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# PUBLIC HEALTH RESEARCH

## Evaluation of the Impact of Enhanced Primary Health Care Intervention Programme in Malaysia: A Repeat Cross-sectional Pre-Post Quasi Experimental Study

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**ABSTRACT**

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| **Introduction** | Non-communicable diseases (NCD) lead to substantial mortality and morbidity worldwide. Malaysia is currently experiencing an epidemic of NCDs. This paper aims to evaluate the effectiveness of the Enhanced Primary Health Care (EnPHC) intervention in reducing the prevalence of undiagnosed diabetes, undiagnosed hypertension, and undiagnosed hypercholesterolemia as well as NCD risk factors in the population after about one year of intervention. |
| **Methodology** | This is a repeat cross-sectional pre-post quasi-experimental study comparing intervention and control groups. The target population included adults aged 30 years and above living within the 40 selected clinics' catchment areas for at least six months. Data were collected using face-to-face interviews and clinical assessments. A difference-in-difference (DID) analysis was used to determine the effect of the EnPHC intervention. |
| **Results** | The percentage of the population screened for diabetes mellitus, hypertension, and hypercholesterolemia increased from the baseline status by 8.7%, 9.9%, and 9.2%, respectively. The prevalence of undiagnosed diabetes mellitus and hypercholesterolemia decreased from the baseline status by 17.6% and 13.7% compared to the control group. However, the EnPHC intervention did not affect the prevalence of overweight, obesity and smoking. |
| **Conclusion** | The EnPHC intervention contributed to the reduction in the prevalence of undiagnosed NCDs. A more extended period of intervention would be required to show the effect on NCD risk factors. Further strengthening of the intervention would be needed for implementation in other localities. |
| **Keywords** | Non-communicable disease; primary health care intervention; community intervention; Malaysia |

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# INTRODUCTION

Non-communicable diseases (NCDs) pose a significant challenge to the health, well-being and prosperity of populations across the world.[1] About 70% of all deaths worldwide currently are due to NCDs – mainly cardiovascular diseases, diabetes, chronic respiratory diseases and cancers.[2] These deaths are distributed widely among the world's population, and-about one-quarter of all NCD deaths occur below the age of 60, amounting to approximately 9 million deaths per year.[3] In terms of disease burden, there has been a marked increase in the proportion of non-communicable diseases globally since 1990, where the main burden was contributed by years lived with disability (YLDs).[4]

Similarly, Malaysia is also currently experiencing an epidemic of NCDs. The prevalence of NCDs and their risk factors in Malaysia have risen substantially in the last decade.[5] The National Health and Morbidity Survey (NHMS) in 2015 showed that the prevalence of hypertension at 30.3%, prevalence of diabetes at 17.5%, hypercholesterolemia is 47.7%, obesity 17.7% and overweight 30%.[6] The trend of diabetes and high cholesterol had increased drastically from 11.6% and 20.7% respectively in 2006 with no significant change in the prevalence of hypertension over that period. Furthermore, about half of people with diabetes and hypertension and 80% of those with high cholesterol were not aware of their disease status (undiagnosed).[6-8] A separate study on disease burden, ischaemic heart disease, diabetes, and cardiovascular disease was reported as the top three leading causes of disability-adjusted life years (DALYs) in Malaysia.[9] These figures indicate an alarming situation of NCD status in Malaysia. The NCDs were driven by an ageing society and a high prevalence of risk factors such as overweight, obesity, physical inactivity, smoking and unhealthy diet.[10-12] The prevalence of awareness, treatment, and control of NCDs in Malaysia is low, indicating the importance of enhancing Malaysia interventions.[13,14]

Intervention at the primary health care and community has been recommended to reduce mortality and morbidity due to NCDs.[15] Studies have shown that such interventions at a large scale could improve NCD risk factors. As most NCD risk factors require behavioural change, a more extended period of interventions yields better results.[16-18]

In 2017, the Ministry of Health launched the Enhanced Primary Health Care (EnPHC) programme as a pilot project in selected localities in Selangor and Johor, Malaysia, as part of an intervention package to address this challenge. In this programme's context, 'Enhanced' is defined as incorporating prevention, primary care, and social support service delivery as part of a 'network' linked to appropriate secondary and tertiary hospital services.[19] The main objective of the EnPHC programme is to improve the entire continuum of care from community to primary care to secondary/tertiary care on NCDs, thus enhancing the quality of care. There were 20 health clinics in the state of Johor and Selangor in Malaysia that were selected to implement the intervention. This study's main objective was to evaluate the short-term effect of the EnPHC intervention on NCDs at the population level, particularly in screening coverage of NCDs, changes in the prevalence of undiagnosed NCDs and NCDs risk factors.

# METHODS

Study Setting

In Malaysia, the primary health clinics (PHC) provide primary health care services to the surrounding community, including services to patients with NCD. These would include screening NCD and risk factors, providing treatment, monitoring disease and complications, and referral for tertiary care when required. Each PHC has its catchment area. In each of these areas, there are about 20,000 to 50,000 residents depending on the health clinics' size and locality. Every individual from this area usually seeks primary health care services from respective PHC.

The EnPHC program was a pilot project in 40 PHC (20 as intervention sites and 20 as control sites) in two states in Malaysia. The matched 20 HC pairs' selection was based on predetermined criteria [locality (urban or rural), total number of staff and specialists, and patient load]. Each pair had similar criteria and were in different districts to avoid contamination to the control sites. The random allocation of clinics for intervention and control was done by flipping a coin.

Enhanced Primary Health Care Intervention

The Enhanced Primary Health Care intervention on NCDs consists of three key pillars: a] Community empowerment and health awareness; b] Person-centred care bundles; c] Integrated care networks. The community empowerment and health awareness pillar consist of establishing a population health database with population enrollment and risk profiling, community-based intervention programs, branding, and social marketing. This involved introducing a community health coordinator who oversees the full implementation of the interventions, including health promotion and prevention, health screening, enrollment outreach, and defaulter outreach. The person-centred care bundle pillar consists of integrated multi-disciplinary care, continuous improvement of care delivery and improved organisation practices. The integrated care network pillar consists of continuity of care across healthcare facilities and communities. Further details of the intervention are described elsewhere.[20]

This study's evaluation is related to the first component of the interventions which is community empowerment and health awareness. The community-based intervention programme is enhanced by consolidating efforts and resources on community outreach and mobile health team and community empowerment through active participation of non-governmental organizations (NGOs) and community leaders in health promotion and community screening activities. These activities involved population enrolment, NCD risk profiling of the population, and NCDs screening, which include screening of diabetes, hypertension, and hypercholesterolemia. The community-level screening was conducted by trained volunteers and mobile health teams from health clinics during medical camps or outreach programmes, apart from screening done at the clinics. A population database with an NCD risk profile was developed. The intervention's main aims were to promote a healthy lifestyle, reduce NCD risk factors, and reduce undiagnosed NCDs in the population through enhancement of health screening and health education and promotion.

Study design

This is a repeat cross-sectional pre-post quasi-experimental study comparing intervention and control population.[21] This study is one of the components of the evaluation on the impact of the EnPHC intervention. In measuring the intervention's impacts, 20 matched health clinics were selected within the same states as the control sites. The matching was based on a few criteria: clinic type, number of medical officers, number of specialists, urban/rural locality, and total attendances. The target population included Malaysian adults aged 30 years and above living within the 40 selected clinics' catchment areas for at least six months.

The sample size was calculated using a two-proportion formula to measure the intervention's effect on the outcome of interest.[22]

$$n = (Z\alpha/2+Z\beta)2 * [p1(1-p1) +p2(1-p2)] / (p1-p2)2$$

$Z\alpha/2$ = the critical value of the Normal distribution at $\alpha/2 = 1.96$

$Z\beta$ = the critical value of the Normal distribution at $\beta = 0.84$ for 80% power

p1 = the baseline sample proportion based on NHMS 2015 results of undiagnosed hypertension among 30 years and older (18.2%)

p2 = the expected sample proportions based on the expert opinion of the effect change post-intervention (14.2%)

In order to ensure optimum sample size (3,000 respondents per arm), the sample calculated was adjusted for design effect, considering the intra-cluster correlation and the expected non-response rate of 35%.[6,7] A total sample of 5,000 respondents was required for each intervention and control arm at the baseline and the follow-up survey.

Sampling method

The respondents from both the intervention and the control population were selected using a multistage stratified sampling method. The stratification was based on the clinic catchment areas. The sampling frames of Enumeration Blocks (EBs) in the 40 health clinic catchment areas were provided by the Department of Statistics Malaysia (DOSM). An EB is a geographically continuous area with identified boundaries. There are about 50 to 100 EBs in each clinic catchment area. Each EB has 80 to 120 living quarters (LQs). Thirteen EBs were selected from within each clinic catchment area, and twelve LQs were sampled within each selected EB. All adults aged 30 years and older living in the LQs were eligible as respondents. Institutional populations, such as those staying in hotels, hostels, hospitals, etc., were excluded from the study.

Data collection

We conducted baseline data collection in April and May 2017, before the intervention started in June 2017. An appointment with an eligible household was made before the actual visit. Face-to-face interview questionnaire was conducted by using a mobile device by trained research assistants. On the occasion where the LQ was locked, or the respondent was unavailable, further visits were attempted. A household was classified as unsuccessful after at least three unsuccessful visits. The post-intervention data collection took place in July and August 2018 after 12 months of intervention.

*Questionnaire*

A structured, bilingual (Malay and English) face-to-face interview questionnaire was developed for data collection. The questionnaire was adapted from the validated questionnaire used for the National Health and Morbidity Survey in Malaysia. The questionnaire consisted of modules on the non-communicable diseases and the risk factors, namely diabetes, hypertension, hypercholesterolaemia, and smoking. The questionnaire was pre-tested, modified and finalised for full survey implementation.

*Clinical assessment*

The respondent's height was measured to the nearest 0.1 centimetres (cm) using SECA Stadiometer 213.[23] Bodyweight was measured with an accuracy of 0.1 kilograms (kg) using a digital weighing

machine (TANITA HD 319).[23] Each measurement was obtained twice, and the average was recorded as the final reading. Blood pressure was measured with a digital automatic blood pressure monitor, Omron Japan Model HEM-907.[24] It was measured with the participant seated and after 15 minutes of rest. Three readings of systolic and diastolic pressure were taken 5 minutes apart. The average of the second and third reading was used as the final reading for the systolic and diastolic blood pressure. Blood glucose and cholesterol were measured after an overnight fast using capillary blood via the finger prick method. Both tests were done using the CardioChek® machine.[25] A trained staff nurse carried out the clinical assessments at the respondents' house.

*Definitions*

Screening was defined as ever had a test done to measure blood sugar level among individuals with no history of diabetes or ever had blood pressure measured among individuals with no history of hypertension or ever had blood cholesterol level measured among individuals with no history of hypercholesterolemia. In this study, the respondents were asked if they were ever screened in the past 12 months during both the data collections.

Respondents were classified as having hypertension if their blood pressure was ≥140 mmHg systolic or ≥90 mmHg diastolic or told to have hypertension by medical personnel previously.[26]

Diabetes was defined as having a fasting capillary blood glucose level of ≥ 6.1 mmol/L[27] or was told to have diabetes by medical personnel.

Hypercholesterolemia was defined as total cholesterol (TC) of ≥ 5.2 mmol/L[28] or told to have hypercholesterolemia by medical personnel previously.

Body mass index was calculated as weight in kilograms divided by height in meters squared and grouped into three categories based on WHO guidelines: <25.0 kg/m2 as underweight to normal weight, 25.0 to 29.9 kg/m2 as overweight and ≥30.0 kg/m2 as obese.[29]

Data Processing and Analysis

All major data processing activities were centralised at the Institute for Public Health, Malaysia. The quality control was conducted on the dataset (especially on the respondent ID, outliers, or incorrect data). All data analysis was carried out using STATA version 12 software.[30] Complex sample analysis procedures were used in the analysis. All statistical analysis was carried out at a 95% confidence interval.

A difference-in-difference (DID)[31] analysis was used to determine the effect of EnPHC interventions on: 1] increment of screening for diabetes, hypertension and hypercholesterolemia, 2] the prevalence of undiagnosed diabetes, hypertension and hypercholesterolemia, 3] prevalence of NCD risk factors such as obesity, overweight and smoking by comparing between post-intervention and baseline data from repeated cross-sectional surveys. We conducted bivariate comparisons of characteristics between intervention and control groups at the baseline and post-intervention surveys using the chi-square test. A balance test was done to compare the baseline characteristics of the dependent variables based on t-statistics. The difference in the outcomes between intervention and control groups at the post-intervention compared to baseline was measured using DID analysis. The DID analysis would consider the baseline differences between intervention and control groups in measuring the intervention's effect. Other covariates such as age, gender, ethnicity, education, and income were controlled in the analysis.

Ethical approval

This study had obtained approval from the Ministry of Health Malaysia, Medical Research and Ethics Committee (MREC). Before the study, several meetings with relevant departments and liaison officers at the State Health Departments were conducted.

## RESULTS

The total number of samples for baseline and post-intervention were 8032 (4221 in the intervention group and 3811 in the control group) and 8038 (4138 in the intervention group and 3900 in the control group), respectively. The majority of the respondents were Malay, female and aged 60 years and above for the intervention and control groups during baseline and post-intervention surveys.

Table 2 shows the test for balance of dependent variables at the baseline between intervention and control groups. The balance test shows that the difference in these characteristics is non-significant except for undiagnosed diabetes and obesity, where they were slightly higher in the intervention group.

Table 3 shows DID estimates of the EnPHC program's effects on NCD screening rates/coverage, the prevalence of undiagnosed NCD and NCD risk factors among adults aged 30 years and above.

This study found the percentage of the population screened for diabetes mellitus, hypertension, and hypercholesterolemia increased from the baseline status by 8.7%, 9.9% and 9.2%, respectively. In comparison, the prevalence of undiagnosed diabetes mellitus and

hypercholesterolemia decreased by 17.6% and 13.7% compared to the control group. However, the EnPHC intervention did not show any significant effect on the prevalence of overweight, obesity and smoking after about one year of intervention.

**Table 1** Socio-demographic characteristics of respondents

| Socio-demography | Baseline Intervention (n=4,221) | | Control (n=3,811) | | | Post-Intervention Intervention (n=4,138) | | Control (n=3,900) | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Count | (%) | Count | (%) | *p* value | Count | (%) | Count | (%) | *p* value |
| Age Group | | | | | | | | | | |
| 30-39 | 785 | 18.6 | 829 | 20 | 0.096 | 719 | 18.9 | 827 | 21.2 | 0.010 |
| 40-49 | 864 | 20.5 | 877 | 21.2 | 0.415 | 825 | 21.6 | 810 | 20.8 | 0.345 |
| 50-59 | 1,024 | 24.3 | 1,023 | 24.7 | 0.623 | 905 | 23.7 | 936 | 24 | 0.794 |
| 60+ | 1,548 | 36.7 | 1,409 | 34.1 | 0.012 | 1,362 | 35.7 | 1,327 | 34 | 0.115 |
| Gender | | | | | | | | | | |
| Male | 1,641 | 38.9 | 1,652 | 39.9 | 0.328 | 1,579 | 41.4 | 1,660 | 42.6 | 0.314 |
| Female | 2,580 | 61.1 | 2,486 | 60.1 | | 2,232 | 58.6 | 2,240 | 57.4 | |
| Ethnicity | | | | | | | | | | |
| Malay | 3,268 | 77.4 | 2,761 | 66.7 | <0.001 | 2,545 | 66.8 | 2,519 | 64.6 | 0.043 |
| Chinese | 522 | 12.4 | 748 | 18.1 | <0.001 | 852 | 22.4 | 925 | 23.7 | 0.156 |
| Indian | 285 | 6.8 | 374 | 9 | <0.001 | 274 | 7.2 | 293 | 7.5 | 0.587 |
| Other Bumiputeras | 12 | 0.3 | 10 | 0.2 | 0.704 | 22 | 0.6 | 42 | 1.1 | 0.016 |
| Others | 134 | 3.2 | 245 | 5.9 | <0.001 | 118 | 3.1 | 121 | 3.1 | 0.987 |
| Education | | | | | | | | | | |
| Primary education | 2,071 | 49.1 | 1,853 | 44.9 | <0.001 | 1,727 | 45.4 | 1,679 | 43.1 | 0.045 |
| Secondary education | 1,627 | 38.6 | 1,680 | 40.7 | 0.055 | 1,572 | 41.3 | 1,526 | 39.2 | 0.058 |
| Certificate/ Diploma | 325 | 7.7 | 381 | 9.2 | 0.013 | 310 | 8.1 | 399 | 10.2 | 0.001 |
| Degree/Postgraduate degree | 192 | 4.6 | 209 | 5.1 | 0.283 | 197 | 5.2 | 292 | 7.5 | <0.001 |
| Household Income Quintile | | | | | | | | | | |
| Q1 | 934 | 23.5 | 792 | 20.7 | 0.003 | 1,044 | 28.8 | 800 | 21.2 | <0.001 |
| Q2 | 1,110 | 28.0 | 1,021 | 26.7 | 0.215 | 621 | 17.1 | 741 | 19.6 | 0.005 |
| Q3 | 741 | 18.7 | 710 | 18.6 | 0.916 | 778 | 21.5 | 787 | 20.9 | 0.533 |
| Q4 | 472 | 11.9 | 456 | 11.9 | 0.958 | 670 | 18.5 | 725 | 19.2 | 0.414 |
| Q5 | 713 | 18.0 | 844 | 22.1 | <0.001 | 514 | 14.2 | 720 | 19.1 | <0.001 |

**p value of chi square test, significant level: <0.05*

**Table 2** Baseline Test for Balance of Dependent Variables between Intervention and Control groups

| Outcome variables | Intervention (I) | | Control (C) | | *p* value |
|---|---|---|---|---|---|
| | Mean | SD | Mean | SD | |
| Screened for DM | 0.48 | 0.50 | 0.49 | 0.50 | 0.473 |
| Screened for HTN | 0.46 | 0.50 | 0.49 | 0.50 | 0.091 |
| Screened for HCL | 0.43 | 0.50 | 0.45 | 0.50 | 0.052 |
| Undiagnosed DM | 0.40 | 0.49 | 0.32 | 0.46 | <0.001** |
| Undiagnosed HTN | 0.20 | 0.40 | 0.20 | 0.40 | 0.720 |
| Undiagnosed HCL | 0.45 | 0.50 | 0.43 | 0.50 | 0.051 |
| Overweight | 0.54 | 0.50 | 0.51 | 0.50 | 0.060 |
| Obesity | 0.45 | 0.50 | 0.42 | 0.50 | 0.035* |
| Current smokers | 0.17 | 0.38 | 0.17 | 0.37 | 0.960 |
| Current smokeless tobacco user | 0.01 | 0.11 | 0.02 | 0.13 | 0.275 |

*Note: SD=standard deviation, DM=diabetes mellitus, HTN=hypertension, HCL=hypercholesterolemia. Data include cross-sectional data of people aged 30 and above at baseline.*
*p value based on t statistic from balancing test. *p<0.05, **p<0.001*

**Table 3** Difference-in-difference estimates of the effects of the EnPHC programme on NCD screening coverage, prevalence of undiagnosed NCD and NCD risk factors

| Screening | Phase | Mean | | Treatment effects | | | |
|---|---|---|---|---|---|---|---|
| | | I | C | β | 95% CI | | *p* value |
| | | | | | Lower | Upper | |
| DM | Baseline | 0.481 | 0.490 | 0.087 | 0.036 | 0.137 | 0.001* |
| | Post intervention | 0.579 | 0.498 | | | | |
| HTN | Baseline | 0.464 | 0.487 | 0.099 | 0.045 | 0.154 | <0.001** |
| | Post intervention | 0.544 | 0.471 | | | | |
| HCL | Baseline | 0.427 | 0.451 | 0.092 | 0.039 | 0.145 | 0.001* |
| | Post intervention | 0.531 | 0.466 | | | | |
| Undiagnosed | | | | | | | |
| DM | Baseline | 0.400 | 0.316 | -0.176 | -0.237 | -0.115 | <0.001** |
| | Post intervention | 0.252 | 0.336 | | | | |
| HTN | Baseline | 0.202 | 0.199 | 0.014 | -0.017 | 0.044 | 0.385 |
| | Post intervention | 0.196 | 0.177 | | | | |
| HCL | Baseline | 0.454 | 0.432 | -0.137 | -0.181 | -0.094 | <0.001** |
| | Post intervention | 0.387 | 0.500 | | | | |
| Body Mass Index | | | | | | | |
| Overweight | Baseline | 0.539 | 0.514 | -0.030 | -0.069 | 0.009 | 0.131 |
| | Post intervention | 0.486 | 0.497 | | | | |
| Obesity | Baseline | 0.451 | 0.420 | -0.019 | -0.062 | 0.024 | 0.383 |
| | Post intervention | 0.387 | 0.392 | | | | |
| Smoking | | | | | | | |
| Current smokers | Baseline | 0.169 | 0.169 | 0.017 | -0.005 | 0.038 | 0.123 |
| | Post intervention | 0.181 | 0.170 | | | | |
| Current smokeless | Baseline | 0.013 | 0.016 | -0.002 | -0.012 | 0.007 | 0.607 |
| tobacco user | Post intervention | 0.018 | 0.025 | | | | |

*Note: DID=difference-in-differences, I= Intervention, C=Control, DM=Diabetes Mellitus, HTN= hypertension, HCL= hypercholesterolemia. Data include repeated cross section data of people aged 30+ at baseline and post intervention. Analyses use OLS regression; the treatment effects are β coefficient in equation.*

**Significant at p<0.05*

***Significant at p<0.001*

## DISCUSSION

This is the first large-scale multifaceted intervention programme in Malaysia involving various initiatives at the primary health care and community levels. EnPHC had vastly enhanced screening activities on NCDs resulting in more populations been screened during the intervention period. Among the factors that could have led to this were introducing a community health coordinator at the district level to link health clinics and the community to implementing the interventions. This is further strengthened by incorporating NGOs in this programme to ensure sustainability. The involvement of volunteers in community-based intervention programs was also implemented successfully in other countries.[32] This strategy was also advocated by the Asia Pacific Economic Cooperation framework on community-based intervention to control NCD risk factors.[33] Another related intervention was enhancing social media and messaging applications as a strategic communication to increase enrollment in screening activities. The use of technology in the current digital era provides better engagement with the community in the current lifestyle.[34]

Timely detection of NCD risk factors is essential in the prevention and control of NCD complications. A well-structured screening programme can significantly increase the chance of detecting undiagnosed NCDs in the population. This was proven in this study as the prevalence of undiagnosed diabetes and hypercholesterolemia have reduced considerably in the community. Early detection and diagnosis with prompt treatment contribute to better outcomes of the diseases.[35] Unlike diabetes and hypercholesterolemia, this study observed no significant difference in the prevalence of undiagnosed hypertension between intervention and control sites, despite a significant increase in screening at the intervention sites. This study showed a slight reduction in the prevalence of undiagnosed hypertension in both intervention and control sites, resulting in no significant difference in the prevalence between the two sites. One of the possible explanations is that although the screening activity has increased, the detection of new cases of

hypertension has not increased proportionately at the intervention site in this study.

Our study found no significant changes in the prevalence of smoking, overweight and obesity. A review done on the effect of a community intervention on obesity in other countries was not encouraging.[36] However, a study by Dyson et al. involving three countries (China, Mexico and India) showed a significant reduction in tobacco use and a positive effect on BMI in the intervention group.[37] Our findings could be due to the short implementation period. Other studies that showed positive effects on NCD risk factors had a longer duration of implementation and required lifestyle changes.[18,38]

In this complex community-based intervention programme, it is vital to learn what and why some interventions work and do not. Evaluating this programme outcomes would benefit all the stakeholders in reviewing the program's content and its implementation. This new knowledge can further expand this intervention programme to a larger scale that is better tailored to the community and healthcare system.

There were few limitations in this study. This study evaluated EnPHC after 12 months of the intervention. This intervention period is shorter than many other studies[18,37,39]. As non-communicable diseases are chronic diseases, it would be essential to demonstrate if the observed outcomes can be sustained long term. The study used the clinics' characteristics as the criteria for matching without knowing the prior population characteristics. Therefore, there might be some differences in sociodemographic characteristics of respondents in the control and intervention groups. The other limitation of the study is the exclusion of certain variables that are related to NCD, such as diet, physical activity, and alcohol consumption. Future research should consider incorporating these factors to provide a more comprehensive analysis.

## CONCLUSION

In conclusion, after one year of EnPHC intervention, there was a significant reduction in undiagnosed diabetes and undiagnosed hypercholesterolemia at the intervention sites as compared to the control sites. However, there were no significant changes in the prevalence of undiagnosed hypertension, smoking, overweight, or obesity.

Despite the period of implementation of this intervention programme was relatively short, evaluation of this intervention programme does provide some necessary feedback that can be useful in future implementation. The findings of this study highlight the need for the evaluation of the intervention and its implementation. Although this intervention programme did not significantly affect NCD risk factors, it can still positively affect if a more extended intervention period is applied.

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Disclosure statement

All authors declared no potential conflicts of interest concerning the authorship and/or publication of this article.

Ethics and consent

Medical Research and Ethics Council approved this study. Written informed consent was taken from all the respondents for participation in this study.

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