

What are the Evidence Based Public Health Interventions for Prevention and Control of NCDs in Relation to India?

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ABSTRACT

The accelerating epidemics of noncommunicable diseases (NCDs) in India call for a comprehensive public health response which can effectively combat and control them before they peak and inflict severe damage in terms of unaffordable health, economic, and social costs. To synthesize and present recent evidences regarding the effectiveness of several types of public health interventions to reduce NCD burden. Interventions influencing behavioral risk factors (like unhealthy diet, physical inactivity, tobacco and alcohol consumption) through policy, public education, or a combination of both have been demonstrated to be effective in reducing the NCD risk in populations as well as in individuals. Policy interventions are also effective in reducing the levels of several major biological risk factors linked to NCDs (high blood pressure; overweight and obesity; diabetes and abnormal blood cholesterol). Secondary prevention along the lines of combination pills and ensuring evidenced based clinical care are also critical. Though the evidence for health promotion and primary prevention are weaker, policy interventions and secondary prevention when combined with these are likely to have a greater impact on reducing national NCD burden. A comprehensive and integrated response to NCDs control and prevention needs a “life course approach.” Proven cost-effective interventions need to be integrated in a NCD prevention and control policy framework and implemented through coordinated mechanisms of regulation, environment modification, education, and health care responses.

Keywords: Evidence base, India, NCD, public health interventions

Introduction

Noncommunicable diseases (NCDs) represent a cluster of major chronic diseases including cardiovascular diseases (CVDs), diabetes, stroke, cancers, and chronic obstructive pulmonary disease (COPD). A progressive rise in the burden of NCDs is attributable to the demographic and developmental transitions which are occurring in India

accompanied by an epidemiological transition.⁽¹⁾ Recent estimates project that NCDs accounted for the highest proportion of deaths (nearly 50%) in 2004.⁽²⁾ Many of these deaths occur before the age of 65 years. Over the next two decades, these diseases will contribute to rising high burdens of death and disability, with adverse impact on national development due to productivity losses which arise from premature death and prolonged disability.⁽³⁾

Therefore, there is a need to urgently formulate and implement prevention policies to reduce the burden of NCDs in India. In this review, we discuss the evidence for public health interventions in reducing NCD burden from both developed and developing countries and describe how such interventions can be contextualised to the Indian perspective.

Access this article online	
Quick Response Code:	Website: www.ijcm.org.in
	DOI: 10.4103/0970-0218.94705

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Received: 01-12-11, **Accepted:** 14-12-11

Scientific Basis for Prevention and Control of NCDs: Risk Factor Concept

NCDs have multiple determinants, including several risk factors which are common to different diseases. The “risk factor” concept provides the scientific basis for prevention and control of NCDs.^(4,5) Since risk factors exert a steadily rising effect on the risk of disease and interact with each other to increase the overall risk, strategies for prevention must attempt “to reduce risk” across the “whole population” and simultaneously “deal with multiple risk factors.” Behavioral risk factors such as unhealthy diet (diet rich in salt, sugar, and fat and low in fruit and vegetable intake), physical inactivity (sedentary life), tobacco consumption (tobacco smoking and use of non-smoking forms of tobacco), and alcohol use have been shown to increase the risk of several NCDs. Public health interventions which influence these behaviors through policy, public education, or a combination of both have the potential to be effective in reducing the risk of NCDs in populations as well as in individuals. Such interventions are also likely to be effective in reducing the levels of several major biological risk factors linked to NCDs (such as high blood pressure; overweight and obesity; diabetes; abnormal blood cholesterol).

Approaches to Prevention

A life course approach with a combination of population-based and high-risk strategies is recommended considering their synergistic, complementary, cost-effective, and sustainable impact on reducing NCD burden in India.

A “life course approach” is essential for prevention and control of NCDs in populations. This approach starts with maternal health, prenatal nutrition, pregnancy outcomes, proper feeding practices in infancy, and child and adolescent health through reaching children at school, youngsters at college, followed by interventions targeting adults to encourage healthy diet, regular physical activity, and avoidance of tobacco from youth into old age. In addition, those with manifest disease will need cost-effective medical interventions.

The “population approach” aims at reducing the risk factor levels in the population as a whole through community action. Since there is a continuum of risk associated with most NCD risk factors, this mass change is expected to result in mass benefit across a wide range of risk.⁽⁶⁾ The “high-risk approach” aims at identifying persons with markedly elevated risk factors, and also for people who have had an event and, therefore, at the highest risk of diseases. These individuals are then targeted for interventions to reduce risk factor levels. While many consider that the overall benefits to society are limited in terms of deaths or disability avoided as the number

of such persons is proportionately small in comparison with the total number at risk. However, given the rising burden of NCD risk factors, the high risk approach also have a role to play and should constitute a major component of public health interventions.

Although, the population strategy has the advantage of being lifestyle linked, inexpensive, and behaviorally more appropriate, the high-risk approach which is often pharmacological are more expensive but due to the large quantum of projected risk and anticipated benefit elicits better motivation in both patients and health care providers.⁽⁷⁾

Evidence from Published Literature

Key findings, from a vast body of published global research in relation to public health interventions reducing NCDs burden, are summarized below.

Reduction in tobacco use

Tax increases on tobacco products, with a resultant rise in their prices, have been shown to reduce tobacco consumption.⁽⁸⁾ The effect is especially greater on young persons and people in low-income groups who have limited disposable incomes and have a higher level of price-elasticity for tobacco consumption. This effect has been observed in many countries across high income and low/middle income countries with greater gain in saving number of deaths at latter. The World Bank has estimated that a 10% increase in tobacco prices can save up to 9 millions of lives in developing countries and around 1 millions of deaths in developed countries.⁽⁸⁾

A comprehensive ban on tobacco advertisement and promotion reduces the industry-driven demand for tobacco products and their consumption levels, especially among young persons. Partial bans are less effective. While the effects of such advertising bans are complementary to enhanced public awareness of the dangers of tobacco use, countries which have implemented a comprehensive ban have shown steeper rates of decline in tobacco consumption in comparison to those with no ban or partial bans.

Reduced exposure to second hand smoke (also called environmental tobacco smoke) decreases the dangers due to passive smoking. This can be achieved by bans on smoking in public places, public transport and indoor work places to reduce such harmful exposure to non-smokers. Such bans also promote tobacco cessation among smokers or at least reduce their consumption levels.⁽⁹⁾ The health benefits of such bans are evident in a surprisingly short time-frame [Box 1].⁽¹⁰⁾

In order to facilitate a comprehensive reduction in the

Box 1: Impact of public smoking ban on hospital admissions for acute coronary syndrome: Experience from Scotland

Epidemiological studies have shown that people living or working in an environment polluted with second hand smoke have a 30% increase in risk of a heart attack. Second hand smoke causes abnormalities in the blood vessel wall and increases the tendency of blood to clot, besides causing changes in heart rate and blood pressure. All of these can contribute to the precipitation of a heart attack.

Smoking was prohibited by law in all enclosed public places in Scotland since end of March 2006. Over the next 10 months after the promulgation of law, hospital admissions due to heart attacks decreased by 17%, in comparison to the average of the previous 10 months. A total of 67% reduction in hospital admissions involved non-smokers.

(Source: Pell et al, NEJM 2008)

use of tobacco and its products, India ratified the WHO Framework Convention on Tobacco Control which recommends several demand reduction measures and some supply reduction measures as components to be integrated into a comprehensive national strategy for tobacco control. Furthermore, the WHO has recommended the mpower package⁽¹¹⁾ which helps facilitate the implementation of six effective tobacco control measures proven to reduce tobacco use as described below:

- Monitor** Monitoring tobacco use by conducting effective surveys to support stronger tobacco control policies.
- Protect** Protecting people from tobacco smoke by effective smoke free laws that help quit smoking and lead to smoke free homes.
- Offer** Offering help to quit tobacco use; quit advice from health professionals is effective.
- Warn** Warning labels increase awareness of health risks.
- Enforce** Enforcing comprehensive bans on tobacco advertising and promotion reduces tobacco consumption by 7-16%.
- Raise** Raising taxes on tobacco products reduces tobacco consumption rates significantly.

Cessation of tobacco use is best promoted through a strategy which combines policy interventions such as raising taxes on tobacco products, advertising bans, health warnings on tobacco products, mass health education, behavioral counseling in community- and clinic-based settings in addition to the use of pharmacologic aids when indicated (nicotine replacement therapy or drugs like bupropion may be used).^(11,12)

Reduction in alcohol use

Recently the WHO has published a review of 1265 studies undertaken globally regarding prevention of psychoactive substance use.⁽¹³⁾ Available literature

indicates that no single intervention is effective, while combined and coordinated strategies are beneficial. Important public health interventions targeting reduction in alcohol use are summarized below.

Supply reduction measures

Sale to minors (Age at which alcohol is legally sold): For each delayed year of initiation into alcohol drinking, there is a significant reduction in the likelihood of developing alcoholism and the lifetime risk of alcohol abuse. Increasing the minimum drinking age results in reduction of adolescent drinking and road crashes.⁽¹⁴⁾ Another analytical study proposes that making 21 years as the uniform age at which alcohol is legally available in countries like India can bring about a prohibition like effect to the extent of 50-60%.⁽¹⁵⁾

Price of the Alcoholic Drinks: The real price of the alcoholic drink significantly influences the type of drink consumed and the quantum consumed; taxation on alcoholic drinks directly affects the price of alcohol and plays an important role in mitigating the harm from alcohol. The state of Uttar Pradesh in India saw a doubling of beer consumption for the years 99-00 and 00-01 when market price of beer was reduced by 15-20%.⁽¹⁶⁾ An evaluation of population based program in Australia, which included increasing the real price of alcohol demonstrated reduction in estimated alcohol caused deaths, hospital admissions for non-road injuries, road crash injuries, per capita consumption, and also self-reported hazardous consumption over the 9 year period.⁽¹⁷⁾

Demand reduction measures

Screening for Alcohol and its Related Problems (Early Detection and Brief Screening): Inpatient treatment may be required only for severely dependent patients, while brief out-patient interventions may be suitable, and cost-effective options for less severe forms of alcohol dependence.^(18,19) Short-term successes have been demonstrated in the designated de-addiction centers with respect to those who have a hazardous and dependant drinking patterns. Multiple modes of therapy and appropriate rehabilitation are constituents of a successful program.⁽²⁰⁾

Work place initiatives

The workplace alcohol prevention program among the public sector Road Transport Corporation workers in Bangalore demonstrated that an effective and early intervention for employees with alcohol-related problems was associated with reduction in accident rates and other violent incidents.⁽²¹⁾ Similar experience has been demonstrated in other countries as well.^(22,23)

Mass Media, Community-Based Awareness Programs

and Health Promotion Complementary and reciprocal community actions pursued in conjunction are more effective than media campaigns alone. Community initiatives are more successful in influencing public perception of the problems, their knowledge base, and acceptance of policy alternatives than effecting changes in individual consumption levels. Complementary general health/life skills education produces greater changes in behavior and can ideally be integrated into a school curriculum.⁽²⁴⁾

Interventions promoting healthy diet

Experience from Poland shows that significant benefit can accrue from population wide preventive measures, in terms of NCD mortality declines, even in a short time frame [Box 2].

Based on extensive global evidence, WHO's global strategy on diet, physical activity, and health recommended several measures which would promote health and reduce the risk of NCDs⁽²⁶⁻²⁸⁾ as presented below:

- Achieve energy balance and a healthy weight
- Limit energy intake from total fats and shift fat consumption away from saturated fats to unsaturated fats and toward the elimination of trans-fatty acids
- Increase consumption of fruits and vegetables, and legumes, whole grains, and nuts
- Limit the intake of free sugars
- Limit salt consumption from all sources and ensure that salt is iodized

Population-based studies, some involving long term follow up, show that persons who consume less salt (<6 g/day) are less likely to suffer from hypertension than those who consume a higher amount (>10 g/day).⁽²⁹⁻³²⁾

Overweight and obesity are best prevented by adopting healthy dietary practices (avoiding excess intake of calorie-rich foods and ensuring adequate intake of high-fiber foods like fruits and vegetables) as well as regular physical activity (which provides for adequate energy expenditure). Other potential interventions for which evidence of benefit is available are:

Exclusion of trans-fats from the diet and limiting saturated fat intake to less than 10% of daily energy intake (preferable around 7%), and^(27,33,34) regular intake of fish (on at least 2 days a week).⁽³⁵⁾ Other foods (such as soya and nuts like almonds, walnuts pistachio, and peanuts) also have favorable effects on blood lipids.^(27,35)

Intake of fruits and vegetables (which contain anti-atherogenic soluble fiber, anti-oxidant vitamins, and other phytonutrients) help to alter the effects of blood

Box 2: Diet drives mortality decline in Poland

Between 1960 and 1990, Poland experienced a serious increase in death rates from heart disease among young and middle-aged populace. Unexpectedly, beginning with political and economic changes in 1991, this trend sharply reversed. Death rates declined dramatically, with an annual rate of decline of 6.7%. A sharp reduction in CHD mortality was the principal cause of this decline in overall mortality.

These results have been attributed principally to the replacement of dietary saturated fat with polyunsaturated fat. Vegetable fat and oil consumption increased (primarily in the form of rape-seed and soybean oil products), while animal fat consumption, mainly butter, declined. These trends were associated with the removal of price subsidies on butter and the availability of cheaper vegetable oils. Other factors contributing to the decline include increased fruit consumption and decreased tobacco use.^(12,25)

lipids on blood vessels.^(28,35) The minimum recommended intake is five servings of fruits and vegetables daily. But in India, a very small proportion of people are able to achieve this minimum goal due to high costs. Therefore, policy measures through multisectoral action are needed to increase the availability of fruits and vegetables. Further measures are needed to prevent loss during storage and transportation. Encouraging consumption of locally available and inexpensive fruits and vegetables could be an alternative strategy.

Increasing physical activity

Increased physical activity has been shown to have a favorable effect on blood pressure, cholesterol and reducing obesity and overweight. Physical activity can be enhanced by interventions at the personal, family, community, and national/sub-national levels. The success of a mass campaign for the promotion of physical activity is illustrated by the "Agita Sao Paulo" program of Brazil [Box 3].⁽²⁹⁾

Public health interventions, for which evidence exists to support their effectiveness in increasing physical activity, are summarized below [Table 1].

Many studies show an association between the built environment and physical activity levels, but few studies are able to show that changes to the built environment will directly lead to improvements in activity.^(36,37) The current body of evidence is relatively weak in showing that changes to the built environment will promote activity. However, many communities are undertaking efforts to improve the built environment. These efforts provide important research opportunities to examine the impact of built environment changes on activity.

A multi-faceted approach may be needed to increase activity in communities as many intersecting factors influence physical activity. Changes to community environments will need to be combined with policy changes, health promotion activities, greater social

Table 1: Interventions to promote physical activity: Effects and evidence*

Area of focus	Intervention	Comment
Informational approaches to increasing physical activity	Community-wide campaigns	Recommended
	Point-of-decision prompts (e.g., signs or posters at elevators and stairs)	Recommended
	Mass media campaigns	Evidence needed to evaluate effectiveness
Behavioral and social approaches to increasing physical activity	Classroom-based health education focused on providing information	Evidence needed to evaluate effectiveness
	School-based physical education	Recommended
	Social support interventions in community settings	Recommended
	College-based health education and physical education	Evidence needed to evaluate effectiveness
	Class-room-based health education focused on reducing television viewing and video game playing	Evidence needed to evaluate effectiveness
Environmental and policy approaches to increasing physical activity	Family-based social support	Evidence needed to evaluate effectiveness
	Creation of or enhanced access to places for physical activity combined with informational outreach activities	Recommended
	Point-of-decision prompts	Recommended

*Adapted from Zara S et al 2005

Box 3: Sao Paulo on the move for health

The Agita Sao Paulo program promotes physical activity among the 37 million inhabitants of the state of Sao Paulo, Brazil. The program organizes city-wide mega events as well as regular community based physical activity promotion programs through 300 partner institutions and their networks. The program is largely state funded, within an investment of less than US \$ 0.5 per inhabitant per year.

Results of population surveys showed that the prevalence of respondents engaging in regular physical activity rose from 55% in 1999 to 60% in 2003. Targeted subgroups showed much more dramatic improvements, with a 96% increase in the performance of regular physical activity in a subgroup of persons with high blood pressure and diabetes who received personalized advice in education sessions.

support for activity, and individual interventions that incorporate theories of behavior change.

Community mobilization

A landmark study in Finland, involving a comprehensive community-based intervention in North Karelia, showed that the program substantially lowered NCD risk factor levels and mortality rates over a 20 year period.⁽³⁸⁻⁴⁰⁾ However, it should be noted that the control population also demonstrated similar reductions. Potential explanations include secular changes, contamination, or a policy effect which affected the whole population.

Another “healthy living” program in Mauritius, which combined health education of people with policy changes leading to the substitution of palm oil with soyabean oil, as subsidized “ration oil,” resulted in the reduction of multiple NCD risk factors within a 5 year period [Table 2].⁽⁴¹⁾

China has been implementing several community-based projects for NCD prevention and control. Starting with the city of Tianjan in 1984, a total of 32 demonstration sites have been organized across the country. Notable outcomes so far have included a reduction in the annual CVD deaths in those patients with high blood pressure

Table 2: Results of NCD intervention in mauritius

Results	Men	Women
HT prevalence	15% → 12.1%	12.4% → 10.9%
Cigarette smoking	58% → 47.2%	6.9% → 3.7%
Heavy alcohol consumption	38.2% → 14.4%	2.6% → 0.6%
Moderate exercise	16.9% → 22.1%	1.3% → 2.7%
Mean population serum cholesterol	5.5mmol/l → 4.7mmol/l	

who were being managed, from 1.6% to 0.8% between 2000 and 2002. In Shenyang, there was a reduction in the prevalence of adult smokers from 29% to 13% between 1997 and 2002 and an increase in the proportion of people participating in planned regular physical activity from 41% to 84% in the same period.^(42,43)

The benefits of health promotion not only benefit adults who are at an immediate risk of NCD, but also pass on the benefits to other immediate and distant family members who will grow without exposure to NCD risk factors.

Secondary prevention**Best example for secondary prevention of CVD**

Persons who have an established CVD, or even preceding conditions like angina or transient ischemic attack, are at a high risk of a future heart attack, stroke, or sudden death. Early diagnosis and management is highly effective in reducing the risk of recurrent adverse events in such persons.⁽⁴⁾ This is possible through the use of drugs like aspirin, beta blockers, statins, ACE inhibitors and diuretics. These drugs have been shown to be protective, alone and in combination, in many clinical trials.⁽⁴⁴⁻⁴⁹⁾ Health care delivery systems must be made effective vehicles for providing the benefits of such secondary prevention to those who need it. The costs, however, are a constraint. The recent development of combination pills containing off-patent generic medications holds promise for highly affordable and effective treatment.

Evidence is emerging on the use of polypill strategy in high-risk populations.

Prevention of cancers

Cancers of lung, stomach, liver, esophageal and colorectum are major types seen among men while cancers of cervical, breast, stomach, lung, esophagus account for the top five cancers among women.⁽⁵⁰⁾ Among primary prevention interventions for cancers, immunization against liver cancer (HBV) is currently in widespread use. Cervical cancer (HPV) vaccination for cervical cancer prevention permits later age of screening and less frequent screening interval, which is likely to be cost-effective for developing countries.⁽⁵¹⁾ Early detection of cancers through screening offers enough opportunity for effective early treatment. Studies in India have proved that the lifetime risk for cervical cancer was reduced by 25-35% with a single lifetime screening by either one-visit Visual Inspection after application of acetic acid (VIA) or two-visit HPV DNA testing targeted at women age 35-40 years. Risk was reduced by more than 50% if screening was performed two or three times per lifetime and would be extremely cost-effective.⁽⁵¹⁾ Furthermore, tobacco control policies and programs, particularly among children and adolescents, would result in greatest potential gain in life years.

Prevention of chronic respiratory diseases of Indoor air pollution origin

The use of solid fuels such as biomass and coal substantially contribute to the chronic respiratory disease burden (acute lower respiratory infection, chronic obstructive pulmonary disease).⁽⁵²⁾ Globally, solid fuels were estimated to account for 1.6 million excess deaths annually and 2.7% of disability-adjusted life years (DALYs) lost, of which, approximately 37% of this burden (DALYs) occurs in South Asia and estimated 400-550 thousands premature deaths just in India.^(53,54) The personal exposure to indoor air pollution can be substantially reduced with either replacing the fuel (replacement of wood, dung, crop residues, and coal for cooking and heating with kerosene and LPG) or by replacing the traditional stoves with improved stoves for burning traditional biomass fuels. A cost-effective analysis regarding the usage of above alternatives on health outcomes indicate that an improved biomass stove is the most cost-effective intervention for South Asia.⁽⁵³⁾

Examples from India

School-based interventions for health promotion

Several school-based health education in India⁽⁵⁵⁻⁵⁷⁾ have successfully reduced the rates of both experimentation with tobacco and offer of tobacco by peers [Box 4].

Box 4: School based tobacco prevention program in India

Experience in India suggests that multicomponent intervention is effective in delaying onset and reducing tobacco use among youth. Project HRIDAY was a school-based cluster randomized trial in India of 30 public and private elementary schools. The study showed that an intervention that included information provision, interactive classroom activities, and roundtable discussions reduced experimentation, intentions to use tobacco, and offers of tobacco among the intervention schools. Another randomized intervention trial designed and implemented in Indian schools was Project MYTRI (Mobilizing Youth for Tobacco Related Initiatives in India). After a rigorous 2-year tobacco use prevention intervention, students in the intervention schools were significantly less likely than controls to exhibit an increase in cigarette or bidi smoking.

Evidence from worksite interventions for health promotion

Alternative non-pharmacological approaches targeted to multiple risk factor reduction in non-randomized evaluations in Indian factory study showed promising results [Box 5].⁽⁵⁸⁾

Community mobilization program in India

Community-based awareness program like PACE Diabetes project in Chennai showed considerable benefits in terms of promoting health education for healthy diets, increasing physical activity, and screening for diabetes prevention and control [Box 6].⁽⁵⁹⁾

Quality improvement program in secondary prevention

Evidence from a Quality Improvement Programme (QIP) carried out at secondary healthcare setting in Kerala involving the use of a service delivery package and formal education, in the detection and optimal management of ACS for healthcare professionals, has shown estimable results and can be replicated.⁽⁶⁰⁾ Improvements in evidence-based treatment practices were observed after the comprehensive QIP. The Time to Thrombolysis (TTT) dropped significantly (median difference of 54 minutes, $P < 0.05$) after the intervention program. Additionally, when TTT was stratified into different groups, 52.1% of STEMI patients received thrombolysis within the first 2 hours of the onset of symptoms in the post-intervention group as compared with 45.3% in the pre-intervention group. Such a significant reduction in TTT has the potential to improve clinical outcomes in patients with ACS.⁽⁶⁰⁾ The methods used to implement this program are readily available and could be easily implemented in any similar hospital and community setting.

What is Needed for Public Health Interventions

At the macro-policy level, the need to identify NCD prevention as part of the primary health care package should be recognized and given due priority alongside

reproductive and nutritional health and communicable diseases.

NCD prevention should be seen as being synergistic with poverty reduction strategies, and addressed in development initiatives. Policy initiative should aim to integrate NCDs with communicable disease, reproductive health and population control programs in an attempt to create cost- and time-effective opportunities for prevention.⁽⁶¹⁾ Policy change with respect to NCD must include relevant areas in the domains of food and nutrition, tobacco, agro-industrial diversification, urban planning, education, and rural development.^(3,12,62) Policies should ensure the availability of effective drugs, devices, and procedures at affordable prices to be used in a cost-effective manner. Policy issues regarding tobacco should be dealt at two stages. Initial priorities should focus on goals that are realistically achievable in the short to medium term, such as imposing bans on advertising and sale to minors, displaying statutory warnings on labels, and legislation to ban smoking in public places and transport utilities. Subsequently, major issues should be addressed such as agro-industrial diversification favoring tobacco substitution and transnational marketing of tobacco, which may affect pricing, production, and taxation [Box 7].⁽⁶³⁾

Multi-sectoral coordination approach

Prevention of NCD requires multi-sectoral co-ordination to provide an “enabling” environment which help people to make and maintain healthy choices. Many sectors, other than the traditional health sector, like agriculture, urban development, and education, need to work in concert to address the multiple determinants of NCDs through multi-sectoral pathways. Furthermore, setting up a suitable institutional mechanism to enable active partnership of multiple government ministries such as health, finance, excise, and taxes, home, education, agriculture, civil supplies, food processing, urban and rural development and panchayat raj, information and communication and participation of civil society organizations, private healthcare sector, media, donor organizations, and corporate is equally important to devise policies and programs which will find wide acceptability, an essential criterion for successful implementation.

In order to effectively coordinate these multiple stakeholders, the health ministry, both at central and state levels, would require a cadre of public health professionals (epidemiologists, health economists, health-management specialists, nutritionists) who can assist with developing evidence-based NCD policies, cost-effective NCD programs, and facilitate monitoring and evaluation of such policies and programs. Health impact assessment, of proposed policies and programs

Box 5: Impact of worksite intervention program in India

A multicomponent and multilevel intervention was implemented by trained, locally stationed, project healthcare personnel in 10 participating industries, in India, over a period of 4 years. A population-based approach was the mainstay of the intervention, which was augmented by high-risk and combination of policy and environmental approaches.

The study demonstrated the feasibility of a comprehensive CVD prevention program in reducing CVD risk factors level in the intervention group as compared to the control group.

BOX 6: Prevention awareness counseling and evaluation (PACE) project in South India

PACE Diabetes Project is a large scale community based project carried out to increase awareness of diabetes and its complications in Chennai through (1) public education, (2) media campaigns, (3) general practitioner training, (4) blood sugar screening, and (5) community based “real life” prevention program. With the help of the community, awareness programs were conducted at residential sites, worksites, places of worship, public places, and educational institutions through lectures, skits, and street plays. Messages were also conveyed through popular local television and radio channels and print media. The General Practitioners (GPs) program included training in diabetes prevention, treatment and the advantages of early detection of complications.

The project demonstrated that mass awareness and screening programs are feasible and, through community empowerment, can help in prevention and control of diabetes and its complications.

Box 7: Tobacco taxing for health

Tobacco taxes have been used not only as price-linked mechanisms for discouraging tobacco use, but also as a means of raising resources to fund health promotion and tobacco control programs. Victoria (in Australia), California (in USA), Thailand and Nepal are among the countries that have supported public health programs through such as “sin tax.”

Similarly, it is also possible to levy “highway taxes” to gather earmarked revenues to support urban facilities for promoting physical activity and taxing unhealthy processed and “fast” foods to subsidize health promoting foods.

in other sectors which may influence the determinants of NCDs, should be prospectively undertaken.⁽⁶⁴⁾

Conclusion

Interventions influencing multiple risk determinants (both behavioral and biological risk factors) to prevent or reduce the NCD risk include: (a) policy interventions (related to tobacco control, alcohol reduction, production and supply of healthy foods, regulation of unhealthy foods, and urban planning which promotes physical activity); these have benefits for all the major NCDs; (b) empowerment of communities through health promotion programs (which enhance knowledge, motivation and skills in turn foster awareness and adoption of healthy behaviors); (c) early detection of individuals at high risk (due to modest elevations of multiple risk factors or marked elevation of a single risk factor) and effective interventions to decrease those risks (by reducing blood pressure, blood cholesterol, blood glucose, overweight

and promoting tobacco cessation, physical activity, and healthy diets); (d) secondary prevention in persons who have developed CVD (by using similar measures and employing effective drugs with proven survival benefits, such as aspirin, beta blockers, ACE inhibitors, statins, diuretics and blood sugar lowering oral drugs or insulin), preventative screenings for cancer prevention and replacement of solid fuel with LPG to prevent COPD due to indoor air pollution.

Community empowerment is crucial for the success of all such programs and partnerships among different stakeholders are required to provide effective pathways for the design and delivery of NCD prevention and control programs. The limited resources available for health programs amidst competing priorities in India, necessitates the adoption of a “stepwise approach” to prevention as recommended by the WHO.⁽¹²⁾ This approach is practical and should be undertaken in phased and progressive manner for implementation of sequentially prioritized measures.

Contributions of authors

K. S. Reddy and D. Prabhakaran developed the concept of this paper. K Singh compiled the literature and wrote the first draft of this paper. All authors contributed further and modified the paper.

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How to cite this article: Singh K, Reddy KS, Prabhakaran D. What are the Evidence Based Public Health Interventions for Prevention and Control of NCDs in Relation to India?. *Indian J Community Med* 2011;36:23-31.

Source of Support: Authors declare that they have not received any funds for writing this review article. DP is supported by National Heart Lung Blood Institute BAA grant number HHSN268200900026C and National Institutes of Health – Inter disciplinary Research Training grant number 1D43HD065249-01. He has received grant support from Wellcome trust, NCI, European commission, United Health, Eli Lilly, Duke University and Canadian Institute of Health Research and the Indian Council of Medical Research., **Conflict of Interest:** None declared.