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Effectiveness of nurse led screening and intervention for common non communicable diseases in a peri urban community of Chandigarh

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ABSTRACT

Background: Globally the non-communicable diseases (NCDs) are accountable for most of mortality and disability. The Lack of skilled human resources for health is one of the contributing factors for low screening coverage. Nurses plays a vital role, in the early detection and prevention of common NCDs. Objective of the study was to assess the effectiveness of nurse-led screening and intervention for common NCDs on risk factor modifications.

Methods: Pre-experimental design was used in the present study. The study was done in slum area Indra colony Chandigarh. A total of 500 individuals aged ≥30 years were enrolled from 2,700 households. All the subjects were screened for hypertension, diabetes mellitus and oral cancer. However in female participants addition screening of breast, and cervical cancer was also done. WHO STEPS survey was used to assess the risk factor of common NCDs. The interventional package on risk factor modifications for prevention of common NCDs was developed and was delivered to all subjects during home visits. The follow up to assess risk factor modifications was done after one month. The primary outcome of the study was risk factor modifications and prevalence of common NCDs.

Results: There was significant mean change in systolic blood pressure $(0.65\pm6.31 \text{ mmHg})$, diastolic blood pressure $(1.19\pm3.7 \text{ mmHg})$, body mass index $(0.95\pm0.85 \text{ kg/m}^2)$, and waist circumference $(1.5\pm1.46 \text{ cm})$ among subjects after one month of intervention (p value <0.05).

Conclusions: The Nurse-led screening and intervention for common NCDs was effective in risk factor modification among studied subjects.

Keywords: Interventional package, Nurse led screening, Non communicable diseases

INTRODUCTION

Non-communicable diseases (NCDs), also known as chronic diseases, tend to be of a long duration and are the result of a combination of genetic, physiological, environmental, and behaviors factors. As per the Global Burden of Diseases 2017 non-communicable diseases

accounted for 41 million of total deaths globally. The largest number of deaths estimated due to cardiovascular diseases (17.8 million) followed by neoplasms (9·56million) chronic respiratory diseases (3·91 million) and diabetes mellitus (1·37 million) in 2017. The deaths from NCDs increased globally, from 2007 (33·5 million) to 2017(41·1 million). In India NCDs contributed 63% all

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deaths in the year. The CVDs accountable for 27% of total deaths followed by other NCDs 13%, chronic respiratory diseases 11% and injuries 11%, cancers 9% and diabetes 3%.³

The high systolic blood pressure was the leading risk factor globally, accounting for 8·74% of total DALYs in 2017. Smoking was the second leading risk for both deaths and DALYs. It was responsible for 7.31% of total DALYs globally. ^{4,5} To a large extent, the NCDs are preventable by modifying the risk factors. About 3/4 of heart disease, stroke and type 2 diabetes, and 40% of cancers would be prevented by screening tests for early detection of unrecognized disease and treatment and behavioral risk factor modifications. ^{6,7} Primary prevention emphasizes on lifestyle changes to help reduce the risk factors of NCDs and at the secondary level of prevention the early diagnosis and treatment of NCDs can be done by screening test. ⁸

The Government of India has initiated population based screening for common NCDs under NPCDCS programme. The acute shortage and mal-distribution of the health workforce is a major obstacle in achieving better health outcomes for the prevention and control of NCDs. 9,10 Screening is an very important component in prevention and control of common NCDs. Some evidence suggests that the nurse led interventions are effective for prevention of NCDs. 11-14 Involvement of professional nurses in the NCDs screening, may help in, coverage of large population. So, the need was felt to assess the feasibility of nurse led screening and risk factor modifications for common NCDs. Hence, the present study was undertaken with the an objective to assess the effectiveness of intervention and nurse led screening for common NCDs on risk factor modifications in the peri urban community of Chandigarh.

METHODS

Study design used in the present study was Pre-Experimental. A total of 500 individuals aged ≥30 years from 2700 households were enrolled from month of July 2019 to September 2019 in present study. Sample size calculations were based on the prevalence of hypertension, which resulted in the sample of 500. Considering the 20% attrition sample size was rounded off to 500. All the calculations were done at 95% confidence interval and 80% power. The study was conducted in Indra colony, Chandigarh. Selected community was a periurban community. All the subjects enrolled in the study were screened for common NCDs i.e. Hypertension, Diabetes mellitus and common cancers (oral, breast and cervical). WHO STEPS tool was used to assess the NCD risk factors The inclusion criteria of study was individuals aged ≥ 30 years, willing to participate in the study and available during the period of data collection.

The exclusion criteria of the study was antenatal mothers and terminally ill patients.

The data was collected by house to house survey in the selected community. The blood pressure monitoring was done by the OMRON digital sphygmomanometer, blood glucose level was checked by the code free glucometer. The screening of oral cancer was done by oral visual examination of oral cavity for the presence of precancerous lesions. The Breast cancer screening was done by clinical breast examination and cervical cancer screening was done by visual inspection of cervix with acetic acid. All the screening procedures were carried out during home visit except cervical cancer. For screening of cervical cancer by visual inspection of cervix with acetic acid women were asked to report in Health and Wellness center of Indra colony, Chandigarh and screening of cervical cancer was done there.

The protocols were developed on B.P monitoring, Blood glucose monitoring, Oral visual examination, Clinical breast examination, and Visual inspection of cervix with acetic acid. The investigator who conducted all the screening test worked as a NCD staff Nurse in community health center Haryana for 6 months under which she had taken 2 days training from district hospital Ambala city Haryana. Before the start of study the investigator freshened up her skills under the supervision of senior resident of Health and Wellness center in the periurban community of Chandigarh. Screening and risk factor assessment was followed by an intervention related to lifestyle modification for which the interventional package was developed by the researcher

The interventional package on risk factor modifications for prevention of common NCDs consisted of the set of educational interventions. It was developed in the form of booklet and flash book which contained the information related to diet intake, tobacco and alcohol consumption cessation, physical activity, warning signs of cancer, importance of follow ups and regular health check-ups. It was implemented in the form of one to one teaching to the subjects. The content validity of the tool and protocols was confirmed for the completeness, content and language by the experts of different medical departments.

The primary and secondary outcomes of the study were risk factor modifications and prevelance of common NCDs (Hypertension, Diabetes mellitus) Follow up of the subjects was done at one month interval to assess the effectiveness of interventional package among the participants screened for common NCDs. Written informed consent was taken from all the participants. Study is approved by the Institutional ethics committee of PGIMER, Chandigarh.

Data analysis was done with the help of SPSS version 20. Both descriptive and inferential statistics were used to analyze the data. Percentage, frequency were used to describe the categorical data. Hoewever, mean, standard deviations were calculated for continuous variables. Chi square, paired t-test, Mc-nemar test were also applied to determine the level of significance at p<0.05.

RESULTS

Table 1: Socio-demographic profile of study participants screened for common NCDS.

Socio	Male f (%)	Female f (%)				
demographic profile	(n=173 (34.6))	(n=327 (65.4))	(%)			
Age (years)						
30-40	80 (46.2)	160 (48.9)	240 (48.0)			
41-50	38 (22.0)	93 (28.4)	131 (26.2)			
51-60	28 (16.2)	51 (15.6)	79 (15.8)			
>60	27 (15.6)	23 (7.0)	50 (10.0)			
Education						
No formal schooling	54 (31.2)	209 (63.9)	263 (52.6)			
Less than primary school	20 (11.6)	44 (13.5)	64 (12.8)			
Primary school completed	24 (139)	11 (3.4)	35 (7.0)			
Middle school completed	28 (16.2)	19 (5.8)	47 (9.4)			
Secondary school completed	28 (16.2)	22 (6.7)	50 (10.0)			
High school completed	8 (4.6)	16 (4.9)	24 (4.8)			
College/ university completed	11 (6.3)	6 (1.5)	17 (3.4)			
Marital status						
Single	5 (2.9)	0(0.0)	5 (1.0)			
Married	146 (84.4)	265 (81.0)	411 (82.2)			
Separated/Divorced/ Cohabiting	5 (2.8)	3 (0.3)	8 (1.6)			
Widowed/ Widower	17 (0.6)	59 (18.0)	76 (15.2)			
Occupation						
Government employee	9 (5.2)	2 (0.6)	11 (2.2)			
Non-government employee	74 (42.7)	12 (3.7)	86 (17.2)			
Self-employed	55 (31.8)	16 (4.9)	71 (14.2)			
Homemaker	3 (1.7)	267 (81.7)	270 (54.0)			
Retired	9 (5.2)	2 (0.6)	11 (2.2)			
Unemployed (able to work)	2 (1.2)	2 (0.6)	4 (0.8)			
Unemployed (unable to work)	21 (12.1)	26 (7.9)	47 (9.4)			
Socio economic scale (BG Prasad scale 2019)						
7008 and above (Upper class)	3 (1.7)	2 (0.6)	5 (1.0)			
3504-7007(Upper middle class)	14 (8.1)	10 (3.1)	24 (4.8)			
2102-3503 (Middle class)	26 (15.0)	38 (11.6)	64 (12.8)			
1051-2101 (Lower middle class)	101 (58.4)	232 (70.9)	333 (66.6)			
Below 1050 (Lower)	29 (16.8)	45 (13.8)	74 (14.8)			

A total of 500 subjects aged 30 years and above were screened from 2700 households over a period of three months from July to September 2019. Socio demographic profile of subjects revealed that nearly one third (34.6%) of participants were male. Nearly half (48%) of participants were in the age group of 30-40 years. As per educational status 52.8 % had no formal schooling and only 3.4% had completed their graduation . Majority (82.2%) of subjects were married and approximately half (54%) of the total participants were home maker. The socio economic status was assessed by using BG Prasad scale (2019) which showed that more than half individuals belong to lower middle class.

Table 2: Prevalence of hypertension and diabetes mellitus of study participants screened for Common NCDs.

Variables	Male	Female	Total
v arrables	n=173	n=327	n=500
Prevalence of hypertension	86 (49.7)	114 (34.8)	200 (40)
Old cases	24 (27.9)	58 (50.8)	82 (16.4)
New cases	62 (72.0)	56 (49.1)	114 (22.8)
Prevalence of Diabetes mellitus	54 (31.2)	70 (21.4)	124 (24.8)
Old cases	21 (38.8)	38 (54.2)	59 (11.8)
New cases	33 (61.1)	32 (45.7)	65 (13)

All the participants enrolled in the study were screened for blood pressure and Diabetes mellitus. Results showed that prevalence of HTN in the present study was 40% out of which 16.4% were known hypertensive and 22.8% were found to have raised blood pressure during screening. The JNC criteria was used for the diagnosis of the hypertension. The prevalence of DM in the present study was 24.8% out of which 11.8% were known diabetic and 13% were found high blood glucose level.

The Joint National Committe criteria categories was used for the diagnosis of hypertension. Blood pressure of participants were assessed, systolic and diastolic blood pressure were measured. In systolic blood pressure 53.2% of the males were found pre-hypertensive whereas, in females 33.6% of females were found pre- hypertensive. In diastolic blood pressure nearly half (45.7%) of males were found pre-hypertensive however, in females one third (37%) females were pre-hypertensive.

The categories of RBS was made as per the cut off given by NPCDCS programme. The 21.4% of the participants had >140 mg/dl and the 44.8% of participants had 101-140 mg/dl random blood sugar level however, 33.8% of individuals had <100mg/dl random blood sugar. The categories of BMI as per Asian Indian categories of BMI. The 54.7% of females and 26.9 % of males were obese with the total prevalence of obesity at 49% (p<0.05).

Table 3: Blood pressure, random blood glucose, overweight and obesity categories and prevalence of hypertension and diabetes mellitus of study participants screened for common NCDs.

Cotogonias (mm IIs)	Male	Female	Total	χ^2 (df)
Categories (mm Hg)	n=173	n=327	n=500	P value
Systolic blood pressure				
<120 mmHg (normal)	56 (32.4)	178 (54.4)	234 (46.8)	
120-139 mmHg (pre-hypertensive)	76 (43.9)	100 (30.6)	176 (35.2)	22.36 (3)
140-159 mmHg (stage1 hypertension)	32 (18.5)	37 (11.3)	69 (13.8)	< 0.01
>160 mmHg (stage 2 hypertension)	9 (5.2)	12 (3.7)	21 (4.2)	
Diastolic blood pressure				
<80 mmHg (normal)	61 (35.3)	169 (51.7)	230 (46)	22.04.(2)
80-89 mmHg (pre-hypertensive)	46 (26.6)	97 (29.7)	143 (28.6)	23.94 (3)
89-99 mmHg (stage1 hypertension)	46 (26.6)	42 (12.8)	88 (17.6)	<0.01
>100 mmHg (stage 2 hypertension)	20 (11.6)	19 (5.8)	39 (7.8)	
RBS category (mg/dl)				
<100	48 (27.7)	121 (37)	169 (33.8)	(51 (2)
101-140	79 (45.6)	145 (44.3)	224 (44.8)	6.51 (2)
>140	46 (26.5)	61 (18.6)	107 (21.4)	0.03
Overweight and obesity category				
<18.5 (underweight)	18 (10.4)	22 (6.7)	40 (8.0)	
18.5-22.9 (normal weight)	65 (37.6)	71 (21.7)	136 (27.2)	18.8 (3)
23-24.9 (overweight)	24 (13.9)	55 (16.8)	79 (15.8)	< 0.01
>25 (obese)	66 (38.1)	179 (54.7)	245 (49.0)	

Table 4: Effect of intervention on blood pressure, BMI, waist circumference and random blood sugar level among participants screened for common NCDs.

Physical Measurements	Pre Intervention Mean±SD	Post - intervention Mean±SD	Mean difference	Paired t-test T (p values)	Cohen,s d	
Systolic blood pressure (mm Hg)	123.26±18.51	122.61±12.21	0.65±6.31	64.317 (<0.01)	0.04	
Diastolic blood pressure (mm Hg)	82.46±11.29	81.27±7.59	1.19±3.7	42.24 (<0.01)	0.12	
BMI (kg/m ²)	25.30±5.58	4.35±4.737	0.95 ± 0.85	1.142 (<0.01)	0.18	
Waist circumference (cm)						
Males	86.78±11.21	85.49±9.8	1.29±4.2	3.98 (<0.01)	0.12	
Females	88.25±14.0	86.63±12.5	1.62 ± 2.92	10.05 (<0.01)	0.12	
Random blood sugar Level (mg/dl)	128.84±58.70	120.60±38.32	8.24±20.38	5.31 (<0.01)	0.16	

Cancer screening among participants screened for common NCDs

Cancer screening results revealed that 1.5% of subjects were VIA positive, however, 0.6% were confirmed cases of cervical cancer. Breast lump was found in 0.6% of females on CBE. However, the precancerous lesion in the oral cavity was not found in any of the subjects during an oral visual examination.

Follow up of the subjects was done after one month to assess the effect of interventional package on blood pressure, BMI, waist circumference, and random blood sugar. Result revealed a statistically significant difference as per the paired t-test (p<0.05). The mean systolic blood pressure decreased from 123.26 \pm 18.517 mmHg at baseline to 122.61 \pm 12.21 mmHg at follow up. Diastolic blood pressure decreased from 82.46 \pm 11.299 to 81.27 \pm 7.59. BMI decreased from 25.30 \pm 5.584 to 24.35 \pm 4.737. Waist circumference in males decreased from 86.78 \pm 11.21 to 85.49 \pm 9.8 however, in females decreased from 88.25 \pm 14.0 to 86.63 \pm 12.5. Random blood sugar level decreased from 128.84 \pm 58.70 to 120.60 \pm 38.32 (<0.05 as per paired t test).

The change in the prevalence of behavioral risk factors i.e. alcohol and tobacco habits, diet intake, physical activity is described in Tables 5 and 6.

In pre intervention the total tobacco users were 29.8% however, in post intervention the number of tobacco users significantly reduced (24.6%) as per Mc-nemar test (p>0.01). The alcohol consumption was reduced from 15.6% to 14.2%

Table 5: Changes in the behavioral risk factors of study participants screened for common NCDs.

Variables	Pre Intervention	Post Intervention	Mc Nemar Test				
Tobacco users	149 (29.8)	123 (24.6)	<0.01				
Type of tobacco	Type of tobacco use (N=149)						
Smokeless	67 (44.9)	57 (46.3)	0.03				
Smoking	82 (55) 103 (69.1)	66 (53.6)					
Frequency of T	obacco consur	nption (N=149))				
Daily	103 (69.1)	98 (79.6)					
Weekly	46 (30.8)	25 (20.3)	0.01				
Alcohol consumption within past 30 days	78 (15.6)	71 (14.2)	1				
Number of day	s consumed fr	uits in a typica	l week				
Never	165 (33)	0					
1-2 days	185 (37.0)	0					
3-4 days	42 (8.4)	291 (58.2)	< 0.01				
>4 days	108 (21.6)	209 (41.8)					
Number of Servings of fruits per day							
Never	348 (69.6)	0	< 0.01				
1 time	114 (22.8)	363 (72.6)					
2 times	34 (6.8)	109 (21.8)					
3 times	4 (0.8)	28 (5.6)					
Number of days consumed vegetables in a typical week							
2-4 days	28 (5.6)	23 (4.6)					
5-7days	472 (94.4)	477 (95.4)	0.01				
Number of Servings of vegetables per day							
1 time	406 (81.2)	14 (2.8)					
2 times	80 (16.0)	442 (88.4)	< 0.01				
3 times	14 (2.8)	44 (8.8)					

The proportion of fruits consumption in the 3-4 days of a week increased from 8.4% to 58.2% after intervention. In pre intervention only 8% of subjects consuming the one time fruits in a day but in the post intervention nearly two third (72.6%) of subjects started to consuming one time fruits in a day. In pre intervention majority (94.4%) of subjects were consume 5-7 days vegetables in a week but in post intervention a slightly increase only 1% (95.4%) of subjects consumed 5 days vegetables in a week. The proportion of vegetable consumption 2 times vegetables per day significantly increased from 16% to 88.4%. (p<0.05).

Table 6: Changes in the behaviour of study participants screened for common NCDs.

Variables	Pre intervention	Post intervention	Mc nemar test		
Physical activity					
Levels of physical activity					
Both types of activities	11 (2.2)	103 (20.6)	< 0.01		
one type of activity	368 (73.6)	351 (70.2)			
Not any type of activity	121 (24.2)	46 (9.2)	•		
Number of day	s to do physica	l activity			
Vigorous- inter	sity activity		-		
0 days	70 (14)	24 (4.8)			
1-2 days	365 (73)	359 (71.8)			
3-5days	4 (0.8)	55 (11.0)	< 0.01		
5 or more days	61 (12.2)	62 (12.4)	-		
Moderate inter	sity activity				
0 days	51 (10.2)	22 (4.4)	-		
1-2 days	139 (27.8)	89 (17.8)	< 0.01		
3-5days	9 (1.8)	80 (16.0)	-		
5or more days	301(60.2)	309(61.8)			
Number of tim	e spend on phys	sical activity			
Vigorous- intensity activity					
>15min	357 (71.4)	321 (64.2)	-		
16-60min	11 (2.2)	103 (20.6)	< 0.01		
61-120min	17 (3.4)	37 (7.4)			
121-180min	4 (0.8)	7 (1.4)			
181-240min	4 (0.8)	8 (1.6)	-		
>240min	37 (7.4)	0			
Moderate intensity activity					
>15min	144 (28.8)	82 (16.4)			
16-60min	146 (29.2)	171 (34.2)	< 0.01		
61-120min	141 (28.2)	154 (30.8)			
121-180min	10 (2.0)	64 (12.8)			
181-240min	3 (0.6)	7 (1.4)			
>240min	5 (1.0)	0			

The proportion of individuals who were not physically active significantly decreased from 24.2% to 9.2% after intervention. The proportion of subjects do not performing vigorous- intensity activity decreased from 14% to 4.8% However, proportion of subjects do not performing moderate- intensity activity decreased from 10.2% to 4.4% after intervention. In pre intervention only 2.2% of subjects spending to 16-60 minutes of day to carry out vigorous intensity activities. However, 20.6% of subjects started to spending 16-60 minutes of day for vigorous intensity activities after intervention. The proportion of subjects spending 16-60 minutes of day to carry out moderate intensity activities. Increased from 29.2% to 34.2% after intervention (p<0.01). Study concluded that the nurse led

screening and intervention for common NCDs was effective in risk factor modification.

DISCUSSION

Screening of common NCDs is an important element for early detection and treatment but due to lack of skilled health workers, inequitable distribution of workers and lack of specialized community based services the screening is not done adequately. Evidence from the western countries revealed that nurses work in both dependent as well as independent role as a nurse practitioner in screening and management of NCDs. 15 however; in our country the nurses have only limited roles. 16 Nurses with appropriate training and with requisite knowledge and skills can play crucial role in the prevention, screening and management of NCDs even in the low and middle income countries.¹⁷ However the role of nurses in population based screening for common NCDs is not much explored. Thus, the need for nurse-led screening and intervention for common NCDs was felt and the present study was undertaken

Pre-experimental research design was used to conduct study. Pretest and posttest were conducted to assess the effectiveness of interventional package. Although randomized controlled trial is an ideal study design but RCT was not chosen due of ethical constraints. It was unethical to not advice the participants for risk factor modifications after screening them for common NCDs. WHO STEPS instrument tool was selected for this study because it is a standardized, specific and, reliable tool. Many researchers around the global have used the same tool in their studies. ¹⁸⁻²⁰

In presents study the number of tobacco and alcohol users were reduced from 29.8% to 24.6%, from15.6 to 14.2% respectively. In present study the significant change was found in the number of participants consuming fruits 3-4 days in a week increased from 8.4% to 58.2%. The proportion of individuals who were not physically active significantly decreased from 24.2% to 9.2% after intervention. The inconsistent results were found in the study of Bhar et al due to different methodology and setting. 16

In present study the prevalence of physical risk factors overweight and obesity were 15.8%, and 49% respectively. A study of Thakur et al. results accounts for inconsistent results due to different sampling technique and large sample size. The prevalence of high blood pressure in present study was 40%. ICMR-INDIAB's study reported that prevalence of high blood pressure in Chandigarh was 13.6% which is in contrast to present study findings due to different methodology and research setting used. Another nationally representative study conducted by Thakur et al. in Punjab, Northern India reported prevalence of high blood pressure (40.1%) was consistent with results values of the present study (40%).

The prevalence of raised glucose level in present study was 24.8 %, similar results were stated by Thakur et al in their study Haryana, North India which results 26.2% prevalence of diabetes mellitus. A study was conducted by Anand et al had inconsistent results with present study which results only 8% prevalence of diabetes mellitus. The inconsistent results accounts due to tuberculosis patients were screened and setting of study was hospital in their study that was different from our study. The inconsistent results accounts due to setting (rural community) and sample size (Male 1998 and females 4997) of their study was different from our study.

The prevalence of cervical cancer reported by VIA test was only 1.5%. A study conducted by Vedantham et al results 5.5% VIA positive that was inconsistent results due to different methodology and setting with present study.²³ The prevalence of lump present in present study was 0.6% and majority of females were normal findings of CBE. National study conducted by Takkar et al that was similar results with present study 90% of females were normal CBE findings.²⁴

In the present study interventional package was developed based on risk factor for prevention of common NCDs, in the form of Booklet, and flash cards. This package consists of a set of educational interventions on risk factors modifications for NCDs. In present study significant change was found in the mean values of BMI and waist circumference in males decreased from 86.78±11.21 to 85.49±9.8 however, in females decreased from 88.25±14.0 to86.63±12.5 respectively and systolic blood pressure decreased from 123.26±18.517 mmHg to 122.61±12.21 mmHg and diastolic blood pressure decreased from 82.46±11.299 mmHg to 81.27±7.59 mmHg after intervention package on risk factor modifications for prevention of NCDs. National study conducted by Sharma Malvika et.al study results that significant reduction was seen in behavioural risk factors.²⁵

CONCLUSION

The study concluded the feasibility of Nurse led screening for common NCDs. Nurse led intervention proved to be effective in reduction of risk factors for common NCDs. The study results imply that nurses can be successfully involved in the task of secondary prevention of common NCDs.

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