpretation and prepared the manuscript. All authors have critically reviewed and approved the manuscript and are accountable for all aspects of this work.


References

6. Strategy for the prevention and control of non communicable

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**Fig. 2.** Changes in the risk profile after implementation of integrated management of cardiovascular disease and diabetes in two polyclinics of Pyongyang, Democratic People’s Republic of Korea, 2014–2015 (n = 2319)


